

The global magazine for corrosion resistant alloy users, suppliers and fabricators

# WORLD STAINLESS STEEL

**cover story:**

## Mannesmann Stainless Tubes: Diversity in Power

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Power Generation

# Mannesmann Stainless Tubes: Ready for the future



*MST is expanding its activities in the nuclear industry; recently it supplied flow elements and liner tubes to the Canadian CANDU power plant fleet.*

When Stainless Steel World met with the team at Mannesmann Stainless Tubes, the effects of the Covid-19 pandemic were still evident. From company HQ in Mülheim an der Ruhr, Germany, Christophe Le Rigoleur (Group Managing Director) and Patrik Schraven (Global KAM Power Gen) described how the company weathered the storm; and how it is expanding its already-dominant presence in the power generation industry. Pride in how their team triumphed against adversity, and gratitude to the solidarity of their business partners, was evident from the moment the conversation started. The team now feels ready to take on the world and whatever the future may bring.

*By Joanne McIntyre*

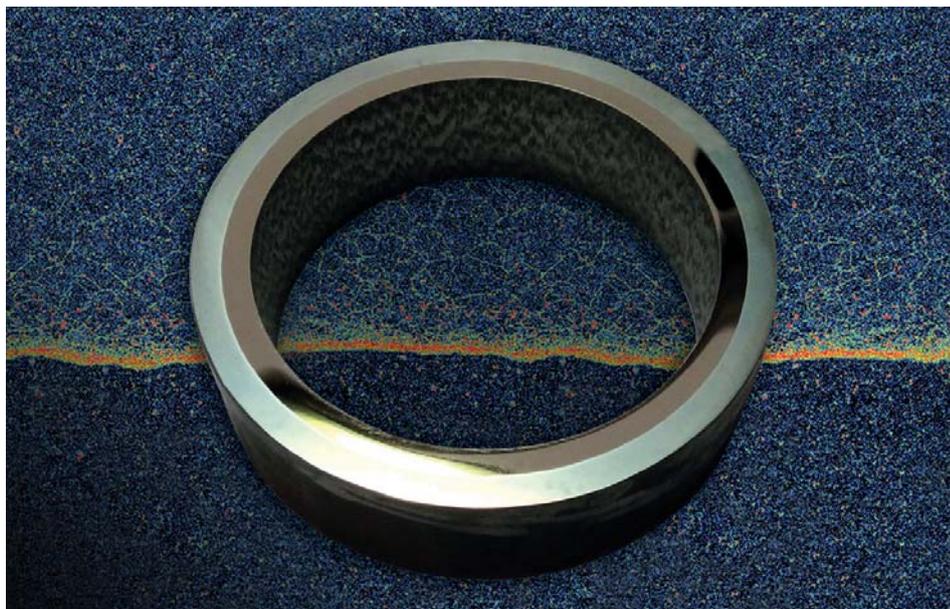
## **Back on track after closure**

Every company in the stainless steel industry has been affected by the Covid-19 pandemic, and the Mannesmann Stainless Tubes team openly shared the impact on their business.

“It’s clear that the pandemic took the world by surprise,” begins Mr. Le Rigoleur. “Our production plant in Costa Volpino, Italy, is located

in one of the most affected regions and was closed for three weeks before resuming activities with safety measures in place. Fortunately, our other facilities in Germany, France and Houston remained open. It’s thanks to the strong commitment and professionalism of our staff that we were able to be back working at full capacity across the company very quickly.”

Throughout those initial difficult first weeks, the MST team remained in close contact with their customers. “Our staff rapidly adjusted to working from their home offices when necessary, which allowed us to carry on almost as normal. As a result, the financial impact on the company was not as severe as we initially feared. This prompt reactivity and close customer communication enabled us to avoid a negative impact on our customer



*CoEx tubes are created during a hot forming operation which creates a strong metallurgical bond between the pipe liners and pipes.*

requirements while maintaining the business on a secure footing for the future". With production facilities working well, albeit within the constraints of the situation, the company quickly focused on rectifying any delays that were created and reached 'normality' by July. "We want to express our deep appreciation to our customers and employees during this time. We'd also like to particularly thank our raw material suppliers, who stayed in close contact with us and operated with solidarity and cooperation to alleviate any potential problems".

### **Investments in development**

Before the Covid-19 crisis began, Mannesmann Stainless Tubes was executing an extensive investment and development plan. "We recently made significant investments at our plant in Remscheid, Germany including the addition of a large cold pilger mill to increase both our capacity and capabilities," Mr. Le Rigoleur explains. "This is particularly useful for producing

OCTG tubing destined for the oil and gas industry."

Another investment was a state of the art straightener at the same facility. This almost fully-automated machine automatically straightens tubes and pipes, measures any deviations along the entire length and then corrects these by moving itself along the tube. The 1,000-ton machine can straighten tubes ranging from Ø 80 – 400 mm. "The cold pilger mill and the stamp straightener represent significant investments and will enable us to expand in both new and existing markets," explains Mr. Le Rigoleur.

The company has also improved its offering of small instrumentation tubing and invested in leading technology equipment for small-bore tubing production in Costa Volpino, Italy. This being complemented by the capabilities of our Issoudun, France (SOTEP) facility where we offer specialist tubes for instrumentation and process measurement. These improvements will allow it to offer greater flexibility to customers in this market.

The MST team expect the current depressed oil and gas prices to bounce back and are well-positioned for when the market recovers. "Until then, we will continue to work through our current backlog. Early this year we received some substantial orders which we will be working on into 2021."

### **Power generation expertise**

MST has a long history of serving the power generation industry. Today it is

widely recognised as one of the leading producers of tubes and pipes for USC (Ultra Super Critical) coal and lignite-fired power plants. The company offers a wide range of alloys for conventional power generation, including DMV 304HCu (1.4907; UNS S30432) and DMV 310N (1.4952; UNS S31042).

The in-house experts at MST have worked for over a decade on the next generation of power plants known as Advanced Ultra Super Critical (A-USC), which operate at temperatures over 700°C. MST has developed stainless steel and nickel-alloy power plant test loops for many notable projects including Coorettec, COMTES 700, GKM 725°C / HWT 1 & 2, the Japanese METI project, the Chinese TPRI qualification project, etc.

Mr. Schraven explains: "Every modern power plant built in the last fifteen years uses high-temperature superheaters. We produce the stainless steel and nickel alloys for these and have become the most experienced supplier, particularly with grades such as DMV 617 modified, DMV 263 and DMV 141. Despite the downturn in the coal-fired sector in recent years, there are still a significant number of ongoing and planned projects in China, Southeast Asia and India."

### **HRSG superheater tubing**

For the Heat Recovery Steam Generator (HRSG) sector, MST is globally the only company producing and supplying standard austenitic and nickel alloys as well as USC grades including DMV 304HCu (UNS S30432) in a single seamless tube length up to 30m.

## [ COVER STORY ]

This unique capability has led to the awarding of several projects for HTSG superheater tubes for both HL-class and 702F5-class gas turbines. “We’ve successfully delivered these tubes to fabricators in Korea, China, Mexico,” explains Mr. Schraven.

“While there is a limited number of modern combined cycle plants today, we expect that to change in the near future as combined cycle gas-powered plants emit less CO<sub>2</sub> per MWh than other fossil fuel power plants. Our ability to manufacture 30m seamless tubing means we are well-placed for this transition. We are currently in the middle of a trial and development project with a major combined cycle OEM to develop the next generation of HRSGs in Ni alloys.”

### Development of CoEx solution

For many years MST has produced tubes of two dissimilar metals which are cold pilgered together; for example, a zirconium liner inside a stainless steel tube for fertiliser applications. The cold process means that no metallurgical bonding diffusion takes place. However, the company has now developed a range of CoEx (Co-Extrusion) tubes, a hot forming operation which creates a strong metallurgical bond between the pipe liners and pipes.

“CoEx joining produces an excellent metallurgical bond,” explains Mr. Le Rigoleur. “It’s particularly useful for joining stainless steels, nickel alloys and other alloyed steels with carbon steel.” Depending on the application the alloy steel may be used on the interior or exterior of the CoEx pipe. Applications include the oil and gas, pulp and paper, power generation and automotive industries.

“We see good potential for CoEx tubes. The technology was developed



*The addition of a cold pilger mill for large diameter tubes at the Remscheid, Germany plant has increased both capacity and capabilities.*

together with our research institute, SZMF (Salzgitter Mannesmann Forschung GmbH) using numerical full process simulation tools to optimise the deformation process.”

*“We want to express our deep appreciation to our customers and our employees.”*

### Biomass and waste-to-energy

MST is a proven supplier of superheater tubes for corrosion critical applications, from standard and optimised grades such as DMV 347HFG (1.4908; UNS S34710) to the more specialised DMV 310N (1.4952; UNS S31042) and DMV AC66 (UNS S33224/ EN 1.4877). DMV AC66 was developed primarily for use in waste-to-energy plants and is today the ‘standard’ material for those and biomass plants.

“An important milestone was the development of A625 weld overlay on a supercritical austenitic stainless steel for Ultra Super Critical applications,” explains Mr. Schraven. “This created a product with exceptionally high corrosion resistance capable of withstanding high steam temperatures. Many waste-to-energy and biomass plants utilise weld overlay on carbon steel or alloyed steel because the process temperature is not high enough to require an austenitic material. However, there is an increasing tendency for operators to increase the amount of energy they produce by raising the operating temperature. The resulting higher steam temperatures create oxidation on the inside of the tube, and therefore we expect a move to use austenitic stainless steel base tubes.”

“We’re currently involved in a project with German waste-to-energy boilers to test the limits of various alloys to develop a customer and application-driven solution.”

There are three different types of biomass plants in use, Mr. Schraven explains.

“Firstly, coal-fired plants which have been refurbished and converted to biomass plants; we have quite some experience with these, particularly in Scandinavia. Secondly, there is a growing tendency, particularly in Europe, to mix coal or lignite with Refuse Derived Fuels (RDFs). The chloride and/or sulphur content in the fuel creates a higher corrosion rate; we are testing and optimising our alloys to withstand this highly corrosive environment.”



*MST is developing high-performance tubes to replace the nickel alloy welded tubes currently used in solar salt receivers.*

“The third type of plant, and one project for which we recently started testing our alloys in the boilers, is burning sewage sludge for energy. The sludge contains a high level of phosphorous, making it a challenging environment for materials.”

### Nuclear power generation

The past two years have seen MST increase their activities in the nuclear power generation industry, for which they produce all tubes and components required for a nuclear power plant – including in-core tubing – with the exception of the steam generator.

Mr. Le Rigoleur: “Traditionally we have focused on the French and American programs, and receive regular orders for European nuclear new build, replacement and repair, with RCCM certification and ASME III qualification. However, we are increasing our activities and geographical footprint in this industry. We recently supplied flow elements and liner tubes during a significant revamping of the Canadian CANDU power plant fleet. We’re also developing our presence in the Russian sector, which is a new area for us.

Additionally, there is good potential in the Indian nuclear industry, and we anticipate that it could develop into an important market for us. The French industry has ambitions to supply India with its EPR technology in future, and we’ll be well-positioned for this.”

“Despite the issue of dealing with the waste, the world’s emphasis on reducing CO<sub>2</sub> emissions will lead to positive developments for the sector. With Hinkley Point approaching completion in the UK, the next project, at Sizewell, is already under discussion. In France, there is talk of renewing the nuclear fleet with new EPR plants.



MST has a great deal of expertise in this business, and with the complete size range of products in our portfolio, we can offer the whole spectrum of products for this application. The products we manufacture range from straight tubes for in-core neutron flux measurements up to 43 meters in length, to components like thermal barriers for the primary cooling pumps.”

### Solar receiver development

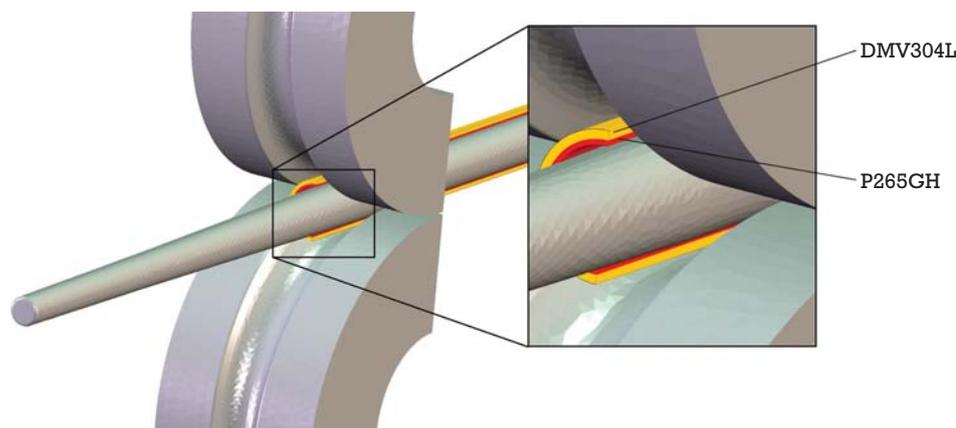
MST began delivering solar receiver tubes in 2009, starting with the Samcasol 1&2, La Florida, La Dehesa and Gemasolar projects. Mr. Schraven: “At that time, thermal oil inside transferred the radiant heat. Today’s technology increasingly uses molten salt inside the tubes. Once heated, the salt retains the energy for use at night or when the sun isn’t shining. The stored heat is converted via a heat exchanger to produce steam and run a turbine. Therмосalt is a fairly corrosive media, and we’re developing a new stainless steel seamless solution to replace the nickel alloy welded tubes

currently used. Two research projects are ongoing with DLR (Deutsche Gesellschaft für Luft- und Raumfahrttechnik), a German state-owned company, to test materials for this application and innovative designs of the solar receiver.”

“The solar sector continues to develop rapidly on a global scale, and in future, it will have a significant impact. The advantage of Centralised Solar Power (CSP) versus photovoltaic (PV) is that the molten salt process can store the energy overnight and run the turbines 24 hours per day, whereas PV only works when the sun shines. We believe there will be ongoing development both technically and commercially for CSP.”

### Conclusion

In conclusion, Mr. Le Rigoleur returned to the lessons learned from the Covid-19 crisis. “The incredible reaction of our MST staff and business partners to the situation was a golden opportunity to witness how solid our organisation is; even in the worst affected location, we were able to stay in contact with our customers. We were able to maintain our order book, while the staff organised themselves quickly to continue working and serving our customers. I’d also like to give a special thanks to our raw material suppliers who displayed true team spirit to ensure continuity of supply. MST is now confident that no future upheavals will halt work here. We’re ready for whatever the future may hold.”



The company has the resources of SZMF (Salzgitter Mannesmann Forschung GmbH) research institute at its disposal, including full process simulation tools.

### Coming up in September...

Don’t miss the Mannesmann Stainless Tubes technical case study on Mannesmann H2 ready© which will appear in the September issue of Stainless Steel World.