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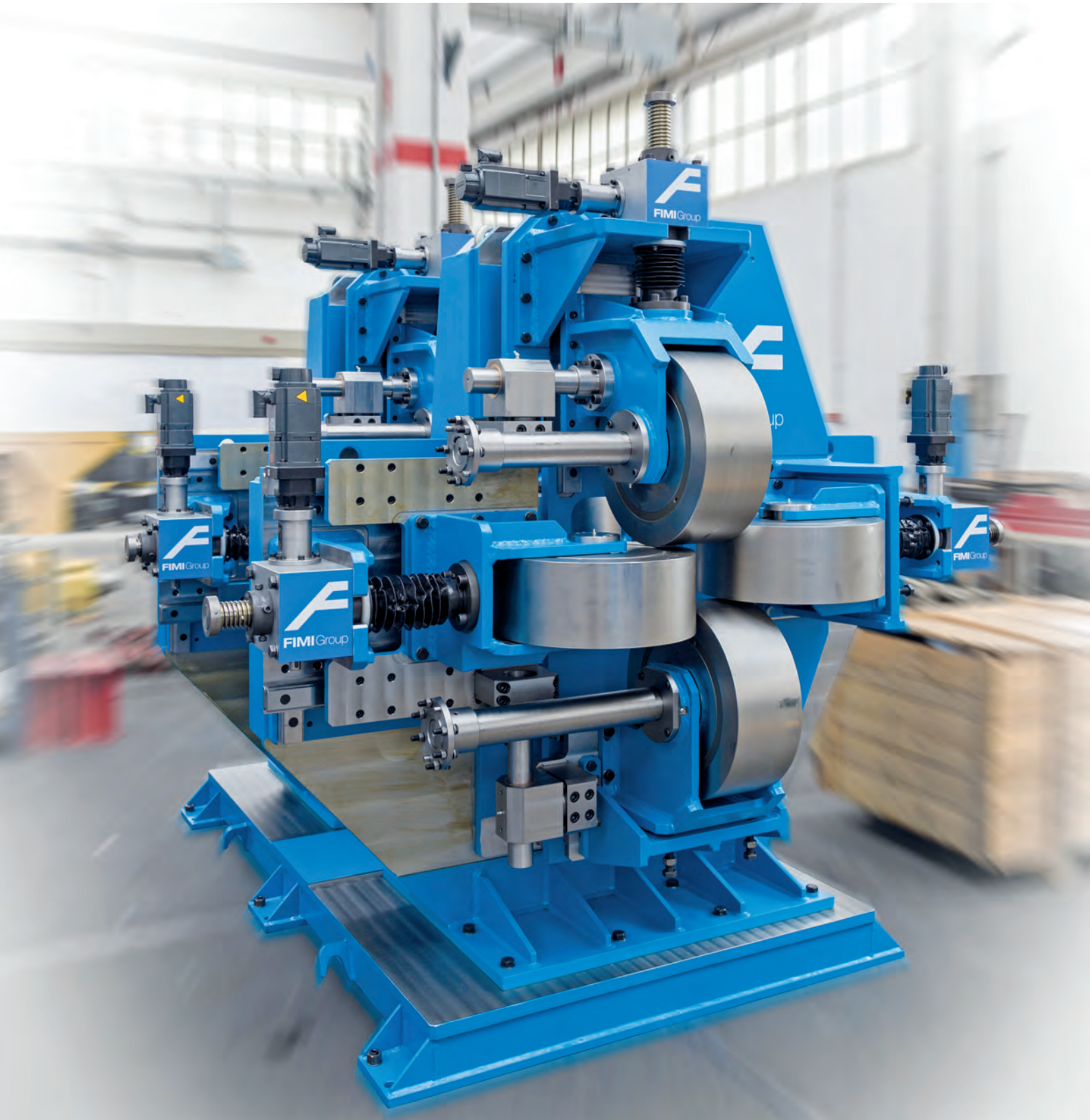

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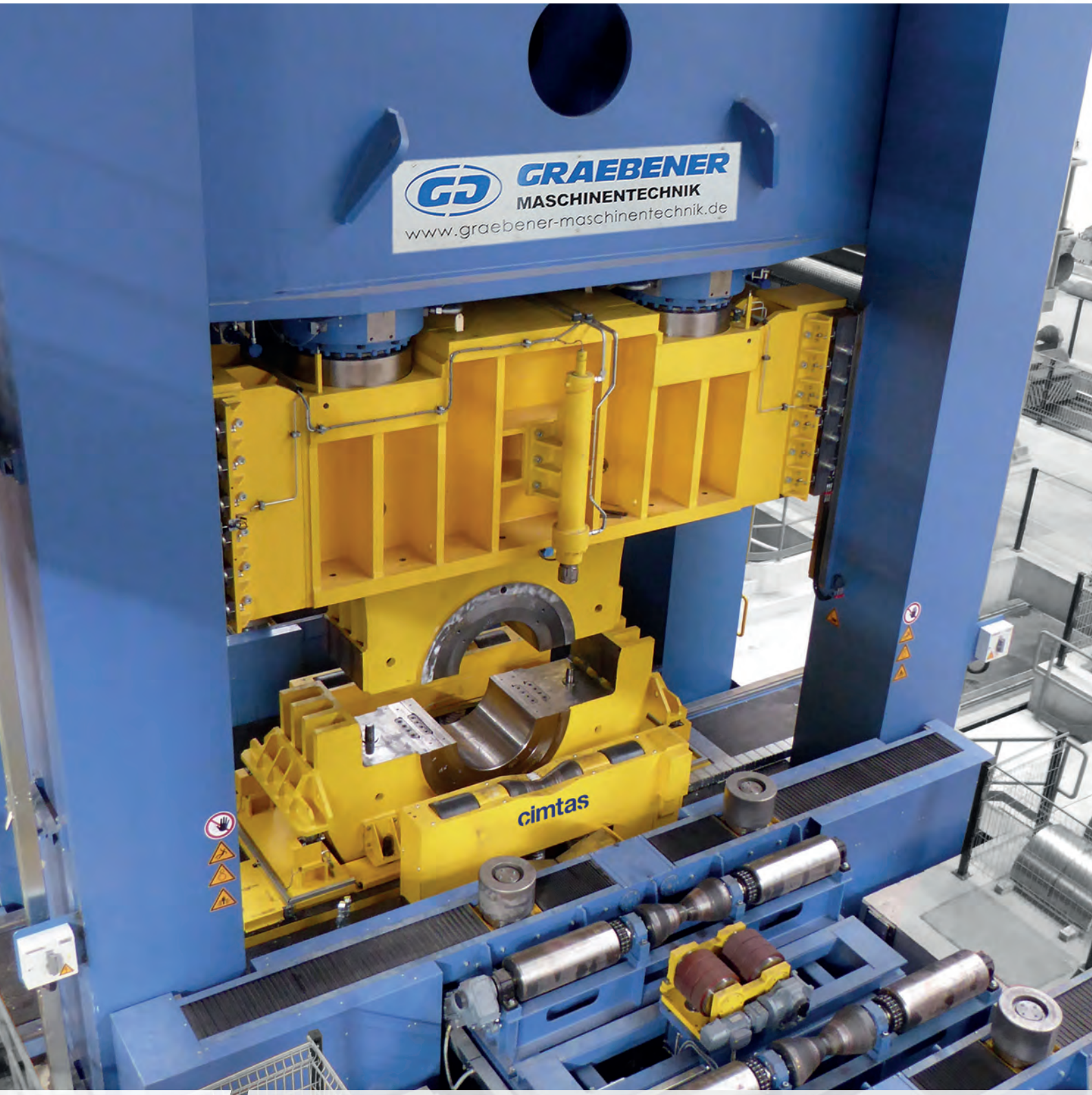

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Greetings from Dr. Gunther Voswinckel President International Tube Association

A warm welcome to the latest edition of ITAtube Journal.

The most recent forecasts predict that the upward trend in steel and related markets is set to continue, though slower. Global steel demand will grow 1.8 percent this year and 0.7 percent next year, driven by favorable world economic momentum, though the market faces risks from rising trade tensions, says the World Steel Association (worldsteel).

The demand for pipes remained comparatively low over the past few years due to subdued oil prices. But recently, the pullout of the US from the Iran nuclear deal and threatened sanctions by the US against Iranian and Venezuelan oil and gas exports sent oil prices to a four-year high of over US$ 80/barrel.

Meanwhile, overcapacity in many regions of the world is leading to further consolidation in the steel tube industry. While pipe prices continue to climb, more demanding high-tech products are the strategic targets, rather than commodity-grade tubes. In this context, trade fairs and expos are of vital importance beyond their value as a marketing forum for individual companies. They let us share and promote the results that will allow us to move forward as an industry and they help us to foster exchange, which drives innovation. As the Messe Düsseldorf press team reported following this year's Tube fair in Düsseldorf back in April, German companies are benefitting from a positive global business climate. The Tube 2018 organizers reported this year's fair was "bigger than ever" and high levels of professional competence once again distinguished the visitors who came to Düsseldorf from all over the world. The next Tube Düsseldorf – the ITA equivalent of a home game – is of course in 2020 (March 30-April 3). In the meantime, we are here to keep you updated on a raft of other events for your diaries:

At April 10, 2019, the next ITA conference is scheduled to take place under the heading, Trend-setting technologies and strategies for tubes & pipes. Convening in Düsseldorf, Germany, it will follow the now familiar format with a list of expert speakers and presentations, a tabletop exhibition and plenty of networking opportunities. Just visit https://www.conference.itatube.org for all further details and booking help.

Consolidation and adaptability in a more high-tech environment form the focus of a one-day conclave organized by the International Tube Association India Chapter, in association with Messe Dusseldorf India, on November 28, 2018 (alongside Messe Dusseldorf India's Exhibition on Tube, Wire and Metallurgy, between 27th and 29th November 2018, in Mumbai). The theme is Transformation of Tube and Pipe Manufacturing Adopting Digital Technologies, and it will focus on topics like Industry 4.0, industrial robotics, predictive maintenance, vision systems and similar, as applied to tube and pipe manufacture.

The fourth edition of indometal makes a return on October 17-19, 2018, at the Jakarta International Expo. Jointly organized by Messe Düsseldorf Asia and PT Wahana Kemalaniaga Makmur (WAKENI), the exhibition is driven by the established know-how and credentials of German-based events

Dr. Gunther Voswinckel
President ITA

under the Messe Düsseldorf group, and there will be an ITA contingent there for the first time.

Another premier for the ITA – though a lot closer to home – is the VALVE WORLD EXPO 2018. The world of valve manufacturers and users is meeting in Düsseldorf again on November 27-29, 2018. This will be the fifth time in Düsseldorf that international specialists in valves, valve-related products, actuators, compressors and engineering services as well as publishing companies and software houses gather to showcase technical highlights of their industries.

The details of all of these events and others, with links to the event-related websites, can be found on our must-visit website, https://www.itatube.org – under Events.

In its own modest way, the ITAtube Journal is also a forum for the exchange of news and ideas, and the electronic version can also be accessed from the website. We hope you profit from this edition and look forward to a fruitful discussion of the many ideas broached within these pages.

Enjoy the read!

Yours sincerely,
Dr. Gunther Voswinckel

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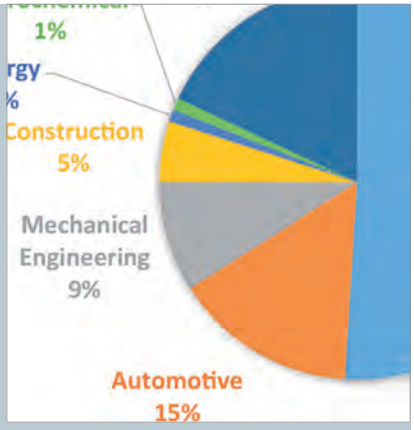

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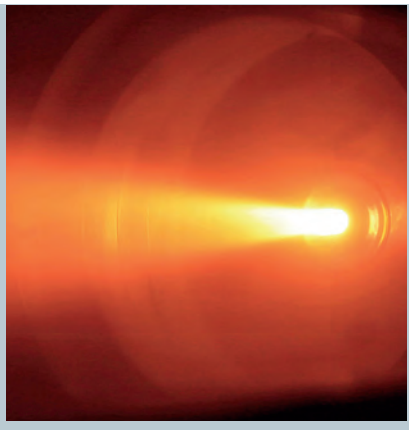

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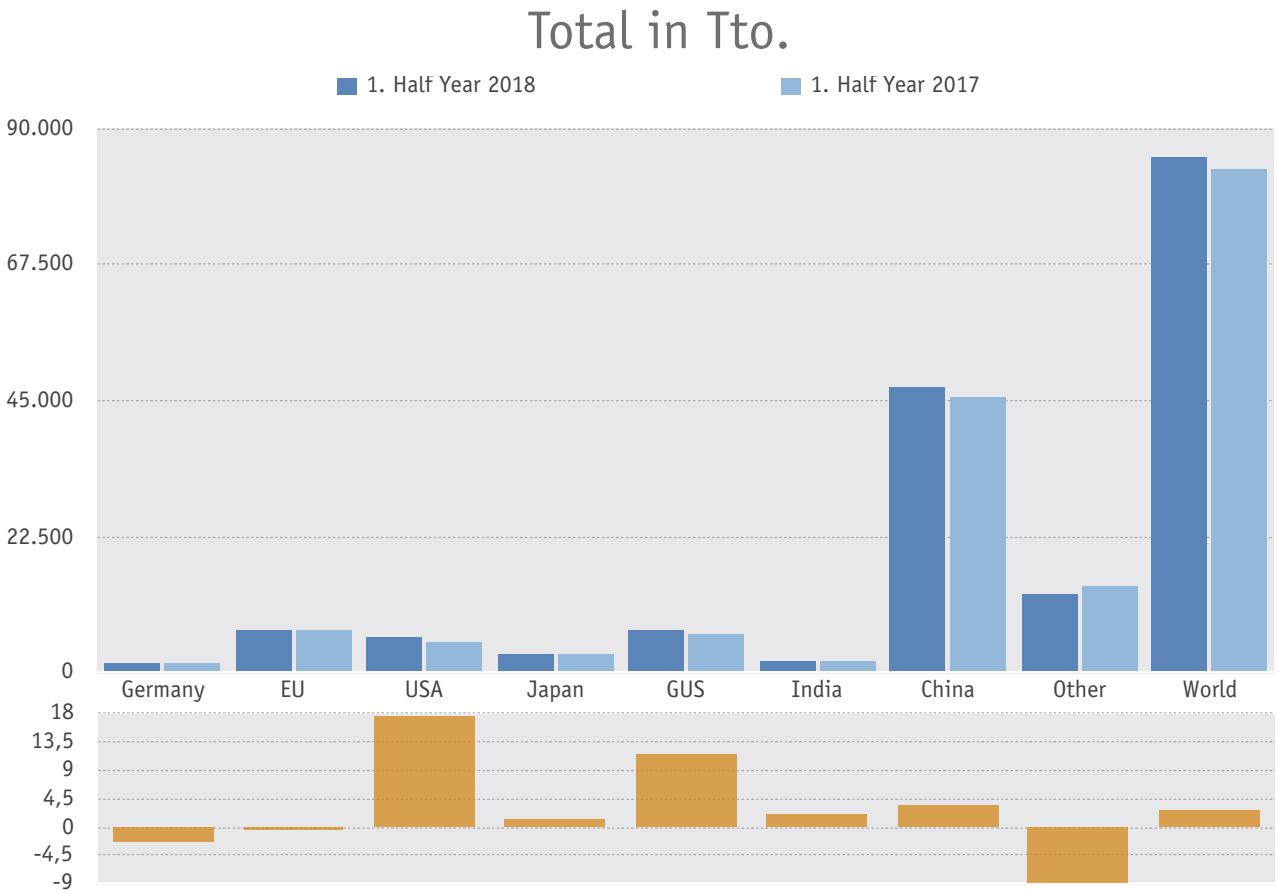
ITA Inside

World Steel Tube Production – Forecast

In the first half of 2018 the World Steel Tube Production reaches 85.3 million tons, an increase of 2.5 %. The production of seamless tubes increased 1.3 % to 21.0 Mio to, significant is the increase in the USA with 19.3 %. Germany reached with an increase of 9.4 % a positive result in the seamless tubes market, but a minus of 12.8% in large diameter tubes. Chinese steel tube producers achieved a production of 47.2 million metric tons, a plus of 3.6 %, the USA with a production of 5.9 million tons a plus of 17.7 %.

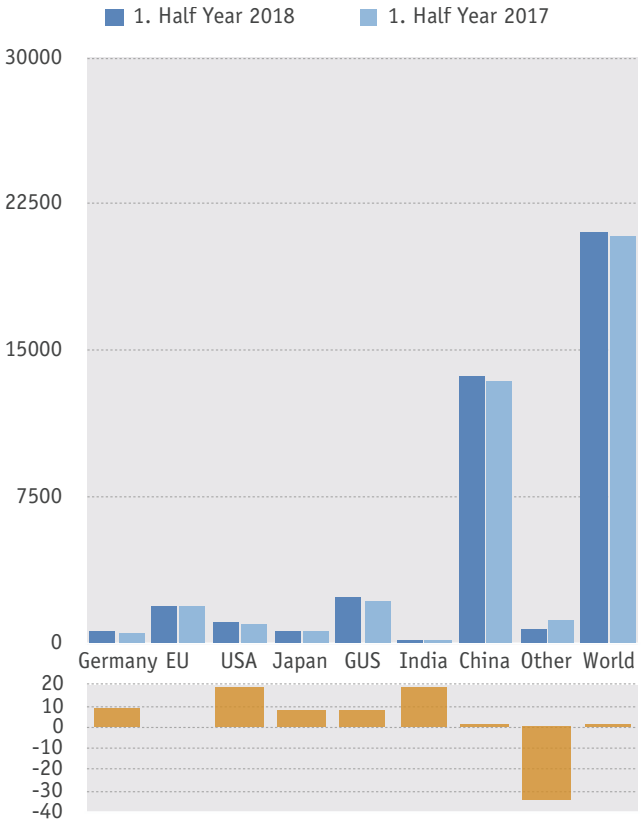


	seamless tubes			welded tubes <406			welded tubes >406			welded tubes			TOTAL		
Region/ country	**1.HY 2018**	**1.HY 2017**	**Change in %**	**1.HY 2018**	**1.HY 2017**	**Change in %**	**1.HY 2018**	**1.HY 2017**	**Change in %**	**1.HY 2018**	**1.HY 2017**	**Change in %**	**1.HY 2018**	**1.HY 2017**	**Change in %**
Germany	653	597	9,4	448	465	-3,7	547	627	-12,8	995	1.092	-8,9	1.648	1.689	-2,4
EU(+Germany)	1.967	1.960	0,4	4.187	4.224	-0,9	867	848	2,2	5.054	5.072	-0,4	7.021	7.032	-0,2
USA	1.191	998	19,3	4.150	3.518	18,0	590	521	13,2	4.740	4.039	17,4	5.931	5.037	17,7
Japan	690	637	8,3	1.707	1.669	2,3	694	746	-7,0	2.401	2.415	-0,6	3.091	3.052	1,3
CIS	2.422	2.245	7,9	2.935	2.886	1,7	1.646	1.155	42,5	4.581	4.041	13,4	7.003	6.286	11,4
India	225	190	18,4	800	800	0,0	1.000	1.000	0,0	1.800	1.800	0,0	2.025	1.990	1,8
China	13.750	13.500	1,9	29.500	27.400	7,7	4.000	4.700	-14,9	33.500	32.100	4,4	47.250	45.600	3,6
Other	847	1.286	-34,1	9.905	10.592	-6,5	2.241	2.342	-4,3	12.146	12.934	-6,1	12.993	14.220	-8,6
World	21.092	20.816	1,3	53.184	51.089	4,1	11.038	11.312	-2,4	64.222	62.401	2,9	85.314	83.217	2,5

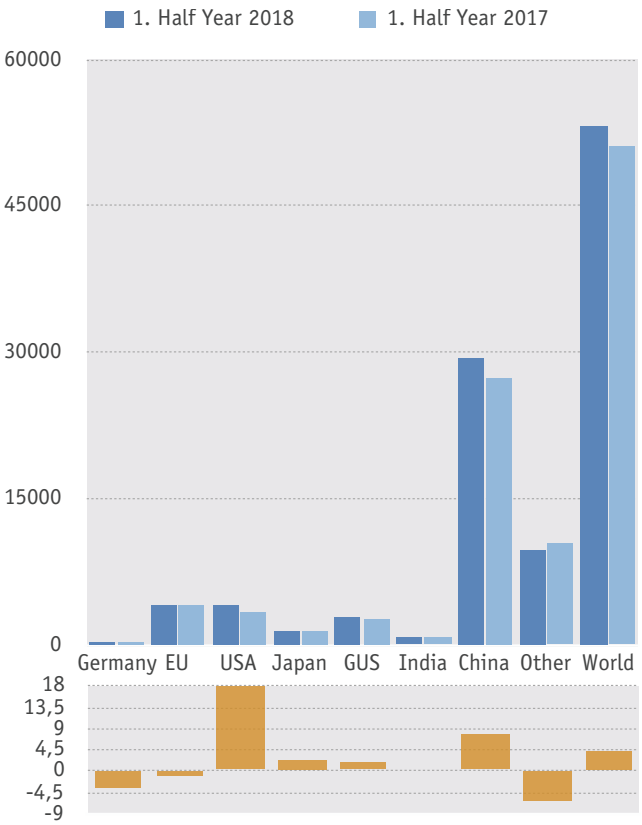
Wirtschaftsvereinigung Stahlrohre e.V.

figures include estimations

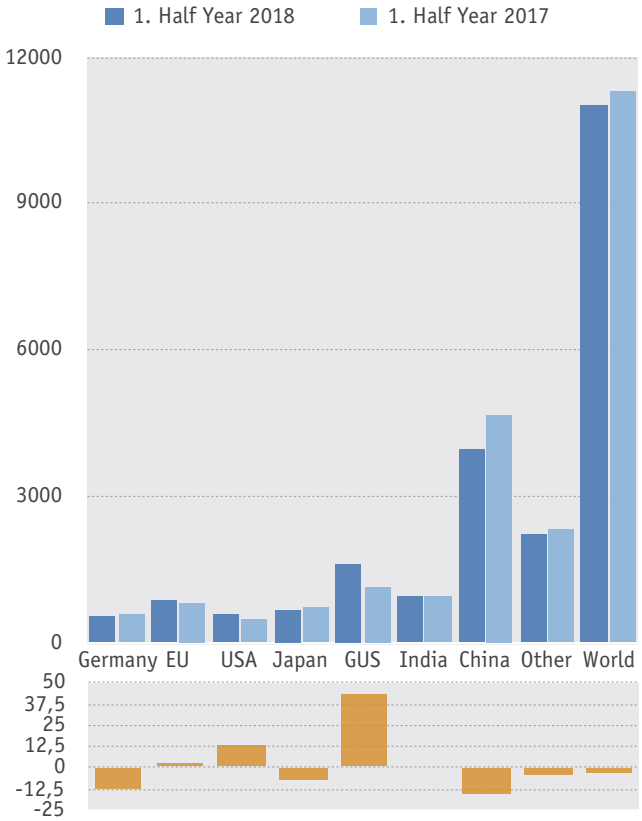
Seamless tubes in Tto.



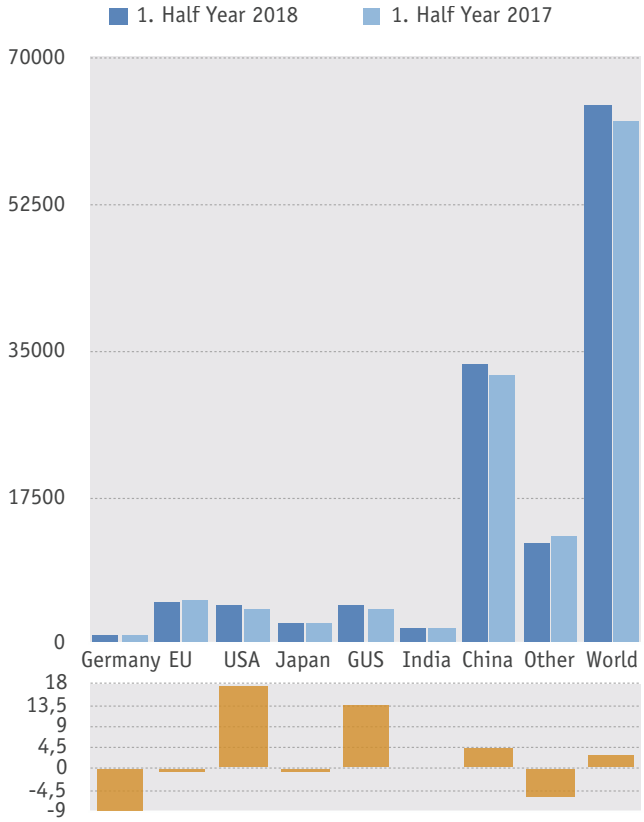
Welded tubes <406 in Tto.



Welded tubes >406 in Tto.



Welded tubes in Tto.



Dr. Gunther Voswinckel, VOSCO GmbH

World Pipe & Tube Market: current factors influencing outlook

Dr. Gunther Voswinckel – Update as per October 2018

Welcome to our regular presentation of the main worldwide economic factors influencing the pipe and tube industry.

The largest tube and pipe consuming market segment accounting for about 51 % of total consumption is the oil and gas industry.

In October 2018, oil prices climbed yet again to a 4 year high of 85 US$ / barrel. This is a consequence on the one hand of the US sanctions imposed on Iranian and Venezuelan oil and gas exports, and on the other due to the increased world market demand for oil. Regular oil price hikes were offset only by a short period of falling oil prices in early February 2018, despite the fact that in early 2018, some US experts were warning that prices could plummet much as they did in 2014 following the first shale gas boom.

The International Energy Agency (IEA) backed up its warnings with figures. The organization expected growth in oil consumption in 2018 of about 1.4 million barrels/day. At the same time non-OPEC countries, particularly the US, were expected to raise their pumping levels by about 1.7 million barrels/day.

Citigroup analysts went even further and predicted a hike in output by non-OPEC producers of about 2.2 million barrels/day.

If the IEA and Citigroup are proved to have predicted correctly, the world could be faced with an oversupply situation.

However, political intervention by the US government, i.e. the sanctions imposed on Iran and Venezuela's oil exports, have created an artificial mood of supply shortages, which in turn prompted the current oil price rally. Analysts will have once again realized that forecasts on oil price levels may be completely overthrown by political intervention on the part of stakeholders.

Several other economic consequences for the tube and pipe industry are discussed in the presentation. Tube and pipe markets such as the automotive (15 %) and building and construction sectors (5 %) are also attractive market segments for our industry.

The world automotive market is characterized by stable growth of about 2% a year. At the same time, the proportion of tubes used in auto design is steadily on the rise, causing increased attractiveness of this market segment.

The building and construction industry market is doing even better, growing by about 4 % a year. This market segment is also characterized by a steady increase in proportional penetration of tubes and tubular profiles.

World production of steel tubes extrapolated from the second quarter of 2018 showed a slight increase of 2 % as the markets further stabilized. In detail, growth of 13 % is reported for the US, supported by political trade barriers for tubular products and the strong growth of the shale gas exploration industry.

For welded tubes below 406 mm diameter, figures show a second quarter production increase of 4 %; the US reports growth of 13 % after gains in 2017 (+ 30 %). On the other hand, ROW is facing a decrease of 2 %.

For welded tubes of 406 mm or larger, second quarter 2018 figures once more showed production fell by 3 % overall. But CIS (+ 24 %) and Europe (+ 8 %) showed remarkable production growth.

For seamless tubes, the second quarter of 2018 saw production grow overall by 1 %. The US, following a boom year 2017 (+ 69 %), reported continued growth at the lesser rate of 15 %. Only ROW suffered a serious downturn in 2018, with production rates down by 33 %. This is a remarkable trend change, with US tube production showing remarkable growth for the second time in several years. It would appear that the US trade barriers policy is having an impact.

Meanwhile, overcapacity in many regions of the world is leading to further consolidation in the steel tube industry. Pipe prices continue to climb, reflected in the pipe price index which showed an increase of 25 % through to August 2018. Competition in saturated markets is prompting minor investments in those tube markets that display growth. More demanding high-tech products are the strategic targets, rather

than commodity-grade tubes.

Tube suppliers located in high-cost countries are successfully taking steps to counter strong international competition. As well as seeking to specialize in products with higher technical requirements, they are globalizing into markets with increased demand and streamlining their productivity to reduce production costs.

Finally, the impact of currency exchange rates on the pipe market is discussed. A strong euro throughout 2017 and early 2018 was seen to cause export disadvantages. As the euro is currently falling again, markets should be able to compensate suppliers for some of the disadvantages.

Looking at the main market segments for steel pipe suppliers: this market is dominated by the OCTG industry (51 %). Besides this, the automotive (15 %), mechanical (9 %) and construction industries (5 %) are also strong market segments for the sector (Fig. 1).

The automotive and construction markets in particular are characterized by stability and high demand.

World car production levels grew overall by about 2% in 2017 (Fig. 2). Regionally, growth rates differed considerably, with growth in Europe (+ 3 %), Mercosur (+ 20 %) and Asia (+ 3 %, dominated by China at + 7 %) offset by the Nafta market (- 4 %) (Fig. 3).

The overall health of a highly attractive automotive market is amply illustrated by the remarkable growth rate of 13 % displayed by the German car production industry from May 2017 to May 2018.

In 2018, further growth was reported from Russia (+ 20 %),

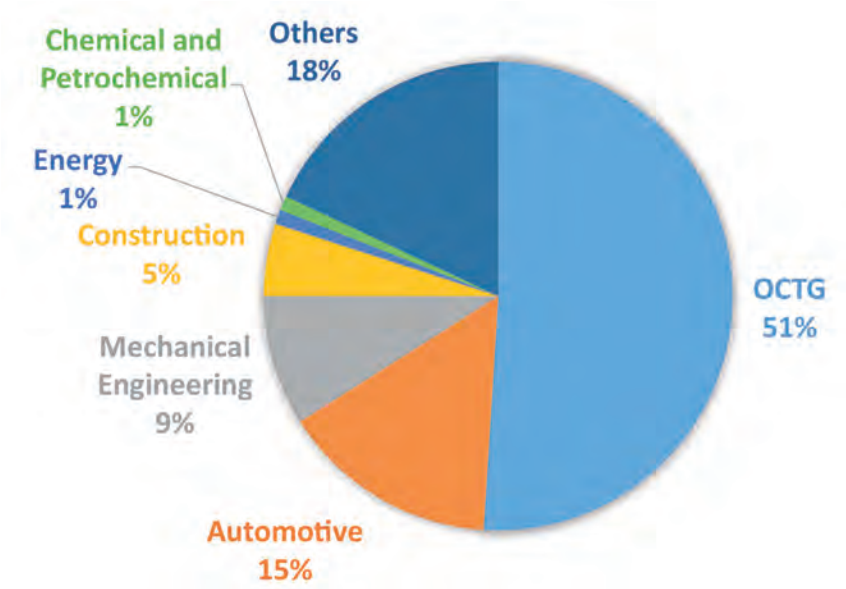


Fig. 1: Markets for Steel Pipe Industries in 2012
Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

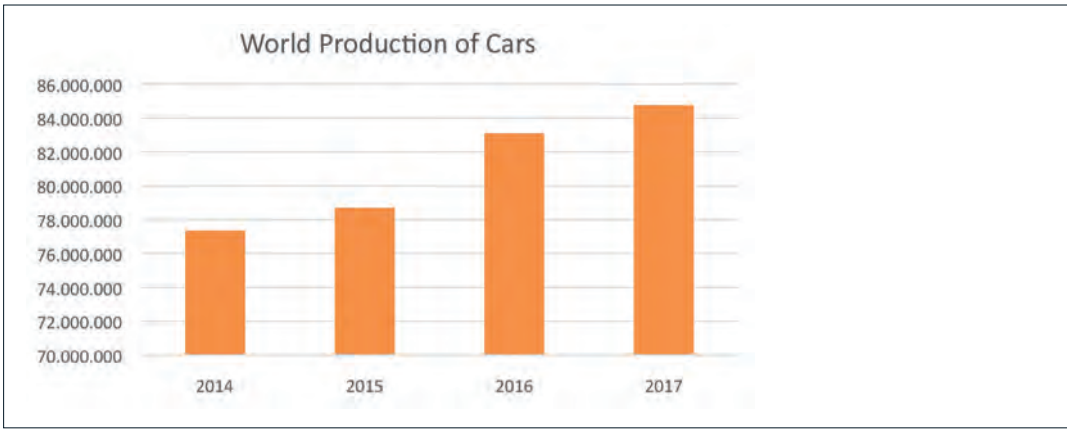


Fig. 2: World car production 2014-17
Source: German Association of Automotive Industry (VDA), June 27, 2018.

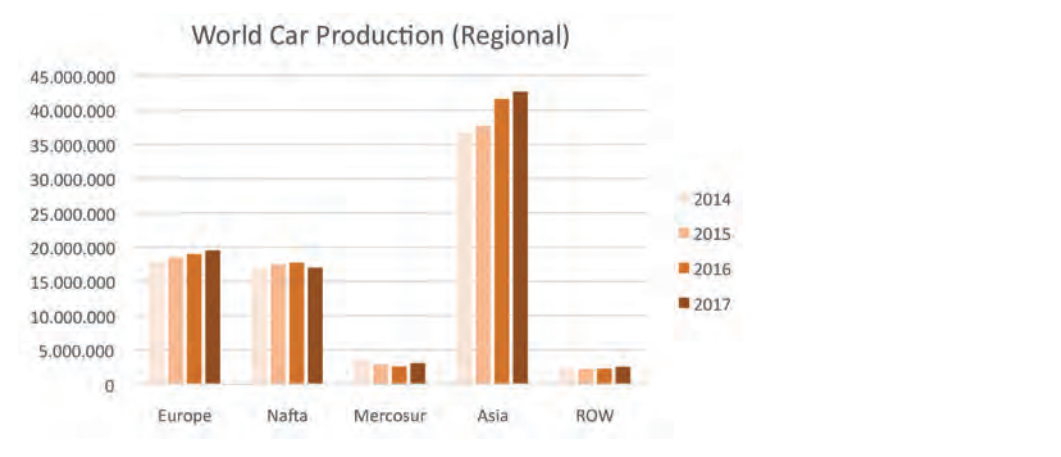


Fig. 3: World car production by region 2014-17
Source: German Association of Automotive Industry (VDA), June 27, 2018.

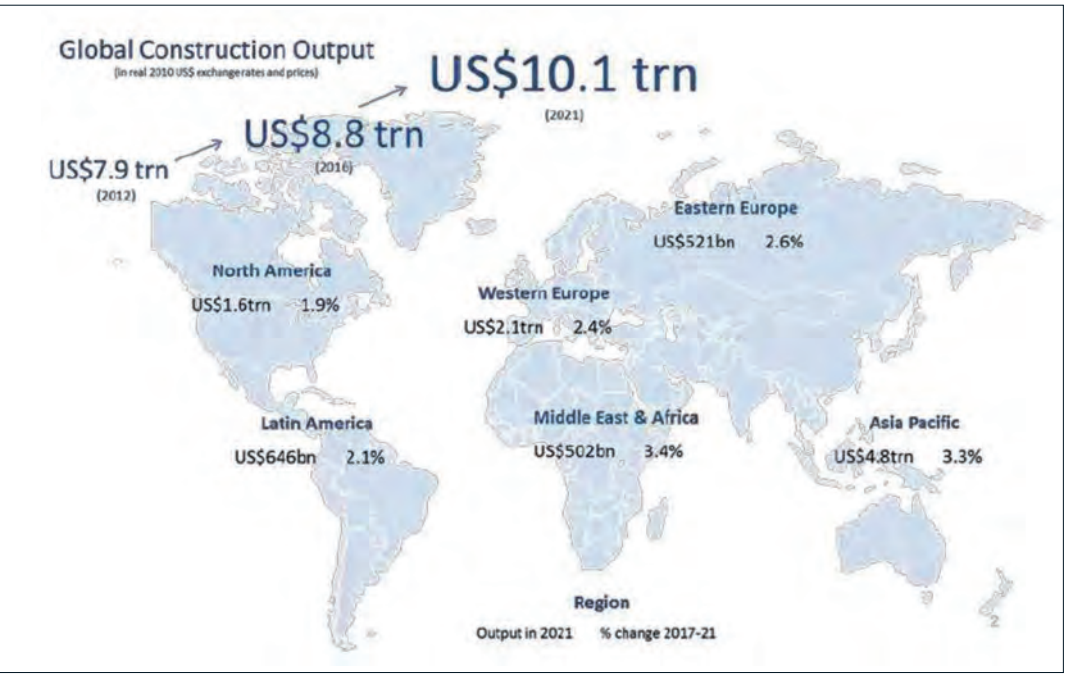


Fig. 4: Global Construction Output 2017 versus 2021
Source: Construction Intelligence Center, June 27, 2018.

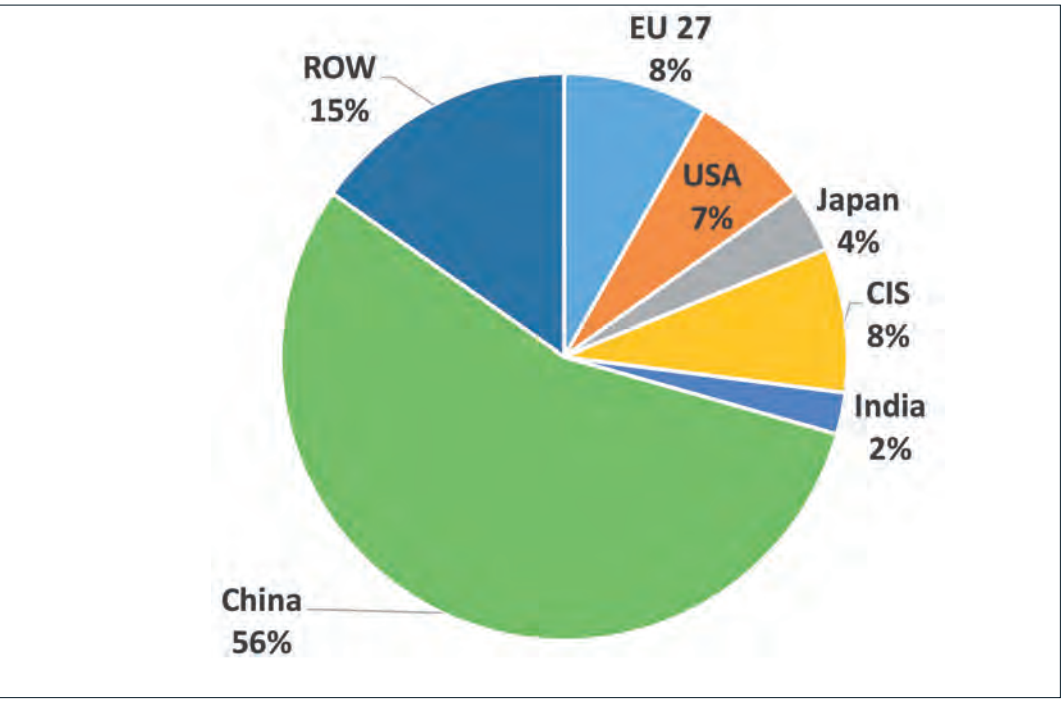


Fig. 5: Global steel tube production by region, Q2 2018
Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

Brazil (+ 16 %), India (+ 10 %) and China (+ 6 %). Since pipe usage intensity for cars is growing in parallel, the automotive market remains an attractive market segment for pipe producers.

The tube and pipe market for the building and construction industry is smaller but nonetheless attractive.

A recently released report, Global Construction 2030, forecasts the volume of construction output will grow by 85 % to $ 15.5 trillion worldwide by 2030, with three countries, China, the US and India, leading the way and accounting for 57 % of the global growth. The benchmark global study, put together by Global Construction Perspectives and Oxford Economics, predicts average global construction growth of 3.9 % a year to 2030, outpacing that of global GDP by over 1 percentage point.

The report says growth will be largely driven by developed countries recovering from economic instability and emerging countries continuing to industrialize.

These market trends cannot fail to make their mark on global steel tube production.

In the second quarter of 2018, world steel tube production was once again dominated by China (56 %), followed by other/ROW (15 %) (Fig. 5). Following 2 years of shrinking production China's market share stabilized at 56 % in 2018.

In 2014, oil and gas markets were flooded by shale gas products. In the second half of 2014, oil prices fell steeply from 110 US$/barrel, bottoming out at around 30 US$ in early 2016. Subsequently, they recovered overall somewhat,

hitting 52 US$ in August 2017 (Fig. 6), mainly thanks to the OPEC countries and their exploration partners reducing output to minimize the glut.

As of October 2018, oil prices have climbed to a four-year high of about 85 US$/barrel.

This most recent oil price rally is in large part due to the political intervention of the US government. The sanctions imposed on Iran and Venezuela, although not yet fully in place, have already created an artificial shortage of available pumped oil bpd.

The climbing prices are reflected in the fact that the crude oil stock volume in the US has recently been increased. Normally, if rising crude oil prices are expected, the storage volume increases, whereas falling crude oil prices lead to an erosion of the crude oil stock volume.

Given that many oil-exploring countries have production costs ranging from 30-40 US$, it is unsurprising that the industry reacts with the utmost sensitivity to current oil price developments (Fig. 8).

However, the entire shale gas exploring industry, regarded in 2014 as a highly attractive industry segment, saw itself forced by the low oil prices of 2016 and 2017 to reduce its cost level to about 24 US$ / barrel (Fig. 8) – with the result that its selling price is now much lower than the current price offered for crude oil by the market. In consequence, shale gas production is booming again. Some US analysts are warning that the current situation bears similarity to the first shale gas flood offensive in 2014, when oil prices dropped from 110 US$

Fig. 6: Crude oil Brent price as per October 2, 2018
Source: NASDAQ

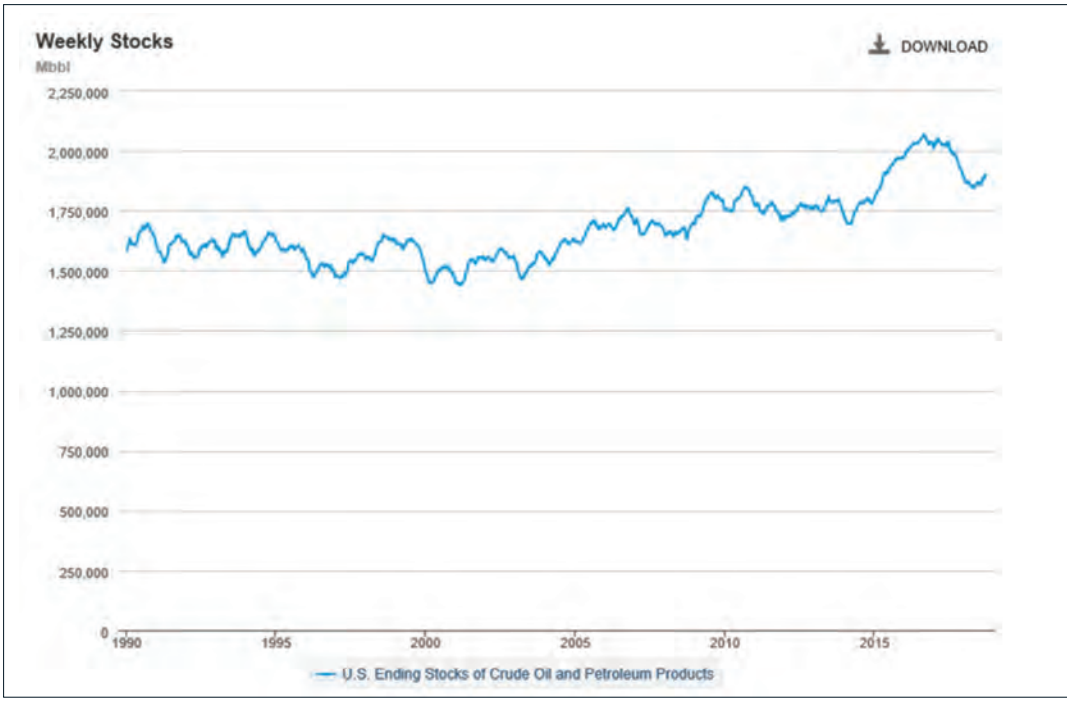


Fig. 7: US crude oil stock volume as per October 2, 2018
Source: EIA

down to 30 US$ / barrel. But as long as US political intervention keeps the available oil volumes low, the oil price will remain high.

The OPEC countries and some other partner countries such as Russia are currently reducing the oil volume offered to the world market by about 1.8 million barrels/day. International Energy Agency (IEA) figures show it expected oil consumption to increase this year by about 1.4 million barrels / day. At the same time, it has predicted an increase in production by non-OPEC countries such as the US of at least 1.7 million barrels / day. Citigroup analysts are predicting

a hike in output levels by non-OPEC producers of as much as 2.2 million barrels / day. But at the same time, the US sanctions on Iran and Venezuela may reduce pumping output levels by up to about 2.1 barrels/day.

If the IEA and Citigroup are correct in their assumptions, the world could be faced with an oversupply of oil – unless the US sanctions remain effective. Currently it is evident that the market believes that they will; as a result, oil prices climbed to 85 US$ / barrel in October 2018 – bringing it forcibly home to analysts that oil price forecasts may be overturned by political intervention.

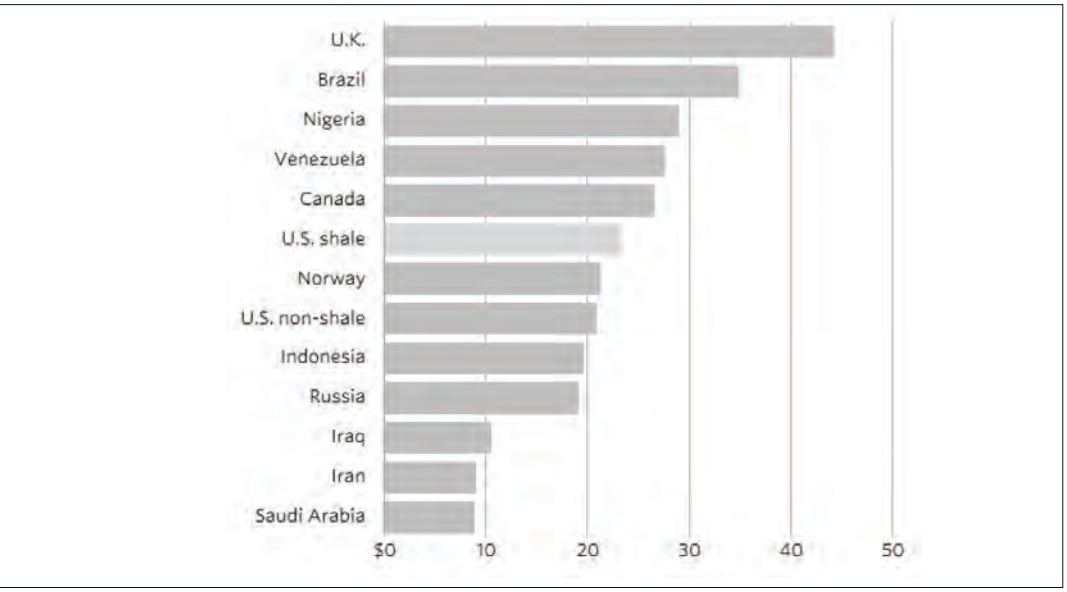


Fig. 8: Cost to produce a barrel of oil
Source: UCube by Rystad Energy, published October 2, 2018

Fig. 9: Producer pipe price index as per August 11, 2017 (Jan. 1982 = 100 %)
Source: US Bureau of Labor Statistics/ Federal Reserve Bank of St. Louis

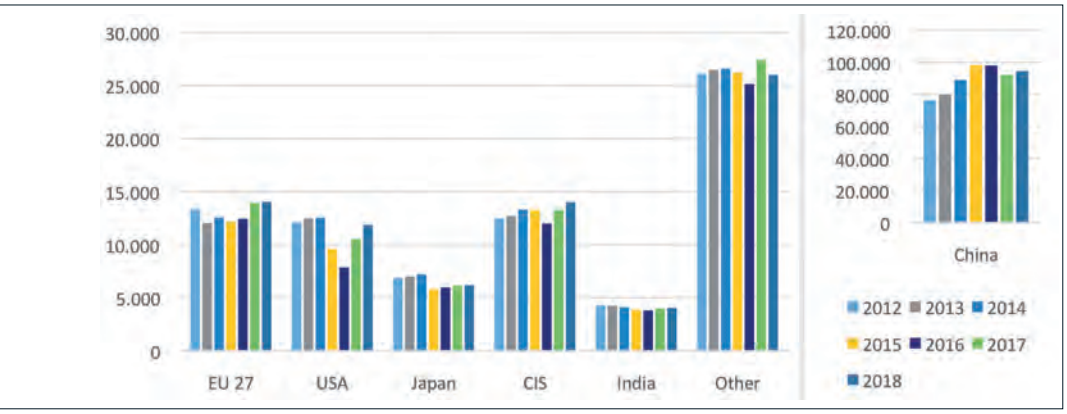


Fig.10: World steel pipe production in Ttons
Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

The upward trend has had an immediate effect on OCTG pipe consumption, particularly in the US. Since January 2018, pipe prices have increased, reflected in a hike on the pipe price index of about 25 %, from 200 to 250 (Fig. 9). The positive signals in 2018 have also prompted traders to begin cautious restocking.

These pipe price corrections have certainly left their mark on the world steel pipe production (Fig. 10). 2016 was considered a no-growth year (-2.5 %). In 2017, global tube production increased slightly (+1 %) and the upward trend has so far been maintained in 2018 (+2 %). Looking at regional statistics for 2018, it is notable that only Other/ROW experienced a fall in pipe production (-5 %). All other regions increased their production figures (China +2 %, US +13 %, CIS +5 %, India +2 %).

The most significant variations were again seen in the market segment seamless pipes and tubes (Fig.11). Global production volumes increased by 1% in 2018, dominated by China with its massive production volumes (+2 %), the US (+15 %), India (+18 %), CIS (+18 %) and Japan (+6 %). Only in Other/ROW (-33 %) was there a significant reduction in production volumes.

The production of welded pipes < 406 mm OD saw a global production volume increase in the second quarter of 2018 (+4 %). China, after a weak 2017, was among those able to report an upturn

(+6 %). Other/ROW (-2 %) and IS territories (- 3 %) reported a fall in production volumes. The US once again had the most significant production increase to report (+13 %) (Fig. 12).

Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

The second quarter 2018 figures for welded pipes ≥ 406 mm OD, large diameter line pipe, once more show an overall production decrease of 3 %, led by China (-5 %) and other/ROW (- 4 %). This trend reflects the fall in demand for pipelines in these regions. The line pipe market is dominated by large projects which are mostly politically driven. The CIS (+24 %), Europe (8 %) and the US (+5 %) on the other hand have increased production and were able to strengthen their position as technologically advanced producers of large diameter line pipe (Fig. 13). The current US administration recently began to impose import duties on line pipe imports to protect US producers – a political signal which seems to be having the desired impact on US pipe production.

In the entire scenario, currency exchange rates have also had a significant impact on pipe exports and pipe manufacturing machinery exports throughout the world.

In 2017 the euro gained about 20% against the US Dollar (US$) (Fig. 14). In the months since April 2018 it has fallen again by about 6 % to 1.17. This does, however, lessen pressure on exports into the US.

At the same time, in 2017 the exchange rate of the euro to the Chinese yuan gained about 9.5 %. Thus far in 2018 the euro has dropped back by about 7.4 %, which offsets some of the gains made by China in 2017.

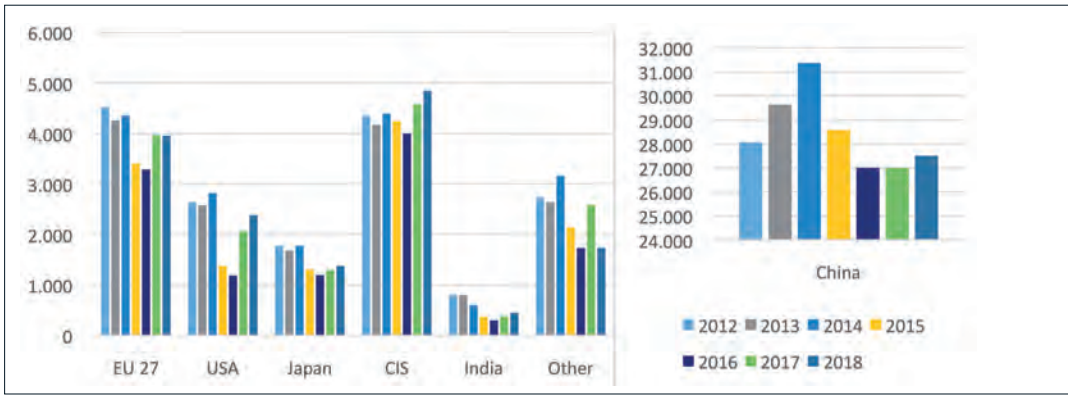


Fig. 11: World steel pipe production in Ttons (seamless)
Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

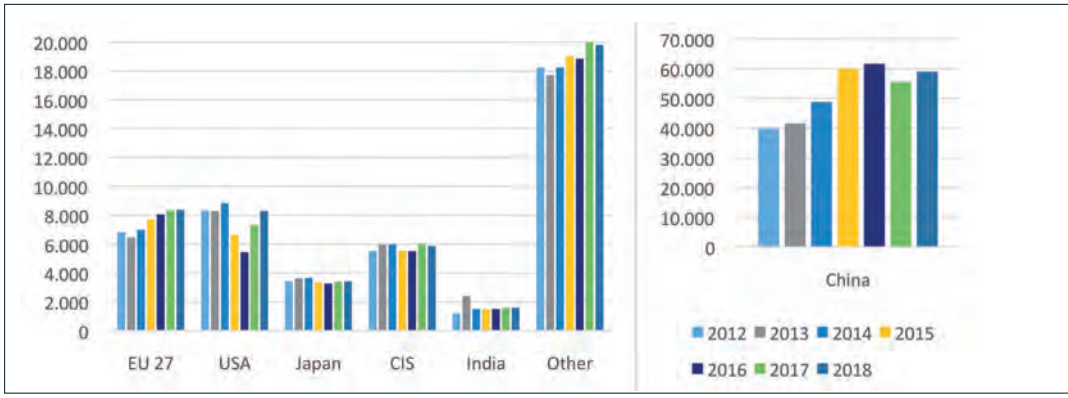


Fig. 12: World steel pipe production in Ttons (welded < 406 mm OD)
Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

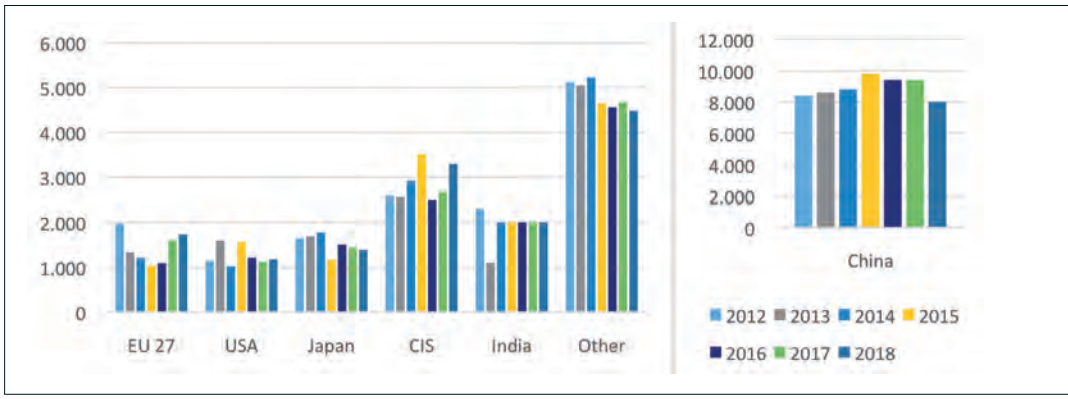


Fig. 13: World steel pipe production in Ttons (welded ≥ 406 mm OD)
Source: ITAtube Journal/Wirtschaftsvereinigung Stahlrohre e.V.

The value of the euro against the Russian rouble has gained some 28 % since April 2017 and is now at a level of about 77 roubles/euro. This meant that local pipe producers to a large extent served the home market, to compensate for export losses due to higher exchange rate costs (Fig. 15).

From January 2017 (4.0) to February 2018 (4.7), the exchange rate of the euro to the Saudi Arabian riyal (SAR) gained about 15 %. However, the euro has most recently fallen against the riyal some 10 % (to 4.4 as of October 3, 2018). Overall, since 2017, European imports to Saudi Arabia have become about 5 % more expensive.

Fig.14: Currency exchange rates vs euro as per October 3, 2018
Source: Finance.net

Fig. 15: Currency exchange rates vs euro as per October 3, 2018
Source: Finance.net

As indicated by these latest figures, US tube and pipe producers in particular have greatly profited from business trends on the oil markets. Increased pumping and exploration activities are the primary driving forces of the market's recovery in the US. If we are to believe the US experts, this trend will continue throughout 2019. To a lesser degree, European tube and pipe producers were also able to profit from these developments.

What measures are pipe producers and plant equipment suppliers taking to overcome current difficulties and to generate sustainable business?

Over-capacity is leading to consolidation in the steel tube industry. Several pipe producing companies are still looking into overcoming such capacity problems by closing production facilities with a questionable economic future.

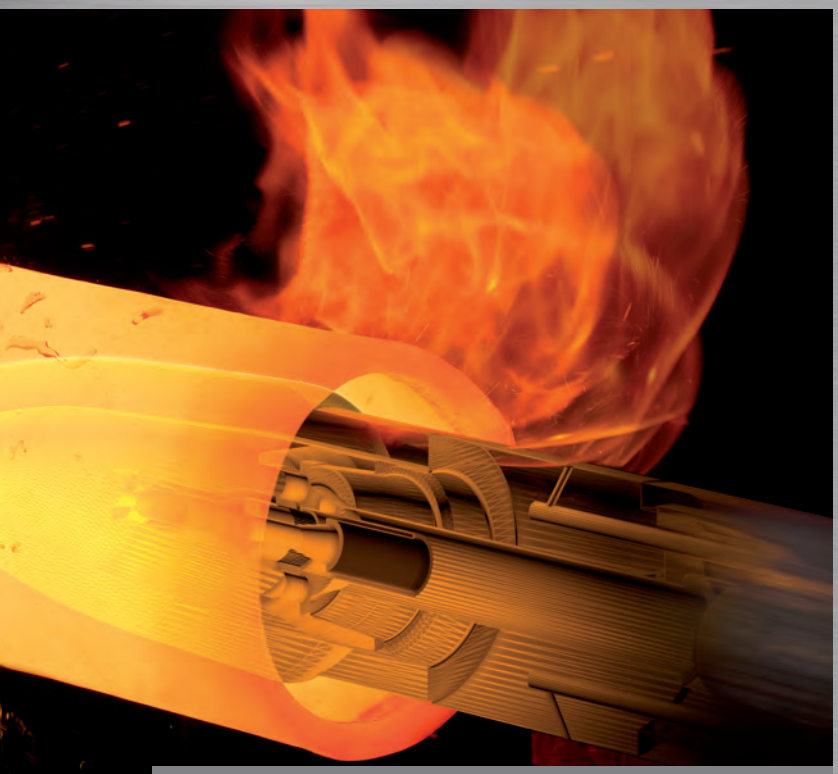
Still, despite the remarkable boom in the US, globalization into markets with increased demand remains one of the key answers. The Middle East and locations with major oil and gas exploration or prospering automotive production and building construction industries are to be considered. Besides this, shale gas exploration, deep-sea offshore exploration and oil sand exploration remain major challenges for our industry.

Price competition from China and elsewhere demands further specialization in high-tech products. This applies in particular to regions with high production costs. Producers seem to have evaluated their market approach and decided to serve commodities or high-tech products even if they only represent niches. Some countries/regions have also installed trade barriers to control imports from other countries.

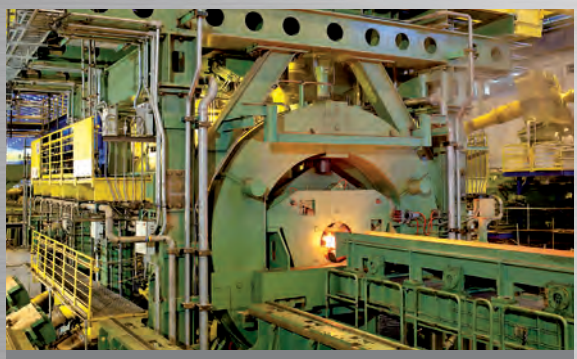
Finally, every producer must seek to make permanent improvements to increase productivity and reduce production costs. Technology suppliers may find interesting business opportunities in this field.

VOSCO Management Consultancy
Dr. Gunther Voswinckel
Scharnhorststrasse 45
41063 Mönchengladbach
Germany
Tel.: +49 2161 309 255
drgunthervoswinckel@vosco.de

SEAMLESS TUBE PLANTS



From the billet to the hollow – piercing mill technology



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Fax: +49 2161 350-1851
seamlesstubeplants@sms-group.com

SMS group
www.sms-group.com

africon GmbH

The East African Steel Industry

A continent of opportunities ...

The public image of Africa today is still heavily biased through stereotypes. Africa is perceived as a continent ruined by poverty, where corruption preys on development funding, tyrannical governments and political stability undermine confidence. These images however hide a different, much more positive side of the continent.

The population in Africa has shown a constant growth of 2.5% yearly for the past 5 years, standing at about 1.2bn people in 2017. Despite also being a risk, this substantial growth represents major opportunities and lays positive signs that can lead the continent to potential social and economic benefits. After a period of inactivity, the substantial increase in economic growth and of Foreign Direct Investments over the last 15 years creates optimism for the future of Africa.

Africa has been changing and developing on different levels over the past decades. It became a valuable consumption region for different industries, especially the steel industry. Steel is the backbone of the economic activity of any region. Direct and indirect consumption of steel is projected to increase overall on the continent and particularly in East Africa. The region has increased its infrastructure and construction activity, driving the growth of its steel industry. Before going into further detail, one should understand the underlying trends boosting the economy, various steel-related sectors, as well as the steel industry itself.

What is driving growth in Africa today?

... a demographic dividend

In Africa today, a growing working age population and fast-economic growth is starting to result in a demographic dividend. As more people enter the workforce, the share of the economically dependent in the population such as minors and elderly is declining. This dividend affects worker productivity, family size, education and health. The movement towards a smaller sized family enables families and governments to provide more resources to invest in health and education per child.

The resulting demographic transition creates a supply side shock to the economy, potentially raising the number of workers, human capital of the workforce and the level of domestic saving. On the other hand, the large young population generates the required demand for many consumer goods and services markets – as well for new housing and construction.

... a rising middle class

With the general economic growth, a growing middle class provides a stable consumer base that attracts productive foreign investment. Beyond that, it is a requirement for robust innovation and entrepreneurship. It is a foundation of trust that promotes social interaction and reduces transition costs, a push towards better governance and a promoter of a better and equal education. Africa today is home to one of the fastest growing middle classes globally.

... a rapid urbanisation

More and more people are moving to cities in hope of securing better living conditions, higher quality education and better economic opportunities.

Similar to Europe, Africa has one of the highest urbanization rates in the world. About 40% (2017) of the population already lives in urban areas. The 20 largest African cities are expected to grow by 50% over the next 10 years. Apart from driving general growth, this trend also creates huge opportunities in urban infrastructure and property developments.

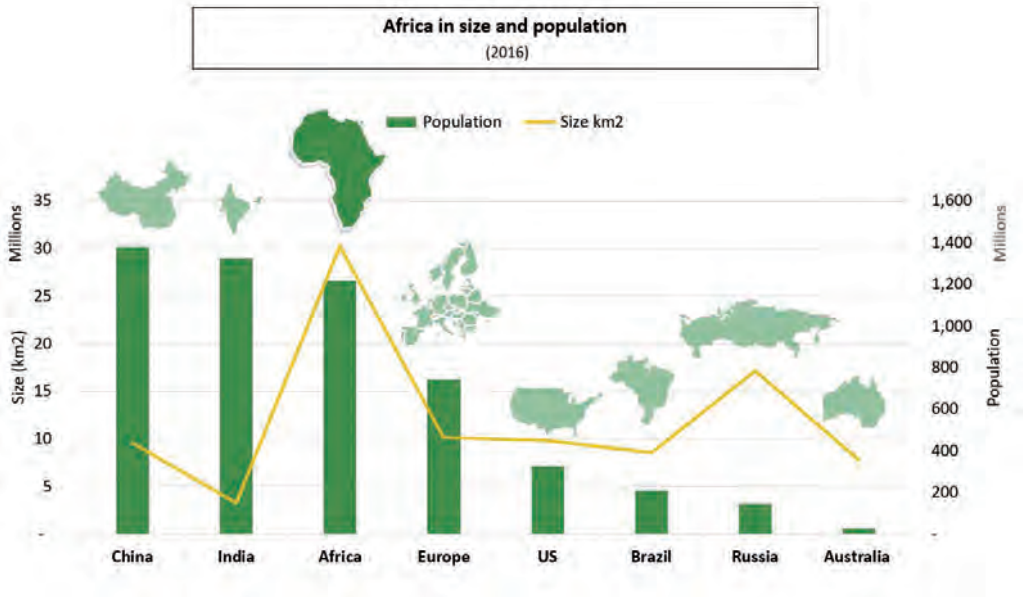
... a push towards manufacturing

Despite its immense natural resources, Africa's manufacturing sector remains its weakest link to the continent's growth and integration into the global economy. To unleash Africa's full potential, the African Development Bank has appointed Industrialization as a top priority in its "High 5 Agenda" by initiating the six-flagship programs to accelerate industrialization in the region. Likewise, the African Union emphasized the importance of industrialization to the continent in its "Agenda 2063". Partly as results of these programs, as well as other factors, manufacturing sectors of many African countries are expanding quickly.

... a rise in Foreign Direct Investments.

Over the past 1-2 decades, there has been a significant increase in the number of FDI projects in Africa. This increase has shifted the type of FDI from the primary sector (resources) towards the sec-

ondary and tertiary sectors (manufacturing, services and hi-tech). Foreign Direct Investments are key to Africa's growth potential since they do not only bring financial resources but also new technologies, knowledge and expertise. Investments promote employment, productivity and competition, which is what Africa needs to develop itself. The growth of FDI in Africa clearly proves that it's an emerging global FDI destination. European countries such as the UK, France and Italy are the largest investor in Africa, followed by Asia and Northern America. Yet, China became the single largest contributor of FDI in Africa 2 years ago. 293 diversified Chinese FDI projects worth a combined $66.4 billion (2005-2016) created around 130 000 jobs on the continent. China is



already realising its opportunities despite the risks. Their willingness to further invest in these markets displays a strong believe in the potential of the region. On the other hand, Western countries' share of total FDIs in Africa is decreasing, especially due to perceived risk factors. China's readiness to manage the accruing risks and their trust in the potential of the region leverage them to lead the race. Western countries however are losing out on an opportunity to lead different markets in the future.

A spotlight on East Africa

Large parts of East Africa are a very promising operating territory in terms of growth and the least dependent on commodities such as gold or oil. Countries like Tanzania, Kenya, Rwanda and Ethiopia are the frontier growth of the continent. The region is projected to attain the highest regional economic growth at 6.3% over the 2018 period. Ethiopia is projected to be the fastest growing economy in Africa at 8.5% according to the World Economic Forum.

Aside of the macroeconomic aspects, a mixture of factors can be attributed to East Africa's growth. Policies are promoting local production of various goods and investments are boosting different industrial sectors. Regional economic integration equally boosts growth. The East African Community (EAC), with member states such as Kenya, Rwanda and Tanzania, is largely seen as the most integrated economic block on the continent.

The vast infrastructure deficit is a constraint on the growth of the region. Yet, the desire to invest and develop infrastructure is an opportunity to leapfrog this constraint and sustain the growth with new and more efficient technologies.

Steel production in East Africa

The steel industry of East Africa is yet heavily dependent on imported raw materials and molten scrap metals. Even though local deposits of iron ore and coal have been identified in several locations, the region is yet to attract enough commercial interest to exploit them. This interest however is expected to gradually increase with the growth of the local steel production.

Over the past few years, growth in production of steel was outpaced by growth in the demand of steel. The consequences are growing opportunities for new plants and expansion projects to cater to this gap in the market.

The largest two markets for steel in East Africa are Kenya and Ethiopia. In Kenya, the East African community's economic hub, demand of steel stands at approximately 1.8 million tons per year. This demand is a result of steel exports and multiple local construction projects such as the ambitious housing projects initiated by The National Housing Corporation (NHC) to construct 500,000 housing units across the country in only 5 years. However, the installed production capacity of steel in Kenya is only about 1.4 million tons, of which 57% is being utilised.

The local market is currently centred around long products due to the rise of construction and transport projects. The local companies Athi Steel, Apex, Dekvi and Tononoka are the largest producers in this segment.

Ethiopia on the other side distinguishes itself with low electricity and labour cost. Multiple big construction projects present opportunities for the steel sector. Ethiopia's demand of steel is about 1.1 million tons per year with an installed production capacity of about 1.2 million tons per year and about 42% capacity utilisation – an indication of producers preparing for the rapidly growing demand.

The biggest companies in the steel market in Ethiopia are Habesha, Steel RMI, East steel and Aarti. Alem Steel, through their subsidiary Osaka steel, is the only organisation operating a rolling mill for flat products such as sheets.

In addition to national players, dominant regional groups in the East African steel industry are SAFAL group, who has the strongest presence in the region, followed by MMI Steel and Athi Steel.

Presently, the market in East Africa is mainly focused on long and flat products. This is however likely to change, as broad demand growth creates larger markets for other products as well. The imports of pipes and tubes into Kenya and Ethiopia are for example already rising at more than 9% (in weight) per year since 2008. In future, market demand – and production – is likely to diversify in terms of the variety of products.

Previously, companies in the region tended to acquire low to medium price level equipment due to the risk factor of capital investments. This leads the markets to be mainly dominated by relatively cheap Indian and Chinese made equipment. Nevertheless, more than half of all companies in the East African steel industry seek to renew their equipment in the next 5 years, many targeting higher quality machinery. As the environ-

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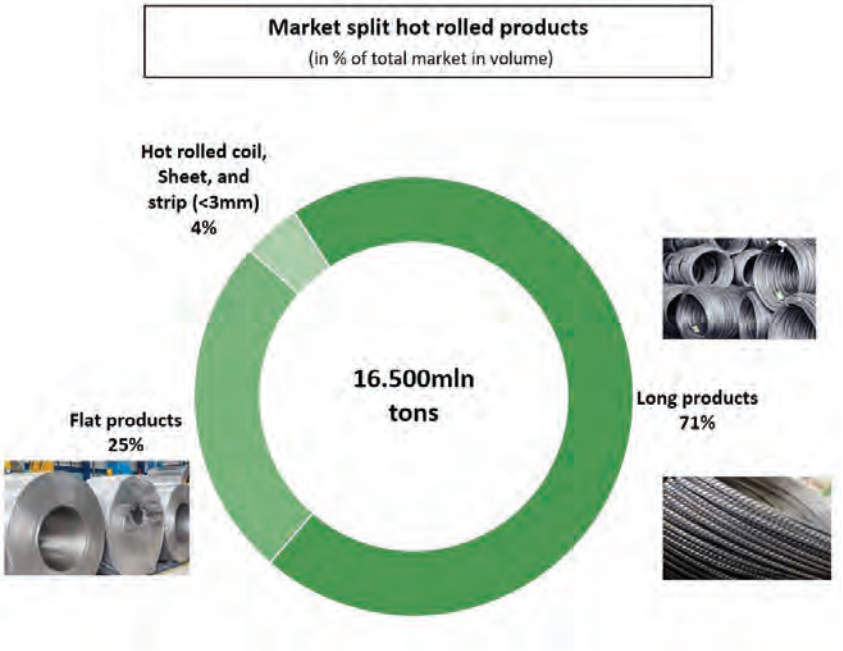

ment is becoming more attractive, African steel managers presented their willingness to buy higher quality equipment with better technology and longer amortization periods. This indicates an increase in the quality of outputs, as well as in production efficiency.

Governments in East Africa are investing heavily in infrastructure and emphasize on improving their power supplies. Their infrastructure spending programs are driving economic growth. Based on expert interviews conducted as part of various studies into the steel sector by africon, governments also offer strong incentive programs for steel projects especially in Kenya and Ethiopia to attract investors. However, government influence in the final decision taking is relatively high in Ethiopia compared to a low governmental influence in Kenya.

What drives steel demand?

Despite growing rapidly, steel consumption per capita remains yet relatively low in East Africa, providing ample space for future growth. In the following, this article is going to highlight a few more and maybe less expected promising industries in East Africa driving demand for steel today - and tomorrow.

... infrastructure & construction

A major demand driver in the steel industry in East Africa today is the development of infrastructure and construction activities. These are partly reflected in the rise of mega construction projects. The region has registered an increase in these projects by about 65.5% for the period 2016-2017. Out of 71 projects, Kenya and Ethiopia have the largest share with 23 and 20 projects respectively.

One of the core projects is the Central Corridor standard gauge railway project that links Rwanda, Burundi and Tanzania spanning across a 1.672 km distance. This project will offer both passenger and freight services between Kigali in Rwanda and Dar es Salam in Tanzania. Apart from potentially reducing transportation costs and linking markets, the rail tracks require huge amount of steel.

The LAPSSET Corridor program is another mega infrastructure project that connects South Sudan, Ethiopia and Kenya. It consists of seven key projects starting with 32 Berth port at Lamu, Kenya, an integrational Highway that connects South Sudan, Ethiopia and Kenya. The program also includes a crude and a product oil pipeline, in addition to three International Airports and Resort Cities. This project requires steel for products from guardrails, pipeline tubes to steel structures for the airports and others.

The most valuable project in the region is the Grand Ethiopian Renaissance Dam, worth US$4.1bn. Upon completion, the dam will deliver energy to both rural and urban areas. The government considers exports to neighbouring countries in case of a surplus in electricity. With its gigantic scale, steel is needed to reinforce cement, as well as for pipes and other segments.

Outside these mega projects, countless smaller construction projects are ongoing in the region. These range from infrastructure, to the construction of hotels, housing and industrial facilities. A large share of these requires steel, making up a major part of the overall steel demand.

... water projects

East Africa lacks national resources compared to other regions on the continent. It is soft commodity orientated, the agriculture sector makes up 36% of the total GDP in the region. However, present deficiencies in infrastructure and climate change effects create the need for water treatment projects to maintain and boost the agricultural sector. On the manufacturing side, companies such as breweries, food & beverage manufacturers, textile mills and

others require large amount of treated water in their production process. Governments are working to provide potable water to wider parts of the countries or private individuals as well.

Despite a shift towards plastic use, water projects are a direct demand driver for the steel industry. This demand lays in the requirements of steel pipelines and steel tubes to connect and distribute water to and from housing, farming and manufacturing entities.

Driving steel demand tomorrow: the automotive industry

Because of economic, political and demographic developments, the demand in the automotive industry is rapidly increasing in the region. Growing incomes and better infrastructure are easing hindrances to mobility, driving rates of car ownership. More attractive credit from financial institutions has equally helped to push demand for motor vehicles. Regionally the industry has its hotbeds in Kenya, Rwanda and Ethiopia, with Kenya being the leading country.

Presently, the automotive market in Kenya, as well as all other East African countries, still depends on vehicle imports to meet domestic demand.

About 85 % of imported vehicles are second hand. Kenya is one of the largest buyers of used private and commercial vehicles from Japan. However, more and more global OEMs have started to invest in local assembly plants across East Africa.

Earlier this year, the German car manufacturer Volkswagen made headlines when it announced a new car assembly plant in Rwanda – the first ever automotive investment in the small East African country. The plant is projected to produce up to 5,000 units per year across three different models for local sale.

Kenya was already able to attract more diverse automotive assembly investments.

As buses are strongly in demand due to being commonly used as means of transport, they are already strongest affected by local production. Imports of fully built up buses have gone down to only 1 % of overall vehicle imports due to operational plants. Local steel demand already exists as Kenyan companies weld metal sheets together to produce vehicle bodies.

In the new vehicle segment, Isuzu and Toyota make up 50% of the total market. This strong presence is equally a result of their fruitful operational assembly plants in the country. ISUZU Trucks Kenya is the biggest assembly plant in the country. It has a total capacity of 6,000

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SCHULER INTRODUCES COMPREHENSIVE PROCESS CONTROL SYSTEM FOR THE MANUFACTURING OF LARGE PIPES INCLUDING PRODUCT DATA ACQUISITION.

For its spiral pipe plants, Schuler continuously develops optimizations aiming at similar objectives: creating a stable and safe process flow which offers high quality large pipes, low costs of operation and a high degree of automation. This is also true for the company's latest innovation, Pipe ID 4.0 – a comprehensive process control system for the manufacturing of large pipes in real time featuring a track and trace system, overall equipment efficiency (OEE) monitoring, condition monitoring, smart diagnostics and power monitoring.

Schuler has already implemented machine monitoring in other production lines, e.g. for the manufacturing of railway wheels.

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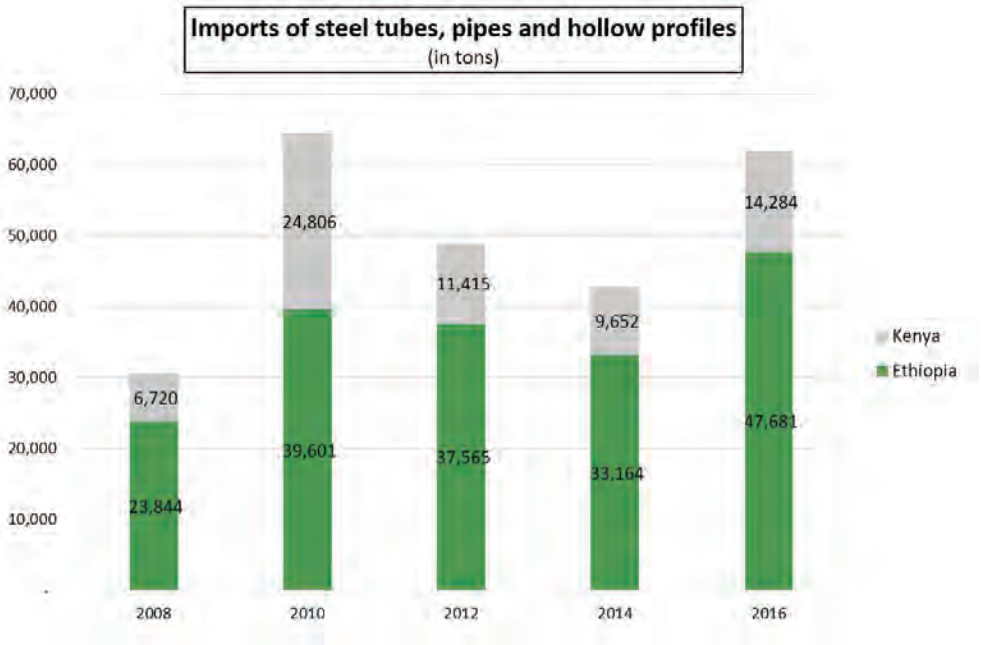
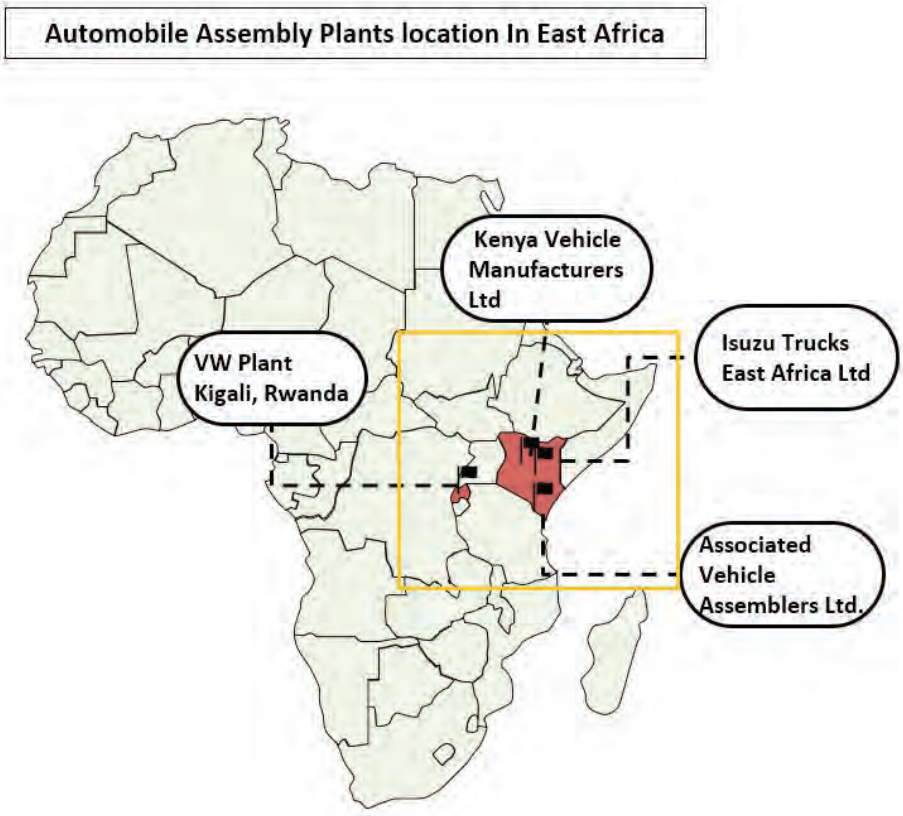
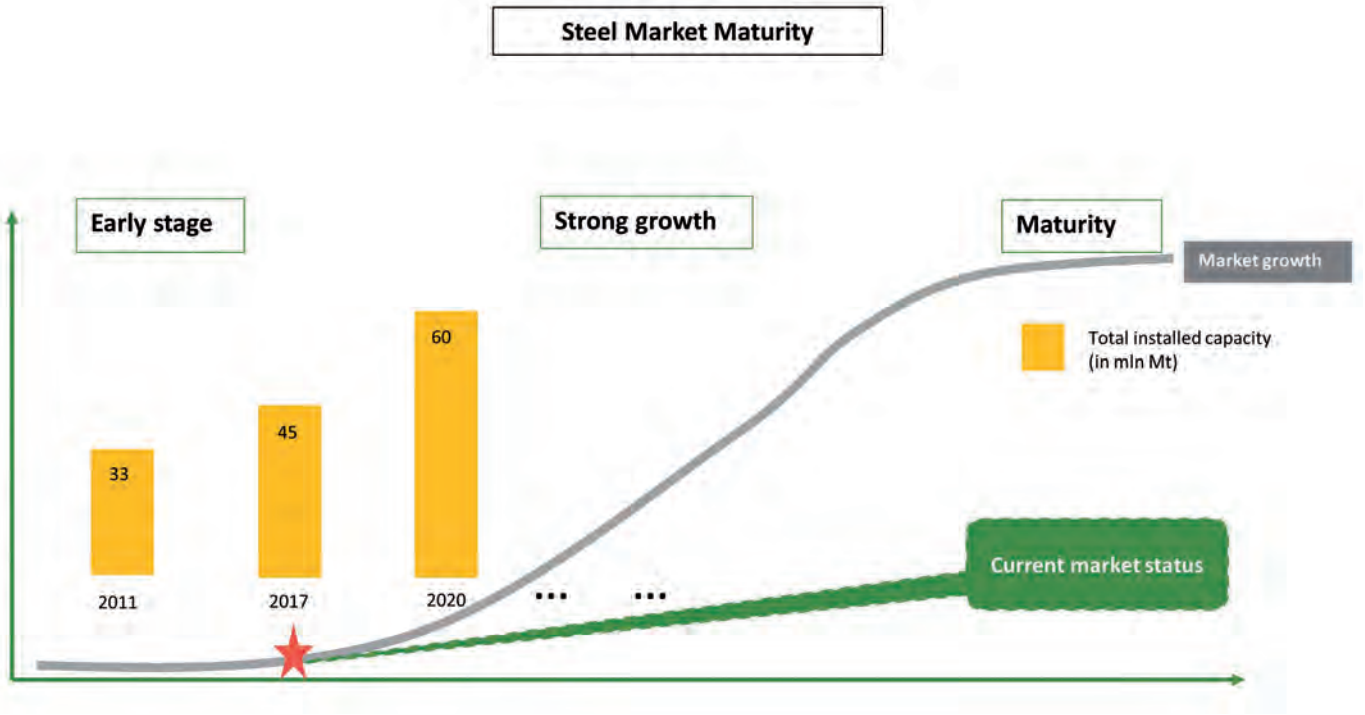




vehicles per year and presently assembles 60 % trucks and 40 % buses from completely knocked down (CKD) kits. Toyota is assembled by the company Associated Vehicle Assemblers (AVA) located in Mombasa. The plant assembles buses and trucks in CKD for brands also including Mitsubishi, Scania and Renault.

Kenya vehicle Manufacturers (KVM) is the third Kenyan plant. Located near Nairobi, the company assembles commercial and passenger vehicles with both completely knocked down and semi knocked down (SKD) kits for different automotive OEMs. In addition to Moebius Motors, the first Kenyan vehicle brand, these include MAN, VW, Ashok Leyland and Mercedes Benz. The famous VW polo is the most recent model to join the assembly line. Many of KVMs European partners only recently started or announced their partnership to assemble vehicles locally. Over the medium to long term, this might increase the so far limited exposure of European brands in Kenya.

Overall, there is no doubt the local assembly industry is still in its infancy with a total output of approximately 10,000 units per year – a fraction of some single plants in Europe or Asia. Nevertheless, the local plants might well be the first steps for the region to become a major emerging automotive market. They also show that Kenya – and East Africa – is an attractive market for the automotive industry. Over time, growing assembly volumes will additionally attract investment into the local production of parts and components, which will further push up demand for steel.



East Africa is becoming a major emerging market!

The East African region has the potential to become a major emerging market. Steel is going to play a major role in this process. Whether it is for infrastructure, urban construction or for the use in manufacturing industries: the demand for various steel products in East Africa is already increasing rapidly and will likely continue to do so.

Companies from all over the world have the chance to reap the benefits of these developments. Opportunities range from the exports of finished steel products, the supply of machinery to the local production of various steel products.

As it once was the case with every emerging economy, East Africa is yet at an early stage of its economic take-off. However, countries such as Kenya, Ethiopia, Rwanda or Tanzania already offer interesting opportunities which can be realized already today. Companies that act fast can position themselves to participate in the growth and development of a region and gain experience to outperform later entrants for many years to come.

africon GmbH

Carl-Ronning-Str. 1
28195 Bremen
Germany

Tel: +49-421-33 111 800
info@africon.de
www.africon.de

FASPAR Spa.

An innovative system for high-capacity cut-to-length lines

At a stainless steel service centre in Italy, Faspar S.p.A. has installed a cut-to-length line with rotary shear cutter, the latest of its kind for Faspar.

The new Faspar line

This new line is the result of a genuine co-design between Faspar and the final Customer, a service centre specialised in stainless steel and noble materials in general. It is designed to process Series 300 or 400 stainless steel coils or other noble materials with resistance up to 700 N/mm2, with a maximum width of 1,500 mm and weight up to 20 t, with sheet thickness from 0.4 to 3.0 mm, running at a maximum speed of 60 m/minute. A levelling machine that guarantees perfect planarity and de-tensioning of materials. A special workstation is dedicated to covering the strip with a protective film (sheets of special paper or plastic film). A rotary shear cutter continuously cuts the material with the possibility to correct "oblique" angles. The line includes a quality control box, which expels any defective sheets and two stacker boxes that prepare the "pile" of sheets on the pallet. The two stacker boxes can also operate as a single workstation, making it possible to stack sheets with maximum dimensions 1,500 x 6,000 mm.

The system is filled with not-so-hidden "gems": in addition to the oblique angle correction system, it also includes a cleaning system for the levelling rollers (Faspar patent). This ensures the perfect and continuous cleanliness of the rollers themselves, a critical factor ensuring perfect sheet metal finishes and superior quality.

Figure 2 shows a glimpse of the line, which as mentioned, is the fruit of a close collaboration between Faspar (manufacturer) and the new stainless steel service center (user). The system is essentially composed of the following:

- loading coil car
- decoiler
- paper collection unit (for the orderly winding of the protective paper exiting the coil)
- feeding and levelling unit with a roller module for haul-off, tilting feed table, six-fold levelling machine with all rollers motorised. The levelling machine is equipped with supporting intermediate and counter-rollers, which are installed underneath. The up and down movements of the pressure counter-rollers are independent: each roller is separately powered, while the stroke of the pressure units can be viewed by way of centesimal electronic indicators installed on the control desk
- cutting unit with pinch-roll system for application of paper or PVC
- electronically controlled rotary shear cutter, with maximum cutting capacity 3.0 x 1,500 mm on steel with resistance 700 N/mm2, double-edged blades, with rapid and automatic regulation of blade clearance
- "transport" and quality control unit with unloading belt and transport to stacker
- stacking station with two separate boxes that can be used either together or separately. The workstation can stack ribbon coils with dimensions from 250 x 250 up until sheets

with dimensions 1,500 x 6,000 mm.

The line also includes a weighing system for finished packs, providing all the essential job data required by the client, including the final identification label with bar code.

One of the most important innovations in this system is without a doubt the rotary shear cutter, which in addition to being a sophisticated and highly accurate construction, also features an exclusive "oblique angle" correction system, which adjusts the entire shear cutter in the right direction and to just the right extent to correct the defect.

Thanks to this function, the line allows the reduction and elimination, within certain limits, of strips with "chamber" on customised sheets, representing an important step forward towards improved quality, but also towards overall consistency.

Another important innovation is represented by the levelling roller cleaning device. The consequences of dirt, dust or foreign bodies on rollers are well-known to all, particularly in the case of polished laminates intended for particular applications. In traditional systems, cleaning was performed more or less manually, entrusted to the diligence of operators in charge of the line, and therefore devoid of any real guarantees. In the new Faspar line on the other hand, cleaning is entrusted to a safe system incorporated into the levelling machine itself, which following a request by the operator from the control desk, distributes programmed quantities of a special detergent onto the levelling rollers, which are subsequently cleaned of any impurities and therefore able to treat the metal in the best way possible.

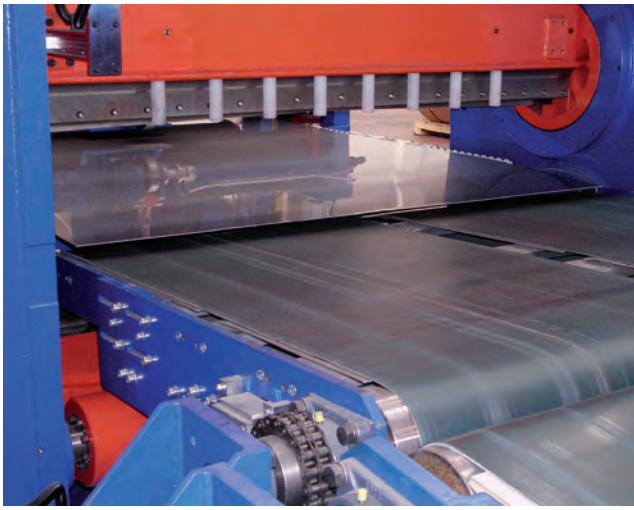
A third aspect worth mentioning in this line is the presence of a "quality selection box", preceding the two stacking boxes we've already seen. Space has been left in the line to allow the material to be visually inspected by a specialised and expert operator. If a defect is found, the operator sends a signal, which is automatically managed by the line PC, and which after taking into account all the parameters, directs the defective sheet into the dedicated box by way of the output conveyor belt.

Thanks to its careful and accurate construction, and by way of these innovations, the new Faspar line has become the strong point of the new service centre production.

This case, a commendable example of cooperation between system manufacturers and users, with a beneficial and reciprocal exchange of knowledge and experience, demonstrates the high technical level that can be achieved by Italian producers of machinery, and by companies that operate in the processing sector for strips made from noble materials, intended for high-quality uses.

Author:
Dr. Ing. Frank Müller
Managing Director HMP Group

FASPAR Spa.
via Ugo Foscolo 20/22
20087 Robecco
Italy
Tel: +39 029471274
Fax: +39 029471611
sales@faspar.it
www.faspar.it



GIFA, METEC, THERMPROCESS, NEWCAST 2019

Casting and steel – The future is digital

Digital transformation and industry 4.0 are among the major topics of the future, also in the metallurgy industries. More and more sophisticated sensor technology provides more and more data from the production process.

First-hand experience of the digital future no longer requires a visit to Silicon Valley. More and more companies are realising that within the quartet of technology trade fairs GIFA, METEC, THERMPROCESS and NEWCAST new and exciting topics are being addressed! "The Bright World of Metals" is focusing on digitalisation and Industry 4.0 in 2019.

Digital transformation and Industry 4.0 are among the major topics of the future in the metallurgy industries. Increasingly sophisticated sensor technology is providing more and more data from the production process in foundries and steel mills. Every cast slab and every rolled steel strip requires thousands of items of data. Even a comparatively smaller steel mill like Saarstahl's at the Völklingen site produces more than 100 terabytes of process data a year with around two and a half million tons of steel products – a data volume corresponding to the contents of around 30 million telephone directories.

It is no longer simply the accuracy of the data that is the basis for information but the sheer volume as well. Evaluating data, recognising patterns and obtaining information is no longer possible with conventional IT methods. As big data analysis, artificial intelligence and networked cloud systems are replacing the data centres and relational databases of the past, the digital monitoring of machines and systems reduces maintenance costs, increases efficiency and has the potential to optimise products. Cloud technologies, with their storage volumes that are subject to hardly any limits, can serve to make it possible to generate more revenue from operational product and machine data with new services.

Metallurgical plant manufacturers such as the SMS group hope that digital services will compensate them for the weakening of their core business due to worldwide overcapacities in steel. Steel manufacturers and foundries link purchasing, sales, production and logistics in a cost-saving manner with hardware-based IT application of Industry 4.0. The development of digital channels puts the customer at the heart of the business.

For Essen-based steel and industrial group ThyssenKrupp, the interlinked steel factory with a digital channel to the customer has already been achieved. The Industry 4.0 hot rolling mill Hoesch Hohenlimburg in Hagen is interlinked with the precursor material supplier Hüttenwerke Krupp Mannesmann (HKM) in Duisburg. The steel slabs are cast in Duisburg, then rolled in Hagen into medium-wide strip, which is then processed by sheet metal processors into components for the automotive industry. Even during the process, customers can use a PC, smartphone or tablet PC to determine when his steel strip goes into production and make changes to material properties such as sheet thickness and width at short notice.

Casters in the data stream

Generating process knowledge from data with the support of Big Data and implementing solutions in Industry 4.0 is also on the agenda of aluminium and iron casters. Solutions such as process optimisation through coupling of the casting process simulation with data-driven process models are in demand – a research ap-proach that Magma of Aachen, a company specialising in simulation software, is pursuing in the IProguss research project. Intelligent energy and resource

efficiency is always an issue, especially for a process-related energy-intensive company such as an iron foundry. Professor Dierk Hartmann, Kempten University is working on an optimised solution for the Adam Hönig iron foundry. The foundry uses barcodes that are scanned by employees on their smartphones and transferred to a database. In this way, new process parameters can be added to the production areas and the production process can be tracked. The aim is to improve energy and resource efficiency by reducing overproduction of liquid metal

"Foundries are experienced in dealing with data-driven business models", says Heinz Nelissen, President of GIFA 2019 and NEWCAST as well as Managing Director of Vesuvius GmbH, Foseco Foundry Division in Borken. Approaches related to machine-to-machine communication, automation and robot use, computer-aided technologies, and product and process development will therefore also be a focus at GIFA 2019.

How Industry 4.0 can look in practice can be seen at Karl Casper Guss in Pforzheim. The foundry produces a wide range of hand-moulded parts with unit weights from 100 kg up to 9.5 t. In order to be able to react quickly to changing customer requirements while guaranteeing high production reliability and quality at the same time, Casper Guss relies on an integrated Industry 4.0 solution with three pillars:

1. Interlinking of all operating equipment
2. Planning and control of processes with 100% traceability through the ERP system
3. As an interface to the extranet, a web portal that gives customers access to production information.

Linking of all systems from end to end makes it possible to plan individual orders directly, as Managing Director Felix Casper describes. The ERP system automatically checks feasibility upon receipt of the order, thus ensuring a high level of adherence to delivery dates. Feedback from all production steps improves throughput and increases quality. Using the web portal, custom-ers can call up production information on their orders from the extranet and directly enter additions as well as changes to dates or quantities. "Interlinking of the customer systems with our own systems leads to faster and more reliable processing of orders", summarises Casper.

FeroLabs: Industry 4.0 for steel production

Agile companies from the start-up scene also have their eye on tapping new business areas with digitalisation. Digital technology opens the door to potential disruptors in the metal industry as well. Voice control via mobile phones along with face recognition in social media such as Facebook, Amazon, Google and Apple is finding its way into the steel industry, thanks to clever company founders: machine learning is one of the most successful subareas of artificial intelligence. While self-learning algorithms were mainly a topic of academic research until a few years ago, today they are increasingly making their way into our everyday lives as well as industry.

"With Fero Software, our customers are able to better understand their production process and thus increase their profitability", says Tim Eschert. As an application engineer at FeroLabs in Düsseldorf, the industrial engineer with a master's degree from RWTH Aachen University is something like the vicegere of the New York start-up in Germany. FeroLabs uses what are known as statistical machine learning (ML) methods. Eschert sees them as a bridge between conventional analysis methods such as Six Sigma, which have so far been used in production, and the modern technology of machine learning. "The area of statistical ML combines these two fields, and we at Fero are proud to be the first to bring these methods from academic research into industrial manufacturing", says the FeroLabs manager.

In the area of steel, the start-up has applied and researched the use of its software in various applications, as Eschert explains. These include, for example, reduction of surface oxidation (cinder) and the prediction of material properties in a hot wide strip mill, quality improvement in a tube mill, detection of inclusion defects in a wire mill and optimisation of alloy usage in a rod mill. "At present, the application of alloy optimisation is the area in which we are most advanced in terms of implementation and scaling, but the other areas are already fully operational", reports Eschert.

Steel customers include Gerdau in Brazil, which produces steel on the scale of ThyssenKrupp and is known for its good quality. For FeroLabs, the focus there is mainly on reducing production costs by means of ML while maintaining the same quality. As Eschert reports, FeroLabs combined data from several different databases to get a complete picture of the

entire production process from the steel mill to the rolling mill. "The merged data set contained hundreds of parameters, including process and sensor data as well as quality metrics. Using data from a few months, Fero automatically trained machine learning modules, which proved to be very accurate in predicting target key figures", explains Eschert.

Today at Gerdau, shop floor managers, quality management teams and process engineers use Fero software to understand complex, non-linear relationships between production and target key figures, for example. "They are currently using these findings to carry out simulations within the Fero software and to determine the optimum production parameters for each product quality", reports Eschert.

Mecorad: Industry 4.0 in the rolling mill

Dr Marc Banaszak is Managing Director of the Cologne-based start-up Mecorad. The spin-off company of the Technical University of Cologne will support operators of hot rolling mills with a high-precision measuring system and applications based around it. In addition to higher product quality, the goal is the lowest possible loss of production value as well as a production that is interlinked down to the end user. During production, the Mecorad measuring system measures flat steel with micrometre accuracy, which is a truly demanding task. In hot-rolling steel production steam, stirred-up dust and thermal radiation have so far prevented the glowing steel strips from being precisely measured during the production process. The company wants to solve the problem using radar sensors. At every point in the process, a measurement precise to the micrometre takes place in real time. Unlike previously used laser or camera techniques, radar is capable of penetrating the surrounding air contaminated by steam and dense dust. Interferences and disturbances caused by strong vibrations, for example, are eliminated by the algorithms developed by Mecorad, assures Banaszak.

Building on these measurements, the company offers further services along the production chain. These include software for specialised measurements, process analyses and control algorithms, such as control of the roll gap or roll calibre. Coordination with external players such as scrap processors can also be managed using Mecorad applications. "Our system is designed to enable services to the end user and to integrate them into production, for example by automating order processing", Banaszak promises.

The goal of founder Banaszek is to support the entire production system with digitalisation. "Using our technology, we are tackling two fundamental problems in steel production: excessively high production value losses due to inaccurate measurements and a lack of control processes, as well as a great deal of catching up to do in terms of digitalisation", says the Mecorad Managing Director.

SMS Digital: Catching up in the digital field

The dynamic nature of young start-ups is also spurring on established players. Plant builder SMS, for example, uses what is known as the design-thinking approach to implement new digital services as they are typically pursued by digital start-ups. That's no accident. Two years ago, with the support of Etventure, a management consultancy specialising in digital transformation and part of EY (Ernst & Young), the leading plant builder set up its own subsidiary to act as a "creative forge", SMS Digital. The slogan of the young creative minds based in Düsseldorf: "We tackle the challenge of digital transformation and Industry 4.0". Their mission: to develop software for Industry 4.0 and digital services for steel companies all over the world.

SMS Digital has already developed the first applications and software solutions to the point of readiness for the market, such as the intelligent alarm management "Smart Alarm". In order to achieve maximum plant availability, it is important for plant operators to monitor the status of the plant. However, conventional visualisation systems with human-machine interfaces (HMIs) do not always meet this requirement, as SMS found. With the new alarm management, all plants of a steel company can be integrated into one system. The plant status is evaluated by trend analyses, with time-consuming training not being necessary thanks to simple and intuitive operation. In the event of an alarm, a text message and e-mail are sent automatically. The digital forge is currently working on predicting alarms and identifying the triggering alarm in the event of many alarms occurring at once.

The fact that traditional plant builder SMS group is serious about digitalisation is demonstrated at the top management level. SMS CEO Burkhard Dahmen appointed Bremen professor Katja Windt to the Executive Board in April 2018.

As Managing Director of Digitalisation, the mechanical engineer with a doctorate is responsible for the Digital Solutions as well as the Electrical Systems and Automation divisions of the SMS group. As a professor at Jacobs University Bremen, the expert for production technology already implemented digitalisation and logistics projects for customers from the steel industry.

Opportunity of digitalisation – danger of disruption

The digitalisation of production creates a dynamic ecosystem. The potential opens up opportunities for new competitors from the start-up scene to offer new services in order to make established companies vulnerable – even to the point of disrupting existing customer-supplier relationships.

"Digitalisation and disruption are affecting every company and every industry", says Philipp Depiereux, founder and CEO of Etventure. The only difference is the speed of change. "What the publishing and music industries have already painfully experienced may also affect steel mills and foundries in the future." This was also demonstrated by examples from other rather traditional sectors such as the heating industry. In this case, start-up Thermondo used a good, digital offer to insert itself between the end user and established providers in a very brief time and is today the largest installer of heating systems in Germany.

Depiereux, who together with Etventure advised not only plant manufacturer SMS but also steel trader Klöckner and assisted in establishing a digital business model with a start-up in Berlin, is certain of the following: "Steel mills and foundries need to be aware of one thing: Everything that can be digitalised will eventually be digitalised. They have to ask themselves whether they want to stand by and watch this change or whether they would rather take action themselves before a digital player attacks their core business", warns Depiereux. The digital expert also has good advice for established companies: "Above all, they need to understand what these large digital players and start-ups do differently and make these success factors their own."

It is not convincing to Depiereux that steel manufacturers and foundries, forges and rolling mills, as classic representatives of the old economy with their heavy and bulky products, appear at first glance to be less willing to embrace the new business models of digital transformation. "Selling a steel slab digitally is of course more complex than doing the same with a book. But that doesn't mean that it can't succeed and that someone will inevitably do it at some point."

(Author: Gerd Krause, Medienkonzept/Düsseldorf)

GIFA, METEC, THERMPROCESS, NEWCAST 2019
Monika Kissing/
Michelle Pietsch
Tel: +49 (0)211-4560 543/465
Fax: +49 (0)211-4560 87543
KissingM@messe-duesseldorf.de
PietschM@messe-duesseldorf.de

Huntingdon Fusion Techniques

Welding reactive metals

The reactive metals by classification are zirconium, titanium and beryllium. We also include here tantalum and columbium (niobium), being from the refractory class and which also present similar challenges to the welding engineer.

Aerospace, automotive, medical and military industries are increasingly using all these materials. They have many technological attractions being durable, low density, bio-compatible and offering high corrosion resistance but they are expensive. Welding procedures need to be carefully developed and stringently applied to avoid expensive waste, rework or risk of service failure.

Successful fusion joining techniques have evolved1 since the alloys were first used in engineering applications. The majority of metallurgical problems, even considering dissimilar metal welding, have been resolved and filler materials are readily available. However, their reactive nature make it essential to continue to address the requirement for thorough pre-cleaning and particularly oxidation at the high temperatures involved in arc welding.

Cleanliness

Weld repair of plant that has been in service presents the most difficult situation for welding reactive and refractory alloys. The equipment is usually dirty and may have process scale on the surface. In most cases, the repairs must be done outdoors where the work area and conditions are not optimal for welding reactive metals - the environment usually is dirty. High humidity and wind also interfere with the welding process.

Furthermore, plant shutdowns that require equipment repair usually result in pressure to complete the work quickly. There is little merit however in cutting corners. Repairs that must be made to partial-penetration welds or where crevices exist pose a special problem because of contaminants in crevices.

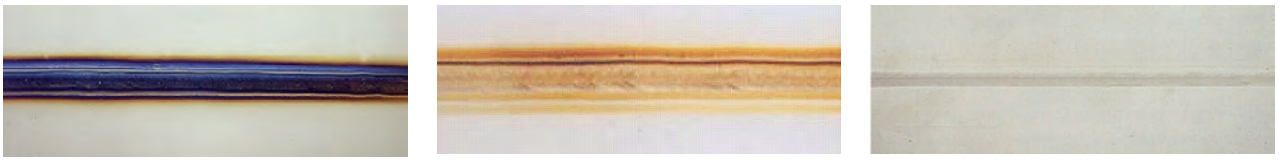
Poorly prepared surfaces can result in weld contamination and lead to a premature failure and a repeat of the weld repair. Overall, expect to spend more time preparing to weld than actually welding when work is undertaken on site.

Even under the cleaner conditions prevailing in most factory environments however there is still a need to prepare surfaces by removing all contamination prior to welding. Published information on cleaning techniques is available 2 - 8 but the basic principles are to abrade surfaces to remove any corrosion products and other debris then degrease and finally dry. Prepared surfaces should then be protected by covering until any joints are to be made.

Protection Against Oxidation

Reactive metals have a strong affinity for oxygen at the temperatures prevailing in fusion welding and when combined form very stable compounds. Refractory metals exhibit many of the same characteristics.

Oxidation will be evident visually as discolouration as may be seen from Figure 1.



Weld made with 500 ppm oxygen in purge gas

Weld made with 70 ppm oxygen in purge gas

Weld made with 12 ppm oxygen in purge gas

Fig.1: It can be generally assumed that for titanium and other refractory and reactive alloys a 20 ppm level is necessary if oxidation is to be avoided.

Discolouration itself may be acceptable and may be removed mechanically after welding but a more significant result of oxygen contamination is the effect on mechanical properties. Tensile strength is often increased but at the expense of loss of ductility. There can also be a dramatic reduction in corrosion resistance. Since the primary uses of these alloys are in applications where strength and corrosion resistance are mandatory, oxidation is clearly unacceptable.

Protection is thus essential and this is achieved by surrounding the joint with an inert gas such as argon or helium. However, the gas shield associated with a standard GTAW torch is inadequate, offering insufficient cover. Specialised purging equipment has evolved over the past 25 years.

Trailing Shields®

The extra coverage provided by trailing shields not only protects the fusion zone, it also provides inert gas protection to all the hot adjacent metal. Figure 2.

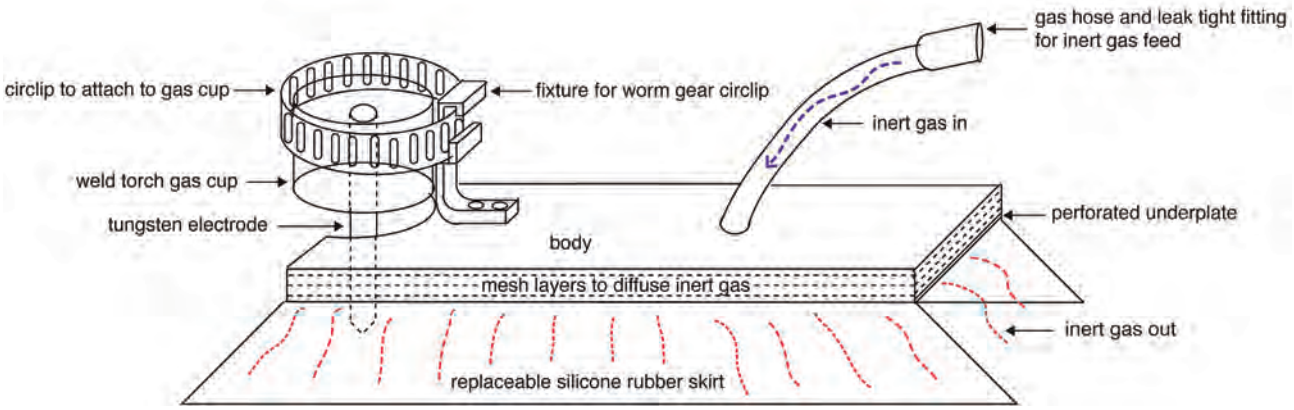


Fig.2: It can be generally assumed that for titanium and other refractory and reactive alloys a 20 ppm level is necessary if oxidation is to be avoided.

Custom made trailing shields are available commercially, but these are inevitably expensive and have limited use. The shields manufactured under the Argweld®11 name have in-built flexibility.

For curved shapes, eg pipes, tubes and cylindrical vessels, trailing shields are available to suit a specific diameter. They can be configured for either internal or external welding and there are versions for mechanised welding.

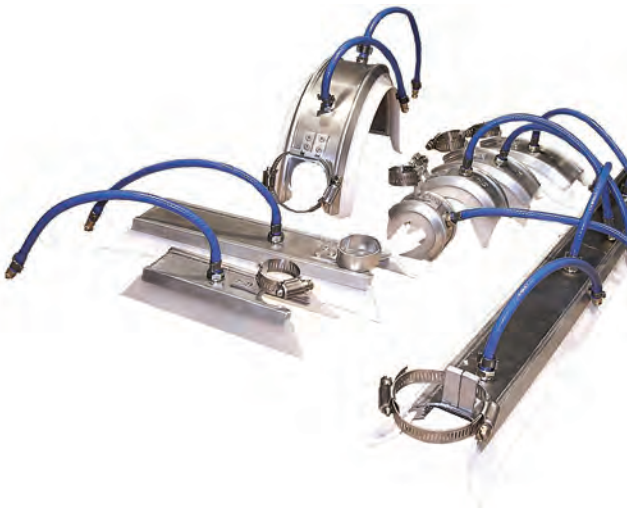


Fig. 3: Standard Argweld® radiused and flat Trailing Shield®.

Home made purge dam set

Flat trailing shields for plate, sheet and rectangular tanks are available in small lightweight versions for manual welders or, like the radiused versions, larger, more robust, versions for attaching to automatic/mechanised welding systems.

Argweld® Trailing Shields® have been designed specifically for use with GTAW (TIG) or PAW (plasma) welding torches and provide a high level of additional inert gas shielding to supplement that supplied by the basic torch.

Pipe and tube purging

Systems for weld root protection are based on sealing the inside of a pipe on either side of the weld zone then displacing air with an inert gas. The seals must be reliable and leak tight, effective and easy to insert and remove. The inert gas must be of a quality commensurate with the need to protect the molten metal.

Gas flow should be laminar to maintain a high level of protection and pressure controlled to offer adequate coverage but without expelling molten metal from the joint. Early, and with hindsight, primitive systems, mostly home made and individually fashioned at great expense, involved the use of paper, card, wood and polystyrene discs. Often these provided at best poor sealing and on occasions burst into flames – satisfactory removal after welding presented challenges.

Ensuring that all oxygen had been removed during purging was left entirely to the skill and experience of the operator.

There were regular incidences where protection proved to be inadequate and the joint had to be re-made with consequent expense and loss of time. It comes as a surprise that these practices are still used, even by prominent fabrication companies across the world.

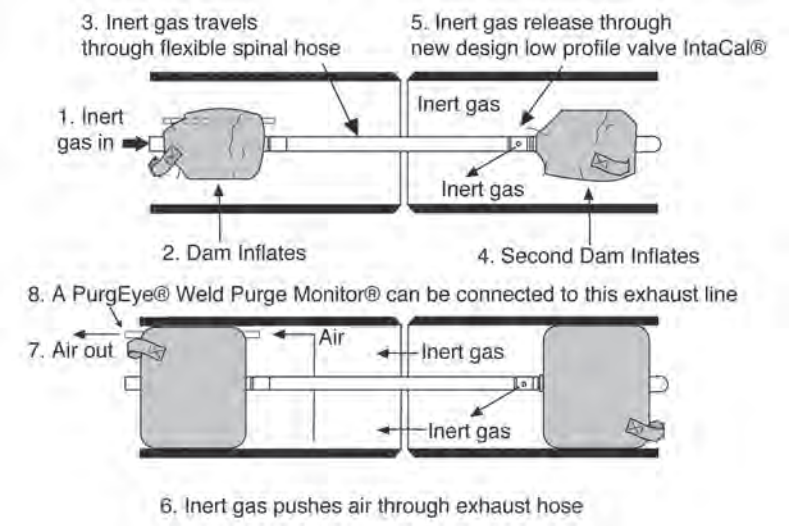


Fig. 4: Pipe and tube purging concept

Argweld® systems have been developed to help speed up the welding of pipes. This has been realised using a design, which allows for easy and positive insertion into position and by limiting the purge volume.

The product range, which includes QuickPurge® and PurgElite® (Figures 5 and 6), has been used successfully and internationally during the welding of reactive and refractory alloys for the nuclear, liquid natural gas LNG, aerospace and process industries.

Fig. 5

Fig. 6

Flexible Enclosures

The highest level of protection is afforded by undertaking welding in a vacuum as in, for example, the electron beam process. A less effective process uses a metal enclosure, the 'glove box', which can be filled with inert gas. Both these techniques are relatively expensive to manufacture and only justified by companies involved in high volume production where the cost can be easily amortised.

Ultra violet stabilized engineering polymers are used throughout during manufacture of Flexible Enclosures. Material thickness is nominally 480 microns.

A large principle access leak-tight zip is fitted. Additional entry points provide for operators gloves access ports for welding torches, electrical supplies and cooling water along with purge gas entry and exhaust ports are incorporated into each enclosure.

Fig. 7:. Glands for electrical, weld torch and water feed through

Fig. 8: Medium size standard enclosure showing large entry zip, two sets of glove ports and a posting port

Residual oxygen measurement instruments

Any effective weld purge process needs to be supported by suitable oxygen detecting equipment. Weld Purge Monitors® have now been developed to meet the need for reliable, robust and sensitive measurements. For reactive and refractory alloy welding these must be capable of measuring oxygen levels down to 10 ppm.

As an example, the PurgEye® 300 Plus instrument manufactured by Huntingdon Fusion Techniques HFT® reads down to 10 ppm with extreme accuracy and has a display range from 1,000 to 10 ppm.

Mains driven, the instrument has integral switching software to control external devices like power supplies or alarms and software to give QC analysis when connected to a PC.

Fig. 9: An alternative version to this model is the PurgEye®500 Desk, see below, which has an integral pump to extract samples on a timed basis when no regular free flow of gas is available.

The entire Argweld® product range is supported by an extensive technical library of publications including Technical Notes, White Papers, Conference Proceedings and peer-reviewed International Articles. These are available on-line by application to Huntingdon Fusion Techniques HFT®.

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Huntingdon Fusion Techniques
Stukeley Meadow
SA16 0BU Carms
UK
Tel: +44 1 554 836 836
Fax: +44 1 554 836 837
hft@huntingdonfusion.com
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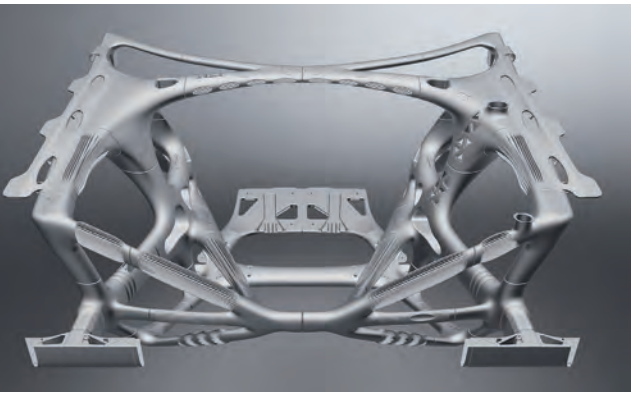
GIFA, METEC, THERMPROCESS, NEWCAST 2019

Additive manufacturing: the key issue for production engineering in future

Preparation of the body: a first-generation VW Caddy was gutted completely and a new front end structure was fitted.



Not only heat management but also passive safety, liquid storage and other functions were integrated in the organic, load-driven design of the front module.

High-tech with integrated functions: heat management as well as space and weight reduction are crucial features of the design for the innovative front end.

Automotive and aerospace industries opt for 3D printing

Additive manufacturing is the key issue for production engineering in future. Conventional manufacturing technologies are being supplemented to an ever increasing extent by three-dimensional printing, which is already in successful operation in many sophisticated fields like the medical engineering, automotive and aerospace industries. The foundry, steel and aluminium industries have also recognised the potential of 3D printing. For this reason, the four Düsseldorf trade fairs GIFA, METEC, THERMPROCESS, NEWCAST 2019 (25. to 29. June 2019) are devoting a special show of its own to the subject of "additive manufacturing".

A look under the bonnet of the demonstration vehicle shows the potential that industrial 3D printing has for the automotive industry: few components but with more functions and considerably less weight. The new crash-proof front end structure of the old VW Caddy, which weighs 34 kg, is made from the extremely strong and tough high-performance alloy Scalmalloy from the Airbus subsidiary APWorks using a 3D printer supplied by the German company EOS. The 3iprint project that was carried out under the leadership of the development service provider csi won the "German Innovation Award 2018" in mid-June. The aim of the Caddy concept is to indicate what is technologically possible in automotive production using new design methods and new materials with the help of additive manufacturing.

Three-dimensional manufacturing processes, which is the general term used for the various additive production technologies with all the different kinds of 3D printing systems, are where the future lies. Additive manufacturing with plastics, metals and ceramics is already an essential feature of industrial production today. Almost 40 per cent of the German companies surveyed in 2016 already used 3D printing, as the consulting firm EY determined. The potential in all the different fields is tremendous. 3D printing with concrete could revolutionise the construction industry, while the bioprinting of living tissue is already possible – and even the printing of human organs is an issue that is the subject of serious research.

3D printing is creating new opportunities for the metal industries from aluminium and steel to titanium and special materials – whether foundries and steel mills or forging and sheet processing companies are involved. With 3D printers, structures are produced layer by layer on the basis of digital design data. Material is only used where it is needed. Additive technologies have their strengths where conventional manufacturing processes like casting, milling or forging reach their limits. 3D printing gives designers unlimited geometric freedom. Complex components with a bionic structure and integrated functions can,

for example, be produced with varying wall thicknesses, cavities and honeycomb structures – like the heavy-duty, lightweight metal, automotive structure from the 3iprint project outlined above.

The production of small batches and even of individual components is economically viable with 3D printing too. Die casting moulds or forming tools are not needed, which can quickly lead to tool cost savings of several tens of thousands of euros. Individualised components, prototypes and spare parts that are rarely needed are therefore considered to be the domains of additive manufacturing. 3D printing is not, however, the universal "assault weapon" for attacking the bastions of established production engineering. The manufacturing expert Franz-Josef Wöstmann from the Fraunhofer Institute IFAM in Bremen says: "Additive manufacturing is a supplement not a substitute."

3D printing reaches its limits at the latest where large product quantities can be made economically with conventional manufacturing processes. This is primarily the case in the high-volume segment of the automotive industry. Additive manufacturing with metal is not productive enough for mass production in series at the present time. Dr Stefan Geisler, Innovation Manager at KSM Casting Group in Hildesheim, is certain: "3D printing will be increasing for premium vehicles and for a limited number of components, but it will not succeed in replacing foundries." He is convinced that the quantities needed in the volume market cannot be reached even with the faster layering speeds possible, for example, using additive manufacturing with wire. Geisler points out: "What is often forgotten is that additive manufacturing cannot overcome the laws of physics either. In the final analysis, all that are involved there too are processes: melting and cooling. There are limits to the speed at which this is possible." In addition to this, the printed articles need to be machined into finished functional components.

Another definite disadvantage of additive manufacturing with metal is the high energy consumption involved. Dr Wolfram Volk, Professor of Metal Forming and Casting at Munich Technical University, calculates that about twice as much energy as in conventional casting is required for the laser melting of metal, from powder production to the finished component.

Additive processes are becoming an increasingly common element of existing process chains. How additive manufacturing and machining can be combined to carry out comprehensive, hybrid processing in a single machining centre is demonstrated by, for example, the machine tool manufacturers DMG Mori and Hermle. World market leader DMG Mori supplements laser metal deposition by subsequent machining in the form of turning and milling. Its competitor Hermle extends a multiaxis machining centre by a thermal spraying process using its MPA (metal powder application) technology, in which metal powder is applied in layers to produce a soundly built component.

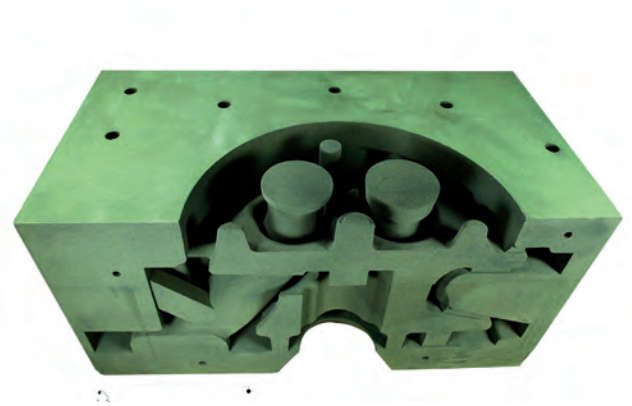
The Berlin company Gefertec is looking to increase manufacturing speed in the additive processing of metals. The 5-axis lines produced by the expert for additive manufacturing technologies weld wire in layers by the electric arc process. The workpieces produced in this way have outlines that are very close to the final shape, which reduces the time and tooling operations required for subsequent machining.

Foundry: direct and indirect additive manufacturing processes

The foundry industry can benefit from additive processes in several different ways. Direct additive manufacturing processes give foundries the opportunity to include individual parts or parts that are needed in small quantities in their product portfolio too. In the case of indirect processes, on the other hand, they use additive technologies to produce moulds and cores out of sand as well as models out of plastic. Hybrid technologies involving a combination of conventional casting and additive manufacturing processes have further potential.

In order to take greater advantage of the potential that aluminium has to produce lightweight structures in automotive manufacturing, the aluminium producer Trimet is working on the development of a hybrid process chain to link die casting and additive manufacturing. The approach adopted in the context of the joint "CastAutoGen" project specifically involves the incorporation of 3D printed structures in a die cast component.

German industry holds a prominent position among the producers of additive manufacturing systems, as the BDI (Federation of German Industries) concludes in a position paper. The country's market share is about 70 per cent with powder bed systems. The



Printed sand mould for a large diesel cylinder head from MAN: the mould with dimensions of 1,460 x 1,483 x 719 mm was manufactured additively in 29 hours by the binder jetting process using a sand printer.

Large diesel cylinder head: cast iron part weighing more than one tonne.

world leaders among 3D printing manufacturers include Concept Laser (metal), EOS (metal and plastic), SLM Solutions (metal) and Voxeljet. Voxeljet has specialised in foundries and markets 3D printers for the production of sand moulds and cores as well as of plastic models for investment casting by the lost-wax process.

In order to produce a casting, what are needed are a mould and the appropriate cores to form the cavities in the component that is being cast. In classic sand casting, the moulds and cores are made from quartz sand, which is strengthened by a special bonding agent. While fully automatic moulding machines and automatic core shooting machines are standard features at modern foundries for the mass production of car engines, for example, it is rarely an economic solution to use automatic equipment for prototypes and small batches. 3D printing is an increasingly common alternative here. Sand moulds and cores of any complexity are manufactured from the CAD dataset via a layering process. Toolless manufacturing of this kind provides high flexibility as regards numbers, design and versions and permits the production in exactly reproducible quality of complex moulds and cores with practically any geometry. Voxeljet talks about cost savings of up to 75 per cent in the 3D printing of moulds and cores made from sand for small batches.

The printing of sand moulds and cores is a highly suitable option for development operations. The iron foundry Düker with locations in Karlstadt and Laufach in Germany, for example, does not use models any more in the casting it carries out for customers. The CAD dataset is all that is needed to produce the sand moulds that are manufactured additively. As a result, new products can be implemented in castings from computer files within a short time and can then be machined for trial purposes. Geometric adaptations are simple to carry out and recasting is then possible once the design data have been changed and another mould has been printed. Düker reports that development time is reduced significantly by this process. It is apparently standard procedure to produce initial samples within a few weeks, for which months are needed in the series process.

Die casting with reusable moulds made from tool steel benefit from 3D printing too. “Additive manufacturing is creating tremendous opportunities for die casting companies”, as Dr. Ioannis Ioannides, CEO of the die casting machine manufacturer Oskar Frech, who is both Board Chairman of the VDMA foundry machine trade association and a member of the board of the VDMA additive manufacturing task force, stresses in an interview with the magazine Giesserei. For example, Frech uses 3D printing to produce a complex key component for its low-sprue FGS tool technology that economises on recycled material (e.g. aluminium or magnesium).

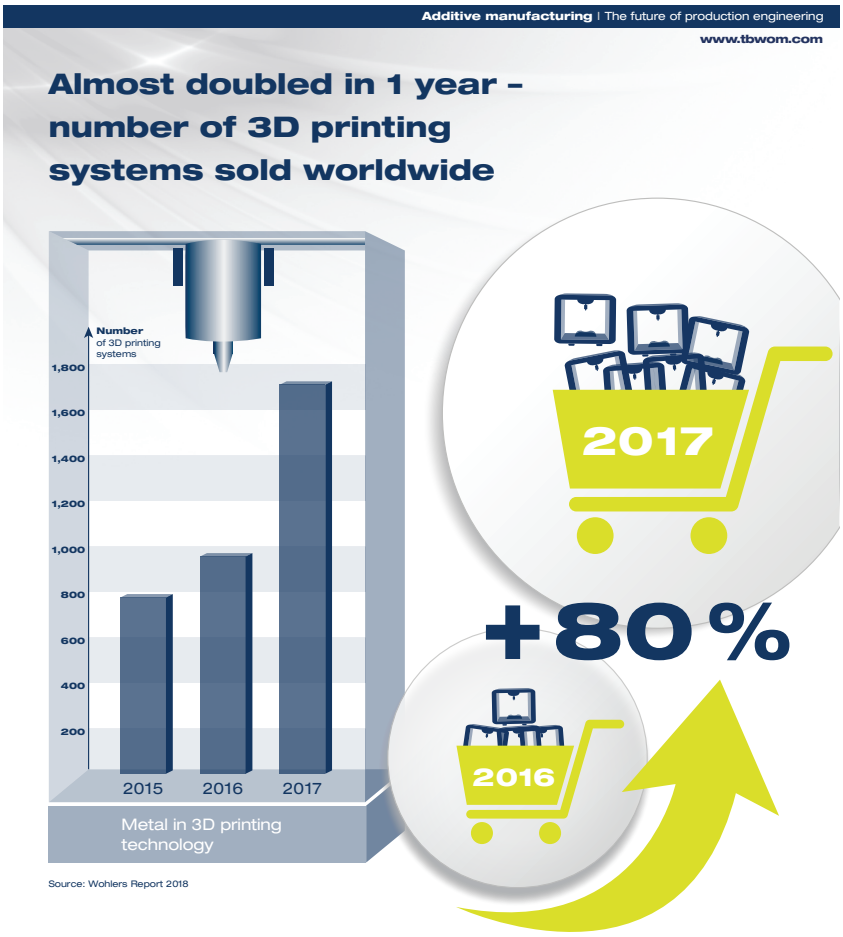
The mould plays a key role in the die casting process. It is important that the castings solidify as quickly as possible. The process time for a component can be shortened by faster cooling, while the quality of the casting is improved at the same time too. This depends on adequate heat removal in the casting mould, which is traditionally achieved

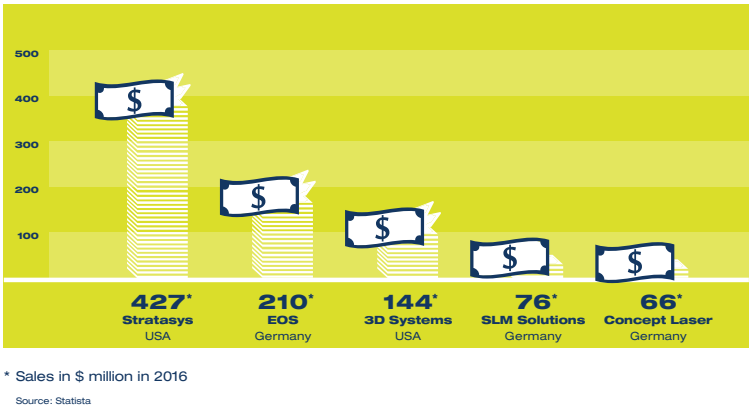
via cooling holes. Due to process constraints, however, there are limits to how close to the shaping surface that cooling holes can be produced. Additive manufacturing can help here, because cooling close to the surface is possible even in critical areas of the mould thanks to the tremendous amount of design freedom the process provides.

Steel industry: numerous opportunities with 3D printing

The situation in the hot forming of steel plate is not much different than in die casting. Cooling close to the surface increases productivity and quality here too. Additive manufacturing has therefore been a standard process in the tool production operations of German car manufacturers for a long time now.

Steel companies are discovering additive manufacturing as an additional area of operation to an increasing extent. The Austrian technology and steel company voestalpine, for example, chose Düsseldorf to be its corporate centre of excellence for metal additive manufacturing two years ago. Initial results have been achieved. Together with the development service provider Edag and Simufact, the specialist for simulation software, the Austrian company has developed a lightweight bonnet hinge with integrated pedestrian protection that is produced by additive manufacturing.





Rosswag from Pfinztal near Karlsruhe, the biggest open die forging company in Southern Germany, demonstrates with additive manufacturing how the best of two worlds can be combined. The long-established company manufactures new products by linking the two manufacturing processes forging and selective laser melting of steel powder. Solid, material-rich, conformal components are made by open die forging. The production of a heavy-duty, forged workpiece with appropriate grain flow is followed by additive manufacturing via a 3D printer in order to supplement the complex structures. In the case of an impeller with additively manufactured vane structures, for example, channels were incorporated to influence flow characteristics.

Steel plant manufacturers: significant reduction in the weight of dynamically moving components

The most recent member of the additive manufacturing club is SMS group, the specialist for metallurgical machine and plant manufacturing. The leading manufacturer of steel and rolling mill technology has installed a new pilot plant for metal powder production at its location in Mönchengladbach, Germany. The company has several objectives with the powder atomisation plant. On the one hand, SMS aims not only to produce high-purity metal powder for additive manufacturing on behalf of customers but also to develop and test new materials. The company can take advantage in this context of decades of experience with the atomisation of iron powder and/or sintering. The extensive metallurgical know-how available within the corporate group and the wide-ranging expertise in thermal process engineering are a good basis too. On the other hand, the plant manufacturer would like to supply the rapidly growing market for metal materials for additive manufacturing processes by marketing powder atomisation equipment.

Last but not least, the in-house metal powder production facilities are a link in the company's additive manufacturing process chain. The plant manufacturer has already started to exploit the potential of this innovative new technology by producing additively manufactured spraying nozzles for swaging presses. Spraying nozzles remove scale from dies, cool the surface, apply lubricants and dry the dies. The original spraying nozzle was a solid and heavy component. Very light and compact spraying nozzles can be produced by three-dimensional printing that are customised precisely to meet the requirements of individual dies. The company reports that use of the 3D spraying nozzles, which can be produced either from plastic or from metal in accordance with the customer's needs, leads to a reduction in cycle time as well as to an extension of tool service life in the swaging process.

SMS reveals that the results of other projects are no less promising. A conformal design with integrated nozzles is an outstanding feature of a new roller cooling pipe for wire rolling mills, for example. Thanks to the use of alumide, a combination of aluminium and plastic powder, the structure is easier and more cost-effective to produce than conventional components. In the steel converter field, it has been possible to reduce the size of the SIS injectors used for molten steel by 60 per cent, while they can be produced from a single part instead of eight parts. And pipe welding machines from SMS group can also produce pipe diameters of 14 inches or less in future thanks to printed parts, because smaller but more efficient lubricating rings for the expander tools are possible in a hybrid structure produced in a combination of additive and conventional manufacturing.

Special additive manufacturing show at GMTN 2019

Messe Düsseldorf is supplementing the metallurgical trade fairs GIFA, METEC, THERMPROCESS and NEWCAST, which are being held from 25. to 29. June 2019, by a special additive manufacturing show. Exhibitors from all over the world will be presenting new developments about additive processes on the GIFA site. Other participants are software companies, which will be highlighting solutions from 3D visualisation and modelling to data processing, as well as metal powder suppliers and producers of machines, equipment and processes for additive processing and subsequent machining.

(Author: Gerd Krause, Mediakonzept/Düsseldorf)

GIFA, METEC, THERMPROCESS, NEWCAST 2019

Monika Kissing
Michelle Pietsch

Tel: +49 (0)211-4560 543/465
Fax: +49 (0)211-4560 87543

KissingM@messe-duesseldorf.de
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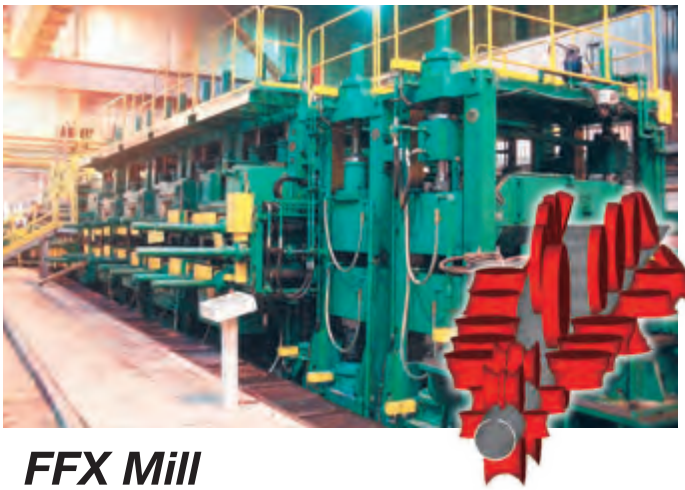
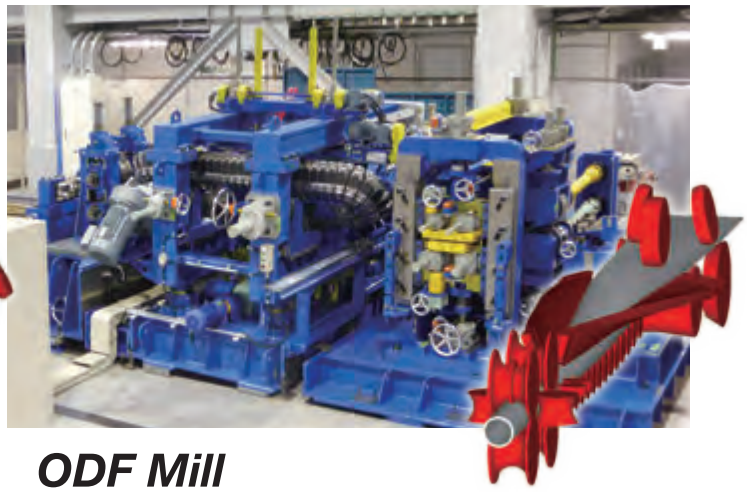
The most advanced
ERW pipe forming technology

We are ready to provide total support for pipe manufacturing equipment from designing to follow-up service, from manufacturing, installation, trial operation to operators training, maintenance training, based on our technical knowledge and extensive experiences.



FFX Mill

FFX is one of the main products from NAKATA, which realized roll's full common use in initial forming stage. Without any roll change, only one set of rolls can produce various size quality pipes, which results in less downtime and higher productivity.

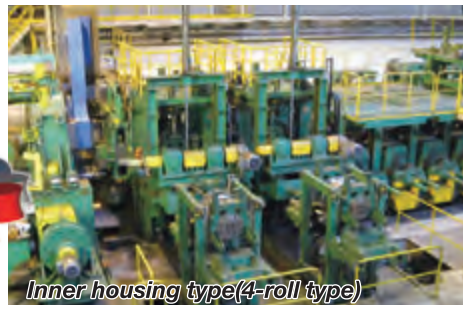


ODF Mill

ODF Mill, as the next generation of flexible forming mill, using forming dies in place of traditional forming rolls, it has ability to produce even extremely thin and low-ductility pipes with no lubrication, which is ususally very difficult in roll forming.In addition, large pipes above 26 inch O.D. , for which there are usually no wide enough steel coil availble, can also be manufactured using steel plates or sheets as raw materials.

Helical edge miller

RollBox



Inner housing type(4-roll type)

Squeeze stand

Flying cutoff

Hydrostatic Tester

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Meaning of “measuring rate”, “averaging” and “accuracy” when investing in a measuring device

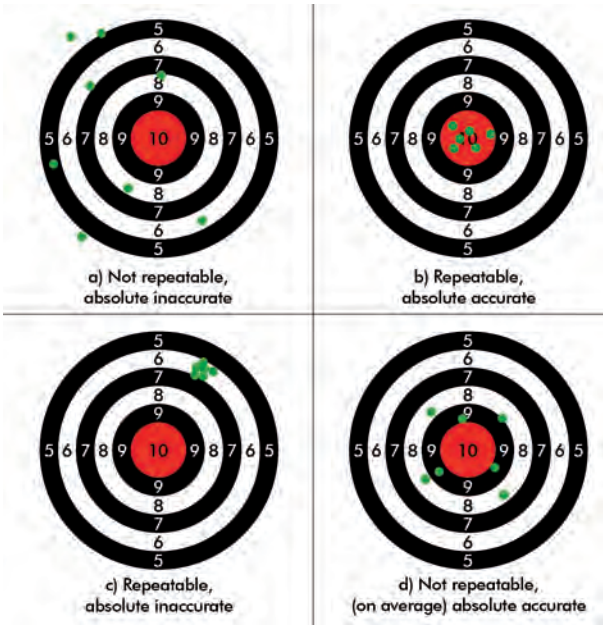


Figure 1: Absolute accuracy and repeatability based on the example of a shooter

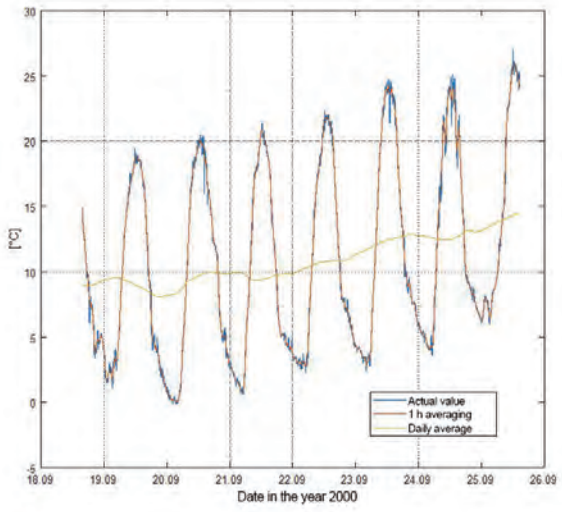


Figure 2: Temperature profile as example

When deciding about investing in a measuring device, one of the main factors – besides the costs – usually is which device is the “best”. Characteristics where “more” or “less” is considered as “better” are seemingly easy to compare. This simplification, however, bears risks. In digital photography, for instance, the size of the sensors and, thus, of the individual pixel in general, is more important than the total number of pixels. The pixel count however is commonly the relevant sales argument. For that reason, it makes sense to question the characteristics of a measuring device, as well as their definition and interaction. Often further information about the conditions under which these characteristics are valid such as temperature, position dependency etc. are missing.

Specifications usually contain the following characteristics: “measuring range”, “absolute accuracy” (also “correctness”), “repeatability” (also “precision”) and “measuring rate”. “Measuring range” indicates minimum/maximum object sizes that are measurable. Sometimes, the visual range is specified instead, this means: the overall range in which the objects to be measured are allowed to move. Occasionally, information about the minimum and/or maximum measurable size is missing, too. The colloquial meaning of “accuracy” is the total of all measuring errors. However, for the evaluation of a measuring device, it has to be differentiated: “absolute accuracy” means the comparison of a mean measuring value with a certified standard value. “Repeatability” is defined as the scattering of the measuring values under the same conditions and, therefore, a characteristic of the measuring value noise of the device itself. The sole specification of only a numerical value for “repeatability” is not sufficient. It might be that one supplier indicates the standard deviation of single values, whereas another calculates those based on a sequence of averaged values. A common visualization of the definitions “absolute accuracy” (also called “correctness”) and “repeatability” (also called “precision”) is shown in figure 1.

The “measurement rate” of a measuring device is the number of measurement values generated per second. This is a further important comparison criterion where “more” is seen as “better”. For an objective comparison, however, the knowledge of the interdependence between measurement rate and absolute accuracy and repeatability of a single measurement is crucial. It may be the case that a measuring device with a higher measurement rate, but lower single value precision is less suitable for controlling or characterization of a process than a device with a lower measuring rate but higher single value precision. For example, this is the case when a long averaging time is necessary due to a lower single value precision. Then, there is a risk that actual product variations, which occur within this averaging time, are levelled

out while really present. In the worst case, the specifications might even be violated without being signaled by the measuring device.

The following example of a temperature profile taken over a week in September 2000 shows to which extent averaging of a measuring value can influence the perception (figure 2).

The displayed "real value" results from single measurements taken in ten minute intervals. Averaging over a period of one hour only smoothes the extreme values. When averaging the varying temperature for more than 12 hours, the changes in temperature are displayed lower than they actually are. Furthermore, if the mean value is generated over an entire day, the information about the daily temperature variations will be completely lost. A device that needs the latter averaging depth will not be suitable for a process where an alarm has to be raised or an adjustment has to be made depending on the temperature range.

A practical example taken from the hose and tube production process is the diameter measurement based on the shadow projection method with rotating mirrors. Often high measuring rates are indicated, which result from the rotation rate multiplied by the number of mirrors' facets ([1] Zanoni, 1973; [2] Vossberg, 1981). The specification of accuracy, however, is usually based on mean values of up to one second due to a relatively poor single value precision. This has various reasons. Each single measurement is done with a different mirror facet. Product movements during measurement increase or decrease the product diameter – depending on the direction of movement – as the measurement of both product edges is not done simultaneously but sequentially. Lastly, the diameter information is only derived from the very transition from dark to light and light to dark. The rest of the time, the information content of the measurement signal is zero.

In contrast to this, for other measuring techniques such as the diffraction method ([3] Blohm, Sikora, & Beining, 2005; [4] Blohm & Sikora, 2017), line scan cameras are used (figures 3 and 4).

On the one hand, product edges are recorded simultaneously – so product movement is not an issue. On the other hand, each single pixel in the diffraction seam outside the product shadow can be directly linked to the product edges. This leads to a much higher single value precision and consequently, the measuring value has to be averaged nowhere near as long to be used for controlling or characterization of a production process.

In conclusion: A mere comparison of measuring rates without considering these circumstances is obviously not sufficient. Hence, for an objective comparison of two measuring devices, at first, it is important to clearly define the requirements of the process. Also, the catalog details given by the manufacturer should be taken into question and brought to a comparable basis using the information needed, so that the investment in a new measuring device leads to an increase in quality, process optimization as well as cost savings.

Author: Dr. Hilmar Bolte, Research & Development/Head of Analysis SIKORA AG

Figure 3: Line sensor technology for diffraction analysis in a SIKORA diameter gauge head

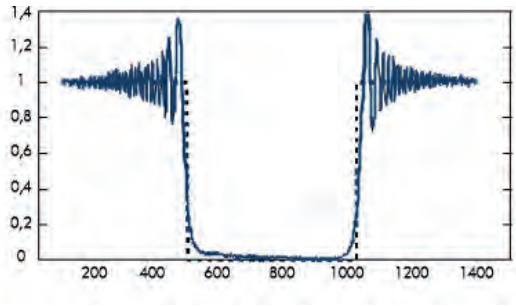


Figure 4: Diffraction signal on a CCD line sensor

References:

[1] Zanoni, C. (1973). Patentnr. US3856412A. USA.

[2] Vossberg, C. A. (1981). Patentnr. US4269514A. USA.

[3] Blohm, W., Sikora, H., & Beining, A. (2005). Patentnr. US6922254B2. USA.

[4] Blohm, W., & Sikora, H. (2017). Patentnr. US9797712B2. USA.

SIKORA AG

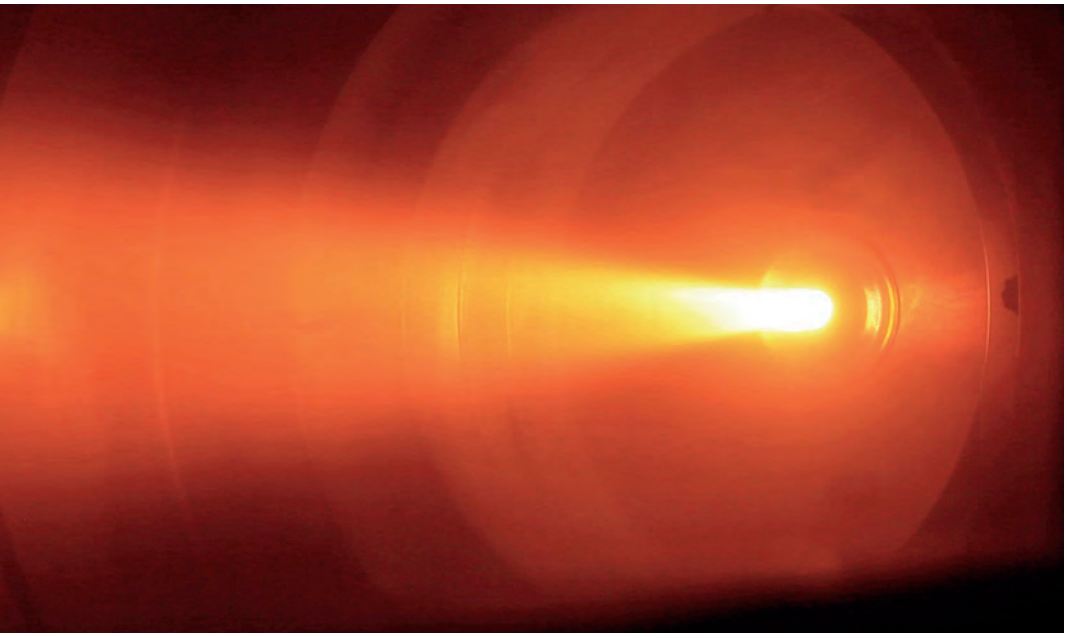
Bruchweide 2
28307 Bremen/Germany

Phone: +49 421 48900-0
Fax: +49 421 48900-90

sales@sikora.net
www.sikora.net

SMS group GmbH

The future is additive



The core process of metal powder production: Atomization of the liquid metal.

SMS groups first plant for metal powder

- The new powder atomization plant operated by SMS group produces only high-quality metal powder because the quality of the powder is decisive for the quality of the printed product.
- The plant performs the tests under realistic conditions – temperatures, pressures and production cycles are adapted to those prevailing in industrial plants.
- The pilot project is a cooperation between SMS group and Additive Industries – specialists in laser melting systems.

A fine, gray powder with an unspectacular look, but with properties on which a completely new growth sector is going to evolve. This extremely homogeneous metal powder is the basis of additive manufacturing – the process of 3D printing of metal. It is made up of perfectly round minute spheres measuring only 15 to 45 micrometers (one thousandth of a millimeter). It is hard to imagine how these microscopic particles are produced in a 13 meters tall and highly complex plant involving an extremely sophisticated technique. SMS group has recently commissioned a pilot plant for the industrial-scale production of this type of powder.

A MILESTONE FOR THE FUTURE

The successful commissioning of the powder atomization plant marks a milestone for SMS group because only a high-quality powder can make a high-quality 3D printed component. The objective is to master – and allow the customers to master – the complete process chain of this innovative technology. This is why SMS deliberately chose to not build a small-scale but an industrial-scale pilot plant. Only this way the process can be tested under real conditions, i.e. at high temperatures and pressures and in long production cycles. SMS works with the cooperation partner Additive Industries, developer and provider of selective laser melting systems for 3D metal powder printing.

The plan is to set up a demonstration plantfor customers at the SMS group facilities in Mönchengladbach. That plant will comprise all process steps of additive manufacturing.

A SOPHISTICATED PROCESS BASED ON SMS GROUP KNOW-HOW

The function of the new pilot plant built by SMS group is to atomize powder. Its main components are a vacuum induction furnace with a crucible and a tundish, atomization equipment arranged in the powder tower, vacuum pumps, cyclones, gas coolers, bag filters, air separators and screens for powder grading.

The plant melts the metals and the alloys inductively and under vacuum. The vacuum technology is key to achieving an ultra-clean product and reliably preventing the material from reacting with oxygen. If this is not guaranteed, oxides, oxide inclusions and other contaminations may result. Ultra-clean powder can only be produced under inert conditions. Especially in this area, SMS Mevac's expertise and know-how in secondary metallurgy technology has contributed largely to the success of the process.

In the next step, the liquid metal is atomized in a jet nozzle of just a few millimeters by means of pure argon. This process pro-

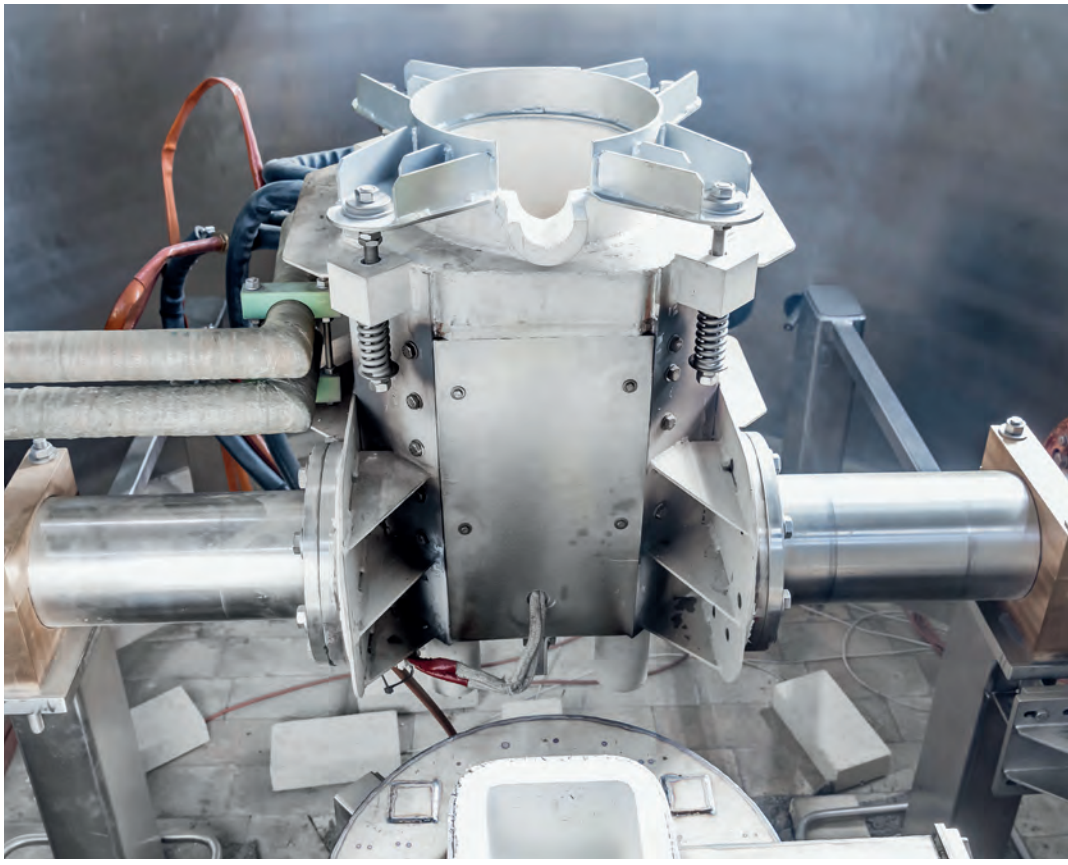
duces spherical particles in the micrometer range. The particles cool down to microscopic spheres forming the metal powder. The fine metal powder undergoes further treatment and will be graded by grain sizes, resulting in fractions of high-purity product of perfect spherical shape, with defined grain sizes between 15 and 45 micrometers, an exact chemical analysis and free from inclusions and satellites (agglomerated material).

Norbert Gober, SMS group: "Our powder is of unparalleled quality because we have the knowhow and expertise to master the complete production process. This means at all steps and in all processes from metallurgy, melting, inert gas based vacuum technology down to quality control, we can build on SMS group experience and competence."

SPECIAL MATERIALS FOR NEW PERFORMANCE PROPERTIES

The new powder atomization plant makes metal powder from superalloys, Ni-based alloys, CoCr alloys, special steels, maraging steels and copper allows. Markus Hüllen: "The plant allows us to develop new alloys with new properties together with our customers and – this is unique – under real production conditions. At the same time we are establishing the basis for Industrie 4.0 in powder production as we are going to implement an automated, seamless quality control system covering the complete process chain of additive manufacturing. This type of consistent documentation and 100 percent traceability are an absolute must, for example, for components produced for the aerospace industry."

Additively manufactured components are already used in a number



Crucible change concept allowing for different crucible sizes (here: 100 kilograms)

of industries. These "enabler" industries include the aerospace industry, the automotive industry, medical engineering, prototype and tool making, and plant and mechanical engineering. Also SMS group uses additive manufacturing in the development of new or optimized components for its plants. A very impressive example are the spray heads used in drop forging plants for cooling and lubricating the dies. Compared to the previously used spray heads, the new ones made by additive manufacturing are much lighter, flow-optimized and individualized to perfectly meet the specific requirements of die at hand. The advantages: Forging press operators can increase the productivity of their operations and improve the quality of their products as a result of the dies being cooled faster and more efficiently.

A MARKET CHARACTERIZED BY ENORMOUS DYNAMISM AND GROWTH POTENTIAL

Both the new powder atomization plant and components made by SMS group by AM techniques provide a very promising market potential. According to a study published by Roland Berger in 2017, between 2004 and 2016 the market for additive manufacturing grew from 0.8 billion to 5.5 billion euros. This corresponds to a CAGR (Compound Annual Growth Rate) of about 20 percent. However, this is only the beginning. Based on several institutes' forecasts, which the study has evaluated, the market growth is predicted to experience a sharp rise reaching a global level of 24.1 to 28.3 billion euros by 2022.

Markus Hüllen: "As powder production and additive manufacturing are very young technologies, there are only very few established quality standards. SMS group has always set great store by complying with highest quality standards. Therefore we think beyond the stage of powder production. In order to be able to produce high-end, high-performance components from the powder, it is essential that the powder does not get in contact with oxygen in the downstream production processes. Therefore we have been developing solutions that ensure that the powder is safely protected by an inert gas atmosphere until it is processed in the 3D laser printer of our cooperation partner Additive Industries. This involves a great effort, but guarantees the high quality level as required, for example, for safety-critical components."

According to Markus Hüllen und Norbert Gober, with the new powder atomization plant SMS group has accomplished a first great milestone. There are more to come. In Mönchengladbach a demonstration center is to be set up comprising the complete process chain, i. e. powder production, powder handling, 3D printing, heat treatment and machining, inspection, quality checks, logistics and, last but not least, a dedicated automation system.

A COMPETENT GLOBAL PARTNER FOR ADDITIVE MANUFACTURING

Nobert Gober: "As systems provider and "Leading Partner in the World of Metals", our objective is to offer our customers complete additive manufacturing plants on a turnkey basis, by integrating the entire process chain from powder production down to the finished products while ensuring series production at a high, reproducible quality level. The pilot plant will allow us to optimize the processes so as to maximize productivity and minimize total costs. Our customers will receive modular, scalable solutions tailored to their individual requirements. With our world-spanning service and support network, we are always readily available for our customers to accompany them along their way into the world of additive manufacturing."

SMS group GmbH

Ohlerkirchweg 66
41069 Mönchengladbach
Germany

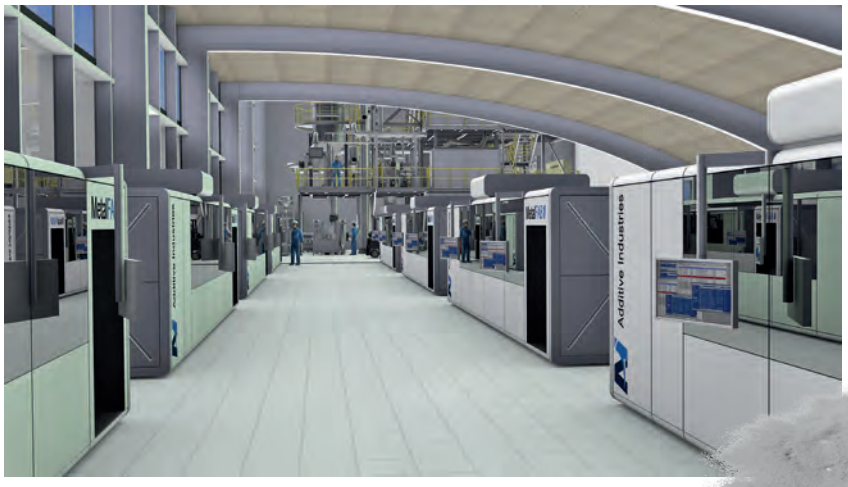
Tel: +49 2161 350 0
Fax: +49 2161 350 1667

communications@sms-group.com
www.sms-group.com

3D view of the metal powder plant.

ADDITIVE MANUFACTURING IN SERIES PRODUCTION

With the name Scale4Series, SMS group describes a holistic production concept for 3D printed components. SMS group has partnered with Additive Industries, manufacturers of 3D printers, to offer a turnkey concept that comprises the complete process chain from metal powder production and 3D printing all the way down to the finishing of the printed components. Besides these, additive manufacturing involves many other process steps, such as the grading, packaging, transport and storage of the metal powder.



Scale4Series: The vision of additive series production. Under this concept, SMS group can offer their customers an integrated holistic solution with simplified interfaces and optimally harmonized components. This achieves an increase in productivity thanks to lower costs involved and a high, reproducible product quality.

The powder for innovative, additively manufactured components.

SMS group GmbH

Benchmark plant for premium tube and bar grades

Immediately after austenitization, the material is evenly quenched in the SMS Quenching Shell® for ID and OD cooling, thus generating a highly homogeneous microstructure.

TimkenSteel is very satisfied with the new AQTF (Advanced Quench-and-Temper Facility) from SMS group for the quenching and tempering as well as normalizing of tubes and bars.

- The Advanced Quench-and-Temper Facility (AQTF) has been jointly developed by TimkenSteel Corporation and SMS group. It is suited for quenching and tempering as well as for normalizing of bars and tubes.
- Special features of the technology are hybrid heating (induction and combustion) and the SMS QuenchingShell®.
- The outcome is homogeneous treatment results and a uniform microstructure.

SMS group has supplied an AQTF (Advanced Quench-and-Temper Facility) to TimkenSteel Corporation for its Gambrinus complex in Canton, Ohio. The flexible AQTF is suited for quenching and tempering as well as for normalizing of bars and tubes. TimkenSteel and SMS group have jointly developed the AQTF concept, which stands out due to hybrid heating with a combination of induction and combustion parts as well as the SMS QuenchingShell® for flexible and simultaneous quenching of outer and inner sides.

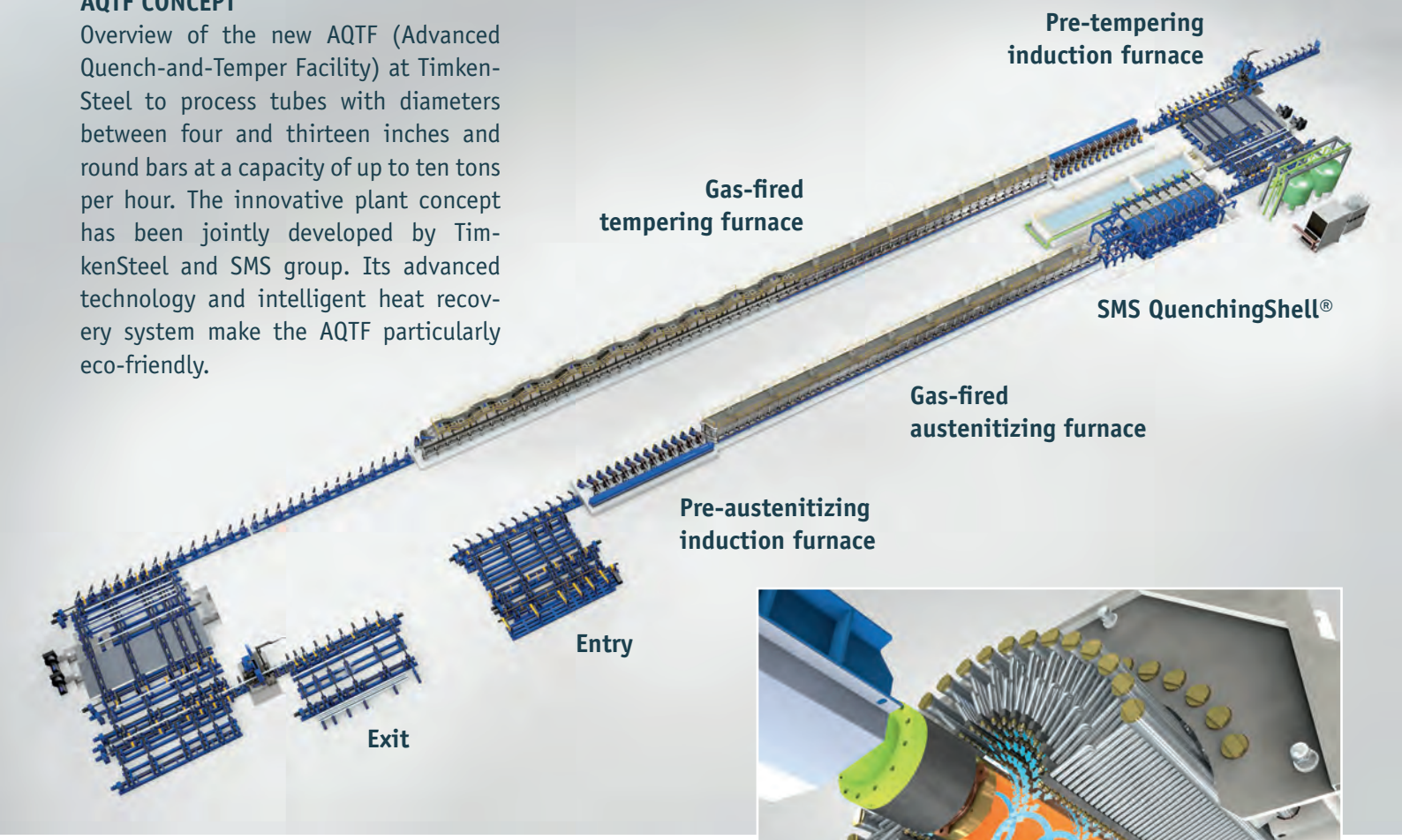
CONSTANT ROTATION

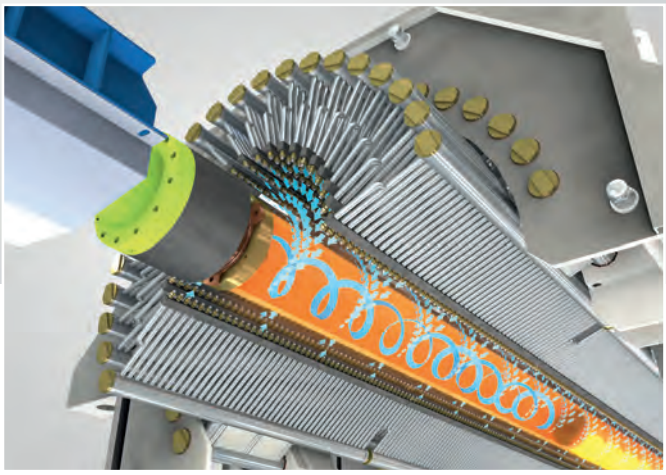
Throughout the whole process, the tubes or bars rotate around their own axes to ensure homogeneous treatment results and a consistent microstructure. Austenitic formation takes place using the hybrid method with an induction and gas-fired furnace. The products are then discharged rapidly and immediately enter the innovative OD/ID SMS QuenchingShell®. Quenching produces a consistent martensitic structure inside the steel. Thanks to their constant rotation and the arrangement of the nozzles, the products are cooled evenly which results in a highly homogeneous microstructure. After cooling, the products can undergo further tempering in the line or be transported to the first sampling saw for testing the material “as-quenched.”

Tempering is performed using the hybrid method, as well. First, the product is preheated by means of induction, and then it enters the gas-fired tempering furnace. The combustion furnace has two sections: The front section contains direct heating chambers with high-velocity burners, and is followed by a section with indirect heating chambers. Special heat-resistant fans, arranged on the tempering furnace second part, ensure the recirculation of the heated air inside the furnace chambers.

AQTF CONCEPT

Overview of the new AQTF (Advanced Quench-and-Temper Facility) at TimkenSteel to process tubes with diameters between four and thirteen inches and round bars at a capacity of up to ten tons per hour. The innovative plant concept has been jointly developed by TimkenSteel and SMS group. Its advanced technology and intelligent heat recovery system make the AQTF particularly eco-friendly.





The cornerstone of the AQTF line is the newly developed QuenchingShell®, an advanced OD/ID water sprayer characterized by high quench severity and, at the same time, great flexibility to adapt to changing process conditions.

The cooling table is equipped with a forced-air cooling system allowing for a compact design.

All the processes in the highly automated AQTF are monitored in the control room, and one single operator supervises the entire process.

Valve World Expo

Solid as a rock: The importance of gas storage plants is growing. Facilities require resistant valves.

Renewables are all the trend in some European countries. Depending on the weather, however, they can be real drama queens. To prevent bottlenecks, grids are increasingly being fed with electricity produced by gas. As such, gas storage is becoming an important issue. For they can also store excess energy, and feed it back in when consumption rises. In unstable times, such storage facilities are as solid as a rock.

It is indisputable that demand for natural gas is rising in Europe – especially during transition phase away from nuclear power and CO2-intensive forms of energy. According to the Arbeitsgemeinschaft Energiebilanzen (AG Energiebilanzen, Working Group on Energy Balances) natural gas consumption in Germany, for example, had a share of 20.9 percent in the total energy mix, by 2016 it had risen to 22.6 percent. With a growth of 9.5 percent, gas belongs to the big winners in primary energy consumption, while renewables came in second with 2.8 percent.

EU to import more gas

Gas supply is an important topic in nearly the whole of Europe. "In the future, the European Union will have to import more and more natural gas to meet demand in the home market. Therefore demand for additional natural gas tank farms is growing," explain the companies Astora and EWE, project partners of the Jemgum natural gas storage cavern.

Gas storage will play a central role in securing the energy system transformation project, "as it is the only way to chemically store excess energy from renewables – wind and sun – in the form of hydrogen or green methane and secure the fluctuating balance," states Maurice Walter, head of sales and services, Hartmann Valves. Or, in other words: if the wind isn't blowing and the sun isn't shining, gas compensates the power fluctuations of renewables. "Storage ensures stable levels of availability and flexible usability of the energy source," emphasises Astora.

Store gas in summer

The German storage facility Wolfersberg makes an important contribution. In summertime, excess gas imports are stored in the storage facility located in Upper Bavaria, and in wintertime it is fed into the gas grid. Wolfersberg has a maximum storage capacity of 140,000 Nm³/h, a maximum withdrawal capacity of 240.000 Nm³/h and a working gas capacity of 365.000.000 Nm³. Capacities, that actively supply energy to the metropolis Munich.

However, old shut-off valves had to be replaced in the natural gas storage facility Wolfersberg, which had been put into operation in 1973. In order to ensure an extremely high level of safety and maximal availability, Hartmann Valves developed highly compact twin ball valves, which are not only extremely gas-tight, but also solved the problem of limited space. They fulfil an important duty for the facility: "We must be able to isolate every part of the plant which needs to be repaired or maintained. Two shut-off valves with the possibility to bleed off pressure in between serve as isolation. Thus, we ensure 100% that no gas enters the area concerned," states operations manager Markus Schuster, DEA.

No problems for renewing isolation section

Most of the Hartmann ball valves installed are single ball valves. As safety requirements were especially high, 40 twin ball valves were installed. They offer a double barrier and two distinctly independent isolating mechanisms in one body. The easy to install, zero-bubble-tight system provides twice the level of safety, and it saves space, as the company states.

An extra compact special design of the twin ball valve was developed when an old isolation section in the main injection line had to be renewed. It consisted of a welded and flanged ball valve. Exchanging the welded valve would have resulted in a long downtime. Hartmann Valves therefore engineered a twin ball valve DN 250 PN 250 version, with the same length of the original standard valve. After a successful trial period, further compact twin ball valves sharing the same dimension were also installed in the gas drying facility. The extreme shortening of the

twin ball valve system was highly beneficial.

Two seals in flow direction

A further custom valve was made for the suction lines. Even the shortest TBVs were too long. Hartmann solved this problem by using a double piston system, providing two barriers in one valve. The system incorporates two seals in flow direction: one on the upstream, the other one on the downstream side. As such, it fulfils a two-barrier requirement, including a bleed-off in between.

Today, a total of 800 ball valves made by Hartmann Valves are installed, in the plant's various facilities. Ten wells are operated here, as well as natural gas compression, pressure reduction, drying and temperature control facilities. With a depth of 2,900 to 3,000 meters, the depleted gas reservoir is the deepest gas storage facility in the whole of Europe.

15 caverns in Jemgum

The Wolfersberg plant is one of the older, yet still well-functioning gas stores. Growing demand for gas, however, means more storage plants are needed. Jemgum serves as a recent example, in 2013 gas filling of the storage facility commenced. In the next couple of years, EWE and Astora plan to construct 33 caverns in the Jemgum salt dome. EWE plans to build 15 caverns with a volume of up to 700,000 cubic meters each, Astora will realise 18 caverns with a geometric volume of up to 750,000 cubic meters.

"The marketable working gas volume is approximately 4,1 TWh. The injection rate is 2.3 GW (= 55 GWh/day), and the withdrawal rate is 2.875 GW (= 69 GWh/day)," reports Ralf Riekenberg, above-ground project manager and department head at the Jemgum gas storage plant. The natural gas stored in Jemgum is to be provided mainly to the German and North-West European market.

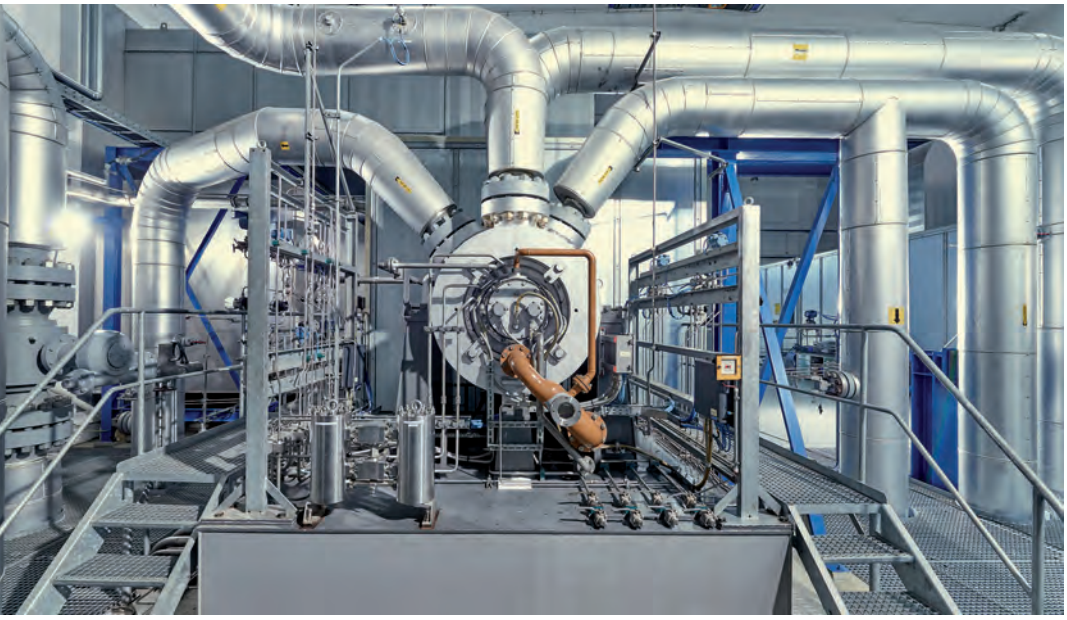
High pressures, high differences

Jemgum was chosen thanks to its subterranean salt domes, which are especially well suited to store natural gas. The caverns being constructed are giant cavities in the salt domes, which are formed by leaching, using water. Deep under the surface the gas is safely stored in the salt formations. Salt walls have an advantage: they seal-off especially well. "Caverns are especially suited for the fast injection and withdrawal of natural gas. Demand fluctuations due to the time of day can be compensated optimally," declare project partners EWE and Astora.

Valves make sure everything runs smoothly at the Jemgum storage plant. "They are used for pressure control, pressure protection and transmission control," explains project manager Riekenberg. Valves are mainly made from steel, and "in most cases exposed to high pressures and pressure differentials". The pressure range lies between 40 and 170 bar, the temperature range between -20 and 150 °C, and the flow rate between 20,000 m³/h and 250,000 m³/h. Valves installed in the gas storage plant are exposed to glycole, which is used to dry the gas, and water, which, in turn, is used to pre-heat the gas. These create challenges the safety, control and shut-off valves have to overcome.

Gas is compressed

And this is how the Jemgum gas storage plant works: the natural



gas to be stored is transported from the gas transmission net to the storage facility. Compressors then condense the gas natural gas to a pressure of up to 200 bar before injecting it into the caverns. "Driven by pressure, the natural gas passes the cavern head, the heart of each natural gas storage facility," explain EWE and Astora. After passing through the cavern head, the natural gas is then stored in the cavern, and can be withdrawn on demand.

Up to 150,000 m³ of natural gas can be withdrawn from a cavern per hour. Before withdrawal, the gas pressure needs to be reduced to the pipeline pressure level. "This cools the gas so much that it has to be pre-heated," state the Jemgum operators. Gas can be stored up to several months in a cavern. During storage, the natural gas comes into contact with the cavern floor, which emits water vapour. The gas is subjected to a dehydration process, making sure no condensation occurs in the pipelines.

High flow rates

Gas storage plants pose a challenge for components: high flow rates occur when opening and closing shut-off valves. Contaminations carried along in the media hit the seal area of the valve at extreme speeds. Soft-sealing systems are quickly damaged, and become leaky. "A pure metallic sealing system makes valves more robust, and as such more reliable and durable," states Maurice Walter, head of sales and service at Hartmann Valves. The metallic seal between ball and seat ring is more resistant than soft-sealing systems – especially if media is contaminated.

Failure-free availability is important, and the seal needs to remain safe for several years. The valves therefore not only need to be gas-tight and reliable, but also low-maintenance and durable, adds Walter. These aspects need to be considered when selecting the proper combination of materials, in order to ensure a gas-tightness over a long period of time.

Stressful corrosion and throttling function

Hartmann Valves supplied the Jemgum gas plant with DN 200 and DN 600 ball valves. The brine pipeline line was supplied with ball valves with nominal diameters DN 500 and DN 900. Deployment in the Jemgum brine plant and pipeline placed particularly high demands on the valves, as the saturated salt solution causes a great degree of corrosive stress. To ensure a maximal service life, the Hartmann tailor-made valves received an internal plastic coating, in addition to the pure metallic sealing system.

The ball valves in the nominal diameters DN 200, 250, 300 and 400 for the gas plant have an innovative throttling function. The main gas line can thus be opened at full differential pressure. The ball valve is used for controlled pressurisation during throttling, afterwards the entire pipeline cross section is available. This simplifies operation, doing away with the need for complex bypass lines.

Adding capacities

The increasing use of renewables makes further storage capacities necessary. Ten years after being put into operation, the Haidach natural gas storage facility in Austria will receive a further connection line to increase the level of integration with the German energy market. The planned pipeline in the region Burghausen/Überackern will use the MONACO natural gas pipeline to connect the storage facility with the German pipeline network. "Since the capacities of the transport network that is already connected are at full capacity utilization, the additional connection line is an important investment in a needs-based natural gas supply in South Germany," explains Astora GmbH & Co. KG, a subsidiary of the Wingas Group.

The additional transmission capacities for depositing and withdrawing natural gas in the Haidach facility will be available from the beginning of 2020, announced Astora. The shareholders of the Haidach storage facility, one of the largest in Central Europe, will invest a total of approximately seven million euro.

The VNG gas storage facility in Bad Lauchstädt, Saxony-Anhalt, is also expanding. By 2017, a further cavern with a planned working gas volume of 65 million m³ will be developed.

„Katharina" has started

In 2017, the first four caverns of the "Katharina" underground storage facility in the federal state of Saxony-Anhalt commenced operation. Eight more caverns are set to follow. Storage capacity will be 600 million cubic meters for the project, Gazprom and the Leipziger Verbundnetz Gas are investing 400 million euro. A German valve manufacturer will make a total 770 ball valves for the new facility, as well as 15 isolation sections: the total volume is a stately four million euro.

At the current moment, the German storage facilities can store 24 billion cubic meters of natural gas, covering around a quarter of Germany's annual consumption. Capacities, however, are also being auctioned to Dutch and French dealers. Demand is on the rise, and valve manufacturers can profit. From November 27 to 29, 2018 the world`s No 1 Fair for valves will present its innovations at Valve World Expo in Düsseldorf accompanied by the Valve World Conference.

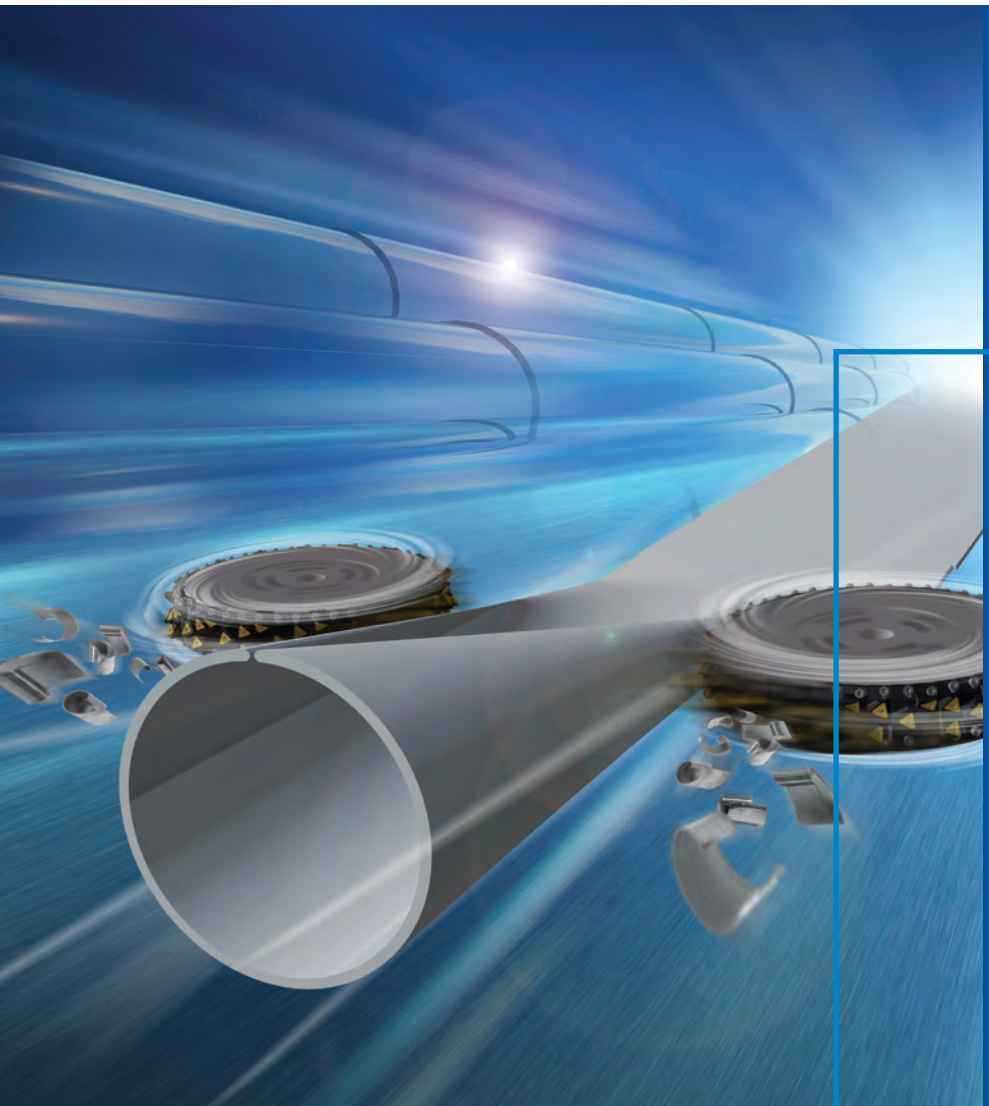
Messe Düsseldorf GmbH

Messeplatz
40474 Düsseldorf
Gernany

Petra Hartmann-Bresgen, M.A.
Ulrike Osahon

Tel.: +49 (0)211 4560 541
Fax: +49 (0)211 4560 87 541

HartmannP@
messe-duesseldorf.de
www.messe-duesseldorf.com



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Valve World Expo

Helping to heal

The medical sector is proving to be a growth sector. Valves are saving lives – at the same time, manufacturers have to satisfy growing expectations.

Just 60 years ago babies born prematurely died of lack of oxygen if their lungs weren't fully developed. Today, modern lung ventilators ensure such children are able to survive. Valves are to be thanked, and help heal. Requirements, however, continue to rise for manufacturers. Only the best high-tech products have a chance in the market for medical technology.

It certainly makes itself paid for valve manufacturers and other technology suppliers to be successful in the medical technology market. Despite great challenges. According to the newest report from GTAI, the US Commercial Service, and Eurostat/Spectaris, worldwide production of medical technology in 2015 totalled 310 billion US Dollars. The USA accounted for nearly 38.8 percent of the market, followed by China with a share of 12.2 percent, and Germany with a slice of 9.3 percent. The medical technology sector is seen as a highly innovative and propitious growth market, emphasises the German Medical Technology Association BVMed.

400,000 different medical products

Medical technology comprises a broad scope of products and processes that save lives, help heal, and improve people's quality of live, declares the BVMed. Germany's Ministry of Health estimates there are around 400,000 different medical technology products. Examples range from devices for diagnostics, surgery,

intensive care, implants, sterilisation to bandages, adjuvants or surgery materials. "According to the German medical products law (MPG), lab diagnostics are also viewed as medical technology equipment," adds the BVMed.

Valves as life-savers

Valves are a common component of life-saving and therapeutic devices. They are of decisive importance in surgical equipment, dental stations or ventilators. Essential components, "for which costs and effort to meet relevant regulations and entry requirements are, however, constantly rising for product development and production," emphasises Michael Mack, global product manager Piezo, HOERBIGER Compression Technology. Reasons are stricter and changing regulations. Furthermore, national and international regulatory requirements need to be observed, as a consequence of globalisation.

There is no standstill in medical technology: changes in regulations and the development of new, innovative methods in areas such as diagnostics and therapy mean new products and product modifications, underscores Michael Mack, global product manager Piezo, HOERBIGER. Needless to say, investments are a matter of course for HOERBIGER.

Higher requirements

Higher requirements apply for devices or systems covered by Germany's medical product law (MPG). "Here, the intended purpose of a valve in an application and inside of a medical technology device plays an important role," explains Peter Jaschke, head of business development MedLab, Festo. Materials compatibility needs to meet requirements – this concerns wetted components, as well as parts directly in contact with the human body. „Traceability and change management are topics that in parts need to be considered for risk-relevant components". However, there also are entirely non-critical areas in medical technology where standard industrial products and components can be used, adds Jaschke.

Additional efforts

This forms a further reason why requirements keep growing for valve manufacturers. "Requirements for producers and distributors for quality management (QM) and QM systems stemming from the international norm ISO 13485 are increasingly being passed on down to suppliers, such as valve manufacturers. As a consequence, the additional personal and financial expenditure required is considerable", explains Jaschke. Festo was early to notice this and had its research and development and production certified for ISO 13485.

Expectations for components in medical technology also are high, reports Michael Mack, HOERBIGER. "Energy efficiency and weight reduction play a central role for battery-operated and mobile devices – while, at the same time, reliability, operational dependability, a long product lifecycle and product availability over a long period without technical changes are demanded.

Reduced operating noise

Requirements are especially high for respirators for prematurely born babies, where, in extreme cases, respiration is entirely taken over by the machine. In order to be up to par, HOERBIGER offers a pressure regulating valve from its piezo valve product portfolio. "Our piezo technology can fully demonstrate its strengths: extremely fast rise time during continuous pressure changes between in- and exhaling allow an ideally natural function of a non-independently functioning lung. Exhaling, in turn, requires a high flow rate. At the same time, a permanent basic pressure has to be set, which is adjusted very finely and may only have a minimal variation. Owing to the extremely low power input it is furthermore possible to increase battery life in mobile or emergency operation mode and thereby raise operational safety to a level conventional valve technology can only realise with additional effort," reports Michael Mack. And as these performance-defining components, of which even three are installed in each device, virtually don't generate any heat, a much smaller ventilator can be used. "Combined with the valve's noiseless switching and regulation, the operating noise of the device is enormously reduced, which in turn positively affects the baby's recovery".

Piezo valves for eye surgery

Eye surgery is a further field of use for piezo valve technology. Here, it optimises delicate processes. Different fluids and gases have to be conveyed during eye surgery. Festo developed proportional valves and piezo valves, as well as integrated sensors. These allow "the precise delivery of vitreous humour replacement solution, help with the vacuum-assisted removal of microparticles and drive all kinds of surgical tools". A further application for the piezo valve is in the treatment of chronic obstructive pulmonary disease (COPD), affecting around 600 million people around the

world, who suffer from breathing problems. Aportable oxygen system device improve the mental and physical ability of patients, and their quality of life, reports Festo. Japanese company Musashi Medical Laboratory supplies easy-to-use controllers as small as a smartphone, making handling easier and improving comfort. Compact piezo valves made by Festo silently supply oxygen.

Efficient oxygen cosumption

The device used for COPD is matched to a patient's respiratory rate. "A sensor ensures that the regulator detects inhalation. The right amount of oxygen is then mixed with the respiratory air," explains Festo. During inhalation, the sensor detects a pressure drop and transmits a signal to the regulator which in turn opens the proportional valve. Oxygen then flows from the oxygen bottle – not uninterruptedly as with other devices, but only for as long as the patient is inhaling. As soon as inhalation has been completed, the piezo valve shuts off the supply of oxygen. "Oxygen consumption is thus much more efficient. The oxygen bottle doesn't have to be refilled as often. The patient's range of action is increased as a result," highlights the valve manufacturer. Even better: thanks to the energy efficient piezo valve, the device has a vastly improved battery life.

Anaesthesia and intensive care

Further applications are pneumatic integration solutions for surgical tools and regulating fluids in dental service units. Anaesthesia, intensive care and emergency medicine also require valves.

Medical technology will face further challenges in the future: "Chronic diseases have increased in the last years, alongside expectations for staying mobile. As a consequence, demand for energy-efficient components with a small form-factor grew," explains Peter Jaschke, head of business development MedLab, Festo. Environmental pollution is a further cause of diseases.

Medical sector a major employer

In order to master future challenges, the German Association of Engineers VDI medical technology has to be developed to safely ensure a diagnosis at an earlier stage, as well as achieve treatment with continuously lower stress for a patient.

These challenges also pose an opportunity for the medical sector, that offers numerous jobs. Germany, for example: manufacturers of medical technology employ 133,000 staff in around 1,250 companies, counting more than 20 employees, emphasises Manfred Beeres, press officer of BVMed. Additionally, 11,300 small companies employ nearly a further 81,000 employees, bringing the headcount in Germany's 210,000 people.

Positive effects for companies

"The exceptionally innovative medtech sector will remain a growth market due to demographic development, progress in medical technology and the dynamics in emerging markets," forecasts Beeres, BVMed. Experts estimate an annual growth between four and five percent.

Favourable developments in the field of high-tech medicine, especially surgical equipment and diagnostics, have had a positive impact on HOERBIGER's business. The currently ongoing investment backlog for hospital equipment won't have an effect, as HOERBIGER "is not affected as a maker of high-tech products".

A win-win situation

Good news: high-technology providers will be able to successfully supply the highly important medical market with high-performance products – for the benefit of the people. A win-win situation for all stakeholders: even though costs and effort will continue to increase in order to meet regulations.

Messe Düsseldorf GmbH

Messeplatz
40474 Düsseldorf
Gernany

Petra Hartmann-Bresgen, M.A.
Ulrike Osahon

Tel.: +49 (0)211 4560 541
Fax: +49 (0)211 4560 87 541

HartmannP@
messe-duesseldorf.de
www.messe-duesseldorf.com

Valve World Expo

Geothermal energy recommends itself warmly

Valves used in the geothermal sector need to be as tough as it gets. In the past, many pumps failed to cope with the hostile environment of this form of energy production, causing tremendous costs. Today, the sector is transforming. Special valves are being produced in series that can make use of geothermal heat.

All signs point towards global growth for geothermal energy – and on a major scale. Many countries will "being to make use of geothermal energy, others will continue to expand this form of energy," predicts the Bundesverband Geothermie (BVG), the German Geothermal Association.

Global growth

In 2015, worldwide heat production grew 39 percent compared to 2010, according to the "Country Reports", to a total of ca. 70,300 MWt (megawatts thermal). China even doubled its installed capacity to around 17,900 MWt. India recorded growth of 272 percent to nearly 1,000 MWt in the same period, while the USA grew 38 percent to ca. 17,415 MWt, France 74 percent to around 2,350 MWt and Germany by 14 percent to 2,850 MWt. Thailand grew strongest, namely 5,060 percent, which brought capacity to "just" 129 MWt.

Worldwide geothermal power capacity also grew from 2010 to 2015, albeit not as strongly. Geothermal energy production grew by 16 percent to a total of 12,600 MWt installed capacity. In the USA, geothermal energy advanced 11 percent to 3,450 MWt, in Mexico by 6 percent to slightly above 1,000 MWt, in Kenia by 194 percent to around 600 MWt, in Germany by 280 percent to 27 MWt, while Italy here increased by 9 percent to nearly 920 MWt. Today, geothermal power plants can be found in 24 countries around the globe, generating energy from heat.

Constant availability

Demand for geothermal energy is growing in Germany, due to the energy transition. Geothermal energy is supposed to augment the mix of renewable forms of energy, generated by solar and wind power. Germany has already embarked on its path – 30 plants are currently in planning, two are being constructed and four will serve as research projects. They will expand on the 33 plants already in operation. Geothermal energy has a major advantage compared to other forms of renewable energy, namely "that it is constantly available, regardless of weather conditions or the time of day or year," as the Munich City Utilities (SWM) state.

The time has thus come for change, as all sectors connected to geothermal energy recognised several years ago. In the past, operators of geothermal power plants were forced to use pumps for oil and gas industries, which weren't designed to meet the requirements of geothermal energy. "Compared to the crude oil sector, pumps used for geothermal energy have to date been not very efficient, and show

signs of wear at an early stage," reports BINE Information Service, published by the FIZ Karlsruhe – Leibniz Institute for Information Infrastructure GmbH, which is in parts funded by Germany's Federal Ministry for Economic Affairs and Energy (BMWi). There were no special pumps available for geothermal applications.

Valves prone to failure

As such, pumps were highly prone to failure, some pumps already broke down after just a couple of months. In the Unterhaching geothermal power plant, ten ESP pumps (electro-submersible pump) had "given out", as VDI Nachrichten, the news service of the The Association of German Engineers (VDI), reported several years ago. More often than enough, broken frequency converters, bearings, damaged bearings or hot windings were to blame. "These failures really cost money". Around one million euro need to be invested, per pump.

Not only the technology, but also the dimensions make pumps for geothermal applications a very expensive component. The rather new pump in the Freiham geothermal plant is 45 metres long, and has a total weight of 45 tons, including the rod. A heavy-duty crane was needed to lower it 600 metres below the surface. Here, the pump conveys thermal water with a temperature of approximately 90° Celsius from a depth of 2,500 metres to the surface.

High temperatures, aggressive gases

The production depths alone indicate the conditions pumps have to cope with, and make understandable, why pumps from the oil and gas industry aren't the best of choices. High temperatures and feed rates, aggressive gases and crystallised salts demand an optimal performance from pumps.

Solutions need to be found for special pumps in geothermal applications – numerous manufacturers are working vigorously on hard-wearing components. Baker Hughes is one such example. The manufacturer of special geothermal pumps constructed a high-temperature test loop on its company site, in order to test entire pump systems under real-life conditions. "Field tests have yielded further insights into structural weak points in the aggregates used to date," reports BINE in its Projektinfo 3/2016. Scientists had salvaged broken pumps from German geothermal plants, taken them apart and analysed the causes of defect. "On the basis of this data, they then developed modified prototypes which promise significantly higher efficiency and a longer service life". Here, they concentrated on the conditions found in hydrothermal plants in South Germany, where thermal water reaches temperatures between 120 and 140° C, and is highly calciferous. Baker Hughes collaborated with the geothermal plants in Oberhaching, Dürrnhaar, Sauerlach, Grünwald and most of all Unterhaching for this task, reports BINE.

Temperature and pressure fluctuations

With hardly any lubricant properties and containing dissolved lime, the thermal water can have grave consequences for components. The limestone "is then deposited on all components, particularly the hotter bearings. These deposits prevent lubrication and cooling of the bearings, which then leads to overheating and destruction of the pump shaft," explains BINE. To make things worse, a layer of limescale acts as insulation, preventing heat dissipation from the motor.

"The high absolute water temperatures and the cyclical temperature and pressure fluctuations which arise when the plant is at a standstill or operates at a reduced capacity are a source of stress for pump bearings, seals and motor insulation. "Thermal water furthermore contains dissolved gases. During the course of time, these diffuse into the oil with which the motor is filled. When a pressure drop occurs, the volume of the gases increases and pushes the oil out of the motor".

Redesigned bearings structure

In general, the pump rates in geothermal plants vary – depending on the current heat demands of the plant and heat grid. "As a result, the pumps are frequently subject to start and stop procedures or phases with reduced capacity," explains BINE. As such, the resulting variation of torque, motor temperature and pressure cause extra stress. In order to monitor pumps deep below the surface and initiate maintenance early enough, measurement sensors are required that can withstand high temperatures, and can transfer a large number of variables with a high data transfer rate.

In the end, the outcome was positive. The motor's bearings structure was entirely redesigned – and there have been no more failures. "A pump with optimised bearings has been operating in a southern German plant for over 8 months without any failure occurring. The weak points found to date in the insulation have been rectified," states the news service.

15-stage flex pump

BINE reports further improvements: pressure relief valves protect new bellow-type seals, designed to ensure safe pressure compensation. The mechanical shaft seals were also improved. A new high temperature measurement sensor also had to be developed. Should the motor short circuit, the sensor electronics need to be protected from up to 8 kV. The development process resulted in a newly designed 15-stage flex pump. It was first used in the Oberhaching geothermal power plant. The pump can efficiently handle varying pump volumes, reaching an efficiency level of 80%.

Additional improvements were also made in the form of a new medium voltage frequency converter for a higher operating voltage, improved design of the operating parameters and a prognostic concept for preventive maintenance and repair works, adds BINE. Development of core components continued to achieve series production in 2017.

Reinjection, condensate and cooling water pumps

KSB also sees geothermal power as a source with "practically endless potential." Needless to say, there is also lots of potential for pumps. As the company knows to report, numerous valve types are used in geothermal plants, where geothermal water can reach temperatures of up to 250° Celsius. Pumps include reinjection pumps, "which return the cooled geothermal water back underground," condensate pumps, "built from materials able to withstand the mineral-rich geothermal water," as well as cooling water pumps, "that have already proven their worth in many conventional power plants".

A variety of pumps is also required for binary geothermal plants with water temperatures of up to 180 °C. Such plants transfer heat to a second cycle, either a so-called organic rankine cycle (ORC), or a Kalina cycle. The plant uses media which turn to steam and drive a turbine, explains the pump manufacturer.

Pumps for binary cycle geothermal plants

"Special feed pumps are used to circulate fluids such as isobutane, isopentenyl, or water-ammonia mixes in this cycle," states KSB. Circulating pumps can use residual heat for district heating, whereas reinjection pumps feed the cooled thermal water back below the ground. The second cycle isn't needed if a heat exchanger is used to directly pump heat into a district heating grid, or is used in industrial processes.

Such pumps are necessary to enable the energy transformation also in the heat market. The Munich City Utilities (SWM) are highly engaged in the heat market, and are developing a vision for district heating: "By 2040, Munich is to become the first major city in Germany where district heat will be produced to 100% from renewable sources of energy. Geothermal heat will contribute significantly to eco-heat," underscores SWM.

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Munich relies on geothermal energy

SWM plans to make a long-term switch to renewables for district heating. The public utilities company aims to make "further substantial improvements in the already excellent climate and resource track record of district heating. Due to the unique nature of Munich's location and that of the region, geothermal energy will play a key role in this context: there is virtually no other region in Germany where the geological conditions are as favourable as they are here".

Optimal conditions for the South German metropolis: "Munich is located right on top of a huge reservoir of this natural energy source". At a depth of 2,000 to over 3,000 metres, water temperatures reach from 80° to over 100° Celsius. Heat from these geothermal water sources are ideal for heating. To benefit from this source, hot water is pumped to the surface and channelled through heat exchangers, which extract the heat from the thermal water. The cooled water is then fed back into the subterranean reservoir. "The geothermal power cycle thus does not impact on the eco-system," states SWM.

Holzkirchen plant online in 2019

Munich has made extensive plans, and will implement them in the next few years. A further geothermal plant will be constructed on the site of the heating and power plant "HKW Süd". It will go online already at the end of 2019. SWM expects the thermal water to have temperatures above 95°C. The plant is at the intersection of three grids: up to 50 megawatts could be fed into the grids innercity, Sendling and Perlach. SWM plans to construct three additional geothermal plants by 2025.

In Holzkirchen, situated in the Bavarian Molasse Base, a fifth ORC (Organic Rankine Cycle) is being planned. The electric capacity will be 3.4 MW, and be utilised as a power source especially during summer. In winter, the heat will in turn be used for district heating. The Holzkirchen geothermal power plant is scheduled to go online in the first quarter of 2019.

High discovery rates

Daldrup & Söhne, a company specialising in drilling and geothermal exploration, has paved the way for utilising geothermal heat in the Dutch drilling project Nature's Heat. Drilling confirmed a capacity of at least 110 litres a second, and a thermal water temperature of ca. 86° Celsius. As such, the "value is well above the projected average value," reports the company. The future operator will be able to utilise 20 MW thermal power, instead of previously calculated 12 megawatts power for heating greenhouses. Natural gas will be extracted as a by-product in parallel, with around 1.2 times the volume. The gas will be separated and be used to produce electricity by a third party. Thanks to the specific discoveries, the entire project is viewed as being efficient above average.

Geothermal energy has long left the starting block. Even though, this type of energy still remains at the very beginning of its potential, while making itself warmly recommended as a renewable source of energy. The more reliable pumps will become as an essential and expensive component, the more attractive geothermal power will become. A further, important piece of the mosaic, without a doubt.

Messe Düsseldorf GmbH

Stockumer Kirchstr. 61
40474 Düsseldorf
Germany

Petra Hartmann-Bresgen, M.A.

Tel.: +49 (0)211 4560-541
Fax: +49 (0)211 4560-87 541

HartmannP@messe-duesseldorf.de
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Tracking the alignment between the welding torch and the weld seam is crucial to ensuring optimal weld quality in any seam welding application. This has been traditionally been done using a dedicated sensor using Laser Vision Triangulation (LVT) technology. Such sensors only provide an image of the laser line and provide no visual information of all the key details of the welding process that operators would like to monitor and control, such as the width of the weld seam, the melt pool size and torch tip condition. A view of these items would help to dramatically improve efficiency and productivity in tube production processes.

Even automatic in-process seam trackers are often subject to limitations that may allow automatic processes to go off seam. Post- weld non-destructive inspection technologies are performed too late after the welding process to allow operators to prevent misalignment and other welding related errors during welding.

However, with recent advances in electronic technology, it is now possible to get a good image of the weld arc and its immediate environment AND perform seam alignment all in the same camera device with the Xiris SeamMonitor™ system, a weld monitoring and alignment system that has been developed to reliably measure the alignment of the weld seam relative to the torch tip, the width of the weld seam and the torch tip condition. The SeamMonitor™ system is a valuable process control tool that automatically alerts the operator when out-of-tolerance weld conditions occur, such as torch to seam alignment, seam gap width or torch tip quality degradation as well as providing a good quality image of the weld arc and immediate environment for process monitoring.

The SeamMonitor™ system provides operators two items in one: a high-quality, real-time image of the weld process that allows operators to see the condition of all the components in the weld area and adjust the process as needed; and an automatic seam monitoring system to automatically alert the operator or related machinery when the torch moves out of alignment to the weld seam or torch condition degrades.

The intuitive system enables the operator to set multiple warning and alarm limits that can integrate with other automation and notification devices. All parameters and images can be recorded for process monitoring and quality assurance based on the set-up parameters and defined warning limits.

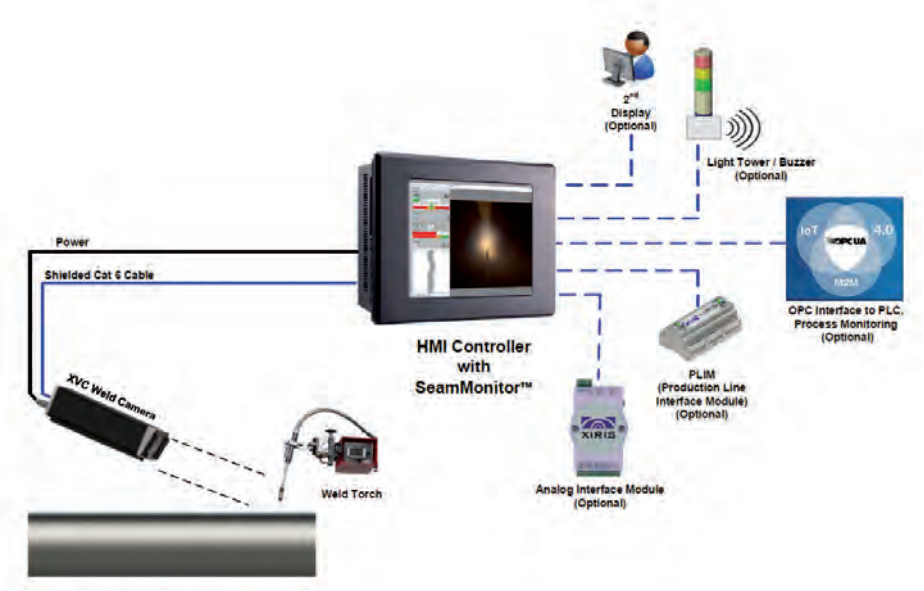
It also provides a seam width and position movement history for process monitoring. Lastly, the system helps enhance operator and welder safety by removing the welder from the weld area, improving their productivity and working environment.

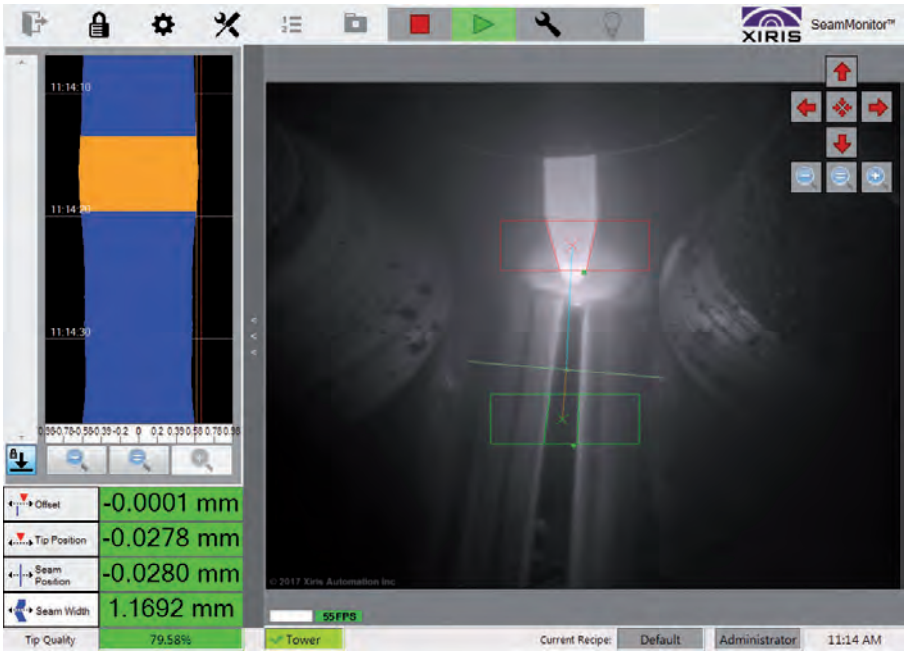
Xiris Automation Inc

1016 Sutton Drive Unit C5
Ontario L7L 6B8 Burlington
Canada

Tel: +1905331 6660
Fax: +1905331 6661

sales@xiris.com
www.xiris.com



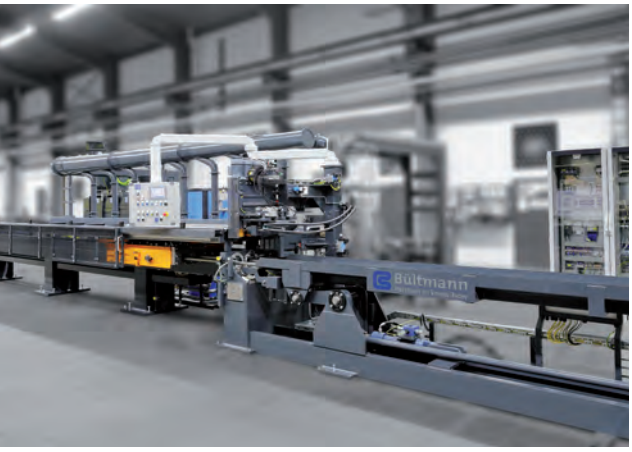


The SeamMonitor™ System includes a high dynamic range (HDR) camera system, configurable optics that can be adjusted to suit most welding environments, an Industrial Panel HMI controller for image recording, processing and display, and image processing software for monitoring all details of the welding process, and optional features such as a Light Tower/ Buzzer to warn the operator of failure conditions or errors. The results of the system's measurements can be used to control external equipment through a set of analog outputs which is also mirrored on the system display, or via a light tower.

By using the Xiris SeamMonitor, operators can obtain seam alignment and other simple weld inspections as well as having a clear image of the weld arc and its immediate environment to allow for weld process monitoring and ongoing adjustments to the weld process.

Bültmann GmbH

Bültmann Drawing machine technology on the rise



As worldwide leading manufacturer of machinery and equipment for peeling, straightening and drawing of bars, tubes and profiles Bültmann is again demonstrating their productive efficiency in the field of the drawing machine technology currently.

Increased receipt of orders of different scopes of application evidences that the consequent enhancement of the drawing machines is meeting its target and also convince the customers. Know-how gained during 45 years of experiences with drawing machines together with state-of-the-art technology provide the basis for this.

The fields of application for the BÜLTMANN drawing machines include materials from steel, stainless steel, copper and copper alloys up to aluminum. Besides the essential basic data of the equipment as

- High productivity
- High product precision
- Short set-up times
- High automation degree
- High availability
- Integrating capability into existing equipment
- Individual, tailor-made machine design

the new developped „Bültmann-Industrie 4.0" Features as

- Drawing force monitoring
- Mandrel force monitoring
- Geometry measuring
- Detection of drawing marks
- Quality monitoring
- Process monitoring
- Predictive Maintenance Monitoring
- Level 2 connection

are becoming more and more important because they are providing together with the technical equipment components of the lastest machine generation as

- Automatic plug /die position measuring and adjustment
- Hydraulic die clamping
- Hydraulic die release
- Automatic threedimensional die adjustment
- Automatic mandrel rod change
- Automatic change from external to internal clamping at the drawing carriage
- Traveling prebench for an optimum accesibility of the die stand
- Tailor-Drawn Tube function

the perfect basis for an advanced, forward-looking and economic production. We would be happy to design for each application the tailor-made drawing machine and are looking forward to appropriate inquiries.

Bültmann GmbH

Hoennestr 31
58809 Neuenrade
Germany

Tel: +492394 18256
Fax: +492394 18171

he@bueltmann.com
www.bueltmann.com

Heiko Machine Tools

Heiko Machine Tools has added Reika to its Line Card

Reika is a reputed German machine tool company with experience of more than 100 years. They offer machines and complete lines for tube mills in both energy and automotive sectors including cold finishing and value-added processes. High speed lines for burr free tube cutting and end working such as facing and chamfering are standard models in their portfolio. Optional forming or welding stations can be integrated in lines, e.g. shock absorbers, gas springs, conveyor rollers, etc. Hans Braun, CEO of Reika, adds, "Reika has been very strong globally and has a strong customer base in North America. By partnering with Heiko, we are re-enforcing our North American presence."

Talk of tariffs and trade wars creates intense interest in US-based operations resulting in a strong demand for solid, reputable suppliers ... suppliers that customers can work with to avoid risk. Heiko offers North American sales, installation and service support with a focus on related markets including the steel, tube, OCTG, heavy machinery and automotive industries.

"With the constant changes in international business, Heiko works to learn and support customer business problems using technical solutions", offers Joseph Kemple, President of Heiko.

Heiko Machine Tools

129 Bell Street
MI 48197-5519 Ypsilanto
USA

Tel: +1 765-561-4539

Info@HeikoMachine.com
www.heikomachine.com

Huntingdon Fusion Techniques

Eliminate Thoria by Switching to MultiStrike® for Safer Welding

Thoriated Tungsten Electrodes contain thoria, a radioactive element that can be dangerous to heath. During the grinding of the electrode there is a generation of radiotoxic dust, with the risk of this being inhaled by the welder.

Welders today continue to use thoriated Tungsten Electrodes. Because thoria was much cheaper than alternative elements to lower the work function of pure tungsten, this type became the industry standard.

To overcome the risk posed by the harmful thoria and whilst maintaining a very high life expectancy for the Tungsten Electrode, Huntingdon Fusion Techniques HFT®'s blue-tipped MultiStrike® Tungsten Electrodes contain a mix of non-radioactive rare earth elements, eliminating the risk to health posed by radioactive thoriated Tungsten Electrodes.

A customer in the UK recently said: "MultiStrikes® are the most consistent Tungsten Electrodes I have used over the past 34 years. I would not use anything else now. I do not think that many people realise how important a good electrode is."

Other Tungsten Electrodes work at higher temperatures so their oxide additions burn out, or evaporate

Tungstens MST PHO 23C MST in use

Tungstens MST PHO 30C MST Welding-Pipe

much faster than those non-radioactive ingredients in MultiStrike®, so much so that MultiStrikes® give at least 10 times more arc striking capacity of other Tungsten Electrodes, when tested under the same conditions.

MultiStrikes® can be used for welding aluminium with the AC process, as well as steels and alloys with the DC process, which allows the welder to have just one type of Tungsten Electrode to weld all materials and reduce the amount of stocks and purchasing requisitions.

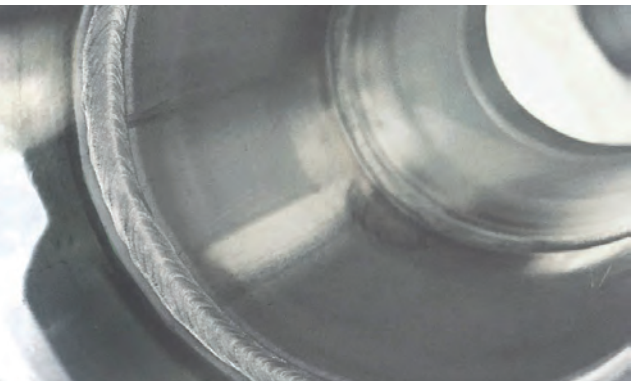
With most Tungsten Electrodes in use still containing radioactive and carcinogenic 2% thorium oxide, MultiStrike® provide the TIG and Plasma welder with a safe and superior alternative.

Each packet comes with a traceability number to ensure that companies with a quality control procedure have traceability over another aspect of their joining processes.

MultiStrike® Tungsten Electrodes demonstration video is available at: https://youtu.be/bx1BeepVMaw

Huntingdon Fusion Techniques

Inert Shielding Gas Monitor for Stainless Steel Welding



PurgEye API100 PHO 61C Action Shot-Weld

Inert shielding gas is used to protect high integrity welds from oxygen and water vapour during TIG (GTAW) and Plasma (PAW) welding processes.

When welding tanks, vessels, chambers and pipes, the most cost effective inert gas used for shielding is argon. As argon is heavier than air, it displaces the air containing oxygen and water upwards and out of a vent tube which can be fed to a Weld Purge Monitor®.

This process, called Weld Purging, will ensure oxide free, metallurgically sound welds in critical joints made of stainless steel, titanium and other refractory metals.

During stainless steel welding, the oxygen content must be purged down to a level lower than 100 ppm. Titanium and other sensitive materials may have to be purged down to 20 parts per million to obtain oxide free joints. Measuring the oxygen level in shielding gas is therefore crucial.

The low cost, hand held, battery operated PurgEye® 100, designed and developed by Huntingdon Fusion Techniques HFT® is perfect for obtaining zero colour, oxide free welds in stainless steel, reading accurately from atmospheric oxygen level (20.94%), right down to 100 ppm (0.01%).

Davina Urquhart, City College AND Senior Welding Engineer at TransWeld Services Ltd recently said: “I am a huge fan of the Huntingdon products and have talked others over the years into using them. The purge meters are second to none. I own and use regularly my PurgEye® 100 for stainless steels and my PurgEye® 300 for titanium. In fact I think somewhere I still have my original Argweld® MKV monitor from the 1970’s. Excellent product guys!”

The PurgEye® 100 is IP65 rated

Huntingdon Fusion Techniques
Stukeley Meadow
SA16 0BU Carms
UK
Tel: +44 1 554 836 836
Fax: +44 1 554 836 837
hft@huntingdonfusion.com
www.huntingdonfusion.com

and comes with leak-tight push buttons, auto calibration features, vacuum-sealed leak-tight probe assembly, wrist/neck strap and tripod mount long life sensor.

The extra long life sensor provides approximately 18 months life before it requires changing. A low sensor indicator will appear on the screen, warning that a new sensor is required. Once that icon appears, it provides the user with adequate time to obtain a new sensor, which can be fitted like changing a battery and the monitor can be re-calibrated easily by the user.

With a clear, easy to read LCD screen, the PurgEye® 100 boasts a 24 mm high display with features such as a low battery icon as well as the low sensor icon. When the monitor is not in use, an automatic sleep mode activates to conserve battery life.

The Weld Purge Monitor® was invented by HFT® in the 1970's and with over 40 years of innovation, design and manufacturing experience, the company now has a Family of PurgEye® Weld Purge Monitors® to measure oxygen levels from atmospheric content (20.94%) down to 1 ppm (accurate to 10 ppm).

Ron Sewell, Chairman for HFT® said: "All of Huntingdon Fusion Techniques HFT®'s Weld Purge Monitors® and Inflatable Tube, Pipe and Pipeline Weld Purging Systems are manufactured in the UK. We do not sacrifice on quality. We guarantee to help you achieve zero colour welds, time and time again."

It is important not to use low cost oxygen analyzers or other oxygen safety monitors as they are calibrated for accuracy at ambient conditions and therefore not suitable for measuring purge levels at 0.01% as the PurgEye® 100 does.

PurgEye API100 PHO 64C API in use on site

PurgEye® 100 video can be viewed at: https://youtu.be/quw_xtSZDAw.

Huntingdon Fusion Techniques

Steel Plugs for Heavy-Duty Pipe Blocking and Stopping

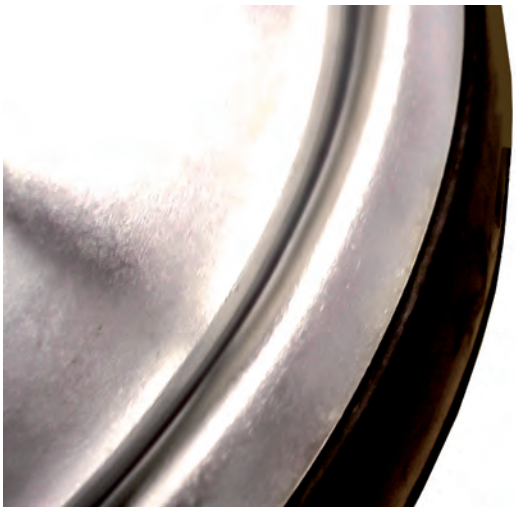
Heavy-duty pipe blocking and stopping may require long immersion in chemicals or exposure to high temperatures, which many plugs are not capable of withstanding.

The Pipestoppers® Division manufacture a range of Steel Plugs, which are ideal for more arduous duties and also available as double versions for even tougher applications.

Luke Keane for HFT® said: "The Steel Plugs can be used for low pressure testing and plugging pipes, pipelines and pipework fabrications and other orifices between 2 and 48" (50 to 1,200 mm) diameter. This Range is specifically designed for heavier duty applications such as long immersion in water, for use at higher temperatures or for contact with acidic or alkaline environments for which the Nylon, Aluminium and Inflatable Plugs in the Pipestoppers® Range are not suitable."

The HFT® Steel Plugs are available as single and double models with sealing rings made from viton, silicon, neoprene, nitrile or natural rubbers for resistance to different temperatures and chemicals.

The Pipestoppers® Division at Huntingdon Fusion Techniques



Steel Plugs PSPS PHO

Steel Plugs PSPS PHO

HFT® design and manufacture a range of Mechanical and Inflatable Pipestoppers® and Plugs to suit every application.

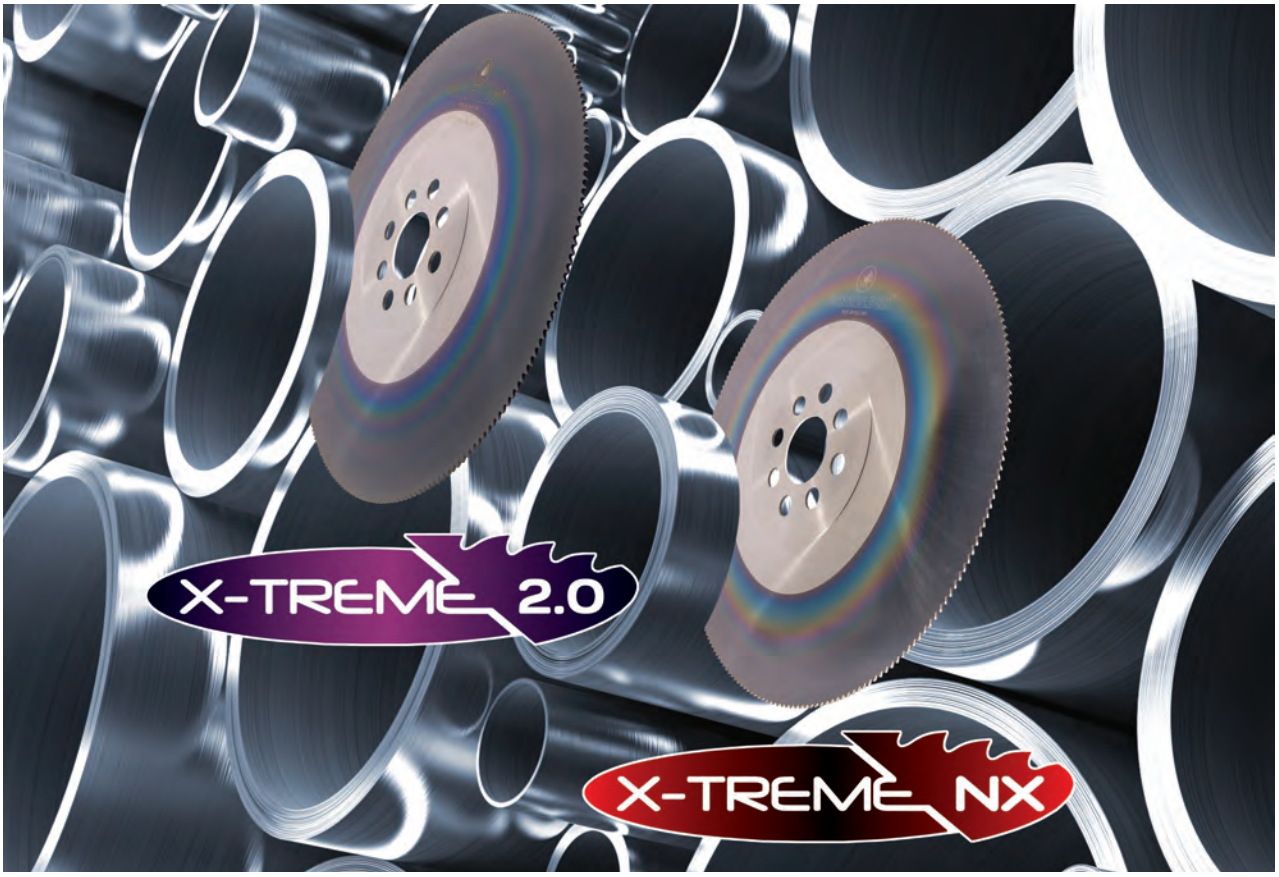
The Pipestoppers® Division Manufactures:

- The lightweight Nylon Plugs for cleanliness, orbital welding techniques as well as pharmaceutical and medical applications. Other applications for these lightweight plugs include leak testing, sealing, isolation and weld purging. Manufactured in sizes 0.5 up to 6" (12 – 150 mm), the Nylon Plugs are available individually or in ready-made kits.
- The heavy-duty Aluminium Plugs allow for arduous duties such as exposure to high temperatures and immersion in chemicals. They are manufactured in sizes 1.5 to 36" (38 - 900 mm).
- Lighter in weight, the Inflatable Stoppers are manufactured in various shapes including the Low Profile, Cylindrical and Spherical. There are Petro-Chem™ resistant versions and high pressure Rubber Plugs as additional products. They are designed for several applications, which include blocking pipes, tanks or other orifices, weld purging, routine maintenance or to prevent the entry of foreign bodies.
- For making ice plugs anywhere in piping systems that contain fluid, the Accu-Freeze™ and Qwik-Freezer™ Systems allow repairs to sprinkler heads, exchange of or maintenance to valves or other controls or instrumentation, without draining the system.

Whether your application is weld purging where there are numerous pipe ends to be blocked, preventing draughts that may adversely influence a process, monitoring gas emissions on waste sites, on-site machining to prevent the ingress of machining fluid, swarf and miscellaneous metal pieces from entering pipework or for making ice plugs in pipework, HFT Pipestoppers® Division has the answer!

Kinkelder BV

Introducing the new generation HSS Advanced saw blades



Dutch industrial saw blades manufacturer Kinkelder proudly presents its new generation HSS Advanced series, which offers a performance level that will surpass existing HSS products in many applications.

Over the past 50 years, Kinkelder has gained a wealth of experience in producing and developing HSS circular saw blades. In addition, the new HSS Advanced series makes use of new state of the art precision grinding machines, newly developed PVD coating concepts and new insights gained in R&D projects.

Three distinct grinding concepts (Fusion, Power and X-treme) each serve specific market demands for high production output, optimized surface finish and low costs per cut. Also, two new PVD coatings have been developed which incorporate the best features of the most renowned Kinkelder coatings. Due to the unique combination of a low friction coefficient and high temperature resistance, very high cutting speeds and feeds can be achieved.

The exclusive multilayer 2.0 coating has been developed especially for cutting steel. The NX coating has specifically been designed for cutting stainless steel, but can also be used for dedicated steel cutting applications. For relevant applications, a recoating program is available.

The X-treme series is the new top range of Kinkelder HSS saw blades. Optimized surface finish, low variations in blade thickness and an extremely small side run-out are the key features that set these blades at the top of their game.

The Fusion- and Power series offer you the saw body concepts you are familiar with. On top of that, the side run-out for the Fusion series has been lowered and both concepts are available with the two newly developed coatings.

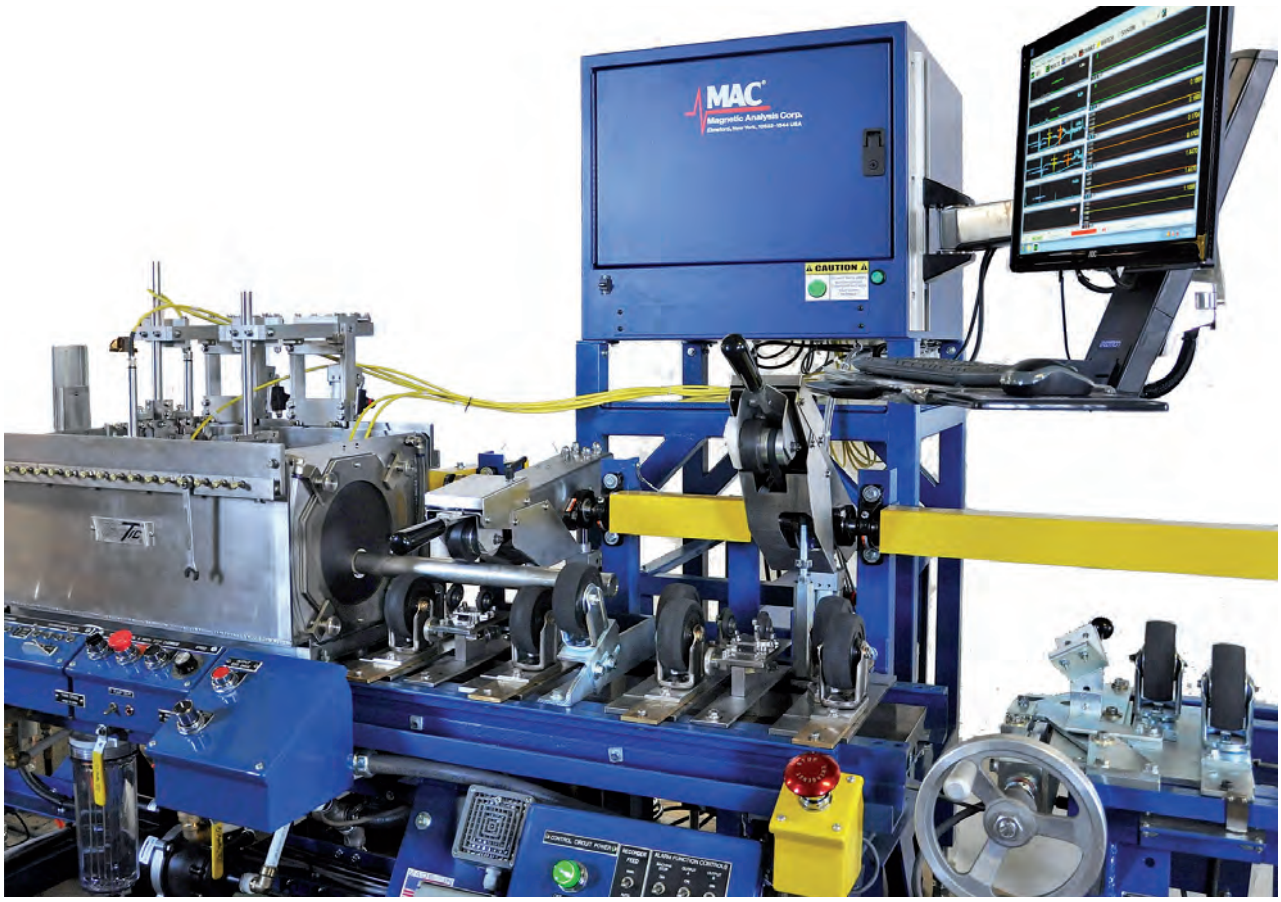
Kinkelder BV

Nijverheidsstraat 2
6905 DL Zevenaar
Netherlands

Tel: +31316582 200
Fax: +31316582 217
gvanoosterum@kinkelder.nl
www.kinkelder.nl

Magnetic Analysis Corporation

MAC's Echomac® FD-6A and TACTIC UT Immersion System for Critical Applications



Ultrasonic Test System for Titanium Tube - TACTIC UT immersion tank containing the transducers which feed directly to the FD-6A is at lower left. MAC 's Echomac® FD 6A UT instrument is at center.

A recent test system supplied to a producer of titanium tubes for nuclear applications incorporates MAC's (Magnetic Analysis Corp.) Echomac® FD-6A ultrasonic instrumentation with TACTIC's, (TAC Technical Instrument Corp.) ultrasonic transducer immersion tank, mechanical handling, controls, and "spin the tube" conveyors, to provide a complete turn-key installation.

For this critical application, the ultrasonic test is conducted directly after the drawing operation to verify the tube meets the required specifications, before more pieces are run. The Echomac® uses 4 test channels to verify the OD, ID dimensions, eccentricity and ovality conditions, and 2 channels for flaw detection. Tube sizes range from 1/4" to 3" diameter. The immersion tank containing the transducers feeds directly to the FD-6A. The conveyor system consists of a 16' inlet and 16' outlet. Tactic's rollers maintain the correct helix as the tube is fed through the tester, a critical part of ensuring accuracy during the test.

The Echomac® FD-6A, Magnetic Analysis Corp's latest UT instrument model, achieves a new level of improved signal to noise ratio,

finer adjustments, improved thickness resolution, repeatability, and reliability. Featuring MAC's user friendly Echohunter® interface software and versatile intuitive operation, control of all key test parameters is on a single screen, and thresholds can be moved by selecting and dragging on screen. A "Global" key allows parameters for several test channels to be adjusted at once, or copied from one channel to another. The 6A model has also received GE qualification for P3TF31, Class A & B, & P29TF82 Class A &B, a typical requirement for nuclear and aerospace applications. New installations or older ones that need to be upgraded can benefit from use of the Echomac® FD6A instrumentation.

Magnetic Analysis Corp. based in Elmsford, NY and Östersund, Sweden, is celebrating 90 years of providing NDT systems to the metals industry, including ultrasonic, eddy current and flux leakage test systems. TAC Technical Instrument Corp., based in Trenton, NJ, has been supplying tube producers since 1962 with immersion test systems to inspect cylindrical materials including tube, pipe and bars. TACTIC is now a subsidiary of Hatfield, Pa.-based Laboratory Testing Inc., a metals testing laboratory.

Magnetic Analysis Corp.
103 Fairview Park Drive
NY 10523-1544 Elmsford
USA

Tel: +1 915 530-2000
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www.mac-ndt.com

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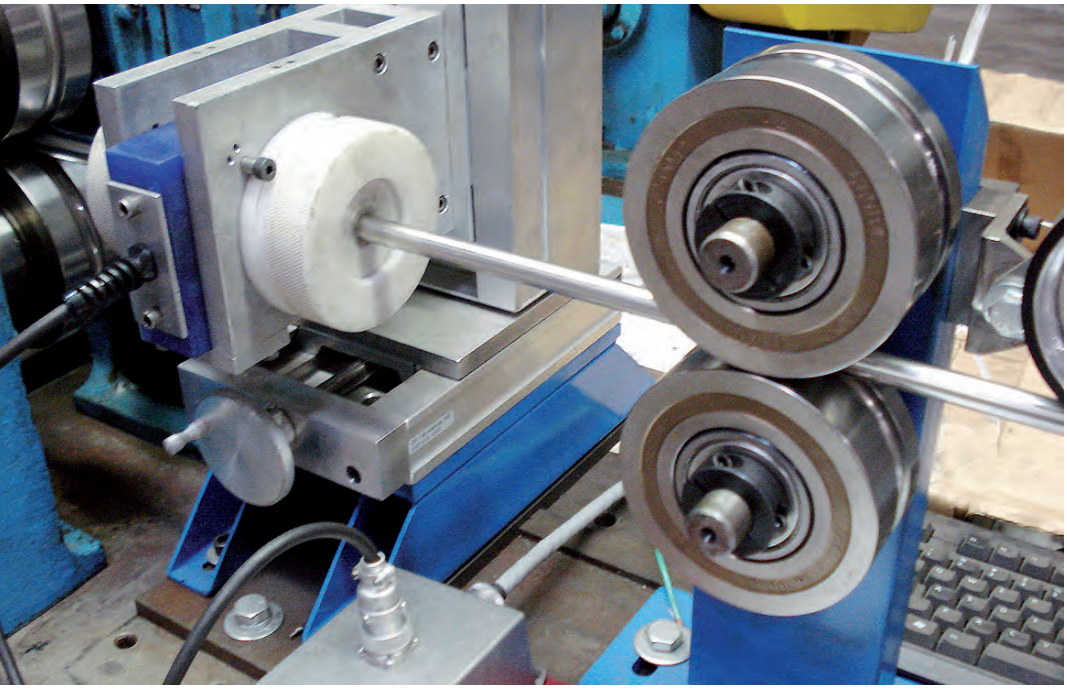
www.azaktool.com

AZAK TOOL TECHNOLOGIES

Magnetic Analysis Corporation

MAGNETIC ANALYSIS CORP. to exhibit at Tube India 2018



Eddy Current Encircling Coil unit Inspecting Stainless Steel Welded Tube as part of a MultiMac® test system.

MAC (Magnetic Analysis Corp.) will be featuring its line of nondestructive test instruments and systems at Tube India Booth L-33, as a co-exhibitor with MAC's representative in India, Inmar Engineering Services Pvt. Ltd.

Information on MAC's full range of Eddy Current, Ultrasonic, AC and DC Flux Leakage test instruments and systems will be available, including the new Echomac® 25mm Ultrasonic Rotary tester, the Minimac® 55 single channel eddy current tester, and the Echomac® 500mm Ultrasonic Rotary and Rotoflux 500mm Flux Leakage systems for inspecting heavy wall tube.

MAC's Minimac® 50 and 55 eddy current instruments are high performance yet affordable, compact testers that are used to inspect a range of tubing, including copper, stainless steel, cold drawn welded, and seamless. Operating at speeds over 4000 fpm, they detect short surface and some subsurface defects, including laps, slivers, cracks and weld line faults. Sensitivity, phase and filter are easily set on-screen while viewing a full color polar and linear display of real time, true wave form signals. Convenient review of test results on-site or remotely is included. These powerful, compact eddy current testers offer the robust capabilities of MAC's top of the line, proprietary MultiMac® software, yet are much more affordable.

Information on the MultiMac® eddy current tester with up to 8 test channels will be available. And data will be present on the Rotoflux® 500mm flux leakage system which, with the Echomac® 500 ultrasonic rotary, meets API standards requiring Ultrasonic testing as a first method and a second method such as flux leakage for inspecting oil country goods.

Now celebrating 90 years of serving the metals industry with nondestructive test instruments and systems, MAC's experienced and knowledgeable Engineers and Representatives can advise customers on selecting the most effective solutions, including instrumentation, test coils and sensors, rotary test heads, benches, and accessories for ensuring their products meet industry standards.

Mair Research S.P.A.

Mair Research has supplied an Integrated Cold Draw Bench and Finishing Line to a primary producer of precision tubes

Mair Research has recently supplied an integrated Cold Draw Bench and Finishing Line to a very important producer of automotive tubes where it is required to have a high productivity and ensure a very tight ID tolerance which is measured automatically.

Tubes to be drawn are special steel grades up to 70mm diameter for the production of shock absorbers and other automotive products.

The Cold Draw Bench is a 4 tube pull with 40 tons capacity. Drawn tubes will then be processed by the finishing equipment with which it is fully integrated to achieve one seamless line. The end product is a bundle ready for dispatch.

The scope of supply is fully integrated line composed of the following main equipment:

- Loader with special descrambling system
- Pointing machine (press type)
- 4-Tube Draw Bench
- 10 roll Straightening Machine
- Multicut machine to eliminate pointed end and cut to final lengths
- Deburring machine and chips removal
- Automatic ID tube tolerance measurement and on line verification
- Visual inspection
- Interfacing with NDT testing
- Automatic bundling in final shapes
- Wrapping with VCI film
- Strapping and labelling
- Storage and weighing of finished bundle

Particular attention is given to the interconnecting handling placed between the machines in order to smoothly transport the tubes and avoid any sort of denting or scratching of the tube surface.

All the above equipment was fully designed and manufactured by Mair Research is their plants located in Schio, Italy. Before dispatch the equipment went through a careful in-house testing in presence of the customer.

Since all operations are performed automatically, a very limited amount of operators with sole supervisory tasks are sufficient to conduct the line. Consequently all operator hazards have been eliminated providing a constantly safe work environment.

Mair Research is specialised in the design, manufacture and supply of finishing lines in general (automotive, OCTG, cold drawn DOM, other) having delivered to very important world reference producers in the field of ERW and seamless tubes.

MAIR RESEARCH S.P.A.
Via Lago di Albano, 55
36015 Schio (Vicenza)
Italy

Tel. : +39 0445 634 444
Fax: +39 0445 634 409

salesdept@mair-research.com
www.mair-research.com

Straightening machine

Draw Bench

Olimpia 80, Tube Mills

Two new tube mills installed by Olimpia 80

Two new tube mills were recently installed in China by Olimpia 80 to the same customer. These are two complete lines destined to produce high quality welded tubes mostly for automotive applications.

One tube mill uses a LASER technology and the second one, the HF welding method.

The Laser tube mill can cover the OD range up to 80 mm and 2 mm max thickness, with a 6 kW laser welding generator.

The HF tube mill can arrive at the max speed of 100 m/min to cover the range of OD up to 80 mm and 2 mm max, with a generator of 300 kW.

Others different tube mills are in commissioning in Mexico and Algeria; some of these are destined to produce tubes for automotive industries, confirming the fact that this market is in continuous expansion in the last 3-5 years.

The big contract signed in Algeria, for a supply of a total of 5 tube mills for stainless steel products, started the activity with the two first tube mills, waiting the others three in construction on our plant, together with a complete steel service center for the stainless steel coils processing.

A big tube mill with the cage forming technology for square and rectangular sections, is in commissioning in India, to cover the range from 80x80 up to 200x200 mm and 10 mm max thickness of carbon steel.

At last, the most important technology innovation is the recent tube mill for stainless steel tubes installed with the IPG fiber laser generator, to produce small size of tubes.

Olimpia 80, Tube Mills
Località.Cà Verde
29011 Borgonovo V.T. (PC)
Italy
Tel: +39 0523862614
gianlucat@olimpia80.com
www.olimpia80.com

Roll-Kraft

Roll-Kraft's annual tube, pipe and roll forming seminar continues to set attendance records

Roll-Kraft recently hosted its annual regional tube and pipe and roll forming training seminars in Mentor, Ohio. This year's event was attended by more than 60 companies from all over the United States, Canada, Mexico, and as far away as Korea. Many companies sent several attendees. Both seminars included tours of Roll-Kraft's state-of-the-art corporate facility in Mentor.

Seminar attendees included operators, maintenance and quality personnel, supervisors, and management of varying experience levels in the tube and pipe and roll forming industries.

Robert A. Sladky, Vice President of Tube Mill Engineering for Roll-Kraft, was the organizer of the event, as well as one of the speakers for each of the two programs.

Sladky said, "Demand for our regional seminars, as well as for our in-house programs at customer locations, has dramatically increased over the past two years, and attendance continues to grow, with programs booked well into 2019. In this day and age, it is encouraging to see new businesses starting up, instead of shutting down.

"Today's market demand for quality products is at an all-time high, and companies need to get it right the first time," Sladky added. "There is no room or time for reworks or doing it over, especially with the increased cost of raw material. This is one of the primary reasons the audience comes to these sessions – to learn to improve their operations."

In past years, attendance at tube and pipe training sessions offered by Roll-Kraft had outnumbered the roll form training sessions. However, 2018 has seen a more equal demand for training in both industries.

Roll-Kraft's training programs – both regional seminars and in-house training sessions – focus on developing a standard for all to follow in the areas of mill integrity, alignment, setup, and tooling maintenance.

In addition to giving the audience an understanding of the equipment, tooling, and processes for their industry, the primary focus is to get all employees "on the same page," performing their duties in a predictable, repeatable fashion in order to minimize changeover and down times, while at the same time increasing production and profits.

This year's event incorporated even more interactive videos in each of the two presentations. These videos, along with numerous technical publications, can be found on Roll-Kraft's website, the most comprehensive, informative resource in the industry.

20 of the 20 Biggest Steel Manufacturers Trust in IMS

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- Automatic classification of the severity of the defects

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60+
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IMS Messsysteme GmbH | Dieselstraße 55 | 42579 Heiligenhaus | Deutschland
Tel.: +49 2056 975-0, Fax: -140 | info@ims-gmbh.de | www.ims-gmbh.de

Roll-Kraft

ROLL-KRAFT offers instruction and tips in its new tube mill setup video series

Roll-Kraft is pleased to announce a new 14-video series covering all phases of tube mill setup. The company is an internationally known supplier of roll tooling to tube and pipe and roll forming manufacturers and is the industry leader in providing mill setup and operation education.

Roll-Kraft hosts annual tube and pipe and roll forming training seminars that have been attended by hundreds of professionals through the years. This new 14-video series is accessible for viewing on an easy-to-use video player on the Roll-Kraft website. It is a synthesis of teachings offered at the seminars, and provides step-by-step instruction in all 14 phases of the tube mill setup process. The topics include:

- Presetting Side Roll Passes
- Pregapping the Breakdown Rolls
- Tapering the End of the Strip
- Centering the Strip in the 1st Breakdown
- Threading the Breakdown and Fin Section
- Threading through the Coolant System and Sizing

Topics (continued):

- Validating Driven Breakdown Passes with Solder
- Using the Setup Chart
- Setting the Side Pass Stands and Breakdown Section
- Setting the Fin Section
- Verifying Parallelism of Driven Passes
- Checking Weld Size
- Setting the Sizing Section

Conclusion – Tube Mill Running Smoothly

The videos are presented by Robert A. Sladky, Vice President of Tube Mill Engineering at Roll-Kraft. Sladky has been associated with Roll-Kraft for more than 30 years and has spent 49 years working in the tube and pipe industry. All processes and procedures in the videos demonstrate tested practices that have been documented as successful over the years and are currently used throughout the industry.

In addition to the video series, regional training seminars, and events, Roll-Kraft also offers on-site tube and pipe and roll forming training programs at the customer's location. Conducting an on-site training program allows the instructors to focus on the mills as they are currently operating, with tooling and staff, and allows interaction with everyday issues and experiences. It is a convenient way to train the operators and staff in-house and provide customized guidance for specific situations.

Roll-Kraft
8901 Tyler Blvd.
OH 44060 Mentor
USA
Tel.: +1440253100
Fax: +14402053110
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Schwarze-Robitec GmbH

Taking fully electric tube and pipe bending to the next level

Schwarze-Robitec at Fabtech 2018

Schwarze-Robitec is to present a world first at Fabtech – the biggest fully electric multiple-radius tube and pipe bending machine featuring transport boost technology. By showcasing the CNC 220 E TB MR at booth C10623, the traditional German company will demonstrate how complex tube geometries with diameters of up to eight inches can be produced swiftly, flexibly and efficiently. By delivering consistent precision during the tube and pipe bending process, the new machine enables users to achieve high productivity in their production processes – regardless of batch size.

Extraordinary in terms of dimensions and capacity – Schwarze-Robitec's new product, the CNC 220 E TB MR, represents a milestone in the production of fully electric, multi-stack tube and pipe bending machines. Forming part of the High-Performance-series, the CNC tube and pipe bending machine is unique in terms of the capacity it offers. It was developed by the tube and pipe bending machine specialist for one of its American customers active in the automotive industry. The machine fully meets the high requirements it faces in terms of short cycle times, top speed and maximum flexibility. The maximum bending capacity of the CNC 220 E TB MR amounts to a diameter of up to eight inches. The multi-stack tube and pipe bending machine can bend an especially broad spectrum of tube and profile dimensions. It can process tube and pipe lengths of up to 13 feet, with a vertical height-adjustable pressure die moving to the required bending level in each individual case. This enables users to better gauge the requisite bending forces and consistently apply the optimal contact pressure to the tubes and pipes they plan to bend.

Maximum productivity

Used in combination with individually adjustable tools, the multi-level technology integrated into the CNC 220 E TB MR allows tubes and pipes to be bent simply and precisely, with very low distances between bends. The machine also features the NxG control system, which contributes to the swift cycle times offered by the High-Performance-series. By optimizing time, tool path and speed on all CNC axes, the system enables users to significantly enhance productivity. Depending on the tube or pipe system to be bent, production times can be slashed by up to 35%. Like all tube and pipe bending machines produced by Schwarze-Robitec, the energy-efficient CNC 220 E TB MR boasts bend former retraction. The bend former and swivel arm can therefore be operated separately, enabling a highly diverse range of tube geometries to be more easily adjusted and positioned during the bending process. Schwarze-Robitec has already prepared the tube and pipe bending machine for future developments in the context of Industry 4.0. For instance, Fabtech visitors can test the mechanical engineering firm's smart remote maintenance solution with numerous diagnosis functions at the trade fair.

Fabtech visitors looking for more information and comprehensive advice can head to booth 10623 in Hall C or go to https://www.schwarze-robitec.com.

Schwarze-Robitec GmbH
Olpener Strasse 460-474
51109 Köln
Germany
Tel: +49221 89 00 8-0
Fax: +49221 89 00 8-9920
sales@schwarze-robitec.com
www.schwarze-robitec.com

Schwarze-Robitec GmbH

Tube and pipe processing with modular configuration for the maritime industry

Schwarze-Robitec at SMM 2018

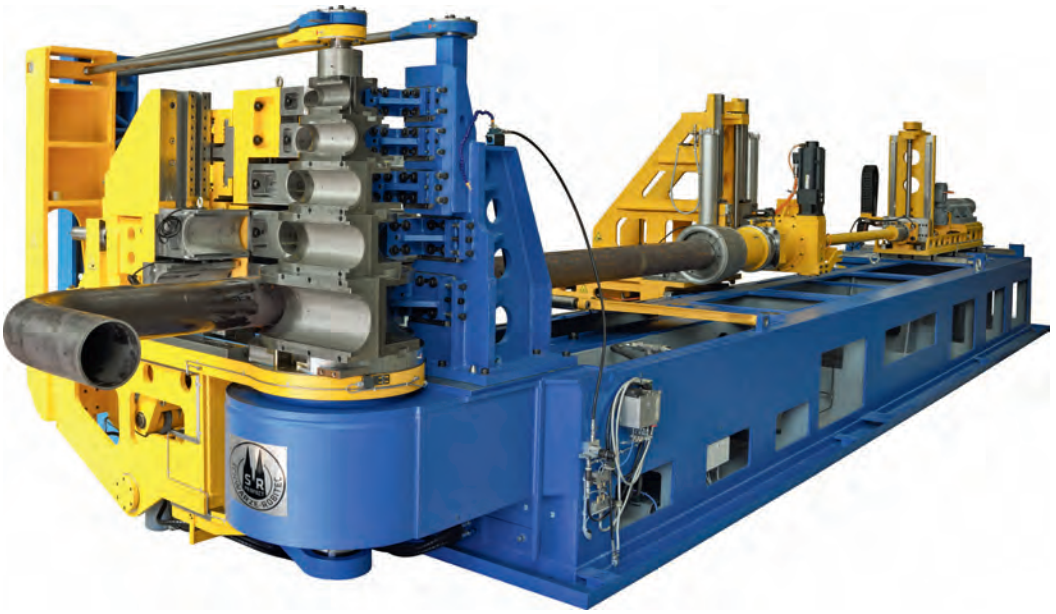
Manufacturing kilometres of tubing systems with efficiency and precision – it's a challenge that many companies in the maritime industry are very familiar with. At SMM, Schwarze-Robitec will be showcasing its solutions for achieving even greater productivity in tube and pipe processing. The manufacturer of tube and pipe cold bending machines will be providing information about its Heavy Duty product line in Hall B7, Booth 480 at the trade fair. Heavy Duty tube and pipe bending machines can be adapted to meet individual production requirements, and therefore play a key role in helping manufacturing firms in the shipbuilding and offshore industries get ahead of the competition.

To safeguard the supply of oil and gas, ships contain kilometres and kilometres of tubing below deck. They are made from a wide range of different materials with varying diameters. Due to the limited space available on board, engineers design the tube and pipe systems to take up as little room as possible. That is why very small bending radii are often required during tube and pipe processing. At the SMM, Schwarze-Robitec will be showcasing its solutions for the efficient and precise bending of high-strength tube and pipe materials, with the Heavy Duty product line taking centre stage. This series enables particularly small tube and pipe radii (up to 1 x D) to be bent. The machines are specially designed for continuous use under major strain. They can accommodate huge bending forces and deliver high-quality results.

Slashing refitting times in shipbuilding

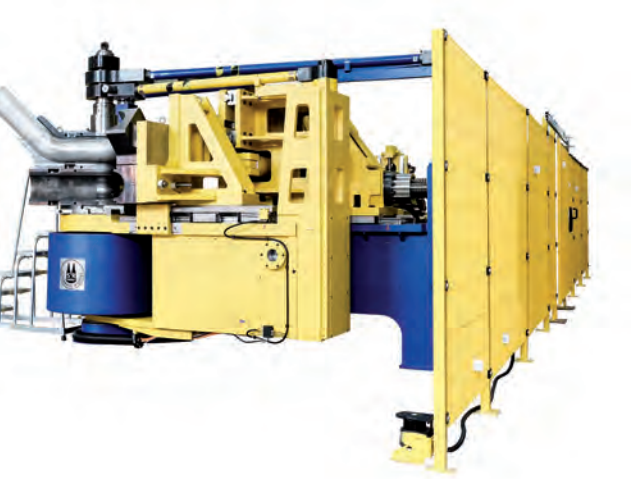
As an optional extra, the Heavy Duty machines can also be equipped with multi-stack bending tools for a range of nominal sizes, reducing refitting times by up to 70 percent compared with conventional tube and pipe bending machines. Designed to be highly user-friendly, Heavy Duty tube and pipe bending machines can be seamlessly connected to all relevant networks and production programmes.

SMM visitors looking for more information and comprehensive advice can head to booth 480 in Hall B7 or go to https://www.schwarze-robitec.com.

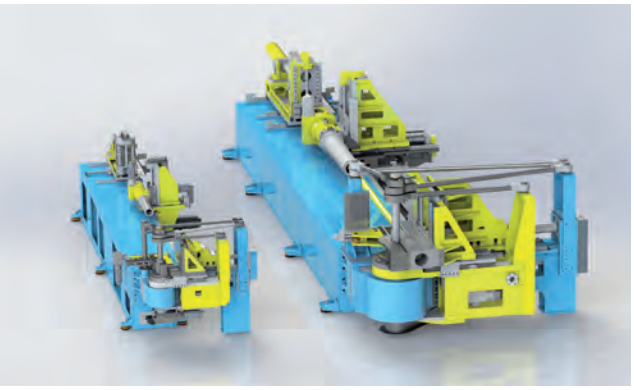


Schwarze-Robitec GmbH

Gigantic tube and pipe bending machine on its way to the USA



With the CNC 220 E TB MR, Schwarze-Robitec sends the world's biggest fully electric multiple-radius tube and pipe bending machine featuring transport boost technology on a journey



The CNC 220 E TB MR of Schwarze-Robitec's High-Performance-series in comparison to a machine of the type CNC 80: unique in terms of dimensions and tube and pipe bending capacity.

Schwarze-Robitec showcases unique technology at Fabtech

The biggest fully electric multiple-radius tube bending machine featuring transport boost technology goes on a journey: The CNC 220 E TB MR has now been successfully approved at the Schwarze-Robitec production site and packed for transport to its place of use. Before the final delivery to a US-American customer from the automotive industry, Schwarze-Robitec will be presenting the tube bending machine at Fabtech in Atlanta. The gigantic machine is unique in its performance capacity. By showcasing it at booth C 10814, the traditional German company will demonstrate, how even complex tube geometries with diameters of up to eight inches can be produced swiftly, flexibly, precisely and efficiently.

Schwarze-Robitec developed the tailor-made CNC 220 E TB MR tube bending machine for one of its American customers active in the automotive industry. Short cycle times, highest speeds as well as maximum precision and flexibility were required. At Fabtech in Atlanta, the tube and pipe bending machine specialist is now presenting the result: a unique machine in terms of dimensions and capacity, with which an especially broad spectrum of tube and profile dimensions can be bent. The maximum bending capacity of the CNC 220 E TB MR amounts to a diameter of up to eight inches. The CNC 220 E TB MR processes tube lengths of up to 13 feet. A vertical height-adjustable pressure die moves to the required bending level in each individual case. This allows the requisite bending forces to be optimally gauged in order to consistently apply the optimal contact pressure to the tubes and pipes to be bent. Used in combination with individually adjustable tools, the multilevel technology integrated into the CNC 220 E TB MR allows tubes to be bent simply and precisely with very short lengths between bends.

Fast and precise production of complex tube geometries

The machine's NxG control system also contributes to the fast cycle times offered by the High-Performance-series. By optimizing time, travel stroke and speed on all CNC axes, production times can be reduced by up to 35%. The energy-efficient CNC 220 E TB MR – like all tube and pipe bending machines produced by Schwarze-Robitec – is equipped with bend former retraction as a standard. Therefore, the bend former and swing arm can be operated separately. This enables users to produce a highly diverse range of tube geometries while easily adjusting and positioning them during the bending process. Schwarze-Robitec has already prepared the CNC 220 E TB MR for future developments in the context of Industry 4.0. For instance, the smart remote maintenance solution with numerous diagnosis functions is integrated into the gigantic machine.

Fabtech visitors looking for more information and comprehensive advice can visit Schwarze-Robitec at booth 10814 in Hall C or on the Internet at https://www.schwarze-robitec.com.

Sikora AG

SIKORA at Tube China 2018 (E1B26)

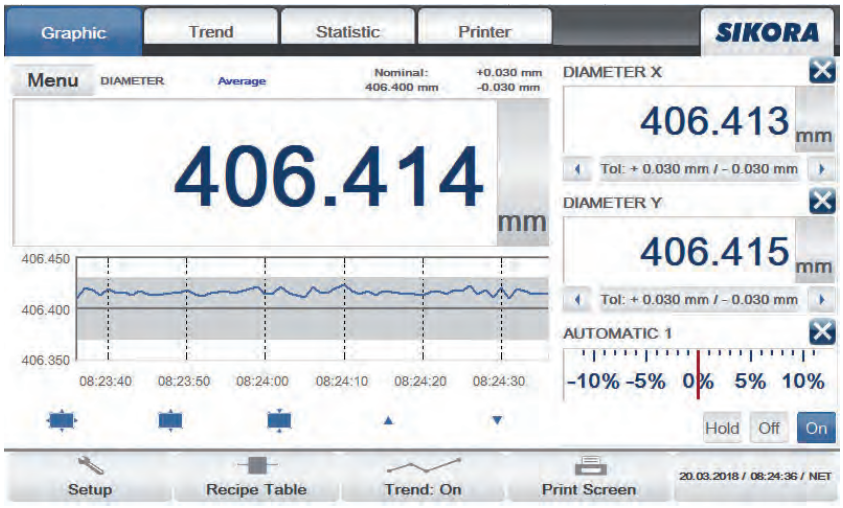
SIKORA AG is a manufacturer and supplier of advanced measuring, control, inspection and sorting technologies for the hose and tube, metal, wire and cable, optical fiber and plastics industries. At Tube China in Shanghai, from September 26 to 29, 2018, the company presents a broad portfolio of innovative systems for non-destructive quality control and process optimization during production of metal tubes, pipes, strips and plates at its booth E1B26.

With the RADAR SCAN 6000, SIKORA showcases a system for the online and contactless measurement of the diameter and ovality of metal tubes and pipes. The system is based on progressive, high resolution radar technology and represents an innovative alternative to optical triangulation technology. In metal tube and pipe applications, the measurement is done simultaneously via transceivers from different directions over 360 degrees of the product circumference. The advantages of radar technology, compared to optical measurement methods, are obvious: The measurement is carried out from a protected position and is resistant to heat, steam and dust. The system records to micron accuracy measuring values gapless, over the entire circumference of the product. In addition, fast rotating tubes and pipes can be precisely measured. The radar measuring system requires no calibration and delivers continuously precise measuring values, which results in high reliability and availability for the user. Due to the narrow design, RADAR SCAN 6000 can easily be integrated into the production process. The technology reliably measures independent of surface roughness in typical tube applications. Therefore, it contributes to the highest product quality, process optimization and cost saving in tube and pipe manufacturing.

Caption 1: RADAR SCAN 6000 measures the diameter and ovality of tubes and pipes

Another highlight on the SIKORA booth will be the PLANOWAVE 6000 M, a non-contact measuring system that is used for non-destructive thickness measurement of metal strips and plates. The system offers a precise thickness measurement independent of material, temperature and surface of the product. A calibration on

the material is not needed. The measurement of the product is accomplished by using millimeter waves based radar technology. An optionally traversing set of transceivers above and below the strip or plate continuously sends and receives modulated millimeter waves. From the runtime difference, the thickness of the product is precisely determined.



Operator screen with analog and graphical visualization of measured values of the LASER Series 2000

SIKORA presents at Tube China 2018 the LASER Series 2000 for diameter and ovality measurement of tubes and pipes

SIKORA also showcases gauge heads of the LASER Series 2000 for a non-contact and non-destructive measurement of the diameter and ovality of metal tubes, wire rods and bars during production. The measuring method is based on the usage of CCD sensors and laser light sources in combination with powerful signal processors. The outer diameter of the metal tube, wire rod or bar is calculated by means of an intelligent diffraction analysis. Extremely low exposure times guarantee a high accuracy of the single value at all line speeds. The gauge heads are free of wearing parts, keep their precision during the entire operating time and no calibration or maintenance work is necessary.

In addition, SIKORA presents the LASER Series 6000. These gauge heads expand SIKORA´s current range of intelligent diameter gauges with three high-end models. Up to 5,000 measurements per second and axis, all with extremely high single value precision, enable an optimum line control, provide reliable statistical data, and allow the detection of lumps and neckdowns at the same time. The SIKORA gauge heads measure the diameter of tubes, wire rods and bars with impressive precision and repeatability. Three gauge head models cover product diameters from 0.2 to 78 mm.

Sikora AG
Bruchweide 2
28307 Bremen
Germany
Tel: +49 4214890 0669
Fax: +49 4214890 0069
sales@sikora.net
www.sikora.net

SMS group GmbH

Železiarne Podbrezová places order with SMS group to modernize existing push bench

Reduced future effort for maintenance and repair in tube production Železiarne Podbrezová has placed an order with SMS group covering the upgrade of its existing pushbench plant in Podbrezová, Slovakia. On this push bench, Železiarne Podbrezová produces seamless tubes in the diameter range from 0.5 inch to 5.5 inches. The modernization order covers two new racks with drive pinions and a new rack guide bed for the push bench as well as 14 new stands for the stretch reducing mill.

The new racks, which have a special gearing, will be supplied in merely three partial lengths (instead of the existing five ones) and with the connecting elements in an even better and stronger version. The rack guide bed will be of robust and single-part design in its cross-section. All individual rack guiding elements are to be supplied in maximum possible lengths so that four elements only will be needed to cover the overall length. As a consequence, the forces and torques in the rack guide bed can be perfectly absorbed and hence significantly reduce the effort for maintenance and repair. The new stands for the stretch reducing mill will be designed for the use of hard metal rolls that can absorb higher rolling forces and permit greater pass diameters to be cut.

SMS group is a group of companies internationally active in plant construction and mechanical engineering for the steel and nonferrous metals industry. It has some 14,000 employees who generate worldwide sales of about EUR 3 billion. The sole owner of the holding company SMS GmbH is the Familie Weiss Foundation.

The Železiarne Podbrezová project team after contract signing at SMS group in Mönchengladbach.

"Since we had good experience with SMS group in the past, we again decided to have the modernization made by SMS," says Milan Srnka, Technical Director at Železiarne Podbrezová.

SMS group GmbH
Ohlerkirchweg 66
41069 Mönchengladbach
Germany
Tel: +49 2161 350 0
Fax: +49 2161 350 1667
communications@sms-group.com
www.sms-group.com

Tracto-Technik GmbH & Co. KG

PIPE BENDING SYSTEMS: Trendsetter in the field of digital transformation

Networked tube and pipe production – global data flow

Improved quality and high added value – PBS-Systems proof their economic efficiency

The quick and easy manner to produce a flange tube

"In tune with the digital transformation", this slogan of the scheduled International Sheet Metal Working Technology Exhibition has been taken literally: Concerning the fourth industrial revolution "Industry 4.0", the PIPE BENDING SYSTEMS (PBS) division of TRACTO-TECHNIK GmbH & Co. KG in Lennestadt (Germany) presents itself as leader of the branch. As example the global player PBS introduces system solutions in the field of pipe assembling which are based on a continuously accompanying digital data flow from the draft stage up to the shipping of the finished tube; i.e. the standard "Industry 4.0" has been implemented in an exemplary way.

PBS had once been founded as a mechanical engineering company, but developed to offer intelligent solutions for all production steps of tube and pipe manufacturing and to get on top of the international league in terms of digital transformation. Today the modular extensible manufacturing system from PBS, composed of CAD interface and measuring technique as well as PIPEFAB software and pipe bending machines, is used around the world in many different fields of application to produce even customised pipes at a cost and quality level which otherwise can only be reached by mass production. Food, beverage or pharmaceutical industries, chemicals, bio-technique or air conditioning, at the shipyard, on a power plant construction site or if the assembly of hydraulic units has to be carried out: PBS systems stand for economical manufacturing, the perfect cooperation of the modular components offers potential savings up to 70 percent.

Directly after the transfer of the design and engineering data from the CAD system the PIPEFAB software controls the entire stages of production – from the material procurement at the very beginning to the final shipment of the finished pipes. Not only the generation of work schedules and production batches as well as the calculation of production times and production costs are based on the stored pipe geometry data; the warehouse management, withdrawal of material, pipe preparation, cutting to length, bending, deburring, welding and quality assurance operations (x-ray inspection, pressure test, etc.) are also derived from this information. No matter where around the world the measurements are taken, the design and engineering data is generated, the bending machine is situated, and whether the pipe segments are manufactured in series or individually: every single piece fits at the first attempt.

Tracto-Technik GmbH & Co. KG
Hunold-Rump-Straße 76-80
57368 Lennestadt
Germany
Tel: +4927238080
Fax: +49272380180
christian.gerlach@tracto-technik.de
www.tracto-technik.de

SCOPELINK and ROBOFIX: Measuring, welding, assembling – done

Another major highlight which has been developed by the PPS research engineers is the worldwide unique measuring system SCOPELINK for the frequently during pipework installation required adapter pipes. The use of SCOPELINK reduces the commonly time and cost intensive manufacturing of adapter pipes considerably: within only a few minutes the isometry data of the pipe layout can be precisely measured and stored. To save time, prefabricated pipe segments can be tailored by the software to meet the particular conditions of the installation on site. After the data transfer to the workshop or the PIPEFAB software the adapter pipe can be manufactured immediately.

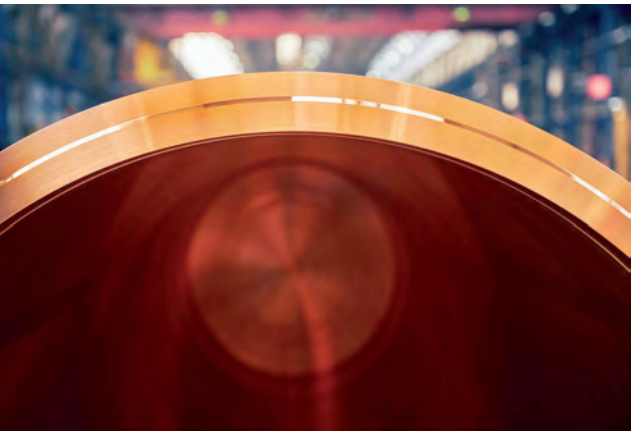
The measuring operation includes precise gathering and documentation of the adapter pipe isometry as well as the position of the flanges and their hole patterns. Based on the pipe isometry the adapter pipe is bent or assembled of segments. For exploitation in the workshop the TRACTO-TECHNIK development section has designed another advantageous tool: the automated positioning unit ROBOFIX. To ensure easy tacking and butt welding this component allows fixing two flanges with their hole patterns in exactly the same position as they will assume after their final assembly. Additionally, the data required for bending and flaring operations can be generated directly from the pipe isometry.

High-quality mechanical engineering: Know-how and expertise

Substantially revised, completely modular structured, functional and ergonomically designed – but still as rugged and reliable as appreciated by the users: As technological pioneer in the field of tube machining the latest generation of the tube working centre TUBOMAT sets its own particular standard. Independently of complex controls by digital information professional and high-quality mechanical engineering remains the key for precisely manufactured tubes of all possible dimensions.

Vallourec Deutschland GmbH

Copper canister for spent nuclear fuel



Vallourec produces huge copper canisters for long-term storage of spent nuclear fuel.

The project was started in 2006, when Finnish customer Posiva Oy, an organization specialized in nuclear waste management, teamed up with Vallourec in the development and production of special copper canisters. These canisters - about 7 tons in weight each - are intended to form the outer shell of an "eternity seal" for used nuclear fuel elements. In May 2018, the 12-year R&D project ended with final inspections and documentation checks which were carried out successfully in the presence of the TÜV.

Since the beginnings of the project, two or three canisters have been produced and tested by Vallourec each year in the framework of agreed ongoing test and development series. Ultra-precise design, perfect surfaces and flawless material properties are crucial to the long term function: Tightest tolerances are mandatory for the precise assembly of a cast iron insert inside the copper canister, the insert embedding the warm fuel rods inside its channels. The inner walls of the copper canisters are slightly textured for even heat absorption by the whole canister surface. The design of the nuclear waste canisters also takes advantage of Vallourec's unique pierce and drawing processes at the Reisholz facilities, in Germany (Land of North Rhine-Westphalia), out of which the tube comes with an integral bottom. After the cast iron insert has been closed with a steel lid, the whole canister will be "sealed" by a welded copper lid.

Copper had been chosen as ideal material for the outer metallic shell due to its excellent corrosion resistance. Under the given conditions it will ensure the tightness of the canisters for much longer than the period of 100,000 years, which is required for the long-term disposal of radioactive material in Finland.

The design of the canisters is part of a disposal concept that has been developed on the basis of the specific geological conditions in Finland and Sweden. The repository under consideration is situated some 450 metres deep in a tectonically and geologically safe granite bedrock spot that has been in a geologically unchanged condition for 1.8 billion years. Precise holes for the canisters will be drilled into the granite, and these holes will be filled with bentonite clay for protection against mechanical wear of rock, before the canisters are finally injected.

Vallourec Deutschland GmbH
Theodorstr. 109
40472 Düsseldorf
Germany
Tel: +492119602267
info@vallourec.com
www.vallourec.com

Vallourec Deutschland GmbH

Vallourec takes part in the EU Raiselife project

Vallourec is involved in the EU Raiselife project for the further development of concentrated solar power plants (CSP).

Raiselife is a project funded by the European Union's Horizon 2020 research and innovation program coordinated by Deutsches Zentrum für Luft- und Raumfahrt from Cologne, Germany. Using molten salt as heat transfer fluid is a challenge for engineers and for companies delivering components for Solar Power Plants. This also applies to tubes and pipes.

During the Raiselife project, Vallourec discussed with several solar players about the specific demand of the tubular solutions for solar power plants. Meanwhile the needs and requirements are outlined. The technical sticking points are identified and the next step is working on intelligent tubular solutions to meet all the requirements.

Based on its long-standing experience in the steels and alloys already used in the energy market, Vallourec shares its expertise in the most advanced ferritic steel, stainless steel or nickel base alloy tubes and can also develop new tailor-made solutions for the specific demand of tubes submitted to particularly corrosive environments such as molten salts currently envisaged in solar power plants. Vallourec's experiences made in nuclear power plants seem

to be very helpful for tubular solutions for solar power plants and the experts see opportunities to draw parallels. First ideas have to be underpinned either by testing material already used in nuclear power plants with molten salt or by finding other proper ways to provide the most competitive tube in the requested size range.

Vallourec launches a new brand Vallourec.smart

The Group accelerates its transformation and launches a new brand, Vallourec.smart, to serve all the customer service needs across the value chain. This decision illustrates Vallourec's ambition to deliver innovative digital services and complement the tubular solutions that have made its worldwide reputation.

Vallourec will be presenting its first commercial offers under the new brand Vallourec.smart at the RIO Oil & Gas conference, starting today.

"This new brand demonstrates our commitment to innovate for and with our customers, and offer new end-to-end services in line with the growing digitalization of our customers," said Philippe Crouzet, Vallourec's Chairman of the Management Board.

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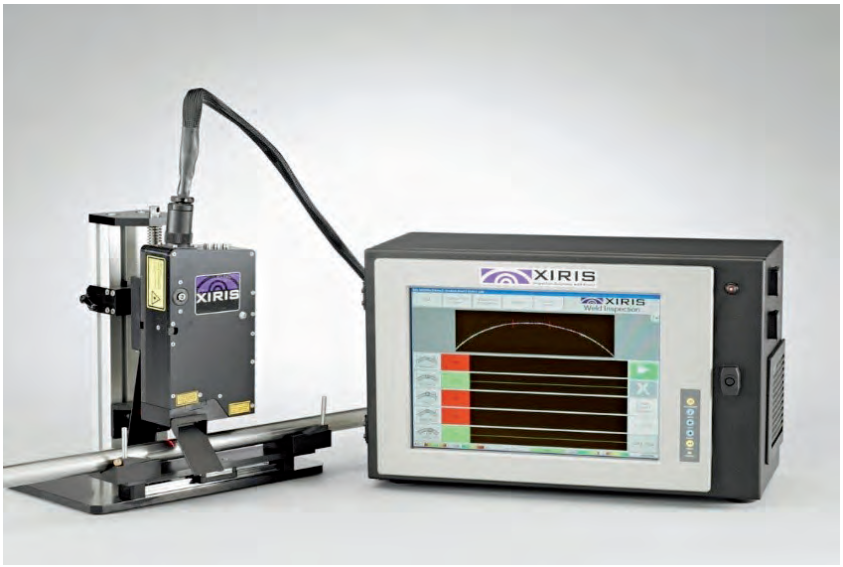
Xiris Automation Inc.

Xiris Recertification Program



Xiris Automation Inc. has developed the WI sensor head recertification program to recertify WI sensors onsite at your facility by Xiris personnel with minimal interruption. Recertification helps to ensure optimal WI system performance helping maximize tube mill productivity and should be part of ongoing quality assurance and yearly preventive maintenance program.

The sensor recertification includes a sensor head inspection and recertification to ensure that electronic and optical components are functioning within factory specifications. Xiris also provides replacement of protective windows, backup of software, settings, and updating software and firmware to latest applicable versions.

Xiris recognizes the importance of continuous improvement in today's manufacturing environment, and the need to ensure optimized speed and product quality. WI sensor recertification will help ensure that Xiris customers can accomplish that.

Xiris Automation Inc. specializes in developing optical equipment used for process and quality control across a number of specialty industries. With an extensive product line, Xiris provides some of the world's most dynamic manufacturers with the ability to detect, recognize, and interpret quality defects in their manufactured goods.

Xiris Automation Inc.
1016 Sutton Drive, Unit C5,
Burlington, Ontario,
Canada L7L 6B8
Tel.: +1 905 331 6660
Fax: +1 905 331 6661
sales@xiris.com
www.xiris.com

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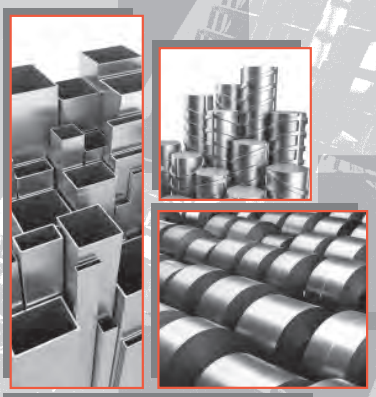

www.tubeandsteelistanbulfair.com

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M-C TSE-ISO 10002 K-C TSE-ISO-EN 9000 TS EN ISO 9001:2015

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BU FUAR 5174 SAYILI KANUN GEREĞİNCE TOBB (TÜRKİYE ODALAR VE BORSALAR BİRLİĞİ) DENETİMİNDE DÜZENLENMEKTEDİR.

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Tube China 2018

Post Show Press Release VIII | October 2018

wire China 2018 – International Wire & Cable Industry Trade Fair
Tube China 2018 – International Tube & Pipe Industry Trade Fair
Fastener Shanghai 2018 - Shanghai Fastener & Tech Show
Shanghai New International Expo Centre, Shanghai, China 26 - 29 September 2018

The Biennial Industry Highlight in Asia's Wire, Cable, Tube, Pipe and Fastener Industry – wire & Tube China 2018 Ended Successfully on September 29th, and the Number of Professional Visitors Hit a New Record of 45,120.

As the flagship event in wire, cabe, tube and pipe industry, the 8th All - China International Wire & Cable Industry Trade Fair (wire China) and the 8th All - China International Tube & Pipe Industry Trade Fair (Tube China) presented the industry with a "grand feast" in this September.

With the care and support from all walks of industry, the exhibition concluded on September 29th at Shanghai New International Expo Center with great success. The organizers once again joined hands with China Fastener Info to hold the Fastener Shanghai in Hall E4, co-located with wire & Tube China 2018, which effectively connected upstream and downstream enterprises in related industries.

Bringing Together Quality Buyers from Around the World and Delivering Real Sales Results

Relying on the strong industry appeal of the show, wire & Tube China 2018 has once again broke the record of visitor number. According to statistics, the four-day exhibition attracted 45,120 professional buyers from 91 countries and regions to the site, an increase of 6.9% over the previous edition.

This year, besides a large number of domestic visitors, there were many more overseas buyers interested in the Chinese market. According to the post-show visitor statistics, the top ten overseas visitors were from: India, South Korea, China Taiwan, Japan, Russia, Malaysia, Thailand, Vietnam, China Hong Kong, Indonesia.

In addition, the participation of nearly 100 local and overseas visitor delegations was another highlight of wire & Tube China. 97 companies and social groups from 10 countries and regions including China, South Korea, Japan, Vietnam, China Taiwan, India, and Thailand visited the exhibition, which increased nearly twice compared to the previous year.

wire & Tube China not only has a great influence in China, but also acts as an important platform for companies from Japan, South Korea, Southeast Asia and even North America to purchase products, learn technology and develop contacts.

Positive Feedbacks from Professional Buyers

Mr. Feng Cao, Director of Operations, Asia Pacific, from Nortech Systems, Inc., in USA, said: "I come from the high-frequency and medical wire harness industry and have visited this exhibition

Messe Düsseldorf GmbH

Messeplatz
40474 Düsseldorf
Gernany

Petra Hartmann-Bresgen, M.A.
Ulrike Osahon

Tel.: +49 (0)211 4560 541
Fax: +49 (0)211 4560 87 541

HartmannP@
messe-duesseldorf.de
www.messe-duesseldorf.com

continuously for the past three editions. Through wire China, we can find reliable suppliers and purchase raw materials, meet with some regular customers, as well as understand the industry trends and new technologies. It's a very worthwhile trip!"

Mr. Wang YongBing from Stainless (Dongguan) Precision Metal Materials Co., Ltd. said with pleasure: "I visited this year's wire & Tube China to look for suppliers of cable and wire processing equipment and raw steel mills. I have met with a number of quality suppliers and have confirmed my intention to cooperate with one of the exhibitors!"

Mr. Anoop Garg from AKSHAJ Group in India said: "I have visited Tube China for many years continuously. I found a suitable pipe processing supplier at the exhibition this year. I have gained a lot! Of course, I will continue to recommend this platform to industry friends, and I hope more peers will join in."

Mr. Mirko Brockhaus from Erzet - HandelsgesellschaftmbH, Germany, said: "I have visited the wire + tube exhibition in Düsseldorf, Germany many times before. This is my first visit to China. Currently, I have contacted with many quality suppliers from China and Asia, and I look forward to more cooperation opportunities after the event!"

1,653 Worldwide Industry Giants Bring Innovative Products and Showcase Cutting-Edge Technology

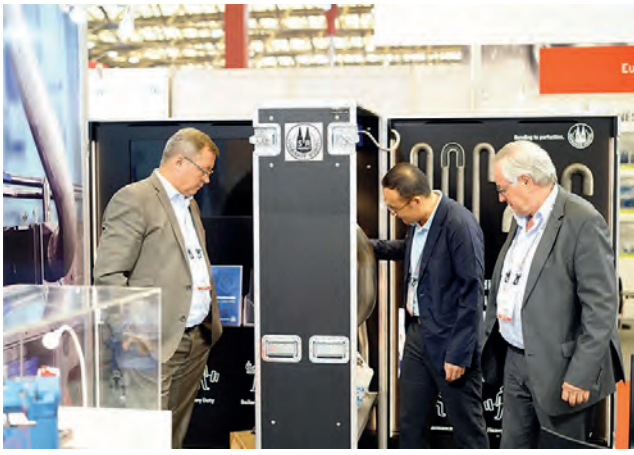
In order to seize the favorable opportunities brought by the "The Belt and Road" initiative and the "Made in China 2025" strategy, 1,653 brands from 31 countries and regions chose to participate in wire & Tube China this year, which increase a little comparing to the previous edition. Among them, many brands have become old friends of the exhibition, and some companies have participated consecutively for eight editions.

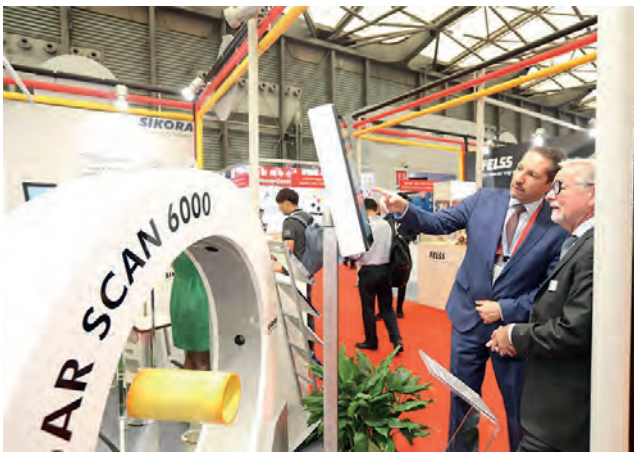
At the same time, some companies from Germany, North America, Italy, Austria, France, Japan, South Korea and China Taiwan have gathered together in their respective pavilions, and along with other independent international brands, have enhanced the global image of the exhibition. Thus, domestic buyers are able to purchase cutting-edge products and technologies and understand advanced production concepts and solutions without going abroad!

Exhibitors Get Positive Results

Mr. Bernd Lohmueller, General Manager and Sales Director of Maschinenfabrik NIEHOFF GmbH & Co. KG, Germany, was pleased to receive a live interview. He mentioned: "NIEHOFF entered the Chinese market in 1970s and has participated in wire China many times. At wire China, we can not only meet Chinese buyers, but also meet with many buyers from Japan, South Korea and Southeast Asia. In order to meet the environmental protection needs from our clients, we are constantly improving our equipment to achieve higher efficiency under lower energy consumption."

Mr. Li BinHeng, Marketing Director of Singcheer, gave positive feedback about the event: "Since the first exhibition in 2004, we have participated in wire China in every session. wire China is the absolute perfect platform for Chinese local enterprises to showcase the power of "Made in China". The clients we





met at the exhibition are professional buyers in the cable industry. We successfully export the latest equipment of new technology machinery to countries all over the world via this platform."

Mr. Zhang Jian, Deputy General Manager of Inductotherm Industries (Shanghai) Ltd. also expressed his recognition of Tube China: "This is the eighth time that our company has participated in Tube China. Like all the past editions, we met many new and old clients at the event and there are also new projects in the pipeline. Under the trend of intelligent manufacturing, Thermatool is also constantly evolving to provide customers with multiple intelligent solutions."

We also received positive feedback from Fastener Shanghai exhibitors. Mr. Song ZhangBin, Director and Deputy General Manager of Dujiangyan Beyond Machinery Manufacture Co., Ltd., said: "This platform is an important bridge to connect with clients from home and abroad. We could see strong demand for fastener products from overseas buyers during the exhibition. Although the industry is currently under pressure from the US trade protection policy, I believe that with the upgrade of China's fastener production technology in the next five years, and the huge market created by the "Belt and Road" initiative; the industry will be able to walk out on a smooth path!"

Multiple Forums Held Concurrently, Focusing on Trending Industry Hot Topics

wire & Tube China is not only a professional one-stop business platform, but also a good place to release cutting-edge technology, share industry trends, and learn advanced cases. At the exhibition, the organizers cooperated with industry associations and powerful media at home and abroad to launch dozens of professional forums and conferences!

China Wire & Cable Industry Conference 2018

In the middle of the "Thirteenth Five-Year" development, China's wire and cable industry is progressing in a right direction with focus on quality brands, strengthen technological innovation, and optimized operational efficiency. In 2018, China Wire & Cable Industry Conference released several wire and cable industry reports and the evaluation result of cable enterprise competitiveness, discussed how to grasp the trend and accelerate the transformation of wire and cable industry during this important time.

China International Tube Industry Development Seminar 2018

On the basis of the first successful conference, the 2nd "China International Tube Industry Development Seminar" was further improved. The organizer, Metallurgical Council of the China Council for the Promotion of Int'l Trade (MC-CCPIT) and Messe Düsseldorf (Shanghai) Co., Ltd., again joined hands with the International Tube Association (ITA) and conducted in-depth discussions on trending topics, trend analysis, and excellent application cases in the steel pipe industry. The feedback from the seminar was enthusiastic.

Automotive New Technology and Fasteners Application Forum 2018

As the concurrent event of Fastener Shanghai, the forum was held in the conference area of Hall E4 on the second day of the exhi-

bition. The organizers invited senior executives of Dongfeng Motor Fastener Co., Ltd., Zhejiang New Oriental Auto Parts Co., Ltd. and Beijing Taagoo Technology Co., Ltd. to present about the latest technology and practical applications for automobile fastener production to the audience, effectively connecting fastener manufacturers and downstream vehicle manufacturers.

Offshore Wind Power and Marine Equipment Industry Fastener Application Forum 2018

For the first time, Fastener Shanghai cooperated with International Ship & Offshore Media China and launched the "2018 Offshore Wind Power and Marine Equipment Industry Fastener Application Forum" on the third day of the exhibition. MAKE, a Wood Mackenzie Business, Shanghai Waigaoqiao Shipbuilding Co., Damen Shipbuilding Group and other mainstream domestic and foreign offshore wind power and marine equipment industry owners, builders, suppliers, design companies and service organizations gathered at the forum and discussed about fasteners in shipbuilding, offshore wind power and applications in the marine equipment industry and related trending topics.

In addition, many exhibitors also held technical seminars and new product launches on site, including brands such as: Dow, Candor, TOTOKU, NUC, EMAG Leipzig, EFD, MAASS, Inductotherm, and Hartco Aerotech.

As a "barometer" for the development of international wire, cable, tube and pipe industry, the biennial trade fair wire &Tube China has been held successfully for eight times, and has won a high reputation from industry insiders in China and abroad.

Mr. Axel Bartkus, the general manger of Messe Düsseldorf (Shanghai) Co., Ltd., expressed: "In the future, we will continue to adhere to the "global integration and business development" concept, and strive to create a one-stop platform to connect domestic and international trade, so that both suppliers and buyers can meet face-to-face, and bring more business results to the industry! Thank you for participating and we look forward to meeting you again in Shanghai two years later!"

Next exhibition date:
September 23-26, 2020
Next exhibition venue:
Shanghai New International Expo Center, China

For more details of the exhibition, please visit the official website of wire China: www.wirechina.net, Tube China: www.tubechina.net, Fastener Shanghai: www.fastener-tradeshow.net, or follow our Facebook to get the latest news of the industries and exhibitions.

Tube India 2018

The Leading Indian Trade Fairs wire India, Tube India and Metallurgy India will present a Power-Packed Technology Display in November 2018

In times of fundamental global, economic and political changes it is as important as ever to expand worldwide techical competencies in order to continue playing in the first league with international competitors.

The Indian trade fair trio wire India, Tube India and Metallurgy India will succeed in doing just that for the seventh time now from 27 to 29 November 2018. In cooperation with Messe Düsseldorf India, Messe Düsseldorf has held these three leading trade fairs in India for years now and with growing success.

To the tune of 400 exhibitors from 25 countries have registered so far. Alongside many Indian exhibitors and companies from neighbouring countries there are exhibitors from Germany, Italy, Austria, the USA and China. Around 12,000 international trade visitors are expected to attend.

At the Mumbai Convention and Exhibition Centre exhibitors from throughout the world will be showing the latest machinery and equipment, state-of-the-art technolgies and services from the fields of wire and cable making, tube production, tube processing and metallurgy.

At wire India 2018 machinery and equipment for wire production and finishing, forming, spring making, cable and strand making, tools and auxiliaries for process engineering, measuring and control technology as well as all types of wires, cables and sheet metal can be found. Such companies as Wafios AG, Sikora AG, Saarstahl AG, Conoptica A.S., Sampsistemi Srl, Mario Frigerio S.p.A., Maillefer Extrusion Oy, Mexichem Specialty Compounds Ltd, Rosendahl Nextrom GmbH and Buss AG, to name but a few, have already filed binding registrations.

Tube India 2018 covers the complete spectrum ranging from tube production and finishing through tube processing and raw materials to tubes and tube accessories, tube trade, tube production machinery, second-hand machinery, process engineering tools, auxiliaries as well as measuring, control and inspection technology. Linsinger Maschinenbau GmbH, Mair Research S.p.A., Officine M.T.M. S.p.A, Tata Steel Ltd and Inductotherm Pvt. Ltd are just some of the well-known enterprises exhibiting at Tube India 2018.

Messe Düsseldorf GmbH
Messeplatz
40474 Düsseldorf
Germany
Gunnar Holm Ahrens
Tel.: +49 211 4560-7725
AhrensG@messe-duesseldorf.de
www.tube-india.com

+++ For members only: **ITA** offers the possibility to release all your information and pictures on the **ITA** website and social media at **365 days** a year – up to **29,000 visitors** monthly. +++

Tube India 2018 - Conclave

Transformation of tube and pipe manufacturing adopting digital technologies

International Tube Association (ITA) (www.itatube.org) is the world's largest and most influential personal membership association for the tube & pipe industries and offers a unique range of benefits, services and events to promote new technology and growth within our industry. Individuals in more than 70 countries worldwide have already discovered the world of difference ITA membership can make to them personally and to their business. ITA in India is based in Chennai and is involved in training and education of its members on manufacturing and technology for Tubes and Pipes.

Digital Technologies cover the areas of IoT, Industry 4.0, Automation, Robotics, Artificial Intelligence and many other that has taken Manufacturing Industry by storm all over the world. Adoption of these technologies has helped manufacturers to improve their efficiencies, by a huge quantum, in areas of Quality, Cost, Delivery and Productivity, while supporting all Management systems and functions. Digital Technology is the way ahead in Manufacturing to be heads up on competition and Customer demands.

ITA, along with Messe Dusseldorf India (MDI) will be holding the one day Conference at Bombay Convention and Exhibition Centre, Goregaon East, Mumbai. The Conference will show case the scope and content, and the beneficial impact of Digital Technologies in Manufacturing, the ways to manage the change and, their impact. The programme will bring in experts, consultants, advisors, and general practitioners of Digital technologies, supplemented by actual case studies and practical experience of managing this change as applicable for Tube and Pipe Manufacturing.

The Conference will feature speakers from overseas and from within India, and from some of the top notch companies.

The Conference is being held alongside an Exhibition covering Tube and Pipe, Wire, Metallurgy and Welding and Cutting organised by MDI, a premier show on Metals and Metallurgy that could provide an additional impetus and exposure to all the delegates. The Exhibition will have participants from around the world, showcasing the state of art in the respective fields.

The conference is planned as a judicious mix of paper presentations with one panel discussion. It promises to be of great value to all those involved in tube and Pipe Industry. Why not be at the centre of this as a delegate, listening to, interacting and exchanging ideas with the top professionals from Tubes and Pipes Manufacturing, Value Chain partners and allied stake holders.

The programme starts at 9:30 am and will engage you for the full day. The Conference will be followed by a networking cocktail session at the same venue. The delegate fee is ` 2000 per participant, ` 5,500 for a group of three from Corporates and ` 9,000 for a group of Five from Corporates.

For Members of ITA there is no delegate fee. Please confirm your interest and participation by registering with:

International Tube Association India Chapter

5, Brindavan Street
Mylapore
CHENNAI 600 004

Tel.: +91-44-4500 0217

lakshmi@itatube.in

Valve World Expo 2018

Düsseldorf set to be a meeting point for international valve and fittings experts again in 2018

The world of valve manufacturers and users is meeting in Düsseldorf again from 27 to 29 November 2018. Occupying Halls 3, 4 and 5 of the Düsseldorf Exhibition Centre, this will be the fifth time in Düsseldorf that technical highlights and products will be showcased by international specialists in valves, valve-related products, actuators, compressors and engineering services as well as publishing companies and software houses.

The trade fair organisers are expecting to welcome about 650 exhibitors from 40 countries, filling an exhibition space of around 18,000 square metres. The last event in 2016 was attended by 12,420 trade visitors from 89 countries, underlining the high level of internationalism among both exhibitors and visitors and thus also the worldwide significance of the trade fair.

Industrial valves, fittings and valve engineering are key technologies that play crucial and indeed indispensable roles in all sectors of industry. The trade fair is therefore attracting visitors from a wide range of sectors: petrochemicals, oil and gas, the chemical industry, marine and offshore, food, water and wastewater management, automotive, mechanical engineering, pharmaceuticals, medical engineering and power engineering.

The accompanying VALVE WORLD Conference 2018 in Hall 4 will be an integral part of the event, with expert talks and workshops given by international speakers.

A special show entitled Pump Summit will be held in Hall 5, demonstrating both visually and in content that it is closely integrated with the conference and the trade fair.

The show will feature state-of-the-art pump technologies and the latest results from science and research. Acting as an interface between valve and fitting technologies, the Pump Summit will provide a valuable addition and create important synergies for visitors.

Further details can be found on the following website: www.valveworldexpo.de and also at www.pumpsummit.de.

Messe Düsseldorf GmbH

Stockumer Kirchstr. 61
40474 Düsseldorf
Germany

Jennifer Dübelt

Tel.: +49 211 4560-520
Fax: +49 211 4560-87520

DuebeltJe@messe-duesseldorf.de
www.messe-duesseldorf.com

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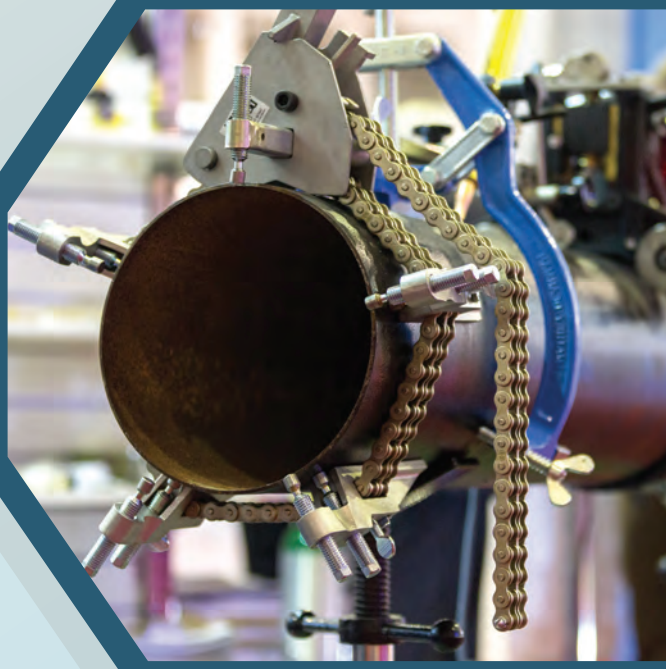
- Pipe Construction



The Middle East premier trade show for the metal working, metal manufacturing and steel fabrication Industry

The 15th Edition
STEEL FAB
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14-17 January 2019

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www.steelfabme.com

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ITA Conference 2019

ITA Conference: Trend-setting technologies and strategies for tubes & pipes

10 April 2019, Düsseldorf, Germany
1st Announcement / Call for Papers

- Market overviews of pipe and tube sectors
- Presentations by producers and equipment suppliers
- Latest technological developments
- Table top exhibits
- Excellent networking opportunities incl. evening networking event
- Reduced fees for early bookers, ITA members and students
- Optional plant tours
- Special room rates at nearby hotels (subject to availability)

Market, product and technology presentation opportunities

- Market overviews
- Trendsetting technologies and strategies in
  - production / material properties
  - quality assurance
  - value adding processes
  - supply chain optimisation and extended services
  - special requirements and solutions for specific market areas i.e. automotive, aerospace, energy

Interested speakers are invited to submit an abstract (max. 300 words) summarizing the main ideas of their papers, together with the presenter's CV (max. 200 words). Abstracts should not focus on company presentation but on markets, technical/managerial classifications, R&D, new technologies or recent case studies. Joint presentations of producers and technology suppliers are welcome.

All confirmed speakers attend free of charge. Each speaker gets a presentation time of 20 minutes plus Q+A. The presented papers will be published in the conference proceedings and distributed to the conference attendees. All abstracts and papers will also be available free of charge for ITA members for six months following the conference.

Conference language: English

Abstract submission
All required data should be submitted via the form available for download at our dedicated conference website https://conference.itatube.org

Deadlines
Deadline for abstract submission: 30 November 2018

Notification of abstract acceptance: 21 December 2018

Final conference paper due: 28 February 2019

Tabletop exhibition

The ITA conference brings together decision makers and specialists from all over the world. It is an excellent opportunity for presenting and promoting your products and services to the tube and pipe industry and securing further potential customers.

Our tabletop exhibition will complement the conference sessions and provide an opportunity for one-to-one discussions with suppliers and producers during breaks and lunch. As all conference participants will have their coffee and lunch breaks directly within the exhibition area, this guarantees highly engaged and influential potential customers right "on your doorstep".Since exhibition space is limited it is advisable to book early (first come, first served).

Included:

- Table incl. two chairs within the exhibition area with display option for own individual information panels/ roll-up stands
- One conference registration free of charge
- Logo + link + profile on conference website

For bookings please visit our conference website: https://conference.itatube.org for the downloadable Exhibitor form.

Registration procedure

To register please visit https://conference.itatube.org where you will find the delegate form to download.

Registration prices range from € 50 (Student) to € 225 (non-ITA Member), and there is an early-bird discount available on all prices until 31 December 2018. Please see the form for details.

Delegates are provided with:

- Documentation
- Refreshment breaks and lunch
- Delegate list (supplied after the conference)
- Attendance at all conference sessions
- Networking event
- Reduced fees for ITA members and students

Hotel accommodation

The ITA has negotiated special hotel room rates for speakers and delegates participating in the ITA conference 2019. These are subject to availability at time of booking.

For information and bookings please visit: https://conference.itatube.org

Sponsorship packages

A key element of the ITA conference 2019 is the support of sponsors, for which the ITA is very grateful. This also represents an opportunity for your company to increase awareness of its products and services. We provide a range of different sponsorship packages, and each sponsor will be included, from the date of booking, in future marketing measures for the ITA conference 2019.

Your benefits as sponsor of the ITA conference 2019:

- Become part of future marketing activities with your company logo displayed in prominent position (brochures, advertisements, website, banners, etc) from the date of registration
- Preferred location for tabletop in case of joint booking of this additional marketing option
- Special discount of 10 % on registration of additional delegates from same company

As sponsorship packages are limited early booking is recommended (first come, first served).

To book please go to:

https://conference.itatube.org where you will find a registration form available for download.

Item	Availability	€ / item
podiums logo	5	1,000.-
program	5	500.-
coffee break	2	1,000.-
lunch	1	2,000.-
badges	1	250.-
evening event	5	1,500.-
Wall of Fame	unlimited	250.-

International Tube Association e.V.

Jennifer Kranz
Heinz-Ingenstau-Strasse 9
40474 Düsseldorf
Germany

Tel.: +49 211 947-5650
Fax.: +49 211 947-3938

jennifer.kranz@itatube.org
www.itatube.org
www.conference.itatube.org

NEFTEGAZ 2019

Leading industry platform for the Russian oil and gas industries in Moscow: exhibitor registrations for NEFTEGAZ 2019 coming in thick and fast

Technological innovations for extracting and processing oil and gas deposits, products for oil and gas transport and storage, machinery and equipment for the petrochemical industry, measuring technology, control equipment, safety systems, environmental monitoring and health and safety – NEFTEGAZ showcases the complete spectrum of the Russian oil and gas industries from 15 to 18 April 2019 in Moscow.

Organisers expect to the tune of 600 exhibitors from all over the world to present their technology highlights and innovations to an international expert audience on approx. 32,000 m^2 of exhibition space.

In a central location in Hall 2.1 on the EXPOCENTRE fair grounds there will also be a joint pavilion of German companies to boost export business alongside international enterprises and a joint pavilion showcasing Chinese firms. As of now international companies from the oil and gas industry can register to take part in this the leading trade fair for the industry.

Looking to the coming event with optimism Peter Schmitz, Director of NEFTEGAZ 2019 at Messe Düsseldorf GmbH, said: "Looking back at an extraordinarily successful event in 2018, NEFTEGAZ has undeniably become the most important and leading sectoral event for the Russian oil and gas industries. Therefore participation in NEFTEGAZ 2019 is a must for all companies seeking to benefit from the extremely positive developments in the Russian crude oil and gas market."

Since 1978 NEFTEGAZ has become established as the leading industry platform for the oil and gas industries on the Russian market. 99% of the exhibitors from 27 countries taking part in NEFTEGAZ 2018 rated their

trade fair participation as utterly satisfactory. 97% of exhibitors achieved their objectives; 96% were also satisfied with their sales figures.

Held in parallel with the trade fair, the National Oil & Gas Forum in exhibition hall 8.3. provides a comprehensive overview of the latest technologies and scientific findings. Trade visitors get an opportunity to enter into dialogue with prominent representatives from industry and politics. The National Oil & Gas Forum is organised by the Russian Energy Ministry which supports NEFTEGAZ with its patronage as the only trade fair in this industry. This means the National Oil & Gas Forum creates important synergies for the trade visitors of NEFTEGAZ.

NEFTEGAZ 2019 is organised and held by Messe Düsseldorf, OOO Messe Düsseldorf Moskau and their local partner ZAO EXPOCENTR. In this context Messe Düsseldorf leverages its longstanding expertise acquired by organising the sector-related, world No. 1 trade fairs Tube und Valve World. Also involved are VDMA (German Engineering Federation) as well as the Ministry of Industry of Trade of the Russian Federation.

For more information go to: http://www.neftegaz-online.com

Messe Düsseldorf GmbH

Stockumer Kirchstr. 61
40474 Düsseldorf
Germany

Petra Hartmann-Bresgen, M.A.

Tel.: +49 (0)211 4560-541
Fax: +49 (0)211 4560-87 541

HartmannP@messe-duesseldorf.de
www.messe-duesseldorf.com

NEFTEGAZ 2019

NEFTEGAZ 2019 – the leading industry platform for the Russian oil and gas industries

An interview with Werner Matthias Dornscheidt, Chairman of the Board of Directors of Messe Düsseldorf GmbH

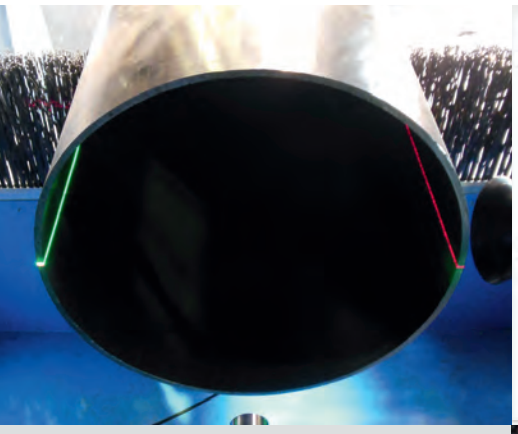
Question: Mr Dornscheidt, a few weeks ago was the beginning of the registration period for NEFTEGAZ 2019. What's your impression of the response from the international oil and gas industries?

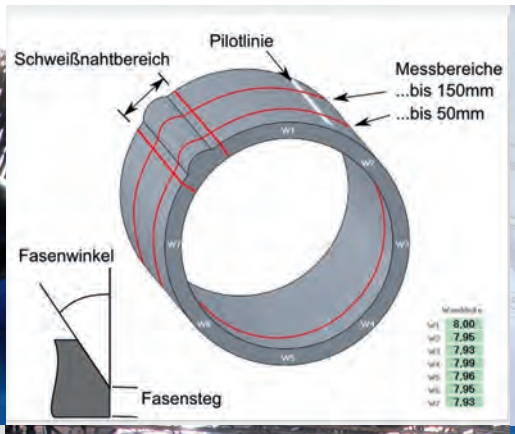
Answer: I trust that we will actually do even better with our exhibitors' and visitors' numbers than we did at the previous event in 2018. The demand for exhibition space continues to be stable despite difficult economic conditions. We can already see that the exhibition will occupy around 32,000 sqm again. This makes us the leading oil and gas trade fair in Russia.

Over the four days of NEFTEGAZ 2018 around 600 well-known exhibitors from 27 nations presented their technical innovations in the extraction of oil and gas. Companies that took part at previous events included major players from Russia such as Gazprom, Tatneft and Transneft, from China (Kerui), Germany (Kanex Krohne) and the United States (Honeywell), to name but a few. The exhibitors were extremely pleased with the event, and some immediately said that they would like to take part in NEFTEGAZ 2019 again. Germany, too, will have its own pavilion again.

What's the difference between NEFTEGAZ and other Russian industry events? What makes it so attractive for international exhibitors and visitors?

Werner Matthias Dornscheidt, Chairman of the Board of Directors of Messe Düsseldorf GmbH





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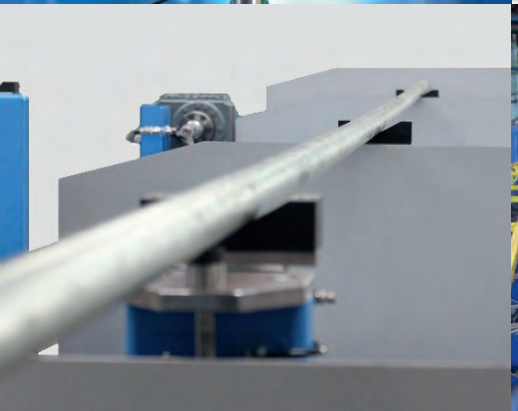

MSG Maschinenbau GmbH
Hünegräben 17a
57392 Schmallenberg
Phone: 02972 - 9 77 40 0
Fax: 02972 - 9 77 40 19
E-Mail: kontakt@msg-maschinenbau.de
Website: www.msg-maschinenbau.de

NEFTEGAZ has been the leading industry platform for the Russian oil and gas sector for over 30 years. It was first held in 1978. This 19th event will again cover the entire bandwidth of the oil and gas industries, including numerous subsectors. These range from drilling equipment through oil and gas extraction, offshore technology, transport and petrochemical, plants and machinery to monitoring facilities, environmental protection and fire protection – a unique spectrum in its diversity.

We are particularly pleased that there is no other trade fair in the industry with so much support from the Ministry of Energy and the Ministry of Trade and Industry of the Russian Federation. The patronage of the Ministry of Energy was also the reason why we changed the dates for NEFTEGAZ: It is now held in April each year, so that it always takes place at the same time as the National Oil & Gas Forum. Another important benefit is that the weather in April is always pleasant, with moderate temperatures, and that there is a sufficient gap between the trade fair and the Offshore Technology Conference (OTC) in Houston.

The event has been characterised by famous national and international exhibitors from the very beginning. By presenting innovative technologies and products at the exhibition stands, the exhibitors attract precisely the target groups that are relevant to them: experts and visitors who are highly skilled professionals. There are other trade fairs in the industry that cover similar sectors or have similar titles, such as “Neft i gaz”. But there is only one NEFTEGAZ, and it has some unique selling points among its global competitors.

NEFTEGAZ 2019 will focus on a comprehensive presentation of the exhibitors, together with innovative engineering. Will there be anything else in the programme to provide trade visitors with news from the industry?

NEFTEGAZ 2019 will feature several Russian companies and industry associations showing the developments and prospects of the oil and gas industries. This will be true for the trade fair stands and also the wide-ranging programme of presentations. Last time the National Oil & Gas Forum attracted over 1,000 delegates, 100 speakers and 130 media representatives to the premises of the Expocentre. A range of prominent representatives from both oil and gas invited visitors to listen in on conversations between experts. The presentations ideally supplement the trade fair, offering some clear added value to visitors.

Who organises NEFTEGAZ, and what does the trade fair specifically offer to German and international companies in the industry?

The trade fair is organised by Messe Düsseldorf, OOO Messe Düsseldorf Moscow, and its local partner, AO EXPOCENTR. Messe Düsseldorf is drawing on its many years of expertise in holding the two leading global trade fairs Tube and Valve World, which also involve two related industries. It supports international companies seeking to gain a profitable foothold in the Russian market.

NEFTEGAZ 2019 will again have a German pavilion, supported by the German Machinery & Plant Manufacturers’ Association (VDMA),

Europe's biggest industry association. German companies will profit from the programme, as they can look forward to an attractive trade fair with numerous benefits. They can be assured of a highly visible position in Hall 2.1, a reduced fee for both their stand space and a shell stand and all-round on-site support by Messe Düsseldorf as well as support with the planning. As a result, they will be able to give ideal presentations of their companies, achieving the best possible effect.

China, too, will have its own pavilion, supported by our Chinese partners and represented by Messe Düsseldorf China.

The success of NEFTEGAZ is based on an ongoing dialogue with our partners. Thanks to these partnerships, the trade fair has been among the world's top ten for many decades now. As before, we will be working with our exhibitors to provide even greater stimuli for the industry in 2019.

Messe Düsseldorf GmbH

Stockumer Kirchstr. 61
40474 Düsseldorf
Germany

Sabine Dahmani / Ute Wynhoff
Tel.: +49-211-4560-7736, -7779

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Tube & Steel 2019

The Largest Gathering of Tube, Profile, Wire and Steel Industries in Eurasia

The TUBE&STEEL ISTANBUL Fair for which the Tube, Steel and Wire industries have collaborated to organize will be held between April 17-20, 2019 at Tüyap Fair Convention and Congress Center, Istanbul by Tüyap Fairs and Fair Services Inc. in cooperation with the Turkish Steel Pipe Manufacturers Association (ÇEBID), Steel Federation, Steel Foreign Trade Association, SteelOrbis, Turkish Steel - Steel Exporters' Association, Turkish Structural Steel Association (TUCSA) and Flat Steel Import, Export and Industry Association (YISAD).

The Most Influential Fair of the Region

It is projected that the Tube&Steel Istanbul Fair, aimed to become the focal point of the industry in our country, will be realized with the participation of more than 500 companies and their representatives in a 100,000 m2 indoor area composed of 11 Halls. The Fair, bringing key associations and institutions of the Industry under the same roof, provides the opportunity to establish new collaborations for participants who desire to make exports and display their innovations to nearly 100 countries from 5 of the world's continents. Steel-Tube-Profile-Wire, Flat Steel, Structural Steel, Steel Service Centers, Steel Processing Technology, Tube-Profile-Wire Processing Technology, Steel Tube-Profile Coating, TubeProfile and Fittings, Pipelines, Tube-Profile-Wire-Steel Manufacturing Machinery, TubeProfile-Wire Measuring and Control Technology, Fasteners, Steel Pump-Valve, Subsidiary Industries and Procurement & Distribution will be on display at the Tube&Steel Istanbul Fair.

Don't Miss the Greatest Meeting of the Industry

The fair is expected to attract a minimum of 500 companies and their representatives and will be the most inclusive address of all developments and innovations in the industry in Turkey and Eurasia. The Tube&Steel Istanbul Fair is expected to welcome more than 25,000 visitors from approximately 100 countries to leverage the industry by bringing authorized purchasing agents together with world leader manufacturers for decision making. For detailed information, please visit our website:
www.tubeandsteelistanbulfair.com

Tüyap Fair and Congress Center

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Tube Russia 2019 – ITA Seminar

ITA Seminar: Trend-setting technologies and strategies for tubes and pipes

Latest market reports say the future of the global industrial pipe market looks promising, with new and increasing opportunities in power generation, the petrochemical and automotive industries, and industrial processing. Analysts at a recent industry conference predicted that demand for steel tubular products for the energy sector in the US will probably remain steady beyond 2018.

However, the market situation is volatile, and with oil and gas the largest market segment for the industry, the threat of spiraling oil prices due to Iranian sanctions in November and less spare capacity from Opec producers means that upstream producers are also unsure what to expect.

Now, the major growth drivers for this market may be more complex drilling techniques (new technology) and the rise of alternative materials.

With this in mind, the ITA team at Tube Russia 2019 (14-17 May 2019) is holding a Tube & Pipe Industry Development Seminar on the subject of trend-setting technologies and strategies to take the industry forward. We would like to invite members and colleagues to give a presentation at the event and are now open for abstract submissions.

This call is free of charge for exhibitors at Tube Russia. Companies/individuals not exhibiting in Moscow can participate for a fee. Please contact us for an individual offer.

The theme of the Tube & Pipe Development Seminar 2019 is: **Trend-setting Technologies And Strategies For Tubes & Pipes**

Interested speakers are invited to submit an abstract (max. 300 words) describing the main ideas of their papers together with the presenter's résumé/CV (max. 200 words). Abstracts should focus on technical/economic classifications, new technologies, modernization, R&D or recent case studies rather than company presentations. Joint presentations between pipeline operators and technology providers are welcome. All proposals received will be considered by our Technical Committee.

Each speaker gets a presentation time of 20 minutes plus Q&A. The presented papers will be published in the conference proceedings and distributed to the conference attendees. All abstracts and papers will also be available free of charge for ITA members six months after the conference.

Abstract submission

For abstract submission please visit our website at www.itatube.org.

Deadlines

Deadline for abstract submission: 14 January 2019

Notification of abstract acceptance: 15 February 2019

Final conference paper due: 26 April 2019

International Tube Association e.V.

Jennifer Kranz
Heinz-Ingenstau-Strasse 9
40474 Düsseldorf
Germany

Tel.: +49 211 947-5650
Mobile: +49 1590 4459871
Fax.: +49 211 947-3938

jennifer.kranz@itatube.org
www.itatube.org

Tube Souteast Asia 2019

Rapid urbanisation, increased infrastructure spending heightens demand in the tube and pipe industries

Riding the wave of opportunity, Tube Southeast Asia 2019 returns to the Bangkok Trade & Exhibition Centre (BITEC), Thailand from 18 – 20 September

Cities all over Southeast Asia are on a growth trajectory, as industry projections indicate about 100 million people in ASEAN are expected to migrate from the countryside to cities from now through to 2030. From an economic standpoint – urbanisation which generally brings about improved productivity, better incomes, education, healthcare and transport, also comes with its own set of challenges. Hence the need for 'smart cities', where information and communications technologies are integrated to improve operations across traffic flows, public transportation, energy and water usage and even healthcare services. In the case of Thailand, the country plans to transform its economy into a digitally powered ecosystem – creating no less than 100 "smart cities" over the next two decades.

The set-up of the ASEAN Smart City Network (ASCN) to support urbanisation will serve as a common platform for each of the region's countries to share best practices, link member cities with private investment and secure funding. The effect of ASCN was seen in March this year, where the Australian government pledged A$30 million (S$30.3 million) into ASEAN smart cities. While in June last year, the World Bank and the Swiss government established the US$13.4 million (S$18 million) Indonesia Sustainable Urbanisation Multi-Donor Trust Fund to ensure the country's urbanisation process is economically, socially and environmentally sustainable.

In tandem, Southeast Asian nations are expected to spend US$323 billion on infrastructure developments, from clear water, clean air, energy, roads, ports, railways, to education and healthcare – promising business prospects for the region's construction companies. In Thailand, its government has pledged 1.5 trillion baht (S$62 billion) over the next five years to boost growth and develop its three eastern provinces as the Eastern Economic Corridor, with infrastructure spending to remain a key driver for the economy and new development projects.

These market opportunities led by rapid urbanisation coupled with Southeast Asia's booming infrastructure developments will undoubtedly trigger higher demand for tubes and pipes thanks to its versatility and rising application across a myriad of industries, from upstream, to midstream and downstream. Likewise, its use in end-use industries from automotive, household appliances to consumer electronics will further bolster demand.

The strategic and timely staging of Tube Southeast Asia 2019, will thus pave the way for companies involved in the tube, pipe and

Messe Düsseldorf Asia Pte Ltd

3 HarbourFront Place #09-02
HarbourFront Tower Two
Singapore 099254

Tel.: (65) 6332 9620
Fax: 865) 63374633

tube@mda.com.sg
mda.messe-duesseldorf.com

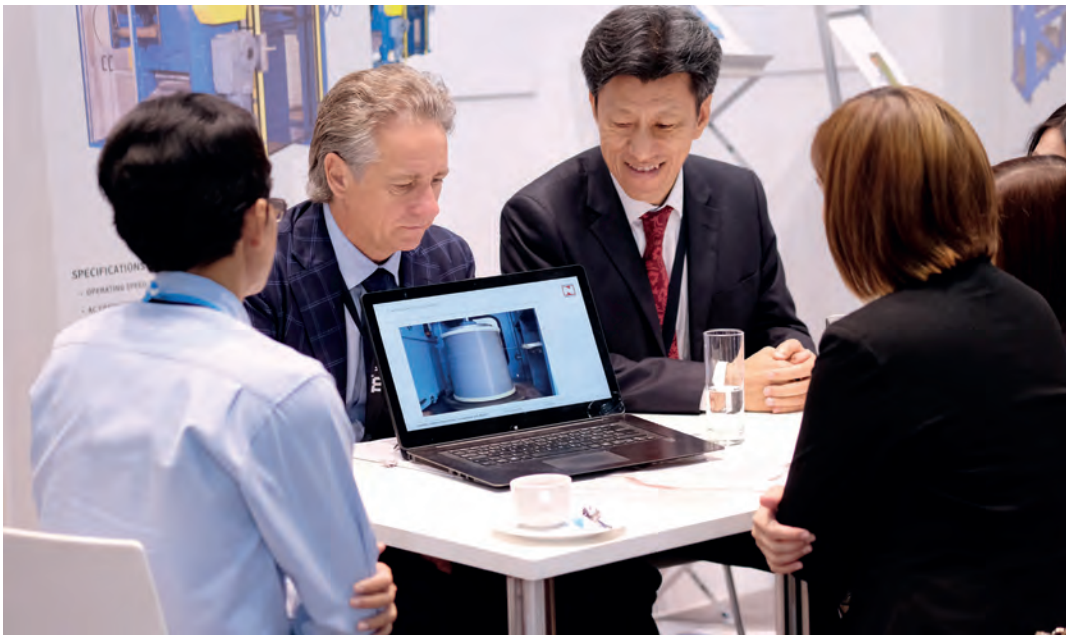
related sectors to make their entry into the Southeast Asian markets, specifically Thailand, and take advantage of these in-market trade opportunities when they exhibit.

About Tube Southeast Asia 2019

Reflecting the established credentials of the world's leading trade fair, Tube Düsseldorf – the International Tube Fair, Tube Southeast Asia 2019 will feature a wide-ranging exhibit profile of machinery and technology highlights in tube and pipe manufacturing, processing and finishing, pumps and valves, new processes in measuring, control and test engineering as well as new and upgraded tools and auxiliary materials. The specialist trade fair with a visitor profile that includes manufacturers, suppliers and buyers from the tube, automotive, oil & gas, building and construction, energy and electrical industries, will also be augmented by a series of industry-focused conferences and seminars.

Held together with wire Southeast Asia 2019, the synergistic fairs will be grounds to a conglomeration of global expertise spanning the wire, cable, tube and pipe sectors by over 400 leading exhibitors from around the world. Some 9,000 trade visitors are expected to visit – reaffirming wire and Tube Southeast Asia's draw as the focal platform to insights of the industries' latest developments and an arena for face-to-face meetings in forging business linkages and partnerships.

Booth bookings are now open. To book, visit www.wire-southeastasia.com | www.tube-southeastasia.com



Tube Southeast Asia – ITA Seminar

ITA Seminar: Trend-setting technologies and strategies for tubes and pipes

Bound to a turgid oil market, the demand for pipes has been comparatively low over the past few years, but recently, threatened sanctions by the US against Iranian and Venezuelan oil and gas exports and fear of shortages sent oil prices spiraling to a four-year high.

Demand in the tubes & pipes sector is growing, but trade tensions mean the markets are volatile. At the same time, growth and innovation in the major pipe-consuming sectors has led producers to seek consolidation and diversification. While pipe prices continue to climb, more demanding high-tech products are the strategic targets, rather than commodity-grade tubes.

With this in mind, the ITA team at Tube Southeast Asia 2019 (18 - 20 September 2019) is holding a Tube & Pipe Industry Development Seminar on the subject of trend-setting technologies and strategies to take the industry forward. We would like to invite members and colleagues to give a presentation at the event and are now open for abstract submissions.

This call is free of charge for exhibitors at Tube Southeast Asia. Companies/ individuals not exhibiting in Bangkok can participate for a fee. Please contact us for an individual offer.

The theme of the Tube & Pipe Development Seminar 2019 is: **Trend-setting Technologies And Strategies For Tubes & Pipes**

Interested speakers are invited to submit an abstract (max. 300 words) describing the main ideas of their papers together with the presenter's résumé/CV (max. 200 words). Abstracts should focus on technical/economic classifications, new technologies, modernization, R&D or recent case studies rather than company presentations. Joint presentations between pipeline operators and technology providers are welcome. All proposals received will be considered by our Technical Committee.

Each speaker gets a presentation time of 20 minutes plus Q&A. The presented papers will be published in the conference proceedings and distributed to the conference attendees. All abstracts and papers will also be available free of charge for ITA members six months after the conference.

Abstract submission

For abstract submission please visit our website at www.itatube.org or use Appendix 1 here enclosed.

Deadlines

Deadline for abstract submission: 22 March 2019

Notification of abstract acceptance: 12 April 2019

Final conference paper due: 30 August 2019

International Tube Association e.V.

Jennifer Kranz
Heinz-Ingenstau-Strasse 9
40474 Düsseldorf
Germany

Tel.: +49 211 947-5650
Mobile: +49 1590 4459871
Fax.: +49 211 947-3938

jennifer.kranz@itatube.org
www.itatube.org

Events for Business, Technology, Education and Networking

Diary of world class tube events

November 2018

6 – 8 November 2018	EXHIBITION: **Fabtech** Atlanta, USA	www.fabtechexpo.com	
27 – 29 November 2018	EXHIBITION: **VALVE WORLD EXPO** Düsseldorf, Germany	Messe Düsseldorf GmbH Fax: +49 211/4560-87 568 nawracalag@messe-duesseldorf.de www.valveworldexpo.de	
27 – 29 November 2018	EXHIBITION: **Tube India** Mumbai, India	Messe Düsseldorf GmbH Fax: +49 211 4560 8540 AhrensG@messe-duesseldorf.de www.tube-india.com	
28 November 2018	CONFERENCE: **ITA CONCLAVE at Tube India** Topic: Transformation of Tube and Pipe Manufacturing Adopting Digital Technology	ITA – India Chapter 5, Brindavan Street, Mylapore CHENNAI 600 004 Tel.: +91-44-4500 0217 lakshmi@itatube.in	

January 2019

14 – 17 January 2019	EXHIBITION: **SteelFab** Sharjah, UAE	Expo Centre Sharjah Fax : +971-6-5770111 steel@expo-centre.ae www.steelfabme.com	

March 2019

28. Feburary – 2 May 2019	EXHIBITION: **Boru** Istanbul, Turkey	https://boru-tel-rulo-fuari.com/homepage/	

April 2019

10 April 2019	CONFERENCE: **ITA Conference 2019** Düsseldorf, Germany	Jennifer Kranz Fax.: +49 211 947-3938 jennifer.kranz@itatube.org www.conference.itatube.org	
15 – 18 April 2019	EXHIBITION: **NEFTEGAZ** Moscow, Russia	EXPOCENTRE in Moscow https://www.neftegaz-online.com	
17 – 20 April 2019	EXHIBITION: **Tube & Steel** Istanbul, Turkey	Tüyap Istanbul Fair and Congress Center http://tubeandsteelistanbulfair.com/en/	

Events for Business, Technology, Education and Networking

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May 2019

14 – 17 May 2019	EXHIBITION: **Tube Russia** Moscow, Russia	EXPOCENTRE in Moscow Fax: +49 211 4560 8540 AhrensG@messe-duesseldorf.de www.tube-russia.com	
14 – 17 May 2019	SEMINAR: **Tube Russia – Tube & Pipe Industry Development Seminar 2019** Moscow, Russia	Organised by International Tube Association e.V. www.itatube.org	

June 2019

25 – 29 June 2019	EXHIBITION: **METEC** Düsseldorf, Germany	Messe Düsseldorf GmbH Fax: +49 211 4560 8540 MuellersM@messe-duesseldorf.de www.metec-tradefair.com	

September 2019

18 – 20 September 2019	EXHIBITION: **Tube Southeast Asia** Bangkok, Thailand	Messe Duesseldorf Asia Pte. Ltd. beattrice@mda.com.sg www.tube-southeastasia.com	
19 September 2019	SEMINAR: **Tube Southeast Asia – Tube & Pipe Industry Development Seminar 2019** Bangkok, Thailand	Organised by International Tube Association e.V. www.itatube.org	

October 2019

1 – 3 October 2019	EXHIBITION: **Tubotech** Sao Paulo, Brasil	www.tubotech-online.com	

March 2020

30 March – 3 April 2019	EXHIBITION: **Tube Düsseldorf** Düsseldorf, Germany	Messe Düsseldorf GmbH Fax: +49 211 4560 8540 AhrensG@messe-duesseldorf.de www.tube-tradefair.com	
3 April 2020	STUDENTS DAY: **Tube Düsseldorf** Düsseldorf, Germany	Organised by: International Tube Association	

New members

The ITA is pleased to welcome the following new members who truly reflect the global status of our Association.

Dr. Kittichai Sojiphan	King Mongkut's University of Technology North Bangkok	Thailand
Asst. Prof. Dr. Panayit Sethakul	King Mongkut's University of Technology North Bangkok	Thailand
Assoc. Prof. Siyiporn Daopiset	King Mongkut's University of Technology North Bangkok	Thailand
Asst. Prof. Dr. Wattana Kaewmanee	King Mongkut's University of Technology North Bangkok	Thailand
Assoc. Prof. Dr. Somrerk Chandra-Ambhorn	King Mongkut's University of Technology North Bangkok	Thailand
Asko Ratanen	Aaltube Oy	Finland
Ajit Verma	Rajkot Seamless Tube Pvt. Ltd.	India
Suresh Kedia	Maharashtra Seamless LTD	India
Dongliang Yao	Jiangsu Suao Metal Product Co., Ltd.	China
Mirza Samar Abbas	Jiangsu Suao Metal Product Co., Ltd.	China
Riyaz Chinoy	Jiangsu Suao Metal Product Co., Ltd.	China
Khawar Bari	Jiangsu Suao Metal Product Co., Ltd.	China
Mohsin Safdar	Jiangsu Suao Metal Product Co., Ltd.	China
Nadeem Shafi	Ayesha Pipe Industry	Pakistan

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- Global network of tube & pipe engineers
- Publisher of ITAtube Journal with information on latest market development
- Host of regular conferences on tube & pipe industry
- Official industry partner of the Messe Düsseldorf Group for all its "Tube" shows worldwide

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40474 Düsseldorf
Germany
Tel.: +49 211 947-5650
Fax: +49 211 947-3938

info@itatube.org
www.itatube.org

Dietger Schroers
(Executive Secretary)
dietger.schroers@itatube.org

Jennifer Kranz
(General Manager)
jennifer.kranz@itatube.org

artworkshop.de
(Graphics and Print Design)

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- Review Tube India 2018
- Review Valve World Expo 2018
- Preview ITA Conference 2019
- Preview Tube Russia
- Preview Tube Southeast Asia

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