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**Guillaume Mehlman
on trends in steel
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Guillaume Mehlman

“We don’t just talk about it, we do it!”

Guillaume Mehlman, president of Fives’ Steel & Glass division, has brought years of engineering project experience in energy, metals, and public rail transportation to his role. Richard Barrett asks him about his priorities and where Fives technology fits into a changing landscape for steel production and trade

In a world in which there is overall overcapacity in global steelmaking, the demand for any means by which a steel producer can cost-effectively gain a competitive advantage has become more acute. One method of staying ahead of competitors is to deploy new production and processing technology of course, used to differentiate the companies investing in it from others in ways such as being able to offer a wider and more flexible product range, higher quality finished products and faster delivery.

With its headquarters in the heart of Paris – nestled on a side road in the 9th arrondissement, a district that includes the magnificent Palais Garnier opera house and the famous flagship store of Galeries Lafayette on Boulevard Haussmann – Fives is a global industrial engineering group with several divisions that supply machines, process equipment and technologies to make a difference.

President of Fives’ Steel & Glass division, Guillaume Mehlman has a 30-year history of working in a series of major engineering and materials businesses. Armed with a Master’s degree from École Polytechnique, obtained in the mid-1980s, he completed a PhD in Fluid Mechanics from the same establishment while working as an R&D engineer for EADS Defence & Security.

A move to Cogema Nuclear Fuel Processing followed, where he successively

headed engineering and then became a project manager – an important role given its location in a country for which nuclear power delivers about three-quarters of the nation’s electricity.

In the early 2000s, further senior roles followed, including the post of managing director of Alstom Transport’s Le Creusot plant in France, and a similar position in industrial operation at the head of Areva’s special metals business. A switch to the US at the beginning of 2011, as Alstom Transport’s senior vice president North America, based in New York, saw a four-year period overseeing a \$350 million business supplying rolling stock, services, signaling and railway infrastructure.

Five years ago, he returned to France as managing director of GE Power Services in South West Europe, before joining Fives in November 2016.

“It’s really been about learning new things and challenging myself from one position to the next,” said Mehlman. “It is what I would call a horizontal career path going from a more fundamental technical background to more operational management type responsibilities,” he explained. “It’s been very exciting and over the past ten years has involved more exposure to sales and business development,” including those few years back to his original culture while based in the US, where he grew up.

“I would say that characterizes me – two sides of the brain – a more American one,

which is practical and has a down-to-earth approach to business, and something a little more analytical, strategic and conceptual, which is coming from my French upbringing and education,” he summarized.

Mehlman sees the variety of industries that he has worked in as an advantage. “I think that helps me to understand the business issues, the technological, the operational, the project and contracting issues from that exposure to energy and rail,” he said. He was a special metals manufacturer for a few years in zirconium, competing against companies like Allegheny Technologies, Westinghouse, some Russian players, and partnering with companies like Sumitomo’s ZircoProducts in Japan. “It was an interesting time on the manufacturers’ side of the technology,” he recalled. Apart from a few medical applications for pure zirconium, its main market was in Zircaloy for the production of nuclear fuel.

It was a role that, in hindsight, hinted at his future career. “I was even using some Fives technology – Bronx straightening equipment – so I can vouch for the quality of the machinery!” he smiled.

“Areva was really interesting in the first part of my career because it was a process industry and it was about big projects. That is where I learned about project management and contracts, and 20 years ago it was a lot less complicated than it is today with public





Two continuous galvanizing lines implemented at Baotou Iron & Steel Group in China

acceptance and regulatory issues that have made the industry a lot more complicated,” he recalled. “You could really deliver industrial assets in a short time and be focused on what you were bringing to the performance of your projects. The industry was not as complicated back then... It was a good school for me in projects.”

Main priorities

Of the 8,700 people in the Fives group, just over a thousand are for steel, spread across ten locations, including Spain, Italy, UK, several in France, China, India and the US.

Mehlman explained that the main aim of the Steel division of Fives is to be able to maintain a competitive edge against the big players in the industry. “We’re not as integrated upstream as the big players are and so we have to focus on bringing value through technology and services for customers, where our big competitors can play and leverage on other aspects; and they serve clearly the upstream part of the industry whereas we are more on the downstream products.

“So that is a constant focus and objective of mine to really think where are we going to take the technology and keep being in a position to bring something different or better,” he stressed. That focus includes services and bringing “really different innovative technology.”

Although Fives is not a ‘full-liner’ like some of the largest international metallurgical plantmakers, as a group it serves a wide variety of different industries, including aerospace, aluminium, automotive, cement and minerals, energy, glass (for which Mehlman also has responsibility), logistics as well as steel.

“We find opportunity in crossing over resources, from an operational standpoint, to manage and cope with the up- and

down-cycles of the various industries. And also for technologies in some instances where, for example, the aluminium business has benefited from innovations for cement – in crushing machines to prepare material for making anodes,” he noted.

The company is also investing in 3D printing to the benefit of different industries. “We see applications in some businesses like burners for steel or glass in furnaces, where we can develop new technologies because we have that 3D printing business within Fives.”

He summarized that there are two aspects to leveraging advantage from serving multiple industries: “One is resources – because basically our DNA is project management in B2B mode for industry – and the other is in crossing-over technologies.”

Managing change

Mehlman has overseen multiple changes since he joined Fives’ Steel & Glass division two-and-a-half years ago, one of the biggest of which has been to address markets outside China. “I think we enjoyed a glorious decade for the steel sector in China and it was a very good period for Fives – we had a good market share there – and we served some of the largest steelmakers,” he recalled.

The geographical pattern of demand for plantmakers has now changed. “That is one shift that we have made within the past two years – addressing the US market, and now the European market where we see investment. And that means changing ways of doing business,” he noted.

“The other aspect is that we’ve managed to bring some really innovative technology to the market in the last two years. I would say, for example, our transverse flux induction heating technology, where we have brought into the market some very new and important

breakthroughs. And in our cooling technologies for strip processing lines we’ve made very important market introductions,” he added.

Customers in China are usually provincial- or state-owned customers. “The way of managing projects, sharing scopes and responsibility, and of executing the projects is quite different from what it is for the markets of Europe or North America,” Mehlman explained. “They [customers in China] will take on more local scope themselves. It is a reflection of local capabilities and the fact that they have their own in-house engineering companies for the most part in the bigger companies, with their own capabilities. They can manage all of the balance of plant and some of the process equipment, which means that we’re much more focused on the core process equipment or technologies.”

He said that Chinese customers’ way of managing contracts is not as demanding as it might be in Europe or the US because the culture and the way of doing business is a little different and based more on informal agreements that enable difficulties to be overcome. “Execution is full of difficulties and there is a different way of addressing them in China than in Europe or the US,” Mehlman noted. “So it means that you have to adapt to that in your way of managing a project. The contract and your contractual requirements are different than in Europe or the US.”

Strategic workshops

Fives’ Steel division echoed the long-established historical growth through acquisition of the Fives group when it bought from FAGOR the coil processing technology business RDI-Met in Spain earlier this year. “The objectives were to expand our capabilities in mechanical engineering, to expand the supply base and the talent pool and the portfolio of products.”

Mehlman said that RDI-Met is a nice fit with Fives’ other companies in steel. “They complement each other very well, which is why we made that move,” said Mehlman. “So that also adds a little more into our portfolio. They have done organic coatings and some co-lamination projects, which is big in the industry now, and it seems to be a big value-add for our customers with the end-users. They had those interesting references, which we think will be useful for us in the next few years.”

The challenge for plantmakers of how to achieve the right balance between maintaining their own in-house workshops and outsourcing manufacturing work is a longstanding one. “The question still goes on!” said Mehlman. “I think we’ve made some moves over the past few years and I think that

we're more confident now and more comfortable with the idea that we don't necessarily need to have our shops – in the mechanical area as opposed to the heat treatment," he explained.

"We act more like final assemblers and so we shop for a lot of the same basic components. And we are able to source those, bring them altogether in one location, do a final assembly and make sure that everything is right before it is shipped to its final location."

"I see that several of our subsidiaries in Fives work exactly with that model and they are managing the quality, the cost and the competitiveness, and the time delivery because you have to take all those factors into account," he added.

"It is working for us now and it is a shift that we made in the past 2-3 years. And that is the way we operate for several of our equipment makers in steel and so we are comfortable with it," he said.

"Where we feel it puts us in a more delicate position is in the emerging markets, where our competitors may have their local shops," he added. "Within those markets they are really able to control the quality locally with their management, and benefit from a very low cost base. I'm thinking of countries like India or in South-east Asia where some of our competitors have workshops."

He summarized that in some emerging markets the question is still open: "I don't have a definitive idea and there are probably several ways to 'skin a cat'."

Mehlman reiterated a differentiation between mechanical and heat treatment equipment. "In heat treatment projects it might be a different story there, because you're going to be a lot more in fabricated structures, refractories, and really the technology is just the combustion and control systems. The core technology can pretty much be imported from anywhere but for the furnace itself it's another operating model and another footprint that will be adopted. For that kind of market segment, you probably will not need your own in-house fabrication capabilities but rather local qualified workshops and construction partners."

Better market balance

Mehlman said that business has been good for Fives' steel activities for the past two years: "I think we've seen a rebound after 2016, which was a very slow year. We see strong investment in the US as the steelmakers there are enjoying good profits. We figure that there is about 10 million tonnes in finished products capacity that will eventually relocate to the US, which will take 3-5 years, so we are enjoying that wave of investments," he said. "We are into year two at least of that cycle. How long

Leveraging human capital

Fives provides a small but important service through consultancy and operational guidance.

"We do it with a number of key individuals and experts – a limited number – it takes 10-20 very good people that have been metallurgists and that have been carmakers," said Mehlman. "Those people that have been operating lines and developing products – or on the carmaking side developing cars with new steel grades – bring together such intelligence and expertise to our end users that it is of huge value to us."

"It helps them to develop their products in turn, and to better operate their process. It helps them create operational efficiencies, mainly in quality and in yield, and they value that very

that will last is probably at least another couple of years. We see something like 10-12 continuous galvanizing lines being built over the period of 3-4 years."

Last year, Steel Dynamics in the US contracted Fives to design and supply a complete 400,000 tonne per year continuous galvanizing line (CGL) No. 3, which will be dedicated to producing unexposed automotive steel grades, as well as other commercial and specialized steel grades for its Columbus plant in Mississippi. Earlier, the same plant contracted Fives to upgrade its CGL No. 2. The revamped line is due to be running by November this year.

"We're hoping to continue and follow on those successes, but that [extra capacity demand in the US] is not going to last forever," Mehlman observed.

"We have been very successful in China and we are still very much engaged there, but we see the pace of investments slowing down with less projects. We still see one or two lines being invested there every year. We see those investments lasting for quite a while – several more years – because there are strong drivers for that such as upgrading quality, relocating sites outside the cities, and meeting the new environmental regulations. China remains a very important market for us."

"When you put all that together, we see sustained investment – even though it's at a lower level than it was a few years ago. Sustained still for several years," he added.

He said that business in Europe is much more about upgrading and renewing capacities and going to the most advanced steel grades. "So it's a different approach to the business there. There is more of a demand for technology and there needs to be a better

much and they ask for it. It is also the thing that often makes the difference in selling, rather than bringing a line and being a plantmaker with the hardware, bringing those few individuals for 6-12 months during a start-up is huge value for us and our customers."

He said that even in western markets there is much value in that: "Working on steel grades, on coatings, on how to ramp up a line and test prove it. So we take a lot of care over that business – it is a small team, for which we hire very good people and let them be consultants with a lot of freedom. They have part of their time devoted to supporting the new capital projects and part of their time when they do consultancy." He concluded that it is important that they have that mix.

understanding of the process, of the metallurgy and of the latest technologies and how they can be applied, so that the steelmakers can be on the leading edge of the products."

The overall picture is healthier for Fives' steel activities, he concluded. "We see the business is good because it is much more balanced than it was before, with different regional markets to serve, and it's better for us to manage loads, resources and expertise to serve it. It is a much more interesting time and a better time than when it was much more focused on China a few years ago."

Advancing technology

Mehlman observed that steelmakers are trying to push the heat treatment cycles to develop higher performance products and find ways to introduce more operation flexibility to manage the extended product mix. "This entails steeper heating and cooling rates. That is where the technology comes into play, whether it is through induction heating to achieve the flexibility they want when they switch over from one product to another, or to manage the most advanced metallurgy and heat treatment cycles, where you might need a very high heating rate and a very steep and controlled cooling rate, followed by reheat right after, before galvanizing," he explained.

He elaborated that both heating and cooling technologies are the ones in which Fives has to be creative, "Where we have to bring the most flexibility and performance." He said that those are the two main areas where the Steel division has focused a lot in the past years.

Fives invented a new generation of rapid cooling technology, called FlashCooling[®], 20 years ago – a dry technology using hydrogen. "I think we pushed that to the limit with 40 ▶

Eyeron quality management

Fives' Eyeron™ is a real-time quality management technology. It has been installed at Russia's Severstal on a steel shop, a hot rolling mill and a plate rolling shop. It follows the complete process route from the steel shop and uses all of the data from along the process to qualify products automatically. "There are process models (a furnace, a skin-pass, etc.) and a lot of data management involved, but you also have to introduce all of the quality rules and all of the metallurgical models of the steel producer," Mehlman explained. "You have to work closely with the quality and product departments [to identify the

references at very high hydrogen content (up to 75%)," said Mehlman. The company has also invented a new wet cooling technology, called Wet FlashCooling®, "where we apply a two-phase liquid/gas spray at very high yet controlled flow rates to achieve even faster cooling of 1,000°C/sec.

More recently, Fives developed a breakthrough wet cooling technology by using other liquid solutions in order to control the strip non-oxidation. Wet water cooling is generally oxidizing the strip, but Mehlman says that Fives is able to counter that and bring value to steelmakers by maintaining non-oxidized sheet metal. "Today, we're able to bring tremendous value to the steelmakers thanks to this new non-oxidizing Wet FlashCooling® technology. It is really revolutionary for them because it means they can process new AHSS grades in galvanizing lines – save on steel metallurgy, conversion costs and pickling costs," he stressed. A contract for one such plant has been placed already and will be commissioned this year.

"Those steelmakers in mature markets such as Europe or North America are interesting for us after the recent years of significant investments in Asia," Mehlman noted. "China would tend to want the best technologies proven, but some of the mature players that understand the value to them are willing to take and bear the risk and introduce those new technologies we are developing. They can evaluate how those technologies can apply in the market, assess them and test them with us," he explained. That kind of approach helps to advance the whole industry.

"One market where customers value technology very much – and are ready to go and be first – is Japan or South Korea," Mehlman added. "For the induction heating, Japan is a market where we have been able to

quality criteria and rules]. You have to introduce all of that in the system, so we've got the interfaces to do that. You bring together all the process information – the whole route – and all the quality management knowledge of the operations at the steelmakers and you have a real-time quality management tool. It's qualifying the products automatically to determine which products are good and to determine which need to be reallocated to another order in real-time."

Mehlman added that Fives is going to some of the more mature steelmakers, such as in South Korea or the US, to develop the technology further.

quickly introduce our latest induction technology. The steelmakers understood that it was the first of a kind which opens new avenues for them to develop higher performance products and we were able to develop and improve the technology together."

The technology is based on the transverse flux induction for heating – where the electromagnetic field is applied through the strip transversely rather than through a conventional longitudinal orientation. Fives has now sold it for several projects in China, the US, Japan and Russia.

"That dynamics has happened in less than two years," Mehlman highlighted. "So the market sees these technologies as kind of breakthrough for their product development, and sees its value. It means more heating power density and more temperature gradient control. It means faster heating rates (up to 400°C/sec) and higher overall annealing temperatures (up to 1,000°C). The industry sees that very quickly and all of a sudden there is a big demand for that. That is another example where we bring some very innovative technologies – and that example started in the US and Japan."

Environmental aspects are a crucial factor for performance and competitiveness for the steel industry. Mehlman noted that Fives was one of the first designers of capital goods to formalize its eco-design program – Engineered Sustainability® – which meets strict and transparent specifications.

For example, he added that the Stein Digiflex® furnace for strip processing lines from Fives was awarded the Engineered Sustainability brand for its eco-design features for its environmental performance. The combustion system of the furnace is able to achieve up to 80% burner efficiency and reduce NOx emissions to less than 50 ppm.

Industrial waste heat recovery is an important focus for Fives.

Enabling digitalization

The terms industry 4.0, the internet of things, big data and digitalization have lost their novelty, having been discussed at length over a number of years now, but that certainly does not mean that they have lost any of their importance. "We don't just talk about it, we do it!" Mehlman exclaimed. "We tackle it in a really meaningful way, because we really do it."

He gave several examples, the first of which was the automatic pilot on a galvanizing line. "Until now, people have been managing a furnace on a processing line by having someone in a control room with a level 2 computer, and an operator working to the calculated set points to manage the furnace. The approach is pretty much the same on the air knife and the skin-pass mill: the operator and the control system are basically not taking into account any of the upstream metallurgy nor are they taking into account the combined effect of the individual setpoints on the different key process steps on the overall outcome in terms of product quality and yield – the state of the incoming coil, how it was hot rolled, the metallurgy and the mechanical characteristics. The operator is not using them. That is the way it operates today."

Fives is developing an automatic pilot for a line. "We're working on the first project where we are doing that, with all the process steps combined together," said Mehlman. "Basically the computer is going to use, from the data management system, the mechanical characteristics of the coil that is coming into the line after cold rolling, and it will adjust all the parameters for the furnace, the zinc pot, the air knives and the skin-pass automatically, in an optimized manner to achieve the best outcome in terms of product quality and yield. It's a true automatic pilot on a smart line."

The first one will be going into service this year and is being developed in cooperation with Italy's Marcegaglia. "It is in the final stages of development and is due to go online this summer," said Mehlman.

He gave Eyeron™, a real-time quality management tool, and furnace control systems (see boxes) as two further examples of digital technologies developed by Fives.

Service, upgrades, revamps

Fives has processing equipment installed at well over a hundred steelmaking sites, so servicing that installed base fleet is a significant part of the business. "Service in general represents about a quarter of our sales,

which is not huge, but it's pretty good. We could probably do a little more," said Mehlman.

For the installed fleet, upgrades outnumber revamps, he added. "We have big jobs where we even revamp lines where we are not the OEM, but there are lines that have been running for 20-30 years. What I like to see is the noble part of the services where we increase the value of the asset through an upgrade."

He provided the examples of upgrading a combustion system, or the control system, or of delivering a more flexible system so that the customer can deal with a bigger, broader product mix. "There is a lot of that going on in Europe, and the US also, but not so much yet in China," he observed. "But I think the Chinese market with the installed base there that is nearing 20 years is coming to a point where we see these opportunities now in China."

As a former plant manager himself, Mehlman is sceptical about the merits of externalized predictive maintenance through third-party software and monitoring. He said that he knows that there are proponents, and that there are digital solutions to do that. He has looked at it in different industries, but added that it is something that he is not really pushing on because he believes that other applications of digital technology are of much greater value and nearer to becoming reality now.

He also explained that for the processing lines in the downstream part of steel production, reliability issues are not that complicated. "We've got motors, we've got fans, we've got burners and valves that are never threatening to stop your process, and there is plant maintenance in place already for the zinc pot on a galvanizing line in general."

Predictive maintenance for the applications that Fives serves is consequently not generally as critical as for some of the other segments of steel production or as it is in other industries, where they are at risk of having a major unplanned stoppage if a critical component fails: "I don't see that on the downstream processing of steel products."

Reducing downtime

Automation to reduce downtime is something that Fives' customers often request now. "We see a lot of interest around how to better serve a cold rolling mill, like our reversible mills for stainless," said Mehlman. "The customers are asking for automatic solutions to reduce the downtime for the changing of the rolls, so you can save probably a couple of shifts a week. That is huge for them."

Innovation is needed to meet that demand. "That is about automation and finding

Payment for furnace performance

One of Fives' applications of digital technology has enabled it to start entering into contracts based on performance.

"We have successfully for the first time delivered performance-based contracts on energy savings. We go to see steelmakers that are using reheating furnaces without a smart control system and we commit to an improvement on the energy efficiency. The longest discussion is about agreeing on a baseline, which has to come out from the software we are delivering," Mehlman explained.

solutions to handle things that are very heavy like rolls, automatically, precisely and without damaging them," Mehlman explained.

"There is a little more Industry 4.0 there in terms of robotics and handling those objects."

He said that Fives is developing that with several prospects in mind: "That is more the stainless steel and electrical steel industry where they are trying, because of the demand now, to reduce their downtime and increase their capacity. It is a different area of technological development."

Long-term partnership

Mehlman concurred that there is a general business trend for companies to form a long-term partnership with customers and for suppliers to aim to become an integral – and as far as possible indispensable – part of the way that their customers do their business. But developing a long-term relationship with a customer is quite difficult on the hardware side, he noted.

"It is more about digital or software solutions," he added. But even then, he pointed out that customers are becoming very mature about these issues and can be very wary before they engage in exclusive arrangements for the long run. For example, "There is a lot of diligence that they do on how you will deal with them in the long term, how much freedom they will have with the software." He said that they ask all the right questions to retain their freedom and their rights.

For emerging markets, Fives is thinking of developing a version of Eyeron that would be helpful for newcomers to the industry making construction steel or long products. Mehlman says that Fives has not developed that to the point where it can push something to the market, but he believes that there is a case to be made for such a product.

"It is about the technology. First, you develop it for the most advanced customers.

"The end-user has to feel comfortable that the software we have delivered that is showing him his baseline without any smart controls is the right one and reflects reality. From that baseline we bring in the control systems and we measure the value that is generated by energy savings, and we share that with the customer."

Fives has such a contract for a customer in Europe, which started a couple of years ago. "We are now seeing the revenue from the energy savings," said Mehlman. "The target there is old furnaces because there is obviously a lot more benefit."

Then you take it to such a level of optimization that you can actually simplify it and package it so then it will apply to those markets, at a later stage," he explained. "Today we're going with the more mature steelmakers with real-time quality management, but within a few years I think there might be an appeal in the emerging markets as a monitoring system [to aid less experienced operators] with less complicated product mixes to manage."

Long-term outlook

What technologies will Fives be supplying in the long term?

"In the nearer term within 5-10 years, I think that we'll see a lot of upgrading on combustion, because there are a lot of older lines running at maybe 60% of efficiency. There is such an awareness on the emissions now, and regulatory pressure, so I think there will be a lot of upgrading," Mehlman answered. "That is something that we are starting to see. In China, for example, there will need to be a lot of upgrading of furnaces to meet those regulations. That is not a revolution in the industry – it is just a general upgrading and a more sustainable way of working."

Further downstream, he said that generally there are some developments on galvanizing, which could be breakthroughs in the coming years: "I think there will be breakthroughs there that mean more productivity and faster lines."

"We clearly see more induction, because when you have a line running it means more heating power and flexibility on the same line, so it's an easy way to get more out of your asset, but again it's not a revolution," he added.

"What will be the next revolution in ten years' time: it's hard for me to say today really. We don't see an underlying trend that is going to really change the nature of processing," he concluded.