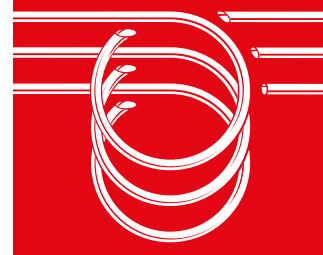




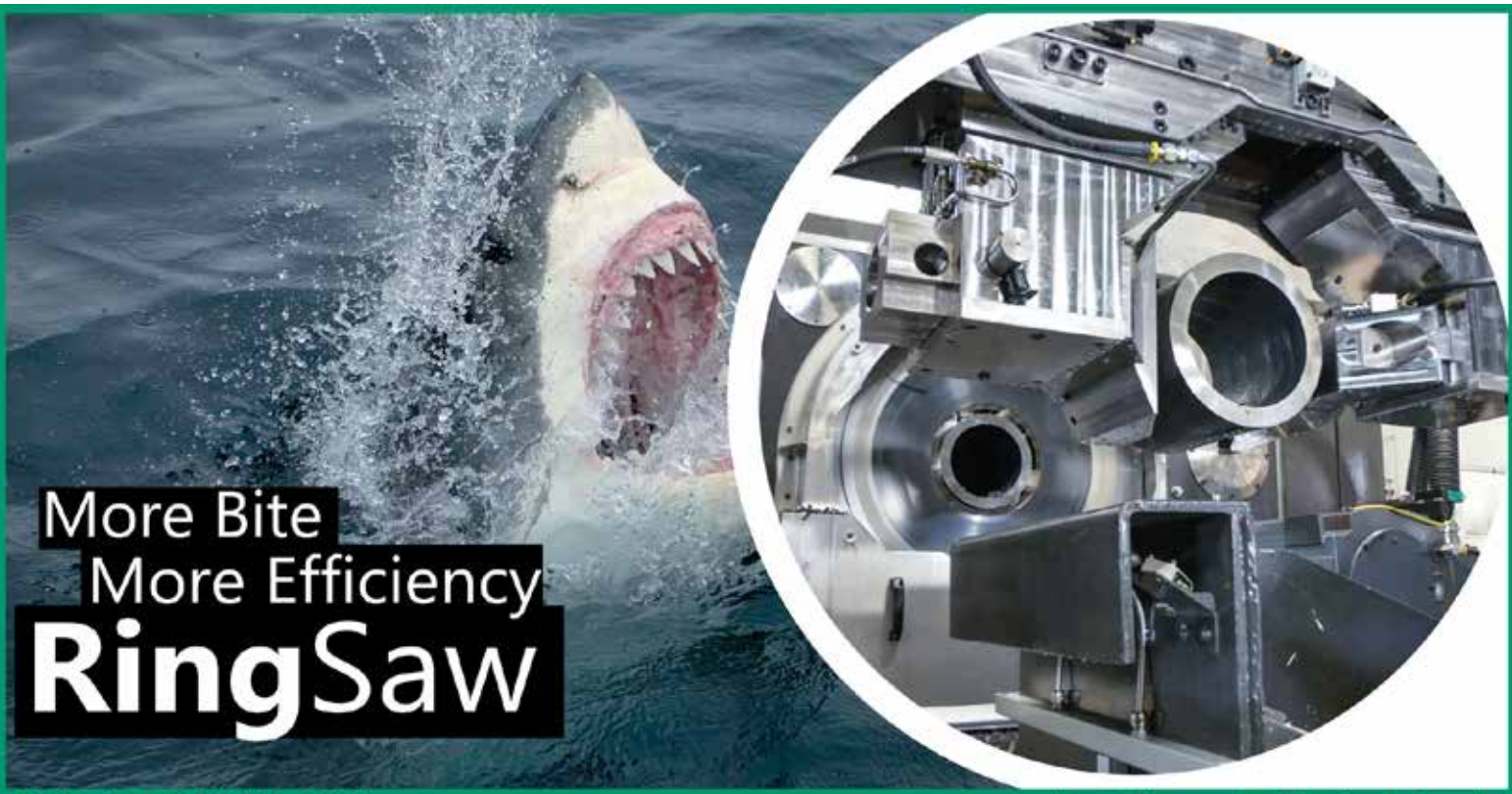
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*Dr. Gunther Voswinckel
President ITA*

Dear colleagues from the Tube and Pipe industry, dear readers of the ITAtube Journal.

The corona Pandemic with its 4th wave is still influencing our living. The industry had an impressive restart in 2021 and our pipe and tube industry did also partially participate from this positive development. Anyhow raw material and energy prices as well as deficits in the supply chains were real challenges to our industry.

The Russian Invasion into the Ukraine may be a role changer for the economic system. So far, the world economic system and structures were based on relatively free trade and the idea that economic networks prevent from warlike activities. This world-view is being put to the test with unforeseen consequences for global free trade.

However, the reconsideration of the world oil and gas supplies, in this scheme, will not only provide new challenges to our industry but also possible chances for future business.

Despite travelling limitations caused by the corona pandemic, the International Tube Association ITA contributed successfully to keep the exchange in our industry ongoing. The ITA, organizing several webinars in 2020 and 2021 for our tube and pipe industry and for the first time we organized the ITA net Forum which was established to substitute the finally cancelled tube show Tube 2020 in Düsseldorf. On top, with our tube market reviews we also participated in some webinars organized by other reputed organisations.

During the corona pandemic, last October we published a special edition of our ITAtube Journal.

Our business activities are still influenced by the corona pandemic. Our largest industrial event, the Tube Düsseldorf 2022 show, which was originally scheduled to take place early May 2022 had to be postponed by a couple of weeks. This postponement shall ensure that present travelling restrictions will be overcome to allow our industry to meet under safe circumstances.

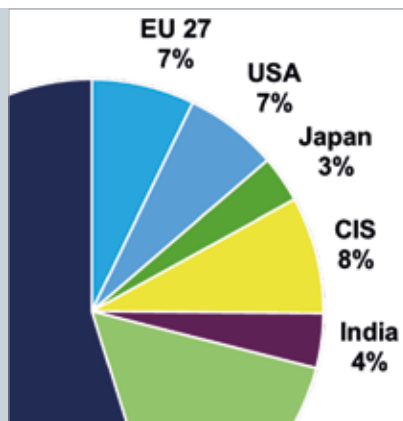
This pre-Tube 2022 edition of our ITAtube Journal provides a great opportunity to prepare exhibitors and visitors for this prestigious event in Düsseldorf. In this edition you will find some articles about possible measures how to achieve sustainable success for our tube and pipe industry.

The next ITAtube Journal will be published alongside the Tube 2022 Düsseldorf trade show from 20th to 24th of June 2022.

Yours faithfully

Dr. Gunther Voswinckel

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World Steel Tube Production – Review

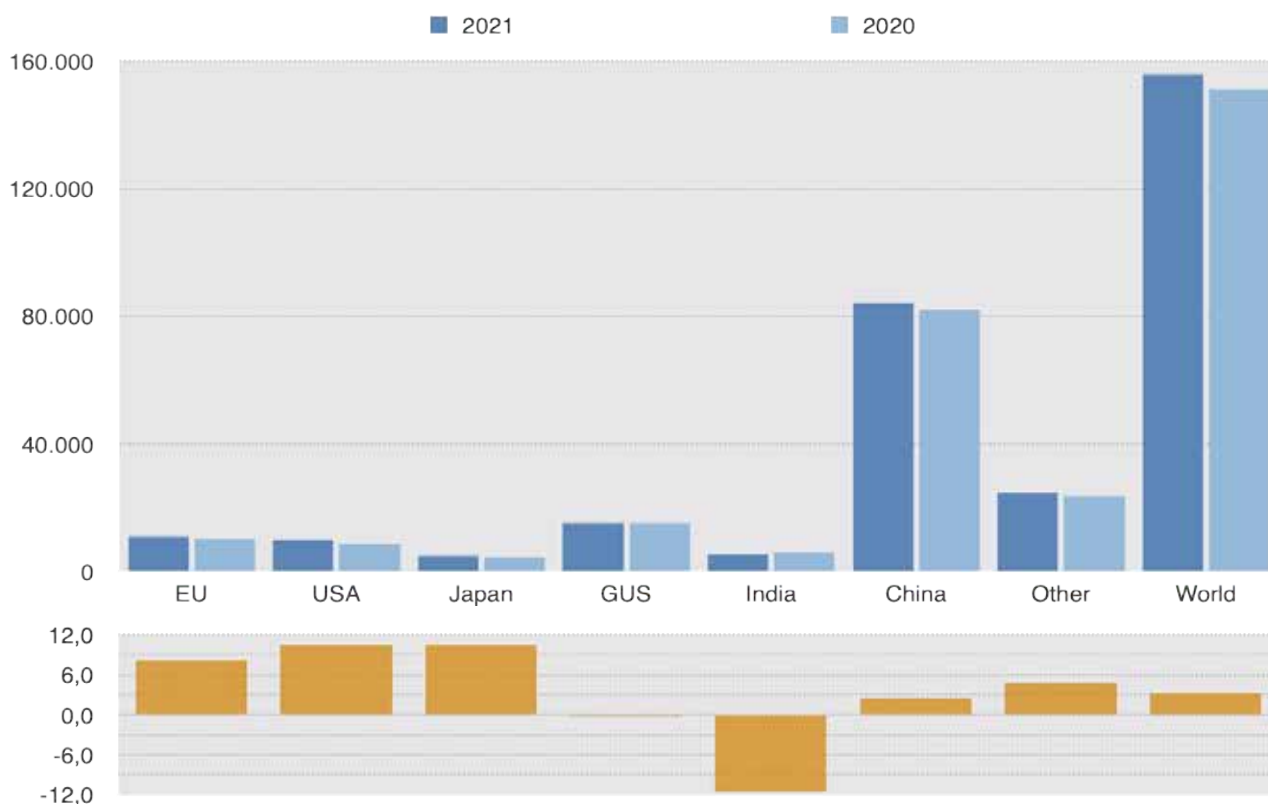
In 2021, 155.7 million tonnes of steel pipes were produced. Compared to the previous year 2020, this represents an increase of 3.1%.

The production of seamless tubes increased by 2.6 % to 43.4 Mio tons; the increase in the USA was particularly significant at 22.2%.

Europe, with a plus of 8.5%, displayed a positive result in the seamless tubes market, and a plus of 8.0% in total productions.

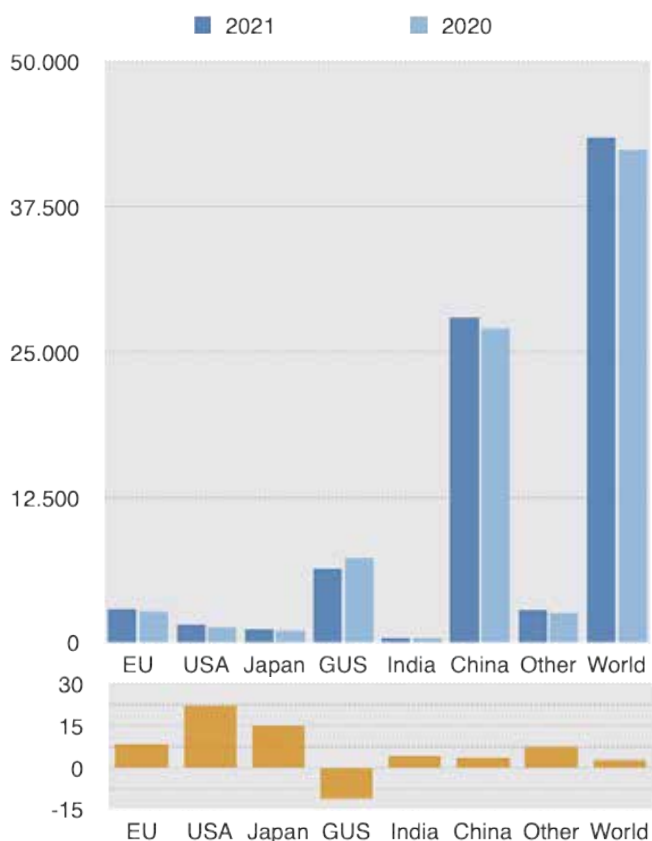
Chinese steel tube producers produced 84 million metric tons, a plus of 2.4%, the production in the USA rise to 10.5% to 10 Mio tons.

Total in Tto.

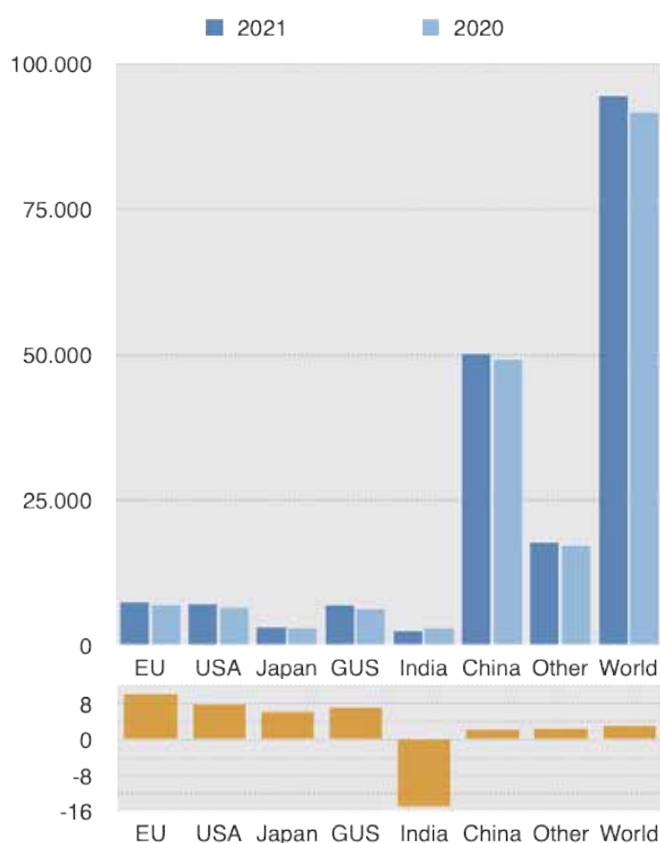


Region/ country	seamless tubes			welded tubes <406			welded tubes >406			welded tubes			TOTAL		
	2021	2020	in %	2021	2020	in %	2021	2020	in %	2021	2020	in %	2021	2020	in %
EU	2.930	2.700	8,5	7.500	6.800	10,3	610	720	-15,3	8.110	7.520	7,8	11.040	10.220	8,0
USA	1.650	1.350	22,2	7.000	6.500	7,7	1.350	1.200	12,5	8.350	7.700	8,4	10.000	9.050	10,5
Japan	1.150	1.000	15,0	3.100	2.920	6,2	750	610	23,0	3.850	3.530	9,1	5.000	4.530	10,4
CIS	6.449	7.253	-11,1	6.800	6.350	7,1	2.000	1.690	18,3	8.800	8.040	9,5	15.249	15.293	-0,3
India	470	450	4,4	2.438	2.863	-14,8	2.643	2.958	-10,6	5.081	5.821	-12,7	5.551	6.271	-11,5
China	28.000	27.000	3,7	50.000	49.000	2,0	6.000	6.000	0,0	56.000	55.000	1,8	84.000	82.000	2,4
Other	2.800	2.600	7,7	17.600	17.200	2,3	4.500	3.930	14,5	22.100	21.130	4,6	24.900	23.730	4,9
World	43.449	42.353	2,6	94.438	91.633	3,1	17.853	17.108	4,4	112.291	108.741	3,3	155.740	151.094	3,1

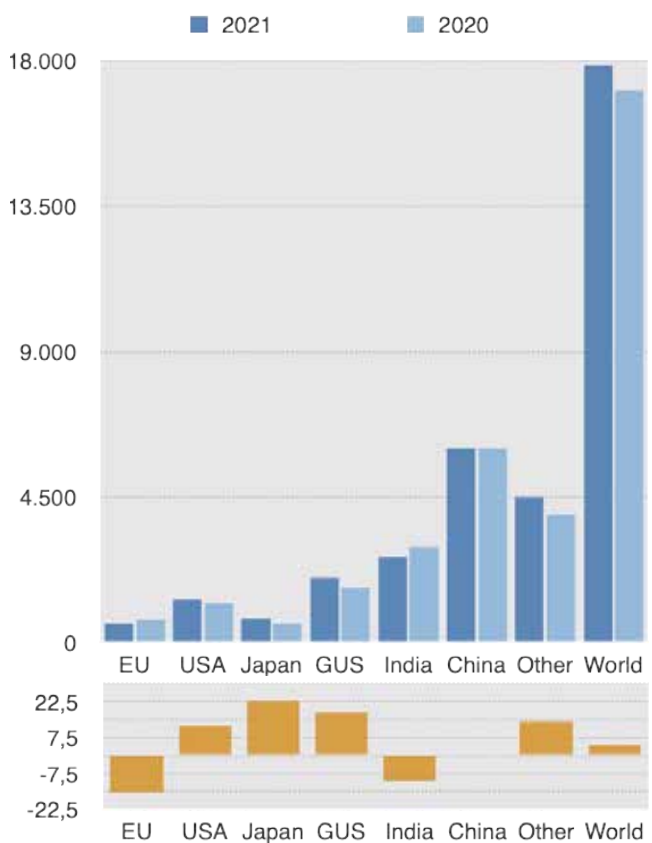
Seamless tubes in Tto.



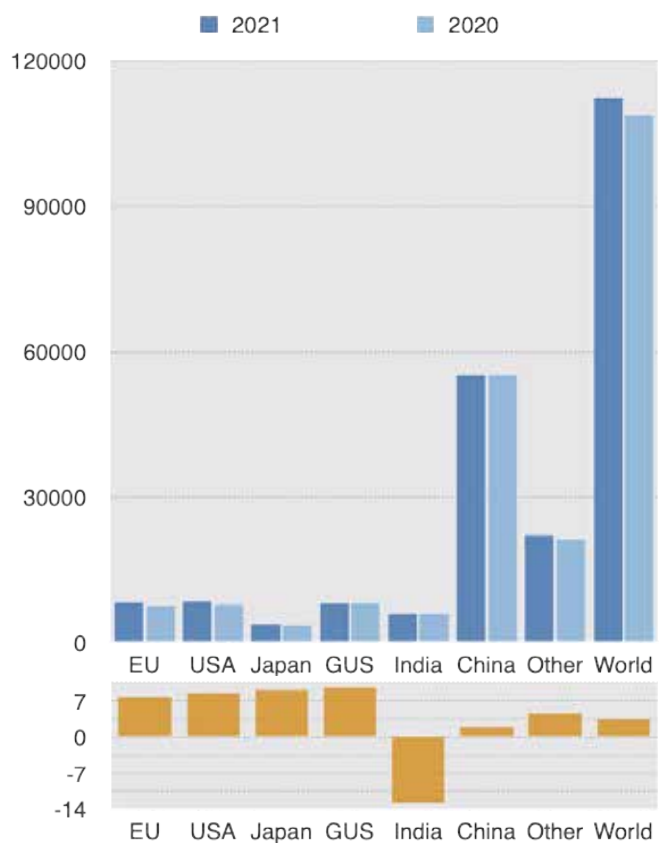
Welded tubes <406 in Tto.



Welded tubes >406 in Tto.



Welded tubes in Tto.



Dr. Gunther Voswinckel, VOSCO GmbH

World Tube & Pipe Market: Factors influencing the current situation

Dr. Gunther Voswinckel – Update as per March 2022

Welcome to ITA's and VOSCO's regular presentation of the main worldwide economic factors influencing the tube and pipe industry.

In this article we discuss several economic consequences for the tube and pipe industry. In many regions of the world, the 4th wave, Omicron, of corona pandemic is striking the communities. Due to intensive vaccinating, worst consequences seem to be brought partly under control.

In the latter months of 2021, we witnessed an impressive restart of the industry. The demand for energy is booming whereas the supply chains are still seriously disrupted. International expenditure programs, established to counteract the economic consequences of the pandemic, flooded the markets with money. And so, after a long period of financial stability, we now see signs of upcoming inflation. In consequence national banks start to cut back their expenditure programmes.

On February 24th, 2022, the Russian army started the invasion against its sovereign neighbour Ukraine. The invasion ordered by Russian President Vladimir Putin represents an escalation of the Russian-Ukrainian war that has been simmering since 2014 by extending it to the entire territory of Ukraine. As countermeasure hard sanctions were imposed on Russia. In consequence the prices for energy, gas and oil, ballooned to unknown highs with significant effect to our industry. The entire Ukrainian tube industry was shut down and some tube mills in other territories were also suspended due to the unaffordable energy costs.

So far, the world economic system and structures were based on relatively free trade and the idea that economic

networks prevent from warlike activities. This world-view is being put to the test with unforeseen consequences for global free trade.

However, the reconsideration of the world oil and gas supplies will not only provide new challenges to our industry but also possible chances for future business.

After a disastrous 2020, characterized by shrinking market demand, some tube and pipe producers closed their production facilities. By contrast, 2021 has been defined by increased demand, followed by an enormous price and cost rally combined with deficits in the supply chains. The price and cost surges peaked in fall 2021, although supply chains and energy costs still present challenges. However, the market in principle provides enough tube and pipe producing capacity to serve the demand, and so will likely calm down as soon as demand and supply can be balanced again.

Still, energy costs will remain challenging for high energy consuming industries like the steel tube and pipe industry. Possible consequence may be the migration of high energy consuming industries to lower cost regions. Producers with unique production advantages may counter such trend.

Strategic measures for our industry are consequently quite demanding. Lean and agile organizations with flexible, customer-orientated production facilities as well as adequate agile purchasing strategies are the best answer to demanding and volatile market requirements. Agile digital solutions in the spirit of "Industry 4.0" offer further opportunities to stay successful.

The International Tube Association organized several well attended webinars

in 2020 and 2021 as well as the virtual fair "ITA netForum" to substitute the cancelled TUBE Düsseldorf 2020 to keep the exchange of our industry ongoing. This August 2021 new technologies for the application of pipelines for hydrogen were successfully presented at a webinar organized by the ITA Indian chapter. The event was well attended by many colleagues from the tube and pipe industry.

The overall economic recovery in 2021 had also positive effects on our tube and pipe industry. Interestingly the collapse of many supply chains supported the trend towards local supplies.

After 2020, a disastrous year for the tube and pipe industry, 2021 showed a slight recovery of the tube and pipe market of + 5% (Fig.1). USA (+10%) and Japan (+10%) had the best recovery. (It must be mentioned that the tube production figures 2021 were partially estimated, since not all regions were providing their official data.)

The increased demand on one hand, and the fact, that some production facilities were put idle, led to a significant price increase for tubes and pipes on the spot market (Fig 2).

The pipe price index inclined by about 80% since January 2021. Anyhow long-term pipe contracts could not benefit from such pipe price increases on the spot market. By contrast to this, most pipe produces were suffering from the fact, that they were not able to pass on price increases for their production cost (e.g., increased energy and material prices).

In the major 3 tube and pipe production segments, the following production volumes were reported. The seamless market recovered by about + 6%. The most significant incline was reported for seamless pipes in the USA (+22%) and Japan (+15%). Welded pipes >16" OD (>406mm), with losses of up to 27% in 2020, the market recovered by about 8% in 2021. Japan reported the best recovery (+23%). Just Europe still had a major production decline (- 15%) in 2021 (Fig. 3).

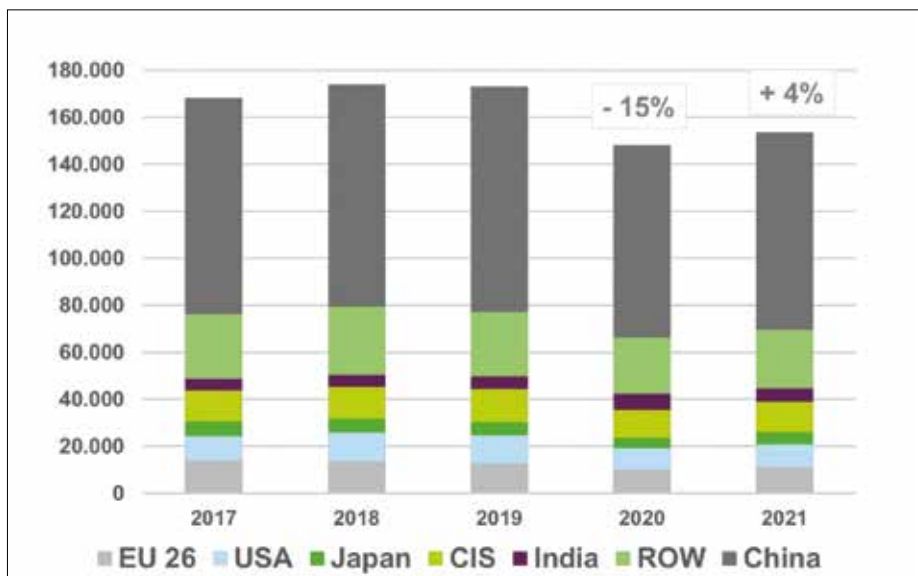


Figure 1: World production Steel Tubes and Pipes
Source: ITATube Journal/Wirtschaftsvereinigung Stahlrohr/CMIE (partially estimated)

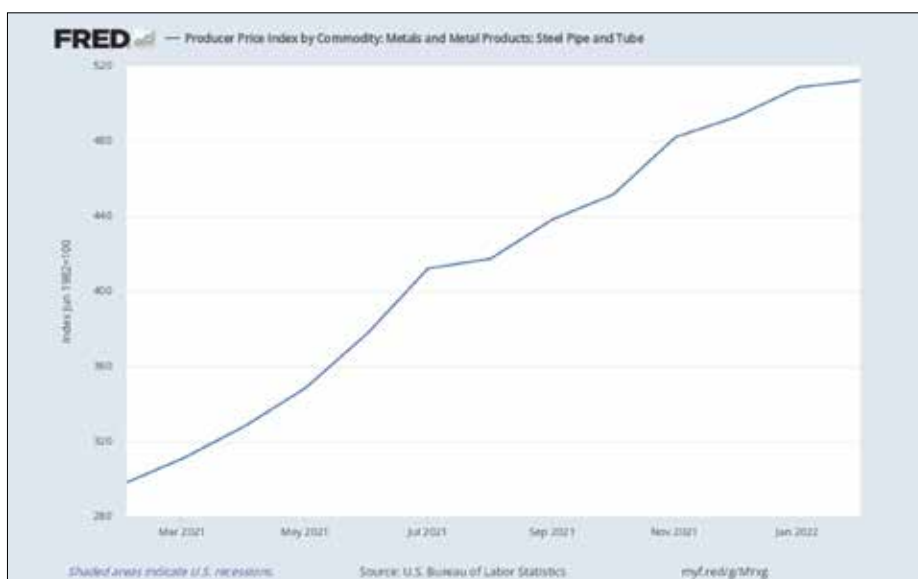


Figure 2: Pipes and tubes Producer Price Index as per March 17, 2022

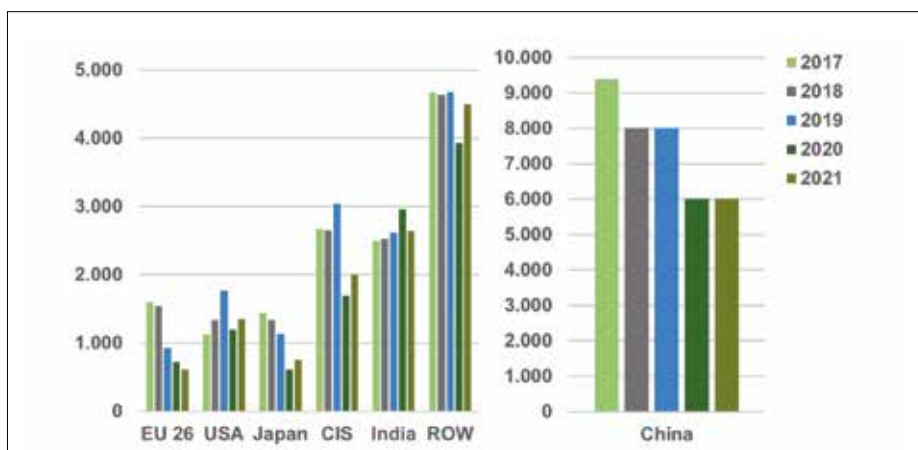


Figure 3: World production Steel Tubes and Pipes > 16" OD
Source: ITATube Journal/Wirtschaftsvereinigung Stahlrohr/CMIE (partially estimated)

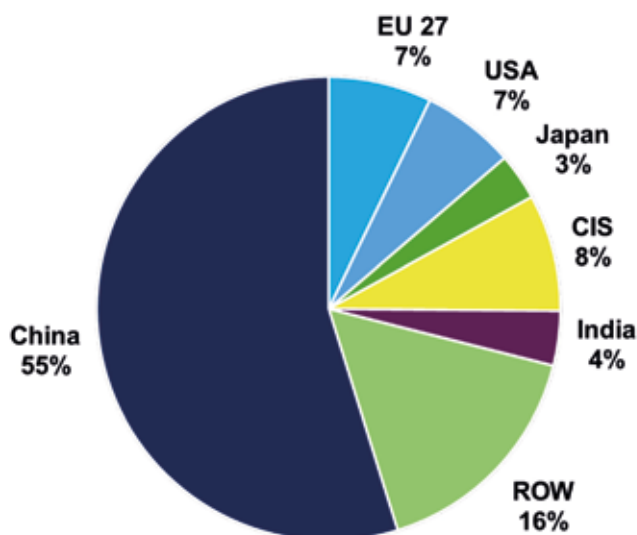


Figure 4: World production Steel Tubes and Pipes 2021
Source: ITATube Journal/Wirtschaftsvereinigung Stahlrohr/CMIE

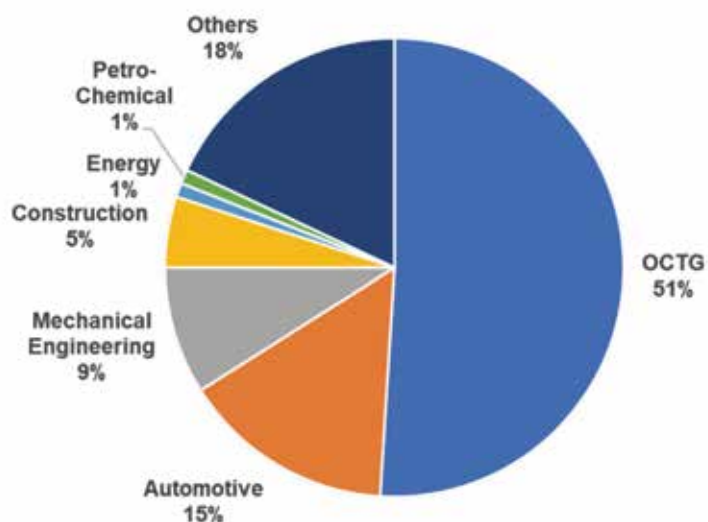


Figure 5: Steel tube and pipe markets
Source: ITATube Journal/Wirtschaftsvereinigung Stahlrohr

Welded Pipes < 16" OD (<406 mm), by far the largest market segment reported a world production increase of 4%. Here Europe (+10%) and USA (+8%) were reporting the largest increases, The world tube and pipe production 2021 is dominated by China with a proportion of 55% of the entire world production (Fig. 4)!

Considering the trends of the major tube and pipe market segments (Fig 5), we will briefly discuss the segments OCTG, automotive, mechanical engineering and civil construction.

The industry in 2021 had an impressive restart, led by China, and followed by other regions, particularly the USA and Europe. Consequently, the need for energy supplies such as oil and gas ballooned, with direct implications for energy prices and the demand for OCTG tubes and pipes (51% of the total market).

The Western Texas Immediate (WTI) crude oil price boomed from January 2021,

55 US\$/Bbl, by 160%, climbing to 88 US\$/Bbl on 3rd of February 2022(Fig. 6). On February 24th, 2022, the Russian army started the invasion against its sovereign neighbour Ukraine. The invasion ordered by Russian President Vladimir Putin represents an escalation of the Russian-Ukrainian war that has been simmering since 2014 by extending it to the entire territory of Ukraine. As countermeasure hard sanctions were imposed on Russia. In consequence the prices for energy, gas and oil ballooned to unknown heights of almost 130 US\$/Bbl (Fig. 6) on March 8th, 2022. The envisaged shortage of oil and gas supplies let the US and European governments restart talks with the former sanctioned oil producing countries Venezuela and Iran to possibly replace the Russian oil supplies. Somehow the world is suffering from some political leaders of the oil and gas producing countries.

These perspectives and the reappearance of corona in some major Chinese cities released some of the oil price pressure to an oil price of about 95 US\$/Bbl these days.

Increased demand from Asia and specula-

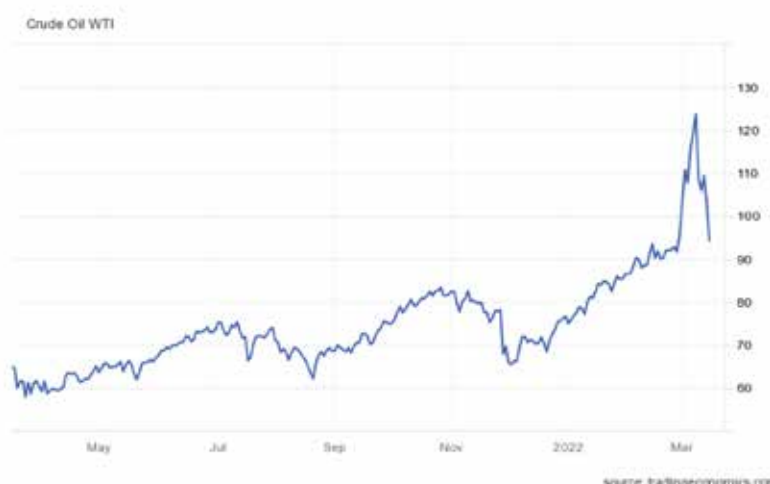


Figure 6: Oil price WTI development 1 year up to 3rd February 2022 (US\$/Bbl)

Source: Tradingeconomics.com

tions about the availability of the pipeline Northstream 2 causing relative empty gas reservoirs in Europe, has also created a boom in gas prices in 4th quarter 2021, who slowed down by the year-end. Now, since the conflict between Russia and Ukraine has broken out, the gas price is raising again (Fig. 7).

The Asian demand for Liquefied Natural Gas (LNG) especially from the USA is enormous. Since April 2021 the Gas price had a rally from 2.5 to 6.3 US\$/MMBtu (+250%), calming down to 3.8 US\$ in January 2022 (Fig. 7). When the Russian Invasion started on 24th of February, the gas price went up again to 5 US\$/MMBtu.

Especially European countries like Germany depend significantly on Russian oil and gas supplies. Due to the Russian invasion into the Ukraine, Europe is looking how to substitute the gas supplies. First action taken was the suspension of the Northstream 2 pipeline.

The international Energy Agency highlighted a possible alternative to replace about half of the Russian supplies. Anyhow still a growing appetite for gas consumption is enormous, the March flows of gas has averaged about 30% higher than February 2022.

So far, the world economic system and structures were based on relatively free trade and the philosophy that economic networks prevent from warlike activities. This world-view is being put to the test with still unforeseeable consequences for global free trade.

However, the reconsideration of the world oil and gas supplies will not only provide new challenges to our industry but also possible chances for future business.

The price rally of oil and gas have had a considerable effect on the number of oil and gas rigs in operation. Since the number of new oil and gas rigs itself is directly linked to the price of oil and gas, the recent price boom caused that the number of oil and gas rigs has significantly increased since October 2020 (Fig.9).

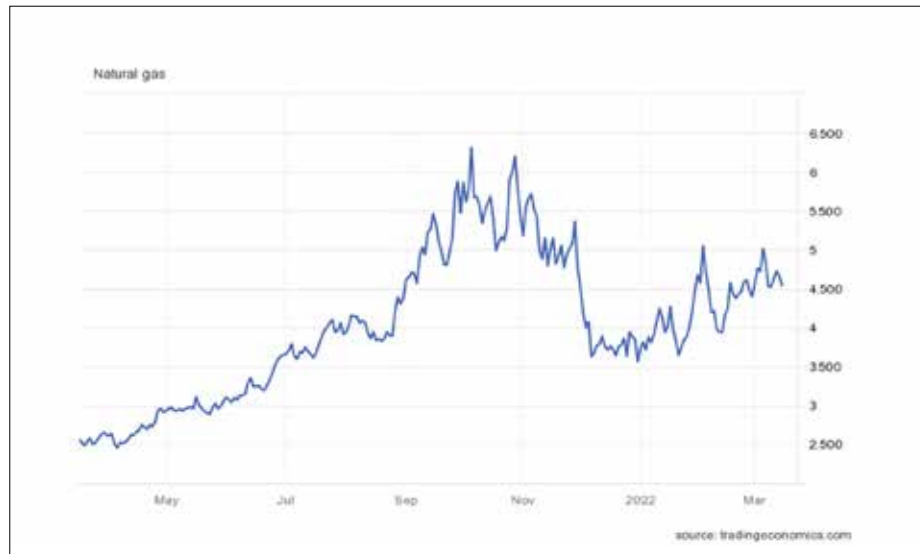


Figure 7: Natural Gas price development 1 year up to 3rd February 2022 (US\$/MMBtu)

Source: Tradingeconomics.com

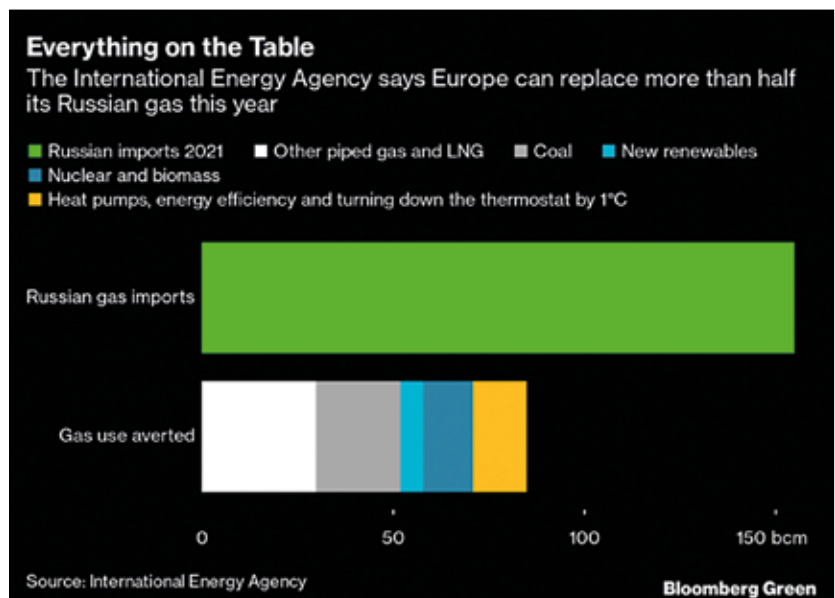


Figure 8: How Europe could compensate the Russian gas supplies

Source: International Energy Agency/Bloomberg Green

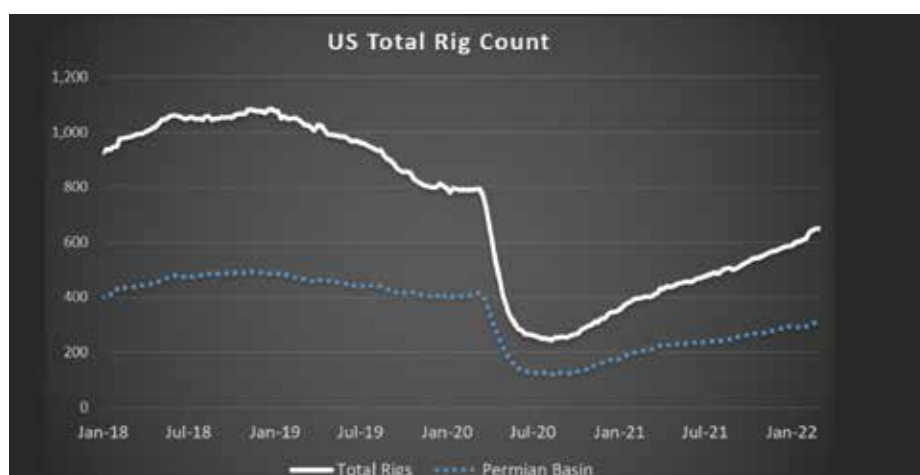


Figure 9: US Total Rig Count 4 years up to 11th of March 2022

Source: OilPrice.com

In the US, the rig count after a height of 1050 in 2018, declined, following the oil price, down to a minimum of 220 in July 2020. Since then, when the oils and gas prices started their price rally, the number of rigs inclined again to 650 dominated by the Permian Basin with about 310 as per 4th of March 2022. Other regions in the world showed similar trends.

The consumption of OCTG tubes and pipes with a diameter < 16" is, as shown in our previous articles, dependant on the number of rigs, as well as the depth of drilling and the capacity of the rigs. Therefore,

as soon as the supply and demand eco-system regains its balance, prices will calm down again, with consequences for the OCTG tube and pipe demand.

The consumption of pipes > 16" OD depends to a major extend on the pipeline kilometres built. This market segment is project based and very much depending on political strategies and availability of financial resources in the relevant regions of the world. The ownership of pipelines is dominated by state-owned enterprises and such companies may be somewhat insulated from the market forces that are impacting the publicly traded oil majors.

The global pipeline expansion has slowed down in the past years and some projects were delayed due to the covid pandemic (Fig. 10).

Overall, however the pipeline expansion curve has been bent rather than broken, with pipelines continuing enjoying both political and financial support by governments and major financial institutions. Anyhow pipelines are losing their social license. Intense opposition from landowners, climate activists and sometimes indigenous groups are causing the cancellation or delay of high-profile pipelines. This to an extend is also changing perceptions of pipelines as a safe investment. A prominent example is the cancellation of the US Keystone XL pipeline.

A planned 212.000 km expansion in the global system of oil and gas transmission pipelines, amounting to US\$ 1trillion in capital expenditures, is on a collision course with commitments by most large economies about transition to carbon neutrality by mid-century. China, Europe, Japan and Korea have committed to achieve net zero emission within the lifespan of pipeline infrastructure currently being processed. This raises the possibility that such planned projects, if built, may be permanently retired. Even though the recent political developments may become a game changer and set entire new priorities. The following table shows the present situation regarding pipeline projects around the world.



Figure 10: Global annual pipeline kilometres build

Source: GEM, global fossil infrastructure tracker, December 2020

the demand for OCTG tubes and pipes is booming as well, leading to significant price increases for our industry (Fig.2).

The essential question right now is how sustainable are these high oil and gas prices and the associated high consumption of OCTG tubes and pipes? We should bear in mind that, besides the revitalisation of the industry across the world, effects such as political aggressions and intervention as well as speculation are currently driving prices. This includes, for example, supply shortages by OPEC and other oil and gas-producing countries and political risks. In addition, we can see market speculations and possible preparations for the raid on Ukraine, which led to almost empty gas reserves in Europe since importers were speculating on falling gas producer prices. Either way, it's to be assumed that

Region	Gas		Oil		Total
	Proposed	Construction	Proposed	Construction	
Asia Pacific	45,925	27,669	2,539	3,869	80,001
Africa	20,446	4,452	6,912	1,980	33,789
North America	12,620	4,034	10,012	4,152	30,818
Europe	15,770	5,911	1,550	207	23,438
Eurasia	15,609	4,469	0	0	20,078
Latin America	8,354	5,479	55	0	13,888
Middle East	2,027	2,559	2,589	2,862	10,037
Total	120,749	54,573	23,657	13,070	212,048

Source: Global Fossil Infrastructure Tracker, December 2020

On one side we can see the dominance of gas projects (ab. 83%), on the other side a quite inhomogeneous spread of projects around the world. Asia Pacific, dominated by China and North America are the centres of pipeline project activities. Russia as one of the main oil and gas producing countries seems to reduce its supply dependence from Europe in favour of Asia by building oil and gas pipelines to the Asian destinations.

Considering, that the overall utilisation of pipe production plants for pipeline pipes > 16" is around 30% only, it can be assumed, that such plants without unique locations or technologies are critical regarding their future prospects (Fig 11).

The second largest market segment for tubes and pipes is the automotive market with about 15% market share.

The automotive production in 2020 was heavily hit by the corona pandemic. Many OEM's and their suppliers production plants had to face temporary shut-downs with the consequence that the automotive deliveries declined by about 15% (Fig.12). In 2021, when the industry restarted, it was expected, that the automotive industry would restart with the same pace as well. The market demand was recovering, anyhow the automobile industry could not manage their supply chains to serve the increasing demand from the market. Mainly IT parts, such as microprocessors created a serious bottleneck for the industry. Consequently, the automotive production declined by another 10% in 2021. The tube and pipe industry was very hardly hit by this supply volume decline in combination with the significant cost increases for energy and raw material. If we look at hot

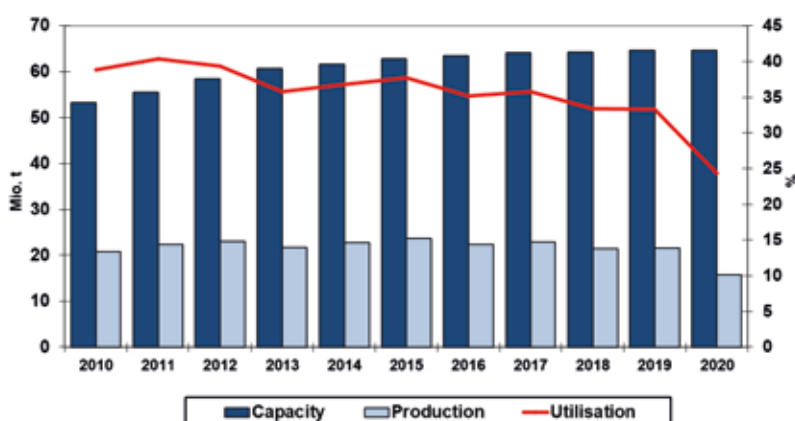


Figure 11: Plant Utilization of Pipe Productions for OD > 16"

Source: ITATube Journal/Wirtschaftsvereinigung Stahlrohr

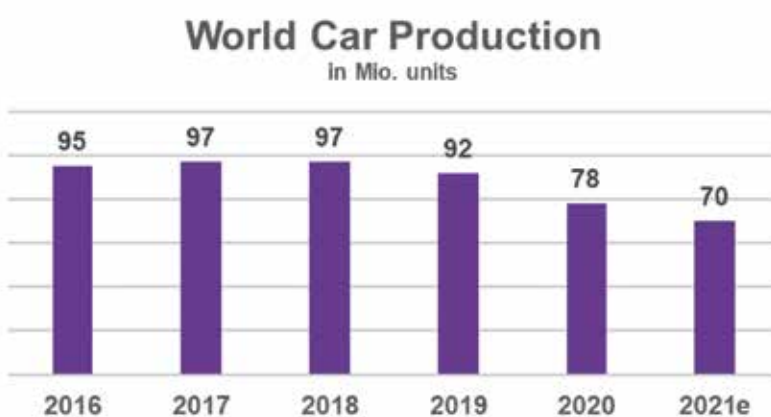


Figure 12: World car production 2016/2021

Source: Statista

rolled coil prices, we see a major challenge for ERW pipes. Since September 2020 the prices have gone up by about 340%, from 450 US\$/ton to a peak of about 1500 US\$/ton in November 2021. Since then the prices for hot rolled coils had a moderate decline on high level. Now the prices raise again.

Market Segment	2019	2020	2021	2022
Automotive				
USA	-2,8	-14,3	20,1	5,1
EU	-5,2	-21,1	20,5	8,0
D	-11,2	-24,4	20,2	12,3
Mechanical Engineering				
USA	-1,1	-8,9	10,9	5,0
EU	-0,6	-12,1	9,4	4,2
D	-2,8	-13,6	9,3	3,7
Civil Construction				
USA	-2,3	2,3	3,4	3,9
EU	0,9	-5,5	4,6	4,0
D	3,5	2,3	3,4	3,9
Chemical				
USA	-0,2	-3,9	3,6	3,0
EU	-1,2	-2,7	7,0	2,7
D	-3,1	-1,1	8	-0,5

Figure 13: Market segment expectations
Source: FERI 2/2021

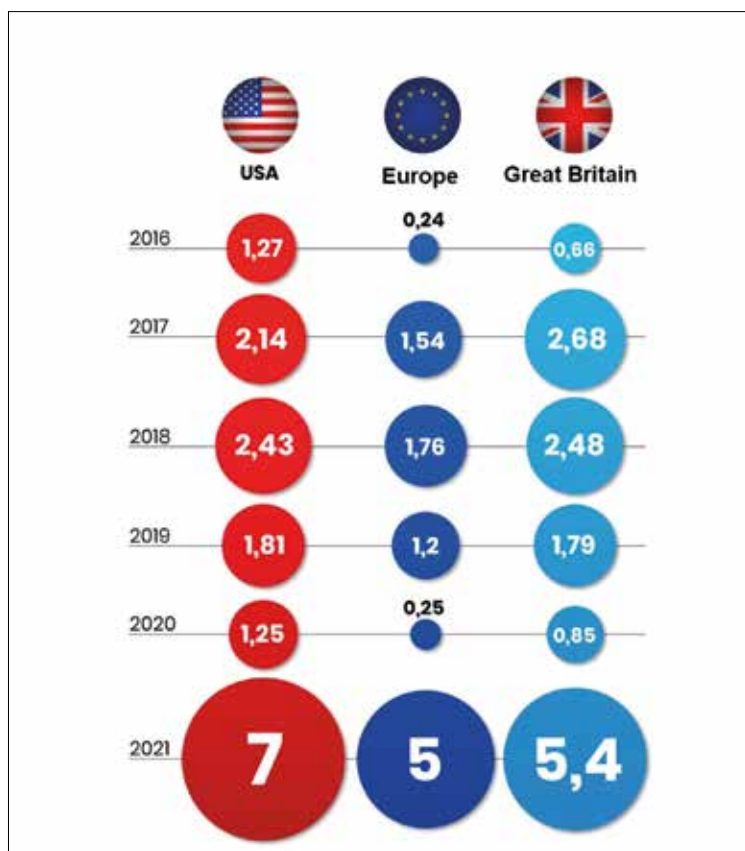


Figure 14: Annual Inflation 2016 to 2021
Source: US Bureau of Labour and Statistics, Eurostat, Office for National Statistics, The Pioneer

The OEM's on the other side could compensate their production volumes by concentrating on premium segment vehicles maintaining good commercial results.

Anyhow we assume that despite the present turbulences, the automotive industry will remain an attractive market segment, since the market demand will maintain high levels and the automotive production will recover as soon as the supply chains are in order again.

Other relevant markets for tubes and pipes are currently not experiencing such spectacular volatility but are nonetheless displaying positive trends.

The market segment mechanical engineering, representing about 9% of the total tube and pipe market, lost about 12% of its volume in 2020. 2021 so far has not been able to compensate for such losses, and it's expected that pre-pandemic levels will only be reached again in 2022 (Fig.13). Some investments in mechanical engineering products are still delayed due to uncertainties within consequences due to the corona pandemic.

Another attractive market for tube and pipe producers is the civil construction market, representing about 5% of the world tube production. The impact of the pandemic on this market segment was much less severe in 2020. Some regions, such as the USA, managed to avoid negative growth altogether. The construction market is steadily growing along with GDP growth, and it's expected that 2021 and 2022 will see expansion continue at a moderate level of 3-4%.

All market segments nonetheless still suffer from supply chain challenges and rising costs. The problems in supply chains, especially from remote Far East sources, have prompted businesses and industries to buy local. Shipping costs are booming as well, and containers represent a serious bottle neck. The USA in consequence forecast an increase in local supply of about 10-12% (approx. 443 billion US\$).

Driven by the prices for energy, cars and raw materials, inflation is on the rise (Fig. 14). In the USA this year the inflation rate

reached 7% (target 2%). This is the biggest increase since June 1992. The US central bank is now planning to restrict its loose monetary policy.

Even in Europe inflation rate has reached 5% by the end of 2021. Great Britain reached some 5,4% by 2021. Since the inflation seems not to calm down as the 2022 figures show, countermeasures need to be taken by central banks to prompt such galloping inflation.

In general, there is enough production capacity to serve even the increased demand for tubes and pipes for all market segments. Raw material prices for the steel as well as the tube and pipe industry would seem to have peaked by the end of 2021.

Energy costs, however, remain high and climb even further since market interventions (e.g. OPEC plus) and warlike actions call free world trade into question. Further challenge may be imposed, if political measures to prevent climate change are not introduced in a balanced way. These effects may also push inflation rates still higher, with possible consequences being the migration of high energy consuming industries to lower-cost regions. Nonetheless, if the balance of supply and demand within the tubes and pipes industry can be restored, price volatility can be expected to calm down.

Tube plant infrastructure with respect to tube mills and finishing lines as well as applied quality assurance systems also plays a significant role. Growing importance can be attributed to agile management strategies regarding customer benefit, process and product quality enhancement as well as purchasing processes by applying "Industry 4.0" measures.

With an eye to the return to something like normal, it should be noted that plant builders and technology suppliers alike may find interesting business opportunities in this new market segment. Some technology suppliers have already reacted and enhanced their product portfolio with the addition of digital solutions.

The International Tube Association organized several well attended webinars in 2020 and 2021 to keep the exchange within our industry ongoing. Some interesting applications of "Industry 4.0" in the tube and pipe industry were presented by various companies at the ITA netForum which was organized to substitute the cancelled TUBE 2020 in Düsseldorf. August 2021 new technologies for the application of pipelines for hydrogen were successfully presented at the webinar organized by the ITA Indian chapter. The event was well attended by many colleagues from the tube and pipe industry.

It is good to realize, that besides the virtual exchange in our industry, such as the webinars organized by the International Tube Association (ITA) now again hybrid or even personal events for industrial exchange take place.

We are looking forward meeting tube producers as well as suppliers to the tube and pipe industry at our world largest tube and pipe show "Tube Düsseldorf 2022" which takes place from June 20th to 24th 2022.

Dr. Gunther Voswinckel

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Andrew Houghton

Cold Pilger Tooling Design Key Steps



Fig. 1 CAD View

The principle

Those familiar with pilger tooling will know that generally there are two ring or half ring dies positioned above each other in a housing so that they can be moved backward and forward over the tube. This imparts a roll profile on the outside of the tube in a progressive manner. Each time the rolls go backward and forward the tube is fed into the roll pinch incrementally. Tube emerges with a smaller diameter and a thinner wall.

There is an equal and opposite profile ground into the circumference of each die and usually there is a mandrel inside the tube with a profile that controls the tube ID and wall thickness.

The fundamental issue is to decide the longitudinal and transverse profile in what has to be a tapered groove in the roll. A coordinated mandrel longitudinal profile is also critical to success as both roll and mandrel together control the strain path.

So, the CAD drawing in Fig 1. shows a typical profile in a single ring die and the Graph in Fig 2. shows a plot in blue of the whole longitudinal die profile measured between the bottom of both opposed grooves through the machine centre line. The red line represents the mandrel diameter. A critical point between these rolls is at the 'C' point. This is nominally where the tooling dimensions will produce the desired tube size. The 'C' point is at position '0.000' on the horizontal axis on Fig 2.

As well as the longitudinal profile there is an equally important transverse profile which is nominally the radius of the tube but also has key elements of 'side relief' which is needed to allow the extending tube to fit into the groove as it progresses forward. It is also needed to accommodate the roll separation under load which produces a larger diameter than initially calculated. A critical measurement which can not

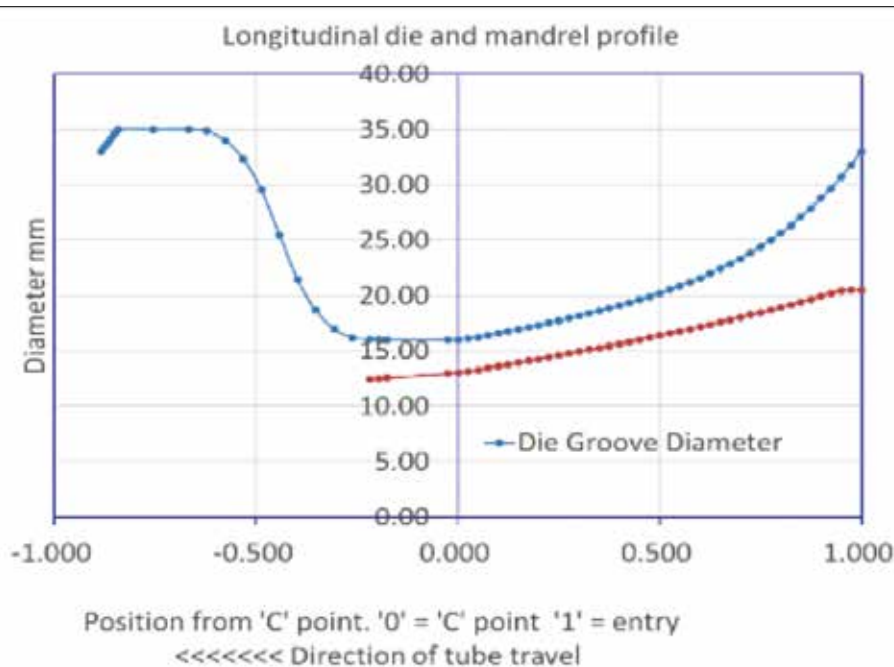


Fig. 2 Longitudinal Profile

easily be calculated is the amount by which the rolls spring together on the forward stroke after they have passed the 'C' point. On the return stroke they will spring out by a similar, but not identical amount.

Optimisation

The formular for the early development of these profiles was developed in Europe largely by Mannesmann-Meer and use of the formular proposed in 1969 will still produce results. However, the use of computers – especially powerful lap tops has led to remarkable productivity gains for those prepared to push the boundaries and fully understand the process detail.

The principal working length of the die is normally split into forty segments from the start to the 'c' point. There are three principal parameters that need to be calculated for each segment. These are the 'Q' factor (which is a measure of the wall strain relative to the diameter strain); The percent reduction (or the total strain if you prefer); and the strain disparity (This is the difference in the strain between the outside tube circumference and the inside circumference). **Together these define the strain path.**

Controlling these parameters in an intelligent way can result in much larger reductions, freedom from lap type inside diameter cold pilger defects and improved dimensional control. Metals with certain crystal atomic configurations can have key mechanical properties controlled. The larger reductions can lead to very large extension of the tube hollows which has significant productivity benefits especially where machines do not have automatic continuous loading. So, Fig 3. shows how these parameters might change as strain path progresses. The horizontal axis is the same as for the previous chart but stops at the 'C' point. Note that when the 'Q' factor goes below 1 and the strain disparity goes negative there is an increased risk of bore defects.

Roll force determination and side relieve implications

Readers who are following this article will be aware of the importance of side relief issues. Usually, operators use both radial

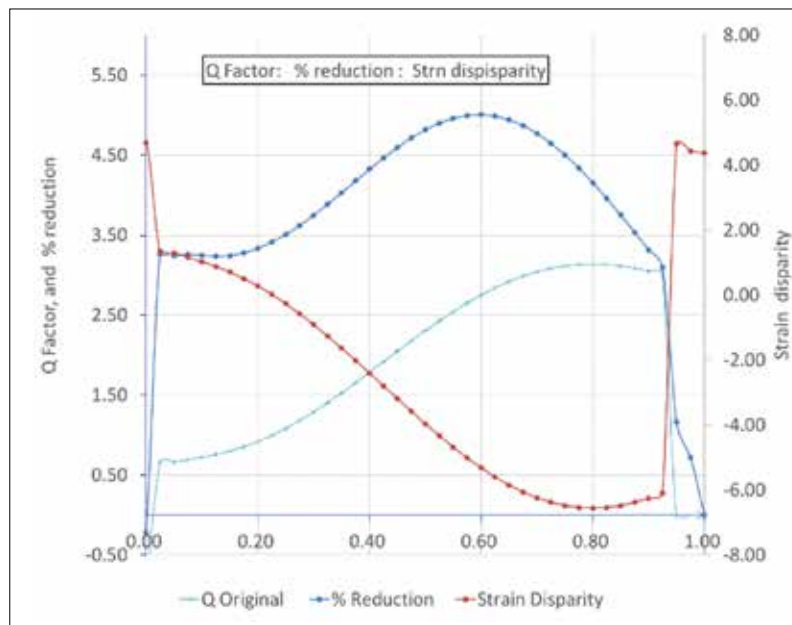


Fig. 3 Key Strain Path Parameters

side relief and tangential side relief or sometimes parabolic side relief. Calculating the side relief needed to accommodate the forward movement of the reducing tube can be found in the literature but there is not a lot of practical information available which explains how much of the calculation to use either as part of radial side relief or tangential side relief. Sometimes it can be beneficial to change the amount of tangential relative to radial side relief through the work length.

Calculating the roll force is also possible given the same base calculation as for the above charts but the formula is complicated. The amount of strain hardening has to be integrated into these values. The force can be calculated as far as the 'C' point on the forward stroke but needs load cell measurement to verify its accuracy and also dimensional measurement to verify the resulting roll separation for use in additional side relief calculation. The Roll separation occurring from the 'C' point and the end of the sizing section also needs to be measured.

If operators can perfect the dimensional measurement procedure, they can in theory avoid the use of load measurements but it is easy to see why it would be useful to have both. For instance, for calculating the force on the mandrel and hence how

close it might be to breaking. Surprisingly, higher elongations do not necessarily lead to higher loads.

Fundamentally the dimensional measurements are not very difficult but they will be found quite challenging due to the environment in which the measurements have to be taken.

Note that it should be obvious by now that if the machine feed increment is changed after the tooling is manufactured then the entire calculation will not then be correct (assuming it was in the first place). Operators who have not meet the computational

challenges will from time to time find adjusting the feed can produce improvements. Even the most proficient operators may find it necessary to make changes for issues like die wear mid-way through the life of the die. Note that it is it is easy to blame die wear when the problem can be elsewhere – roll bearings for instance.

More Sophistication

Fig 4. shows a plot of calculated and actual values of load separating forces. The green line is a correction for reduction in force as a result of the roll separation. A similar graph can be produced for roll separation values. The horizontal axis is the same as the previous graph.

Getting an operation up to a standard where technicians can produce these graphs with the confidence that they are correct involves hard work - however the benefits can be huge.

There is also a possibility to manipulating the die and mandrel longitudinal profile on the approach to the 'C' point in order to reduce and smooth out the reduction in this area. The wall thickness reduction can be modified to accomplish this and also to modify crystallographic orientation – especially in the radial through wall direction. This is not for the faint hearted and is quite a specialist area.

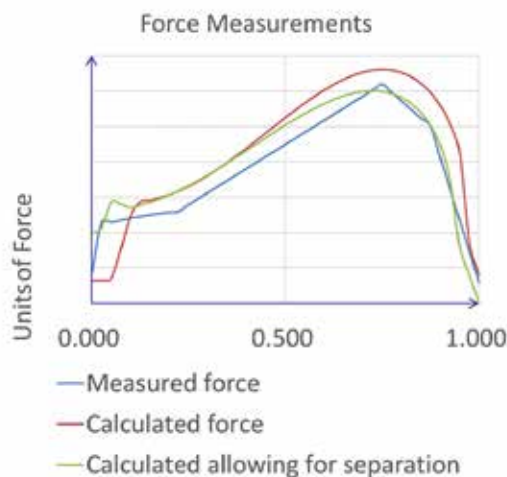


Fig. 4 Roll separation force measurements

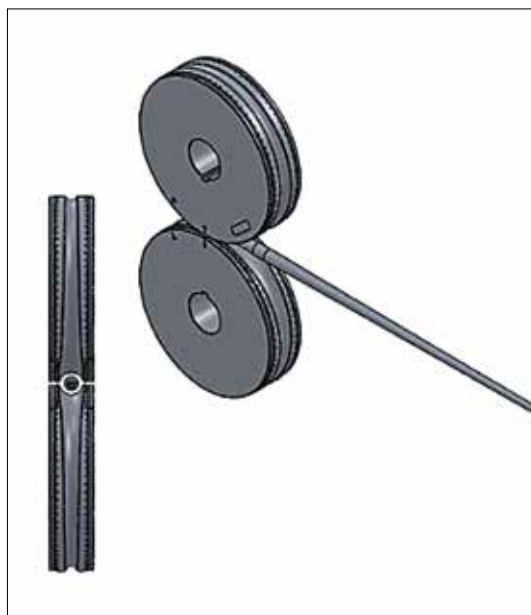


Fig. 5 Checking key tooling dimensions

The Next Step

Up to this point all calculations have been achieved within an excel spreadsheet. There are documents that describe how the spreadsheet works and engineering drawings which define the key dimensions – see Fig 6. These are useful for the tooling manufacturers and the spreadsheet users.

The next step is to convert the spreadsheet to a file capable of downloading to CAD software and finally into the toolmaking machine.

This process also acts as a check that all the die segments are in the correct place and that they match up where they should with the mandrel segments. An especially important check with ring dies is that the mandrel large end and tube hollow

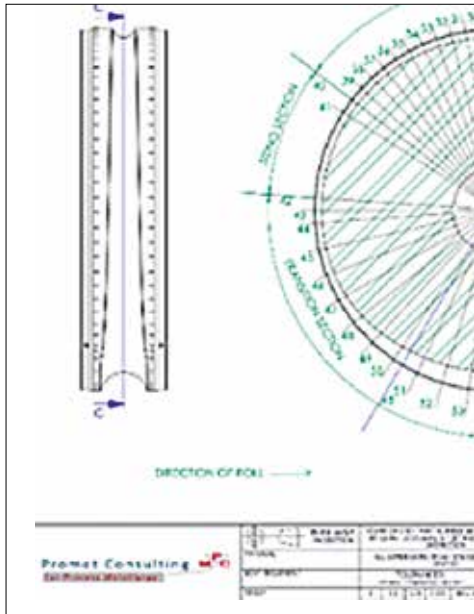


Fig. 6 Purpose designed drawings to match Spreadsheet and CAD files

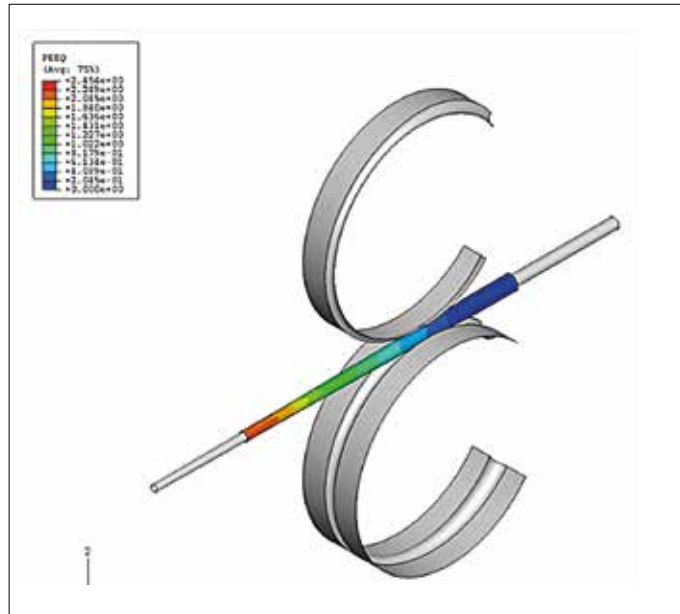


Fig. 7 Typical non-linear FEA analysis of Pilger tooling

together clear the die profile by the specified amount when the dies are in the ET position at the entry end. This is quite tricky to calculate with certainty. In Fig 5. the clearance shows up as a white circle in the centre of the left CAD drawing.

And Finally

Many readers will be aware that Finite Element Analysis can play an important role in processes involving metal deformation. Promet Consulting Ltd had a plan pre COVID to make this a reality but unfortunately it has been delayed.

More accurate predictions of forces, heat 'build up', peak pressure points would certainly be advantageous but all the issues dealt with in this report would be needed to produce viable reductions to try and to provide accurate measurements of forces and roll separations to validate results.

None Linear FEA then can be brought to bear on cold pilgering but issues with very large mesh sizes have limited its use due to cost and time constraints. However, the project was planned to use AI to learn the effects of key variables. As the artificial intelligence developed its predictions would become increasingly reliable and the computational time used in problem solving would be minimal. The system described in this article can be used to rapidly develop and change parameters to input into the FEA Model.

Commercial Note

Promet Consulting Ltd has now been developing the files needed for designing high performance Pilger dies for many years. These files have developed over time which has enabled customers to have the files at very reasonable rates while they have been developed. This initial development is nearing the end and a suit of files is essentially complete but continual development is unlikely to end any time soon. In helping customers to optimise their reductions Promet Consulting Ltd has inevitably acquired some of its customers intellectual property. There may be some potential customers that the company will have to decline to work with due to conflicts of interest but this will depend on many factors. Sometimes materials and reductions can be the same but markets radically different for example.

A group of companies where competition is negligible or very little is ideal for driving forward development and spreading the cost of key projects.

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Andrew Houghton

The Advantages of Cold Pilgering compared to Cold Drawing

Summary

These processes are commonly used in the Tube Industry when reducing the outside diameter and wall thickness of tubes down from a relatively uncontrolled and often hot worked product or large diameter welded tube. The final resulting tubes will have much tighter dimensional tolerances and will have controlled micro-structures and properties.

During the process the tube properties will evolve to meet the demanded requirements of specified for tensile strength and ductility and there may have been significant reductions in the depth of any surface imperfections. The defect depth, surface roughness and micro structure will meet the desired specifications.

Sometimes both processes are used in a reduction sequence to maximise productivity whilst at other times the processes might be used on their own to make use of fundamental advantages. For instance, the material being pilgered can have relatively low ductility but still be subject to large elongations, whereas the drawing process is very good for imparting measured amounts of cold work to meet properties. The drawing process can also be good for producing very smooth inside surfaces and there is a point at which small diameter thick wall tubes will tend to be finished by the drawing process without any inside support.

From a stress analysis point of view the essential difference between the processes is that the stresses in the cold drawing process are essentially tensile as the tube is pulled through a die in a single pass whereas the stress in pilgering is compressive as the tube is rolled between two circular rolls containing a tapered groove. The tube follows the groove dimensions as it progresses incrementally through the rolls. The rolls being moved forward and

backward for each incremental movement forward.

Both processes usually employ mandrels in the tube bores and these are located on the ends of long rods stretching from the start of the machine bed and extending to the work area so that they can resist deformation forces from the drawing dies or pilger rolls. Hence wall thickness reduction is possible at the same time as the outside diameter is reduced.

The tube wall reduction being achieved while the diameter reduction occurs can be expressed as a ratio. This is defined as the wall strain divided by the mean diameter strain and is often designated as the 'Q' factor. For tube makers this factor is very important and its control can have many influences on cost and quality.

For information the 'Q' factor is best calculated as follows:

'Q' = $\ln(\text{Wall strain})$ divided by $\ln(\text{mean diameter strain})$

\ln means natural logarithm

Wall strain = $\ln(\text{Wall thickness at the start of draw} / \text{Wall thickness at end of draw})$

Mean diameter = The average tube diameter or the diameter taken at a point half way through the wall thickness or the diameter less one wall thickness.

Therefore, the mean diameter strain = $\ln(\text{mean diameter at start of draw} / \text{mean diameter at end of draw})$

The use of spreadsheets has made the 'Q' factor very easy to calculate. Technicians who make decisions on what reductions to use need to be careful when deciding on reductions with a 'Q' factor of less than 1. This can lead to undesirable stress distributions in the reduced tube – especially to a value called the strain disparity.

Andrew Houghton



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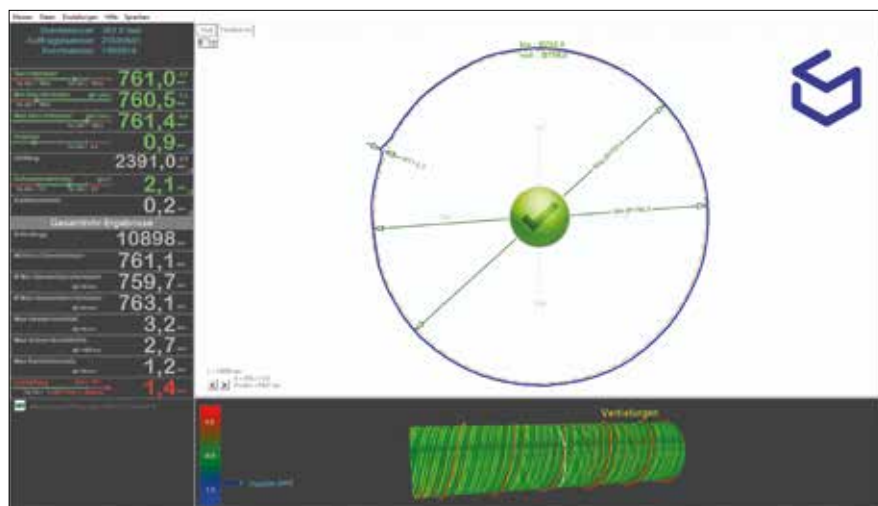
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MSG Maschinenbau

Internal cross section measurement on pipes and tubes

Schmallenberg, Germany. MSG Maschinenbau's latest development focuses on measuring geometries of pipe cross-shapes. Following the API-Standards the new GMS-I (Geometry Measuring System for Internal diameters) enables a highly accurate measurement of internal cross-shapes and specific characteristics like global out of roundness, local out of roundness, max. diameter, min. diameter, peaking or flattening of Weldseam geometries, and counting.



The main features of GMS-I are listed below.

Wide range measurement

MSG's standard system enables the digitalization of internal pipe diameters from Ø200mm up to Ø1100mm with only one head. Besides this standard configuration the GMS-I can be configured to the needs of MSG's customers.

Unique developed circular laser

At the beginning of this R&D project MSG started developing a circular laser projecting a radial homogeneous line (according to thickness and intensity) onto the inner surface of hollowed products.

High reflective surfaces

All measurements during development process have been done on CLAD-pipes,

which are hybrid pipes with internal high corrosion resistant materials like stainless steel. Because of the special developed laser there are no effects limiting the quality of measurement results.

Frequency and resolution

Because of the high-quality circular laser and optimized camera-resolution (4k) the GMS-I reaches scan frequencies up to 200 Hz with 2160 coordinates each scan.

Offline calibration

The calibration is done only once during commissioning. MSG's standard GMS-I reaches an absolute accuracy of $\pm 0,1$ mm.

Integration

Currently MSG will deliver two GMS-I for double sided internal geometry-scanning during pipe sizing operations coupled with expander technology developed by Dango & Dienenthal Maschinenbau GmbH. As part of a technology driven capex expansion program, one of the world's most innovative Pipe producers Eisenbau Krämer GmbH in Dahlbruch - Germany, will implement the new measurement systems into the final stages of pipe production. "These compact and highly accurate measurement heads enable the measurement of the internal pipe-diameters during the calibration-process over a large nominal range. The accuracy and performance of the GMS-I devices, especially on the highly reflective internal surfaces which has been an integral part for the development of EBK's new RollClad MLP product, provide amazing and consistent results!", Bulut Gün, Head of Engineering at EBK says.

The next project focuses a live-measurement application inside an external-bending-press for pipes up to Ø2000 mm. In combination with MSG's know-how of mechanical construction about the past 22 years, they're delivering once more a turn-key-solution where the GMS-I will be mounted on a movable lance-portal.



Coming soon

Following the ideas of our customers our R&D division is focusing on a wireless hand-held system of GMS-I for easy manual diameter-check on field.

The combination of mechanical know-how and MSG's well-founded knowledge of measurement applications on field, lead to reliable solutions.

Get physically in touch with this innovative measurement head at Tube and Wire in Düsseldorf Hall 6 / C02

For more digital information visit us on youtube, facebook, linkedIn, or on www.msg-maschinenbau.com.

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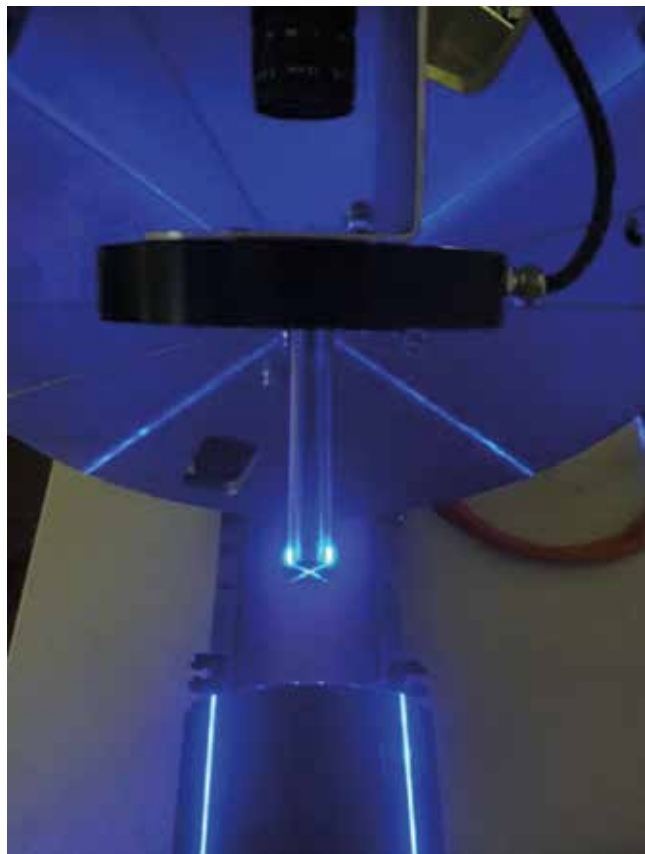
New dimension in tube measurement

Constantly increasing quality requirements as well as the demand for "intelligent" machine technology with high process reliability at the same time were the decisive reasons for the further development of an optical tube measuring system with integrated surface defect detection, which is mostly used directly in combination with modern BÜLTMANN tube drawing lines.

The highly innovative measuring system "Twin Line Laser Check, Type LC", eliminates weak points of hitherto existing measuring equipment and includes additional functions that are required from a state-of-the-art measuring system. Due to its positioning directly in the drawing process, it significantly reduces the amount of scrap. At the same time, the integrated, Industry 4.0-compatible system is able to take into account process-related environmental influences.

The measurements are currently implemented in almost every new BÜLTMANN drawing plant, but can also be retrofitted for older BÜLTMANN drawing lines. Two new patent applications at once secure the new innovations.

We will be happy to advise you on the possible applications of our new system in your production processes and provide you with further technical details.



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Particularly in the case of complex, highly efficient production lines, there must be no compromises in the handling area. All too often, supposedly "inexpensive" handling technology is used, which later turns out to be a bottleneck in the production process.

Those who rely on proven BÜLTMANN handling technology will not experience any unpleasant surprises, as the BÜLTMANN handling components are specially tailored to the BÜLTMANN machines and thus offer maximum process reliability over many years of use.

For this purpose, BÜLTMANN supplies a wide range of handling equipment, such as automatic feeding and separating devices, cross transport systems, longitudinal transports in various designs as well as cradles and packaging concepts. Equipped with various special components, some of which are manufactured in-house, in order to

meet the increased requirements for transport speed, process reliability and material surface protection.

Whether in combination with new machines or existing equipment, BÜLTMANN always offers the optimal adapted solutions. We will be happy to assist you and look forward to your inquiries.



Messe Düsseldorf

wire and Tube 2022 in June in Düsseldorf: The stuff that drives the car industry

Hydrogen-powered vehicles have already tackled the first stretches. And some experts are sure that many more will follow. For them, fuel cell vehicles are the future of the automotive industry. But still H₂-cars are a long way from conquering the roads of the world. It is clear, however, that



hydrogen cars need powerful cables and tubes. The industry has to prepare for this development now in order to be able to pick up speed in time.

Emission-free driving without having to change over in everyday life - that sounds promising. Because the H₂-car can be refuelled within minutes and has a range of over 500 kilometres. Impressive arguments that could make battery-based electric cars only see the tail-lights. Mind you, "could", because there are still only a few hydrogen filling stations and the purchase prices are significantly higher compared to other cars.

Hydrogen-driven buses

Some auto manufacturers are already on course when it comes to using H₂-powered engines. For example, a hydrogen express bus is already on the road in Pau, France. 125 people can take a seat to cover a six-kilometre stretch between a station in the south and the north of the city. A direction that some car manufacturers

also want to take. The BMW Group's view is that hydrogen vehicles are an important alternative and supplement to electric battery engines. "From 2025 at the earliest, and depending on market requirements and general conditions, the BMW Group will offer vehicles with fuel cells to customers," the car manufacturer announced. Mercedes already has a pre-series model on the road. Other companies also have produced the first fuel cell vehicles. It's just a start, because so far only a few hundred of them are on German roads.

High quality cables

The change towards electric and hydrogen cars has consequences for the cable industry. This is because, unlike the internal combustion engine car, there are no cables in connection with the fuel system. In terms of wiring, the hydrogen car is more similar to the electric car - but the main difference is the origin of energy production. In the fuel cell - instead of in the battery as in the electric car - the hydrogen is converted into electrical energy. In both electrically powered vehicles, the electrical energy finally finds the engine and drives it. So H₂-powered cars and electric cars have an electric engine. Both in the case of pure battery technology and a hydrogen system with fuel cells, the functional units must be connected with cables. Electric cars and hydrogen cars needed more cables and wires in total than a car with an internal combustion engine.

The development of fuel cell vehicles is challenging the cable industry not only in terms of quantity, but also in terms of quality, as higher quality cables are needed. Because hydrogen is extremely flammable. The drive components including cables and tubes must be designed and protected accordingly.



Ecological aspects favour the hydrogen car, because it only blows water vapour into the environment via the exhaust. According to a Shell study, by 2050, around 113 million fuel cell cars could cut up to 68 million tonnes of fuel usage and save almost 200 million tonnes of CO₂-emissions. "In this way they could make an important contribution to energy saving and greenhouse gas reduction in the transport sector," the Shell study states.

Standards as a central theme

For tank systems installed in hydrogen-powered vehicles, the subject of standards is of fundamental importance. Railway example: "For hydrogen fuel cell operation, we use rail-approved cables," explains Wolfgang Wolter, Chief Executive Officer

Operations + Sales of Wystrach, a manufacturer of hydrogen tank depots for buses and local trains. Depending on the connection and linking technology under consideration, the base materials used would have to exhibit not only conformity to standards but also properties such as good connection and cross-linking properties, if, for example, connector housings were to be moulded on. "In addition, the different installation types, including demands on cable protection, must be taken into account," Wolter emphasises.

Cutting CO₂ emissions

The network of filling stations is still extremely lacking. Another shortcoming: The tanks must be considerably larger. Experts therefore currently see a greater possibility of getting H₂ technology on the road with trucks.

Billions of euros for hydrogen

The still young industry is very promising. With the National Hydrogen Strategy, Germany aims to become the world's leading supplier of modern hydrogen technologies. The Federal Government wants to use a total of nine billion euros to make the energy source marketable. The funds are flowing into the steel and chemical industries, into the heating sector and also into the transport sector. And in doing so, the H₂-vehicle is also slowly coming onto the road and revolutionising the industry. In any case, the next stage of vehicle development is already beginning.

Innovations in the fields of wires, cables, tubes and pipes will be presented at the leading trade fairs wire and Tube from 20 to 24 June 2022 at Düsseldorf Fairgrounds. Further information is available under www.wire.de/www.tube.de.

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Thermatool Corp

Tubos Colmena invests in Therman-tool HF Welding Technology once again

Consorcio Metalúrgico Nacional SAS (Tubos Colmena), Colombia's leader in the manufacture of structural and mechanical tube and pipe products since 1957, wanted to meet the growing demand from the local market and to increase productivity. Colmena invested in two Therman-tool Solid State High Frequency (HF) Welders to improve operational performance, and as a bonus reduced operating costs because of improved electrical efficiency. Therman-tool's advanced HAZControl™ Technology (HCT) 300 kW HF Welder with selectable variable frequency was com-

missioned on July 1, 2021, and a Therman-tool single cabinet Compact 150 kW HF Welder on November 27, 2021.

The HCT welder will enable Tubos Colmena to get precise weld heat input control and also store and recall tube welding recipes. This feature offers consistently optimized process parameters such as Power (Heat), Frequency (Heat Affected Zone Width), Vee Length, and Mill Speed, to deliver uniform and repeatable weld characteristics. HAZControl™ Technology allows tube and pipe producers to tailor their products to the exact specifications required by their



Therman-tool HAZControl™ Technology 300 kW High Frequency Welder



*Thermatool Compact
150 kW High Frequency
Welder*

customers. Precise weld heat input is the new global standard for HF Welding. The Thermatool Compact 150 kW HF Welder equipped with Electronic Load Matching was perfect for retrofitting and upgrading the second mill where the Thermatool vacuum tube welder had been in operation for over 40 years. The Compact welder is one of the most cost-effective upgrades available with a small footprint, fast installation, and commissioning.

Nicholas Gomez, Lines Production Manager at Colmena, noted that “the increase in mill productivity was immediate. Not only did this installation increase mill speed and reduce weld power, but also electrical efficiency has improved by over 20%. We are running faster and more reliably than ever before, with consistent and repeatable, precision welds. We were able to increase our speed from 45 MPM (meters per minute) at 5 MTPH (metric tons per hour) to 75 MPM at 8 MTPH.”

“Thermatool and Colmena have been working together for over 50 years transitioning from the old vacuum tube HF welding technology to our current solid-state HF induction welding technology”, said Victor Monreale, Latin American Sales Manager for Thermatool. “Thermatool maintains a strong Latin American presence as we continue to support all of our local customers in Central and South America.”

Alongside 70 years of experience in the tube and pipe industry, Thermatool offers an unmatched level of service. We have a global network of more than 50 service technicians who are on call 24/7/365 which makes it an easy decision for Thermatool customers, like Colmena, to continue partnering with Thermatool. Expanded remote and digital service tools are now proven and widely available using the Thermatool SuperVizor™ Headset (learn more at thermatool.com/supervizor). Additionally, Thermatool now offers online training to help operators run their equipment at continued peak performance with enhanced remote support tools.

To find out more information about how Thermatool can service your needs, please contact us at 1.203.468.4100 or info@thermatool.com; or you can visit us at thermatool.com

About Thermatool Thermatool Corp., part of the Inductotherm Group, is the global leader in the development

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The Boehlerit range of carbide grades

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Boehlerit is a true pioneer in the development of cutting materials from carbide and a European premium manufacturer whose outstanding expertise results from its close links with the steel industry. The result: high-end grade solutions for rotating carbide tools that are suitable for a wide range of applications.

The Kapfenberg-based tool manufacturer looks back on many years' experience with regard to carbide blanks and semi-finished products for the precision tool industry and offers a multitude of special material grades with varying grain sizes. Alongside the well-established micro-grain carbide grades HB10F, HB20F and HB30F, Boehlerit also offers two grades in the ultrafine-grain

range with the HB20UF and the HB44UF. HB20UF is ideal for the processing of composites as well as for HSC milling from 60 HRC. HB44UF is used for all rotating tools within the field of HSC technology and for the machining of hardened steels up to 62 HRC.

HB40T, a special carbide grade that was developed by Boehlerit, offers a combination of toughness and wear resistance that is ideal for the roughing of titanium.

When it comes to milling titanium, its toughness poses a challenge for the cutting material used, as it leads to high temperatures and wear levels on the tool blade. To counteract this, tools require a sophisticated combination of metallic hard materials that have contradictory properties.

Carbide grade HB40T is the ideal combination of high wear resistance and toughness. Boehlerit offers the HB40T grade as a bar material. These blanks are perfect for the manufacturing of shaft tools of the kind that are used for titanium roughing applications. The HB40T is thus the starting point of choice for tooling applications in almost all industrial areas where titanium is processed. Typical areas of application include the processing of aeroplane structure parts or engine components, products in the medical technology sector or components for chemical or energy plants. Boehlerit is also an ideal partner for customised solutions for pre-formed blanks for milling and drilling tools.

The Boehlerit portfolio now also includes the extremely wear-resistant ultrafine-grain HB05UF and the XS10 grade, optimised for diamond coating. HB05UF constitutes an ideal solution for the machining of abrasive compound materials as well as for materials within a hardness range of > 62 HRC. For detailed information and recommendations on the various areas of use, see boehlerit.com or refer to our catalogue "Carbides and Semi-Finished Products".

The company

Boehlerit, head-quartered in the Austrian town of Kapfenberg, sets global standards with carbides and tools for the processing

of metal, wood, plastics and composites. With cutting materials, semi-finished products, precision tools and tool systems for milling, turning, drilling and forming, Boehlerit ensures process safety and efficiency on a global scale. The company's extensive product portfolio includes highly specialised tools for the machining of crankshafts as well as for the mining industry, for bar peeling, tube and sheet metal processing and heavy-duty machining. The Boehlerit product range also features carbides for construction components and wear protection. When it comes to coating technology, Boehlerit holds a global monopoly, ranging from the first-ever nano-CVD bonding layer to the hardest diamond layer worldwide. With its many years' experience in metallurgy, coating technology and state-of-the-art press technology, Boehlerit is a highly competent development partner for toolmakers.

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Tube[®]



20-24 June 2022
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Reika GmbH & Co KG

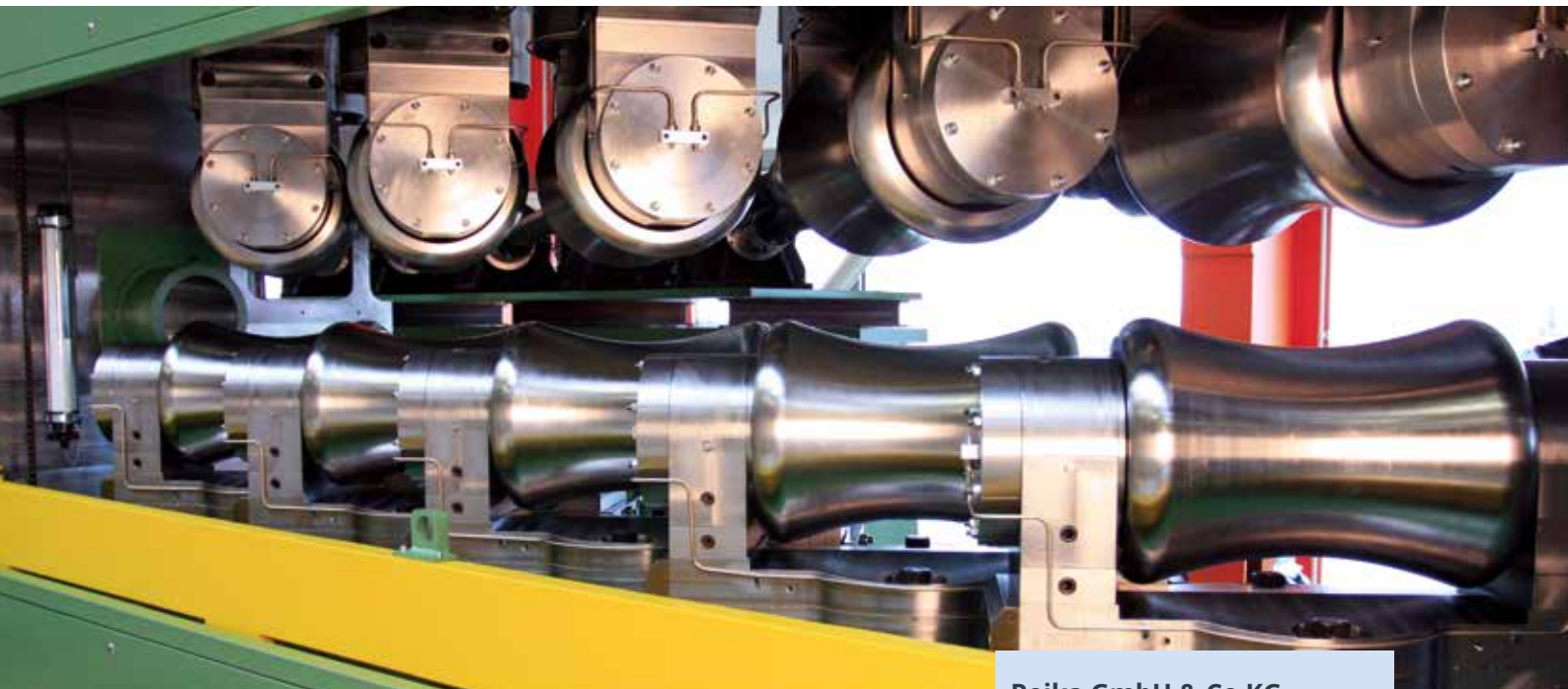
REIKA announces major order

It was a tremendous start into the new business year, with REIKA receiving the biggest order ever in the company's history. One of the leading manufacturers of seamless stainless steel tubes opted for Reika for their new tube and pipe mill.

The new mill will be equipped with a complete REIKA finishing line. Production start in the new plant is planned for 2023 outside Europe borders. Seamless stainless-steel tubes in the diameter range of 42 to 273 mm are the major production program on the fully automatic line, consisting of two parallel straightening lines

followed by a cut-off line and an API chamfering line. Once again, REIKA marked a success against international competitors. The rugged quality of the straightening machines with a straightness of up to 0.5 mm/m over the entire tube length as well as the enormous cutting performance of the RingSaw® were also convincing in this project. The entire finishing line will be supplied as a "turnkey" solution to ensure smooth and fast integration into the production process. The REIKA lines are simply convincing by providing durability, reliability and above all, customized solutions. With the lines' unique features, REIKA succeeds in expanding the companies' production in





a reliable and cost-effective way. Having this in mind, REIKA's Managing Director is also confident that "Further orders can be concluded with the stainless steel tube giant at short notice. Particularly within the seamless stainless steel tube sector there is great demand – apparently REIKA's experience in this sector for more than 50 years and our reference projects at Sandvik, Valinox, Chelpipe and Tubacex, just to quote a few of them, are well known. In other words, top quality tubes deserve top quality technology!"

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Huntingdon Fusion Techniques HFT®

Sustainable Welding

It is becoming ever more important to act sustainably to achieve efficient manufacturing during the welding process. There are many factors that have an impact on sustainability where the welding process is concerned.

Reliable welding equipment

Weld Purge Monitors® are an essential instrument to help obtain non-oxidised, zero colour welds by monitoring the oxygen levels when welding sensitive materials such as titanium, zirconium, nickel, stainless steels and low alloy steels containing chromium. Oxidation can lead to loss of corrosion resistance and a decrease in mechanical strength.

Many decades of design and expertise has gone into developing the PurgEye® range of Weld Purge Monitors®. These extremely reliable monitors can measure residual oxygen content as low as 1ppm (0.0001%).

Increased welding speed

Inert gas purging is now the preferred method to avoid contamination during welding. The use of an Inflatable Weld Purging System can reduce purging times dramatically, particularly as tube and pipe diameters increase.

PurgElite® and QuickPurge® are now the industry's standard inflatable devices. Manufactured from 1" (25 mm) right up to 88"

(2,235 mm), these systems reduce inert gas usage and therefore cost.

Creating high-quality joints

The use of Argweld Weld Trailing Shield® can provide inert gas coverage during the cooling process and thus avoid oxidation in high temperature zones. Trailing Shields® simply attach onto any TIG/GTAW, PAW/Plasma and MIG/GMAW welding torch,



PurgEye-API100-PHO-72C-SS-Weld-with-API100



PurgEye-API100-PHO-70C-API100-Display

For complete inert gas coverage, essential where complex geometry joints are involved, welding inside a Flexible Welding Enclosure® offers the user a further option. The use of Flexible Welding Enclosures® has increased significantly during development of the Wire Arc Additive Manufacturing process, providing a complete inert gas shield around reactive alloy materials.

Reducing costs

By striving for zero colour welds, companies can eliminate any post-weld cleaning costs. These costs can be very high. In some restricted access can even preclude effective post-weld cleaning.

Huntingdon Fusion Techniques HFT® are Weld Purging Innovators, Designers and Manufacturers with offices located globally.

Huntingdon Fusion Techniques HFT® invented the 'Weld Purge Monitor®' in 1975 and own all international intellectual property rights and registered trademarks.

Weld purging is the act of removing, from the vicinity of the joint, oxygen, water vapour and any other gases or vapours that might be harmful to a welding joint. Such gases may combine with the metal to form undesirable compounds that may reduce corrosion resistance or may be instrumental in creating cracks or other structural defects in metals.

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SIKORA AG

Efficient quality control at the end of the CV line

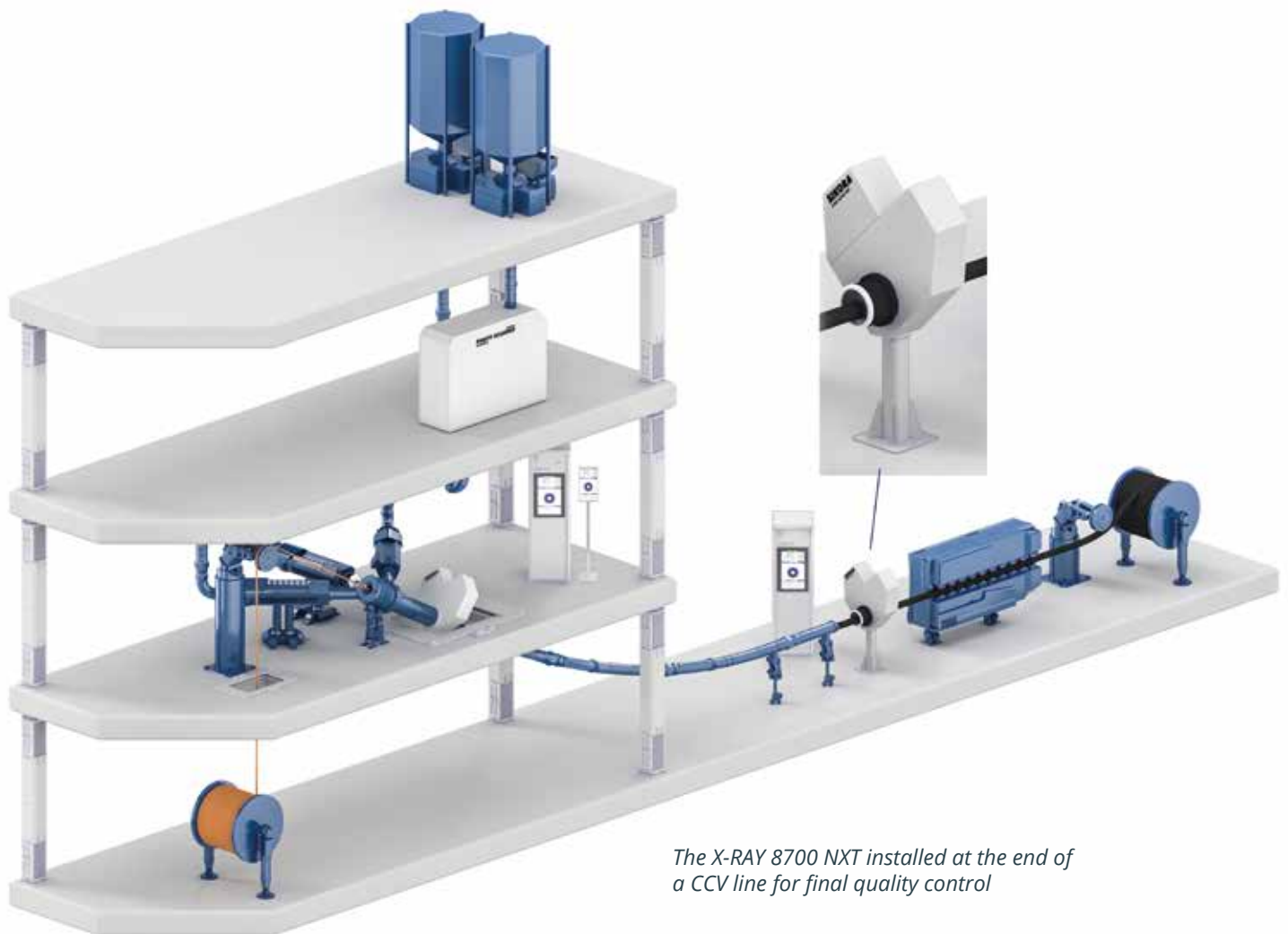
Ningbo Orient uses SIKORA's X-RAY 8700 NXT to ensure accurate cold measuring values in CV lines

For a continuous and reliable quality control at the production of medium, high and extra-high voltage cables as well submarine cables in CV lines, SIKORA's XRAY 8000 product family has set standards with more than 1,500 devices sold worldwide. The systems convince by precise and reliable measurements of concentricity, wall thickness, diameter and ovality as well as by

controlling cables with up to three layers.

Many submarine cable manufacturers, such as the Chinese company Ningbo Orient, rely on X-ray devices from SIKORA for quality control in CV lines. In addition, producers of power cables benefit from the final quality control as it ensures the highest quality of the cables delivered to their customers.

While the X-RAY 8000 ADVANCED/NXT provides information for a fast centering of the cross-head and an automatic control, the



The X-RAY 8700 NXT installed at the end of a CCV line for final quality control



Ningbo Orient uses the X-RAY 8700 NXT from SIKORA in its submarine cable production line for final quality control

X-RAY 8700 NXT measures the final product dimensions (diameter, wall thickness, concentricity) at the end of the production line. It is applicable for cables with solid and stranded as well as Milliken conductors with single, double or triple layer insulation. The X-RAY 8700 NXT is also suitable for quality control of insulation material based on polypropylene (High Performance Thermoplastic Elastomer – HPTE). The combination of the X-RAY 8000 ADVANCED at the beginning with the X-RAY 8700 NXT at the end of the line offers a precise determination of the shrinkage values for all three insulation layers. This assures an optimum process control for a perfect final cable.

SIKORA AG

SIKORA at wire 2022: innovative and sustainable measuring and control technologies (hall 9, stand A41)

- Online quality control of cables to increase quality, efficiency and sustainability
- Future oriented X-ray measuring technique ensures maximum material savings
- Premiere: extremely fast tension measurement of optical fibers with the FIBER TENSION 6003
- Interactive exchange in the "Solution Corner" – customer visions for a measuring technology of the future

At wire 2022 in Düsseldorf, from June 20-24, 2022, SIKORA presents a broad portfolio of future-oriented measuring and control systems for an efficient and sustainable quality control for the wire and cable, optical fibers and plastics industries.



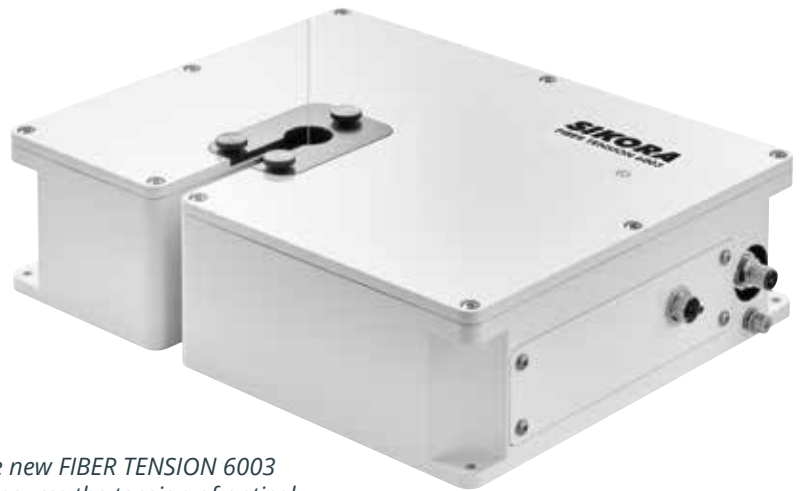
The X-ray measuring system X-RAY 6000 PRO ensures precise measuring and control of the cable dimensions for more cost efficiency and sustainability.

Numerous intelligent technologies, for example, for online measurement of wall thickness, eccentricity and diameter of cables, confirm SIKORA's claim to develop and provide innovative and sustainable measuring solutions for the global cable market. For almost five decades, SIKORA measuring systems have contributed to quality control and a simultaneous reduction of plastic material during cable production. This saves costs and contributes to a sustainable production. Up to 5 million tons of carbon dioxide are saved annually by using SIKORA measuring devices.

At wire, visitors can experience the performance of the measuring devices during extensive product demonstrations. One highlight is the X-ray measuring system X-RAY 6000 PRO that is used for the measurement of wall thickness, eccentricity, the diameter and ovality of cables with up to three different material layers, for example in insulating and jacketing lines. As a pioneer in X-ray measuring technology for cable extrusion, SIKORA has been setting trends for 30 years. The combination of the X-RAY 6000 PRO with the processor system ECOCONTROL 6000 allows for an automatic control of the wall thickness. By reducing the wall thickness by, for instance, 5 %, not only raw material consumption is reduced, but plastic material savings in the six-figure range are also achieved.

The quality of a cable starts with the pureness of the raw material. Thus, SIKORA also offers online and offline inspection, sorting and analysis systems for plastic pellets. By using inspection and sorting systems, contamination can be detected and automatically sorted out, breakdowns eliminated and material costs saved. Besides economic advantages, the environment can be preserved at the same time due to less waste.

With the premiere of the FIBER TENSION 6003, SIKORA widens its product family for quality control of optical fibres. The gauge head offers an extremely fast, reliable and precise tension measurement and control. Due to the high measuring rate of up to 10 kHz and the application of the birefringence principle, the stand-alone gauge head is particularly attractive for manufacturers



The new FIBER TENSION 6003 measures the tension of optical fibres in the drawing tower.

of high-end solutions. The FIBER TENSION 6003 is predestined for optical fibres that are further processed into premium optical fiber cables. The FIBER TENSION 6003 can be used for hot as well as cold measurement of the bare fiber.

Maintaining the availability and efficiency of the SIKORA systems at the customer's site is SIKORA's top priority. At wire, the SIKORA service team presents the entire range of its service portfolio. From installation and commissioning of the devices to consulting and training, always fitting to the individual customer requirements.

Turning ideas into innovations and product developments that achieve the highest quality, sustainability and cost effectiveness in the wire and cable as well as plastic industry is SIKORA's claim. The company emphasizes this at wire with the "Solution Corner". Customers are invited to personally discuss with SIKORA experts their ideas, visions and technical requirements on the systems for quality control for the future of measuring technology in a creative atmosphere. SIKORA's presence at the wire 2022 promises pure quality, innovation and sustainability.

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Messe Düsseldorf

Leading world trade fairs wire and Tube postponed to early summer New date from 20 to 24 June 2022 in Düsseldorf

Messe Düsseldorf postpones wire and Tube in consultation with the partners and associations involved to 20 to 24 June 2022. The currently very dynamic infection patterns and rapidly spreading Omicron variant have resulted in adjustments in the Düsseldorf trade fair calendar that require re-scheduling the wire and Tube originally planned for 9 to 13 May.

The new period offers more planning security and added value due to METAV held concurrently in part. This the leading trade fair for metal-working technologies was already postponed by VDW (German Machine Tool Builders' Association) to 21 to 24 June.

Wolfram N. Diener, CEO of Messe Düsseldorf, emphasizes the backing for the new

trade fair dates: "The tenor among our exhibitors is: We want and need wire and Tube – but at a point in time that promises the biggest prospects of success. Together with the partners and associations involved we regard early summer as the ideal period for this. We not only expect infection patterns to calm down but also more people to be able to enter the country and take part. This means exhibiting companies as well as visitors can do their business in an environment that is clearly less affected by Covid-19."

As the No.1 international trade fairs for their industries, wire and Tube have global appeal and require particularly long lead times. Traditionally, two thirds of all exhibiting companies travel to Düsseldorf from abroad every two years.

Trade visitors from over 80 countries meet at the Düsseldorf Fairgrounds at peak times. The new fair date from 20 to 24 June 2022 therefore now provides these industries with clear planning security.

Bernd Jablonowski, Division Manager of the overall Metals and Flow Technologies Portfolio at Messe Düsseldorf, is confident: "Planning security for exhibitors, visitors and the entire trade fair industry is the most important thing in the continuing pandemic situation. By moving the industries' two top events to early summer, we are enabling a secure live trade fair experience that is adapted to the situation."

Daniel Ryfisch, Project Director wire and Tube, adds: "I would like to thank our exhibitors and partners for their understanding and willingness to once again make wire and Tube with us from 20 to 24 June the industry highlights they have been

for more than 30 years at the Düsseldorf location."

Exhibitors at wire will present their technological highlights in exhibition halls 9 to 15, while Tube exhibitors will be in halls 1 to 7a.

The guest event METAV, International Trade Fair for metal-working technologies, will be held from 21 to 24 June 2022 in exhibition halls 16 and 17. The METAV is organised and staged by the VDW, German Machine Tool Builders' Association.

Press contact

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Optimize your production process with the inline measurement of the cross-sectional geometry of pipes.

Measurement characteristics:

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- OD / ID (mean, max, min)
- Eccentricity & Wall thickness
- Weld seam geometry
- Volume calculation (for optimal cutting before drawing)
- Longitudinal scratch detection



Tolerance deviation detected

1. outside ovality
2. eccentricity



Magnetic Analysis Corp.

Magnetic Analysis Corp. Acquires TacTic™ Ultrasonic NDT Systems

Magnetic Analysis Corporation, (MAC®) a designer and producer of non-destructive test instruments and systems since 1928, is pleased to announce the asset acquisition of TacTic™, a Division of Laboratory Testing Inc. (LTI), effective February 28, 2022.

Originally founded as TAC Technical Instrument Corp. in 1962, the company became part of LTI's operations in 2018. The acquisition will broaden MAC's range of NDT systems to include automated and specialized immersion, "spin the tube" ultrasonic test systems to detect surface and subsurface defects in round tube, pipe, and bar.

These systems are especially applicable to metal producers who are looking for a

cost-effective system to test small batches of material or frequent diameter size changes.

In making the announcement, MAC® President and CEO Dudley Boden noted that "This is a natural fit for us as we have partnered with TacTic™ for a number of years supplying our Echomac® Ultrasonic Electronics for integration with TacTic's systems. Both companies have a long history of helping metal producers achieve reliable, high-quality inspection that meets their specific needs and many of TacTic's customers are also customers of MAC.

Support will be handled through our existing field network of Engineers and experienced



Representatives around the world. With MAC's wider sales and support and the synergies with our existing customer base, we expect to be able to build this into a substantial product line for MAC, bringing this technology to customers around the world."

Commenting on the acquisition, Fred Beck, who has been serving as VP Sales for TacTic™ at LTI in recent years and is a son of TacTic's co-founder, Kenneth H. Beck, said "I am very excited about the future and will continue to play an active role in this new venture.

It brings with it many opportunities as both companies have developed established products that complement each other with little overlap. MAC's instruments provide a much-needed source for ultrasonic instrumentation designed for production testing of tubular and bar products.

Moreover, their domestic and international sales and service teams will allow TacTic customers to be served more efficiently. I am also pleased that our companies share a history of family ownership."

Beck will be assisting MAC during the transition as well as sharing his technical knowledge and years of experience during future sale activities. TacTic operations in Trevoise, PA will be moved to MAC's Elmsford, NY headquarters and manufacturing plant. In addition to expanding enhanced sales opportunities for TacTic systems, customers will gain the advantage of local support, service and calibration capabilities provided by MAC's global network of sales and technical staff. For many markets, MAC will also be able to offer the option of leasing, a choice that has not been available to TacTic customers previously.

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20-24 June 2022
Visit us in
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ITA India Chapter 2021

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Organised by **ITA** International Tube Association INDIA CHAPTER


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INFRASTRUCTURE FOR THE TRANSPORTATION OF HYDROGEN GAS THROUGH PIPELINES

FRIDAY, 27TH AUGUST 2021

HIGHLIGHTS

- 208** Attendees
- 399** Pre-Registration
- 1.5 HOURS** Interactive Session
- 8** Industry's Top Speakers
- 6** Detailed & Informative Presentations



Organised by **ITA** International Tube Association INDIA CHAPTER

Supported by **Messe Düsseldorf India**

INFRASTRUCTURE FOR THE TRANSPORTATION OF HYDROGEN GAS THROUGH PIPELINES



The ITA Indian Chapter organized on 27th of August 2021 a webinar under the headline "Infrastructure for the transportation of hydrogen gas through pipelines".

The hot topic and the interesting presentations attracted many specialists from the tube and pipe industry to join the webinar.

The reduction of greenhouse emissions by using hydrogen gas as alternative fuel to fossil fuels and the control of CO₂ emission by carbon capture technology is a viral topic of today. Hydrogen gas has been identified as one of the energy sources for future which require robust infrastructure and pipelines for transportation across

the globe. The carbon capture and its safe storage and transportation is very much important to control the climate changes of the world.

Dr. Jai Dev Singh Chandel VP from Jindal SAW Ltd. was the moderator leading the event.

The opening address from Mr. T.S. Kathayat, President of Welspun Group and President of ITA India Chapter was giving a comprehensive overview about the hot topic. The entire webinar with all presentations can be viewed at the ITA webpage (www.ITAtube.org).



Tube Southeast Asia 2022

13th International Tube & Pipe Trade Fair for Southeast Asia

One-stop gateway to Asia's thriving tube and pipe industries

Returning to Bangkok in 2022, Tube Southeast Asia – driven by the global expertise of Tube Düsseldorf, marks its 13th edition as Southeast Asia's leading trade fair for the tube, pipe and related industries in the region.

Since its inaugural staging in 1997, the specialist trade fair has set the bar as a trade-focused platform for international exhibitors to showcase their latest tube and pipe processing equipment and machinery, materials and solutions to key local and global manufacturers, suppliers, and service providers from the tube, metals, automotive, oil and gas, and other related industries.

Held alongside the synergistic wire South-east Asia 2022, both trade events will bring together some 400 exhibitors from over 30 countries, providing an attractive focal point and springboard for both international companies and local businesses wanting to make their foray into Asia's markets.

With its proven track record, Tube Southeast Asia has garnered consistent results for both exhibitors and visitors with its ability to:

- Address current and future demands by showcasing leading-edge innovations, machinery and technologies
- Connect top manufacturers and leading brands to active buyers and influential decision makers
- Maintain regional market-relevance by staying on top of global industry trends

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**5 - 7 Oct 2022
Bangkok**



Tube 2022

EcoMetals – So green is Tube 2022



World's leading trade fair Tube 22 in Düsseldorf offer ecoMetals trails through the exhibition halls

How green are the tube and pipe industries? How sustainably do they produce and how environmentally friendly is the handling of the materials used? These are questions that the new ecoMetals campaign wants to demonstrate in guided tours organized jointly by Messe Düsseldorf and ITA, International Tube Association.

During the Tube trade fair from 20 to 24 June 2022, trade visitors will be offered daily guided tours, so-called ecoMetals-trails, to exhibitors for whom the terms sustainability, energy efficiency and resource conservation are not just lip service but lived practice.

At their exhibition stands and at the ITA Stand, they demonstrate how new technologies, machines and systems in their production facilities improve the energy and carbon dioxide balance in order to minimize the company's ecological footprint.

Exhibitors also explain to visitors how they manage to reconcile economy and ecology in their production and process chains. This seems to be more important than ever in order to survive in international competition and to remain a sought-after business partner.

The meeting point for all free tours is the ecoMetals information counter at the North Entrance of Düsseldorf Fairgrounds.

Exhibiting companies can already obtain information on the Tube website at www.tube.de/ecometals or info@ITAtube.org and, if interested, register directly to take part in the ecoMetals trails at exhibitor@Tube.de or directly with Vanessa Mauch at MauchV@messe-duesseldorf.de or Cornelia Büsing at info@ITAtube.org





Discover new ways in value creation: The pillars of ecoMetals.

ecoMetals is dedicated to three areas of sustainability – with trendsetting answers, machines and products along the value creation chain.

Resources

How can raw materials be extracted in a more resource-friendly manner and processed more efficiently? What is the trend in material recycling from metal to plastic? What alternative raw materials are being used?

Production & Processes

In what way can better energy savings be achieved in production and processes? What does optimised energy controlling look like? How are emissions reduced and the climate-friendly use of renewable energies systematically controlled?

Innovation

Which new technologies, machines and plants will improve the energy and CO₂ balance? How do digital and industrial innovations contribute to a more optimal ecological fingerprint?



Trade fair visitors recognise the ecoMetals logo's excellent innovations: Products, processes and technologies in harmony with nature. The tour guides of the ecoMetalsTrails will lead you to the selected stands.



wire and Tube in summer 2022: Düsseldorf's leading world trade fairs profit from declining pan- demic situation



20-24 June 2022
Düsseldorf

The new trade fair date from 20 to 24 June 2022 promises the greatest possible planning security for exhibitors and significantly better travel conditions for trade visitors from all over the world. After four years without their leading trade fairs, the professional world will finally meet again live and on site in Düsseldorf to exchange information about innovations from the wire, cable and tube industries.

There are a lot of innovations on the Düsseldorf Fairgrounds - from end products



in fasteners and springs, an ecoMetals campaign with guided tours to exhibitors such as AMPCO METAL Deutschland GmbH, ARCELOR MITTAL COMMERCIAL SECTIONS S.A., Georgsmarienhütte GmbH, Klöckner & Co SE and SMS group GmbH, in whose production halls sustainability, energy efficiency and resource conservation have a strong emphasis, to expert meetings with keynote speeches by key players in the industries.

As the worldwide place-to-be for the wire, cable, tube and pipe industries, the exhibitors in June will present not only new machines and plants but also increasingly sustainable solutions for e-mobility, digitalisation and Industry 4.0. Start-ups with their ideas and cooperations in wire, cable, tube and pipe production complement the comprehensive range of products and services in the 13 exhibition halls.

The partial parallelism with METAV, leading international trade fair for metalworking technologies, results in additional synergy effects for visitors to wire and Tube.

Traditionally, wire and Tube are among the most international trade fairs in Messe Düsseldorf's portfolio. More than two thirds of the exhibitors come from abroad - exhibitors from 67 countries came to the 2018 pre-events. Trade visitors from over 130 countries meet at the Düsseldorf Fairgrounds at peak times.

The regulations in force in June 2022 concerning a safe hygiene and infection control concept for the Düsseldorf Fairgrounds can be accessed at any time at: https://www.wire.de/de/Besucher/Hygienekonzept_PROTaction_1. The latest information, press releases, industry and company news can be found at www.wire.de and www.Tube.de.



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Tube China 2022 - International Tube & Pipe Industry Trade Fair

Shanghai New International Expo Centre, Shanghai, China

26 - 29 September 2022



**26-29 Sept 2022
Shanghai**

Booth reservation is open for the upgraded Tube China 2022

As Asia's first influential international trade fair for the tube and pipe industry held last year, Tube China 2020 successfully concluded at SNIEC under the strict prevention measures on pandemic, providing effective experience reference for 2022 edition.

From 26 to 29 Sept. 2022, the 10th Tube China will be upgraded and set off another new milestone at Shanghai New International Expo Centre. The organizers Messe Düsseldorf (Shanghai) Co., Ltd. and MC-CCPIT will leverage their respective advantages to promote technological innovation, green and intelligent transformation, focus on industry trending topics and provide a professional trade platform to present the state-of-the-art products, technologies and solutions. Product categories are further expanded, focusing on the segmented fields of heat treatment, saw and laser cutting

Based on the product categories including tube manufacturing machinery, processing technology, raw materials, tubes and accessories, pipeline and OCTG technology, testing engineering, etc., the organizers have upgraded the previous pavilions of thermal process and sawing products and have established further refined concurrent exhibitions - THERMPROCESS China and Saw and Laser Cutting China.

Heat treatment technology changes the mechanical, physical and chemical properties of metal work-pieces, thus greatly improving the performance. Green environmental protection is important in the future development of iron and steel industry, and heat treatment related technology provides greater feasibility for low-carbon and environment-friendly steel production.

Therefore, holding THERMPROCESS China at Tube China 2022 aims to provide a solid communication bridge for heat treatment system and equipment suppliers from all

over the world. The metal and tube processing related products and technologies can be further derived and connect more dots of the entire industry chain.

Accurate cutting is an important part of metal and tube processing, the new upgraded and transformed collocated exhibition Saw and Laser Cutting China will not only showcase the sawing products and technical solutions but also add the laser cutting related machinery.

Positive feedbacks from exhibitors

Post-show statistics showed that 91% of exhibitors were satisfied with Tube China 2020. Despite the impact of the pandemic last year, the former exhibitors and new customers still show their confidence to the fair.

Mr. Zhang Luyao, President of Zhejiang Tsingshan Steel Pipe Co., Ltd., expressed his recognition of the exhibition: "Tsingshan steelmaking capacity is among the highest level in the world. It's the 8th time that we participated in Tube China. Here we can not only showcase the innovative products, but also enhance brand image."

Mr. Ma Jianfeng, General Manager of HIM-MELWERK China gave the feedback: "Since our company was established in Germany in 1950, we have been committed to the development and production of high-fre-

quency and ultra-high frequency induction heating equipment. We are very optimistic about the development potential of the Chinese market, so we chose to participate in the newly launched THERMPROCESS Pavilion at Tube China." With Tube China's good reputation in the industry and the rise in market enthusiasm, many former exhibitors have expressed their willingness to participate in Tube China 2022.

Professional buyers come to Tube China in flock

Tube China 2020 attracted 36,552 professional visitors and 49 high-quality buyer delegations (including the number of concurrent event wire China). Many of the buyers were from fortune 500 companies in automobile manufacturing industry, chemical industry, oil and gas industry, energy industry, aerospace engineering, construction industry and other application industries.

Tube China 2022 is expected to gather 46,000 professional buyers (including the number of concurrent event wire China) to discover new business opportunities with industry colleagues. Booths are open for reservation now, and we look forward to your participation in Asia's leading tube exhibition and explore a new era in the development of tube & pipe Industry. See you in Shanghai from September 26 to 29, 2022!

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Tubotech 2022

Brazilian wire, cable, tube and pipe trade shows wire South America and TUBOTECH will take place in 2022

TUBOTECH

**25-27 Oct 2022
Sao Paulo**

Brazil is still suffering badly from the consequences of the COVID 19 pandemic - there is no thought of opening prospects for trade fairs and other major events.

Therefore, the organizers of wire South America, Cipa Fiera Milano and Messe Düsseldorf, have decided to cancel the trade show for 2021 and postpone it to October 25-27, 2022.

The concurrent TUBOTECH, International Trade Fair for Tubes, Valves, Pumps, Fittings and Components, will also be postponed to this new date.

Originally, wire South America was to be held Oct. 5-7, 2021, at the Sao Paulo Expo Exhibition & Convention Center.

The Internet portals contain up-to-date information on both trade shows at:

www.wire-south-america.com and
www.tubotech-online.com.

Good reasons to attend

A success story: The International Trade Fair for Pipes, Valves, Pumps, Fittings and Components was launched in 2001 and has recorded an increase in floor space of 21% since then.

Competent audience: Approximately 12,000 trade visitors, mainly from the oil and gas, automotive, construction, metal construction and mining industries, will gather information on the latest technologies and current pipe processing products over three days of the fair.

Profitable markets: Tubes and end products are indispensable for the upcoming investments in the South American construction, automotive and energy industries. The interest in investing in Brazil and the entire South American market is growing and increases the prospect of good trade fair business.

Tube India 2022

Good reasons to attend Tube India

New date for Indian metal fair quartet wire India, Tube India, METEC India and India Essen Welding & Cutting: 23 to 25 November 2022, in Mumbai.

With pandemic uncertainties still lingering, Messe Düsseldorf India has decided to move the wire India, Tube India, METEC India and India Essen Cutting & Welding metal show quartet to 2022. The events, originally scheduled for Sept. 8-10, 2021, at the Bombay Exhibition Centre in Mumbai, will now be held there Nov. 23-25, 2022.

Thomas Schlitt, Managing Director of Messe Düsseldorf India, explains, "Our goal

remains to support economic recovery by providing a leading platform for conducting business safely and effectively through our trade shows. However, the current development of the pandemic situation does not allow for reliable planning for our trade fairs in India for the coming months. These circumstances make it impossible to hold the Indian Metal Fairs in September 2021. The decision to move the fairs to November 2022 was made after careful evaluation of the situation together with our partners and key stakeholders," adds Schlitt.

With this decision, Messe Düsseldorf India is honoring its commitments to its partners in the metals and metallurgy industry in India and around the world. "We trust that by 2022, global travel restrictions will be lifted and we will once again see a large international turnout given the international nature of the metals trade show quartet. We are grateful to all our partners for their continued support during these unprecedented times," adds Schlitt.

Interested exhibitors for 2022 should contact the following mail address: messeduesseldorf@md-india.com www.iewc.in



**23-25 Nov 2022
Mumbai**



**For more information,
visit the event websites at:**

www.wire-india.com;
www.tube-india.com;
www.metecindia.com;



Diary of world class tube events

April 2022

NEFTEGAZ
Moscow, Russia

neftegaz-online.com



Messe Düsseldorf Group suspends its business activities in Russia until further notice.

May 2022

2 - 5
May 2022

OTC
Houston, USA

2022.otcnet.org



May - June 2022

30 May -
3 June 2022

IFAT
Munich, Germany

www.ifat.de



14 - 15
June 2022

Stainless Steel World Asia
Singapore

stainless-steel-world-asia.com



20 - 24
June 2022

Tube
Düsseldorf

www.tube.de



August 2022

22 - 26
August 2022

ACHEMA
Frankfurt, Germany

www.achema.de



September 2022

26 - 29
Sept 2022

Tube China
Shanghai

www.tubechina.net



27 - 29
Sept 2022

Stainless Steel World Conference & Exhibition
stainless-steel-world-event.com
Maastricht, Netherlands



October 2022

5 - 7
Oct 2022 Tube South East Asia
Bangkok, Thailand tube-southeastasia.com



5 - 7
Oct 2022 METEC
Bangkok, Thailand metec-southeastasia.com



25 - 27
Oct 2022 Tubotech
São Paulo, Brazil tubotech.com



26 - 27
Oct 2022 Stainless Steel World Asia Conference & Expo
stainless-steel-world-asia.com
Singapore



November 2022

23 - 25
Nov 2022 Tube India
Mumbai, India www.tube-india.com



November - December 2022

29 Nov -
1 Dec 2022 Valve World Expo
Düsseldorf www.valveworldexpo.de



June 2023

12 - 16
June 2023 METEC
Düsseldorf www.metec.de



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Front page	€ 4,000.00	€ 2,280.00	€ 3,600.00
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Look at our next issue:

- Preview Tube 2022
- Preview Tube China 2022
- Preview Tube SE-Asia 2022
- Preview Tubotech 2022
- Preview Tube India 2022
- Preview Metec 2022



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