

Flat Carbon Europe



ArcelorMittal

update

Client magazine | November 2010

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In October 2010, ArcelorMittal unveiled S-in motion, a new concept for car makers who wish to create lighter, safer and more

environmentally friendly vehicles for the 21st Century. S-in motion demonstrates ArcelorMittal's commitment to the automotive sector with a catalogue of high-tech solutions that can be implemented in production vehicles today.

06 Opening the door to savings



Automotive manufacturers will soon face financial penalties if they do not find ways to significantly reduce CO₂ emissions over the lifetime of their

vehicles. As the world's largest supplier of automotive steels, ArcelorMittal has undertaken a major study into the application of newly industrialised steels to lighten the weight of a car door.

12 Luxembourg's World Expo pavilion: a showcase for Indaten®, ArcelorMittal's weathering steel



Since its opening in May 2010, a record number of people visited the World Expo in Shanghai, China. One of the most striking buildings on the 5.3

km² site is the national pavilion of Luxembourg. Designed by architect Francois Valentiny, the pavilion utilises weathering steel to create a dramatic dialogue between the Expo visitor and nature.

16 Magnelis®: the fiercest elements require the toughest skin protection



Over the years, ArcelorMittal has excelled in the development of metallic coatings that offer a wide range of manufacturing options

with outstanding economic, technological and environmental advantages. The latest metallic coating innovation, Magnelis® ensures optimal surface protection against long-term wear and tear.

Cover

S-in motion: light automotive concept - ©Mathieu Noel

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From this issue onward, each edition of Update will feature a different editorial contributor providing their unique perspective on ArcelorMittal, Flat Carbon Europe and the steel business.



Brian Aranha, Head of Automotive, and Global Chief Marketing Officer, ArcelorMittal

Staying in motion

There's no stopping change! Recognizing that steel dependent industries face an ever-evolving technical, regulatory and economic landscape, ArcelorMittal continuously adapts its solutions and services in anticipation of future demands.

Worldwide standards for the automotive industry, for example, are constantly transforming. Globally the industry faces challenges in terms of the environment, safety and crash performance. Thanks to our international reach, capacity, and industrial know-how, ArcelorMittal is uniquely positioned to support automotive companies as they face these challenges.

Today, ArcelorMittal supplies 21% of the world's automotive steel. Our R&D efforts over the last 15 years have mirrored the issues that drive carmakers' R&D activities, in particular safety and environmental performance. As a consequence, we provide the broadest product offer for the automotive industry in the world. This includes flat carbon products at all levels of strength, as well as more advanced products like laser-welded blanks and tubes that are increasingly used in vehicle design. Our product offering is completed by stainless steel and long carbon products for specific vehicle applications.

Our focus, however, extends beyond just product development. Throughout ArcelorMittal we are committed to applying holistic solutions. Our innovative solutions include not only products but also the manufacturing technology to implement our products within the production plant of

our customers. For example, in Automotive, we work with car makers as a co-engineering partner throughout the entire life cycle of a vehicle, from the early development stages, through to the development of steels to meet the vehicle concept, all the way to mass production and after-sales service.

In this issue of *Update*, we are delighted to reveal to you some of the many ways in which we continuously address our customers' challenges. One such example is S-in motion, a catalogue of more than 60 lightweight, cost neutral solutions for carmakers aiming to create lighter, safer and more environmentally friendly vehicles for the 21st Century.

Significantly, S-in motion's safe, strong, and sustainable solutions are already available for implementation. Formability and assembly have been tested, and an industrial validation has already been performed in parallel with a cost analysis. "We have done everything to ensure that S-in motion solutions can be directly implemented into a car on an industrial scale and in a cost-effective way *today*."

Be it for Automotive, Packaging or General Industry, ArcelorMittal is in perpetual forward motion, relentlessly devising new ways to meet the evolving steel requirements of global industries.

Brian Aranha

S-in motion:

Light automotive concept

A catalogue of safe, strong and sustainable solutions for car makers

In October 2010, ArcelorMittal unveiled S-in motion, a new concept for car makers who wish to create lighter, safer and more environmentally friendly vehicles for the 21st Century. S-in motion demonstrates ArcelorMittal's commitment to the automotive sector with a catalogue of high-tech solutions that can be implemented in production vehicles today.

The task for ArcelorMittal's R&D teams was to identify existing solutions that could help car makers lighten the whole vehicle (and especially the body-in-white (BIW)) of a typical C-segment car by 20%. That saving is critical, particularly for European car makers who will face penalties from 2012 if CO₂ equivalent emissions from their vehicles exceed limits set by the European Commission. The result is S-in motion, a catalogue of existing flat and long carbon steel, and stainless steel products that account for 62% of the weight of the BIW (see table below).

However, S-in motion is not just about saving weight. The team were conscious that the solutions had to also help manufacturers minimise costs while delivering vehicles that were safe, strong, and sustainable. To ensure these criteria could be met, the R&D team assessed the

crash resistance and stiffness of each module and of the complete BIW to ensure they met Asian, European, and North American standards.

Life cycle, formability and assembly tested

A life cycle analysis (LCA) was also conducted to determine how much CO₂ would be saved over the life of the vehicle. For a typical gasoline-powered car that will drive around 200,000 kilometres in its life, the weight savings of S-in motion translate to a reduction of 6.23 grams of CO₂ per kilometre driven. During production, CO₂ equivalent emissions are reduced by almost 15%, while over the use-phase of the vehicle's life, the reduction is 13.5%. These savings further help car makers to improve the sustainability of their operations.

S-in motion BIW Cost Summary

	2010 BIW Base Costs	
	Baseline	S-in motion
Tooling amortisation	2%	3%
Assembly	32%	34%
Process	15%	18%
Material	51%	45%

The formability and assembly of each part were also examined and a risk analysis of welding combinations and critical assemblies was conducted. This enabled the S-in motion team to accurately map the forming and assembly sequences for the BIW so that cost assessments could be prepared.

Costs were calculated for the steel used in the part, processing of the material, assembly and the tooling required to create the part with a different type of steel. The comparisons (see table above) showed that there was no cost increase based on 2010 prices for steel. This is because the steels that have traditionally been used for these parts require a thicker, heavier grade of steel. The newer, press-hardened steels (PHS) and advanced high-strength steels (AHSS) used in the S-in motion parts are stronger, yet lighter, than traditional automotive steels.

Potential S-in motion weight savings

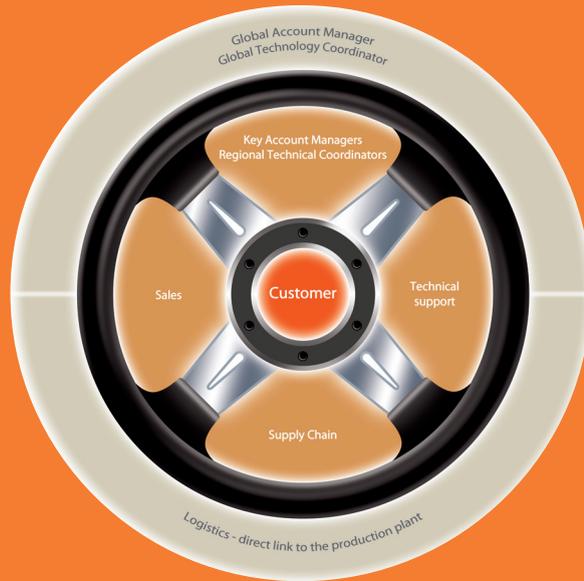
	Baseline (C-segment)	S-in motion Lightest	Weight saved	Saving (% baseline)	Study scope	% of baseline weight	Saving (% scope)
BIW	290	250	40	14%	215	74%	19%
Crash management system	10	9	1	10%	10	100%	10%
Hang-on parts (closures & fenders)	94	78	16	17%	94	100%	17%
Chassis	72	56	16	22%	72	100%	22%
Total weight	466	393	73	16%	391	84%	19%

A steelmaker with solutions

S-in motion is a project of ArcelorMittal, the only manufacturer of automotive-steels with a truly global presence. That enables ArcelorMittal's automotive business unit to support and develop quality solutions for its car-making partners, wherever they are based. ArcelorMittal has four laboratories that are dedicated to finding solutions for ArcelorMittal's automotive clients.

Every automotive client is supported by a dedicated customer team that includes an account manager, as well as technical, logistics and sales support staff (see figure). The result is a flexible, dynamic organisation that continually strives to meet the challenges of its customers.

ArcelorMittal's worldwide support structure for automotive clients



The S-in motion demonstrator



More information

ArcelorMittal will roll-out S-in motion to car makers through the company's worldwide customer teams and dedicated in-house road shows at auto makers. The S-in motion demonstrator vehicle will also be on display at a number of international automotive shows in Europe and North America over the coming year.

You can find out more about S-in motion at www.arcelormittal.com/automotive

Opening the door to savings

Innovative new steels contribute to a significant reduction in the weight of a D-segment car door

Automotive manufacturers will soon face financial penalties if they do not find ways to significantly reduce CO₂ emissions over the lifetime of their vehicles. As the world's largest supplier of automotive steels, ArcelorMittal has undertaken a major study into the application of newly industrialised steels to lighten the weight of a car door.

The car door study forms part of ArcelorMittal's larger S-in motion project, which aims to identify existing steel solutions that will reduce the weight of the vehicle's architecture including the Body-in-White (BIW), chassis and hang-on parts. (For more information on S-in motion, please see page 4-5).

Cost-effective, stronger, lighter

Many car makers are now considering the use of alternative materials, such as aluminium, as a quick way to reduce the weight and CO₂ emissions of their vehicles. The detailed car door study is the first in a series that will demonstrate to car makers how they can implement optimised steel solutions that meet current performance requirements while achieving significant weight and cost savings.

Researchers at ArcelorMittal's Montataire laboratory in France used a car door from a

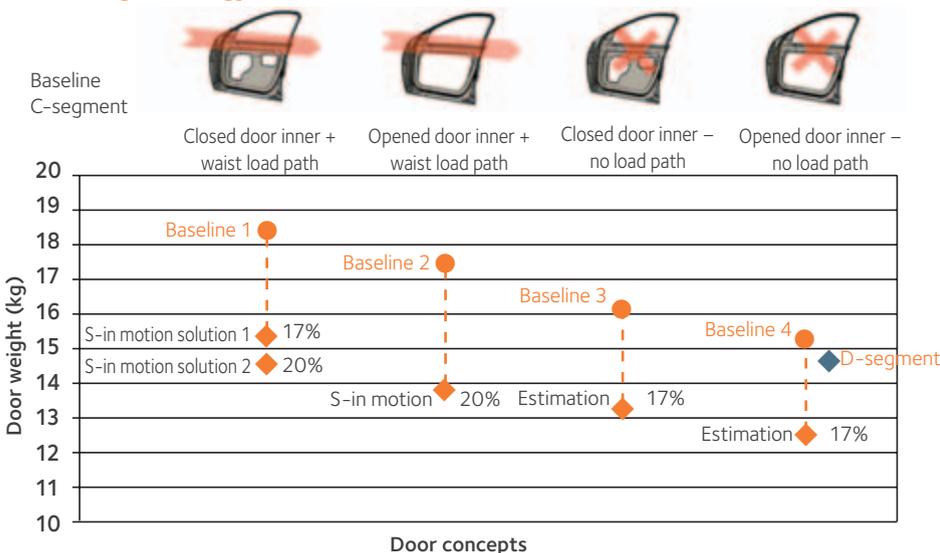


D-segment vehicle as the basis for their study. Made of steel, the baseline door had a weight of 14.64 kg. The researchers estimated that the mass of an aluminium door with similar performance properties

to the baseline would be around 10.0 kg in the most optimistic case.

The challenge was to lighten the baseline steel door, which is already considered to

Door design strategy

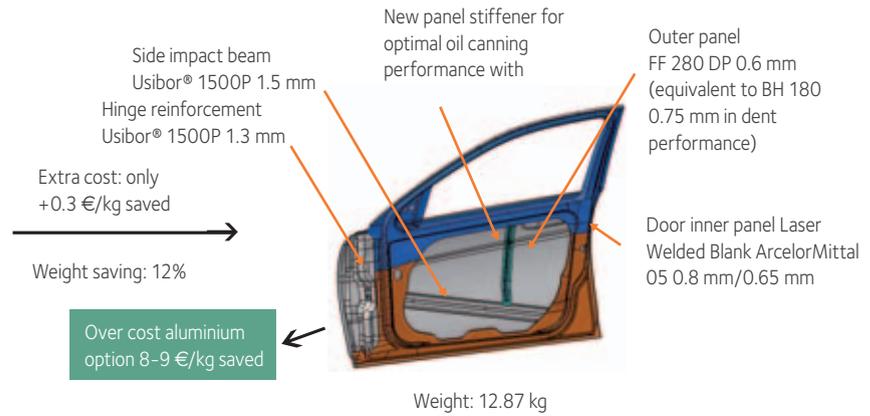


Laser welded blank add strength, lower weight

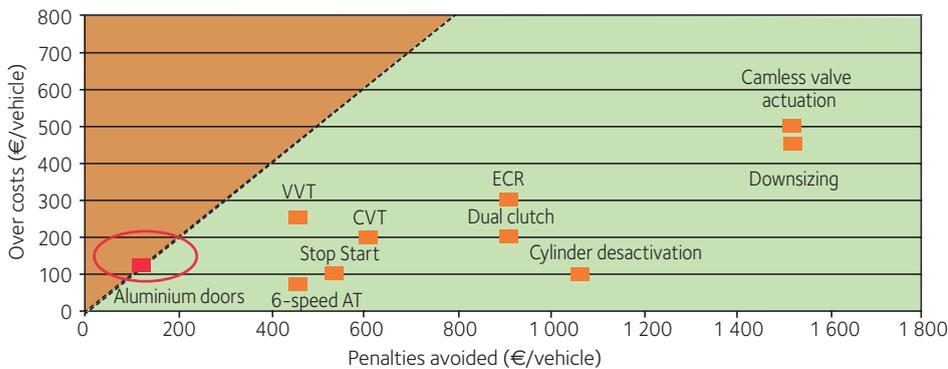
Laser welded blanks are widely used in today's vehicles, typically in the chassis and Body-in-White (BIW) components such as reinforcements and B-pillars. They are made by welding together flat steel sheets of different thicknesses, grades and coatings. LWBs decrease the weight of the vehicle and improve safety by enhancing crash performance.

Optimised steel door showing grades utilised

Baseline: steel door weight: 14.64 kg



Light-weighting over costs versus gains



be fully optimised, and to significantly reduce the weight difference between the optimised car door solution and the virtual aluminium reference door. The steel solutions had to be cost-effective, yet stronger and closer in weight to their alternative counterparts.

New steel products improve crashworthiness

The parts of the door that were examined in the study included the side impact beam, outer and inner panels, and the hinge reinforcement. Four different door concepts were examined (see figure).

The optimum solution utilised a range of new high-performance steels that have been developed by ArcelorMittal. These include Usibor® 1500P, and Dual Phase (DP) grades like 1180 Hy and FF 280 DP.

The steels selected for the optimised steel car door may bring improvements in safety, but what about weight and cost? Utilising the new materials, the optimised door weighed in at 12.87 kg, 1.78 kg (12%) lower than the baseline steel door. The total weight saving over the four doors on the D-segment vehicle would be around 6.5 kg.

Significant savings

The new car door solution is already lighter than the doors of most current C- and D-segment production vehicles. When cost was factored in, the optimised steel door solution showed significant savings over its aluminium counterpart. A comparative calculation showed that car makers who utilise an aluminium solution will pay an additional € 8 to € 9 per kilogram of weight saved due to increased material and tooling costs.

These additional costs suggest that substituting steel with alternative materials would be less efficient than simply implementing recent engine improvements such as six-speed automatic transmissions, dual clutches, and downsizing (see figure Above). However, combining engine improvements with the optimised steel door and the solutions identified in S-in motion will lead to even better environmental and safety performance for car makers.

Optimised car door utilises new steels

Usibor® 1500P steel was selected as the material for the side-impact beam and hinge reinforcement of the car door. A press-hardened steel, Usibor® 1500P provides both weight saving and improved crashworthiness. Thanks to its outstanding mechanical properties after hot stamping, weight can be reduced by up to 50% compared to a high strength steel. In this application, the Usibor® 1500P side impact beam is just 1.5 mm thick, while the hinge reinforcement is just 1.3 mm thick.

Full Finished 280 Dual Phase (FF 280 DP) was selected for the outer panel of the optimised door. This type of steel exhibits excellent dent resistance. The yield strength of dual phase steels is further increased by the paint-baking process. Full finished dual phase steels provide excellent potential to reduce the weight of structural parts and, in the case of FF 280 DP, skin parts such as the outer panel of the door. At 0.6 mm, the FF 280 DP outer panel is 0.15 mm thinner than Bake Hardening 180 (BH 180) steel which gives a similar dent performance.

The inner door panel is formed as a laser welded blank (LWB) which preserves crash performances in the front area of the vehicle. The steel selected is ArcelorMittal 05, a cold rolled, non-alloyed mild steel designed for deep and extra-deep drawing applications.



Increased insight into the use of electrical steels in transformers

ArcelorMittal Flat Carbon Europe (FCE) is a leading supplier of iron silicon (FeSi) and iron cobalt (FeCo) alloys. These materials are used as magnetic cores for electrical machines such as motors, generators and transformers. Manufacturers of auxiliary transformers for various applications in aviation (ventilation, heating passengers' meals etc) recently launched several re-engineering projects aimed at weight, volume and cost reduction. Researchers at ArcelorMittal FCE seized this opportunity to investigate the optimal choice of soft magnetic material for specific applications.

Auxiliary transformers used in aircraft systems – also known as aeronautic transformers – obviously need to provide power, maintain consistent voltage levels and prevent load losses. Moreover, they should be as small and as light as possible and produce little or no noise in use, while keeping costs down.

Is FeCo still the obvious choice?

If volume and weight reduction are the only critical design parameters, FeCo alloys are the obvious choice. Compared to FeSi alloys, they allow the working point of the transformer to be shifted to higher polarisation levels, resulting in smaller magnetic cores and hence lower transformer volume and weight. The use of FeCo alloys also ensures low eddy current losses, so that higher efficiency can be reached.

Although FeSi alloys have lower saturation polarisation than FeCo alloys, they can be designed for high resistivity. Specific production methods allow us to optimise the permeability levels and magnetic performance of FeSi electrical steels so that in some cases they may become viable alternatives to the more expensive FeCo electrical steels.

Sigrid Jacobs is one of ArcelorMittal FCE's electrical steel specialists and also part of Customer Relations & Strategy. 'Several of ArcelorMittal's steel mills are involved in the production of a wide range of FeCo and FeSi alloys,' she says. 'Consequently, we are exceedingly well placed to investigate the pros and cons of both and help our customers make informed material choices in terms of transformer performance, dimensions, noise production and cost.'

'We started our investigation in early 2010,' Sigrid Jacobs continues. 'We decided to focus on a three phase transformer used for auxiliary electrical supply. We took a transformer with a FeCo core and 0.20 millimetre lamination thickness as our reference. The lamination thickness is an important design parameter as it is a significant factor in the heating up of the steel core. Transformers' cores are not made of solid steel because that would lead to losses through the circulation of large currents.'

In the comparative study, aluminium foil was assumed to be the conductor.

Researchers then started to investigate how much they would have to modify the dimensions and the volumes of the transformers to maintain the same apparent power and full load losses,

The comparative study

Alloy type	FeCo				FeSi			
	Non-Oriented (49% Co)		Grain-Oriented (27% Co)		Non-Oriented (3% Si)		Grain-Oriented (3% Si)	
Texture (composition)								
Thickness (mm)	0.20	0.34	0.20	0.34	0.20	0.35	0.20	0.35

As can be seen in the table, eight different magnetic materials were compared.

regardless of the materials that the magnetic cores would be made of.

‘We opted for a numerical approach,’ Sigrud Jacobs explains. With respect to weight and volume, the FeCo core transformer we used as a reference was clearly superior to all other transformers. Accordingly, we used the values we measured in this transformer as benchmarks. By comparing these with the values we measured for all other combinations of materials and dimensions, we were able to establish which alternatives to the reference transformer would be viable with regard to cost and weight.’

In recent years engineers have been able to reduce the total weight of modern aeroplanes. According to Sigrud Jacobs this opens up new possibilities for the use of transformers with FeSi magnetic cores. ‘These are indeed a bit bulkier and heavier than the more expensive FeCo transformers,’ she admits. ‘But since modern fuselages have become lighter, it is now less important if certain auxiliary instruments and appliances are slightly larger and heavier, especially if they contribute to the comfort of pilots and passengers. This is certainly the case with FeSi transformers, which – unlike FeCo transformers – don’t emit an irritating buzz.

Summarised in a handy list

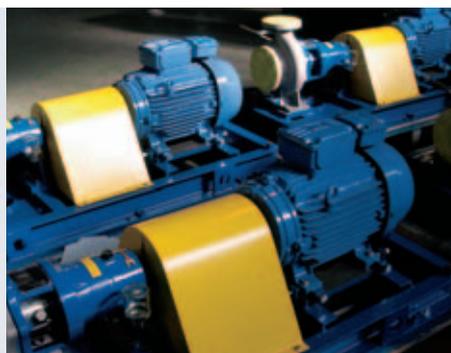
ArcelorMittal FCE’s comparative study has arrived at some interesting conclusions, which Sigrud Jacobs summarises in a handy list. ‘Mind you, these conclusions don’t take into account punching and assembly costs, which are of course also affected by material choice,’ she warns.

1. If the aim is to build a very compact transformer and a buzzing noise (magnetostriction) is not an issue, 0.2 mm thick non-oriented electrical steels with a high cobalt content (FeCo) are still the best option.
2. If a weight increase of about 20% is acceptable and material costs need to be drastically reduced (to 7% of the most expensive option), it is advisable to use 0.23 mm grain-oriented FeSi. This material will only moderately increase noise emissions associated with magnetostriction.
3. Materials which cause a 33% weight increase do not allow further material cost reduction.
4. For the cheapest transformer, use 0.35mm non-oriented FeSi steel. This reduces the material cost to only 6% of the most expensive option. This material also produced very little noise (low magnetostriction) but caused a weight increase of 46%.



‘This was a really impressive team effort with contributions from our Global R&D centres in Ghent in Belgium, Imphy and Saint-Chély d’Apcher in France, Timóteo in Brasil and Frýdek-Místek in Czech Republic.’

ArcelorMittal supplies practically all types of electrical steels for manufacturing cores of high frequency transformers. ‘Thanks to this new study, our technical and commercial team can help customers make the best possible material choice for any kind of transformer application. This was a really impressive team effort with contributions from our Global R&D centres in Ghent in Belgium, Imphy and Saint-Chély d’Apcher in France, Timóteo in Brasil and Frýdek-Místek in Czech Republic. Our research has indeed given us increased insight into the effects of material choice on cost, volume, weight, performance and noise.’




ArcelorMittal

Steel solutions
Construction
Domestic appliances
Mechanical engineering
Pipes
General industry

Flat Carbon Europe
Product catalogue 2010



A real reference work

Our product catalogue on your desk soon!

Over the last twelve months we clocked up over 350,000 hits on our interactive online product catalogue industry at www.arcelormittal.com/fce. Nevertheless, we continued to receive lots of requests from you, our clients, for a printed catalogue. So here it is, our first paper edition of the ArcelorMittal Flat Carbon Europe product catalogue for industrial applications, and we are delighted to present it to you!

In our catalogue you will find comprehensive information about the mechanical, chemical and magnetic properties of all our products, as well as their advantages, applications and brand correspondence. In many instances the "ArcelorMittal" quality label ensures that the quality of a product is even better than the European standard requires. This book is a real reference work: you will find in it all the product information you need.

A handy selection guide

The logical entry point to this new catalogue is the handy selection guide, which is based on a market segment approach and will lead you directly to the grades and qualities of steels and coatings that are ideally suited to your particular applications. The selection guide also contains several new products that are currently under development. Ask your ArcelorMittal contact for details of when and where these will be available.

More than a steel supplier

But ArcelorMittal wants to be more than just a steel supplier. This is why a whole chapter is dedicated to steel solutions, Health, Safety and the Environment, and some technical aspects such as welding and deep drawing. We want to help you design and develop processes to find innovative solutions that make best use of the advantages offered by our steels. Our technical service teams will work with you every step of the way and give you a tailor-made service.

Continuous development

Since ArcelorMittal operates a policy of continuous development, the product catalogue will inevitably be subject to change. We therefore advise you to regularly consult our online product catalogue (available in English, French, German and Spanish) at www.arcelormittal.com/fce

Please note that in some cases, after further consultation or developments in mill production flexibility, it may be possible to modify the range specified in the dimension tables of our product data sheets. In addition to the information in this catalogue, our commercial teams, research centres and product specialists are at your disposal to answer any questions you may have. For product-related matters, feel free to send your query by e-mail to: fce.technical.assistance@arcelormittal.com

The paper catalogue is available in English. Would you like to receive a copy? Just ask your local ArcelorMittal sales person and discover the high quality and innovative nature of our extensive product range and services.

Measuring up for improvement

Quality and continuous improvement are an integral part of the industrial and commercial reality at ArcelorMittal Flat Carbon Europe (FCE). That is why we carry out satisfaction surveys of our automotive and industry customers every two years. The web-based survey of our Industry customers, which was conducted in the second quarter of 2010, is a valuable tool to check whether we are meeting expectations, and to identify what we can do better.

1 114 Industry customers were invited to complete a digital questionnaire which covered various aspects of their relationship with ArcelorMittal FCE: commercial performance, order management, product quality, technical offer and innovation, claim handling, communication etc.

By comparing the new findings with those from the previous survey, we gained valuable insight into the evolution of our customers' satisfaction levels and were able to assess our customers' stance on the introduction of the four regional Business Divisions. In addition, the survey helped us to rate our performance against that of our best competitors.

The survey achieved a response rate of 48% and elicited many constructive comments. To sum up, it may be said that ArcelorMittal FCE has made good progress but still has a long way to go to reach excellence.

The results have already been analysed in detail and in July, a full report was communicated to senior management and the teams in our mills, commercial organisation, and technical support. The management committees and Sales Departments of each of our Business Divisions have started to develop specific action plans, which will soon be implemented. All these plans will be integrated in a general Progress Action Plan.

Many thanks to everyone who participated in the survey. Our sales teams will soon be providing customers with extensive feedback.

By night the oxidised steel of the pavilion echoes the gold of Gëlle Fra

A harmonious dialogue with nature

Luxembourg's World Expo Pavilion showcases weathering steel

Expo 2010 opened in Shanghai, China at the beginning of May with exhibitors from almost 200 countries. One of the most striking buildings on the 5.3 km² site is the national pavilion of Luxembourg. Designed by architect Francois Valentiny, the pavilion utilises weathering steel to create a dramatic dialogue between the Expo visitor and nature.

Weathering steel, marketed by ArcelorMittal in Europe as Indaten®, was first developed in the United States in the late 1930s. Since then it has been used in many buildings, bridges and sculptures where a natural and long-wearing finish are required. Pablo Picasso famously used the material for his 1967 sculpture known as the *Chicago Picasso* which still stands in the city's Daley Plaza.

The latest creation in weathering steel is Luxembourg's national pavilion at the Shanghai Expo. Designed by Francois Valentiny, a native Luxembourger, the pavilion takes the form of an enlarged single-family house surrounded by a fortress-like wall. The hardness of the weathering steel is softened by trees planted on top of the enclosure, a hanging

garden along the inner core, and a pond covered by giant steel lily-pads. "I planted trees and vegetation so the central building looks like a castle," explains Valentiny. "In Chinese, Luxembourg means fortress and forest, so I am playing with images, signs and forms."

A magical product

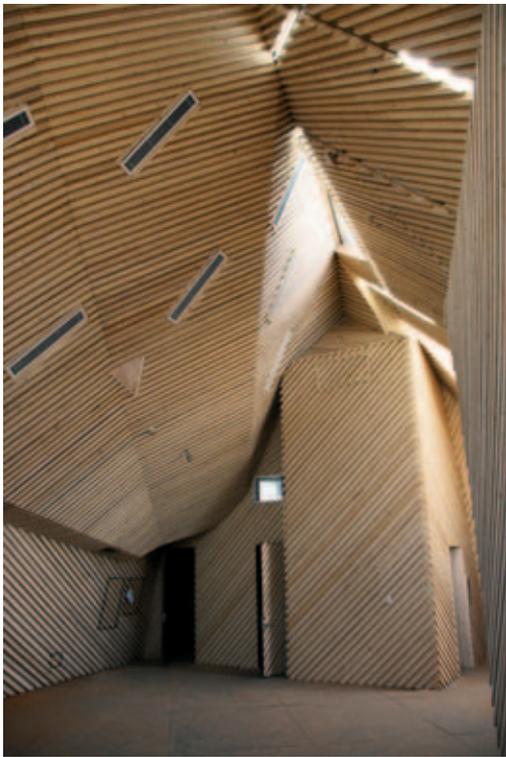
Valentiny chose weathering steel from ArcelorMittal after having worked with the material on a number of projects. His choice was influenced by the purpose of the building as well as a consideration for its lifespan. "For a pavilion with a life of six months steel or wood are ideal because they are easy to construct and recycle." The 5.6 by 1.5 metre sheets of weathering steel were milled at ArcelorMittal's Fos-sur-

Mer plant in France and shipped to Shanghai where the pavilion was assembled by local engineers.

Initially the choice of material was unfamiliar to the Chinese team and the build was delayed for three weeks. "For the Chinese engineers, weathering steel is a magical product," explains Valentiny. "It is something high-level, and they believed that it should be respected." After reassurances that they could work with the material in the same way as other types of steel, the engineers began construction, finishing the pavilion well in time for the opening of Expo.

Steel, spruce and glass

Weathering steel is used for the exterior, floor and roof of the pavilion. This is a signature of Valentiny's design philosophy: "Three materials are enough!" he explains. "I like to use the same surfaces on the walls, the roof and the ground, and there are a limited number of materials you can do that with." The interior ceiling is lined with spruce timber from the forests of

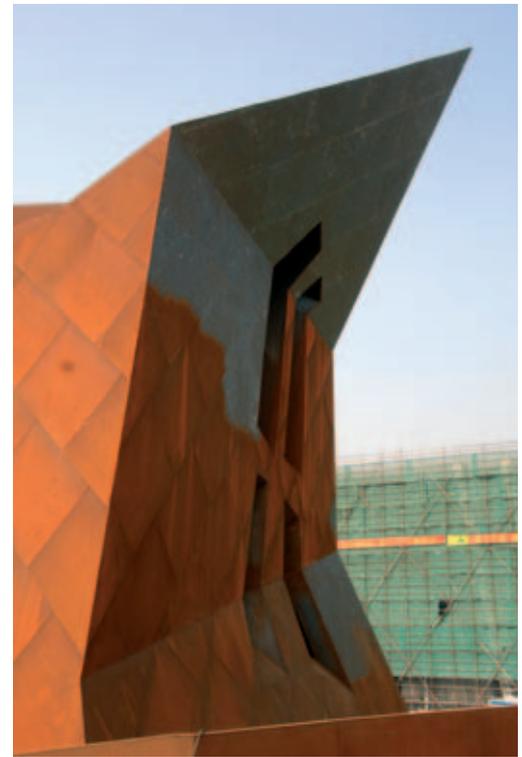


Steel frames hold the internal timber panels in place

About weathering steel

Marketed by Flat Carbon Europe as Indaten®, weathering steel develops its patina following exposure to the atmosphere. The first oxide layer appears within a few weeks with the final colour being achieved within one to two years. The finish can last, without maintenance, for at least 80 years. The steel can also be pre-oxidised.

The primary alloying material in the weathering steel is copper at concentrations up to 0.55%. The copper produces a homogenous and regenerating protective layer over the surface which retards corrosion and ensures the integrity of the underlying steel.



External weathering steel undergoes oxidation treatment

Luxembourg, which is set into steel frames. The third and final material is glass which is used in the openings of the pavilion.

Standing on a three-metre steel column at the entrance to the pavilion is the statue of *Gëlle Fra* (the Golden Lady). Designed in 1923, the statue normally stands in Luxembourg City's Constitution Square but was donated to the pavilion for the duration of Expo. "The contrast between the oxidised steel and the golden surface of

Gëlle Fra produces a strange feeling," says Valentiny. "When you look at it at night, the steel also looks like gold."

Millions of visitors expected

The reaction from Expo visitors to the pavilion has been positive. "Chinese people are very curious and they show great interest in this material," says Valentiny. "In the first weeks they touched the façade because [they thought] it was impossible to

construct with rusted steel." More than six million people are expected to pass through the pavilion during the half-year that Expo is open. Although weathering steel forms both the internal and external flooring, no coating is needed to protect it from the elements or wear and tear from the visitors.

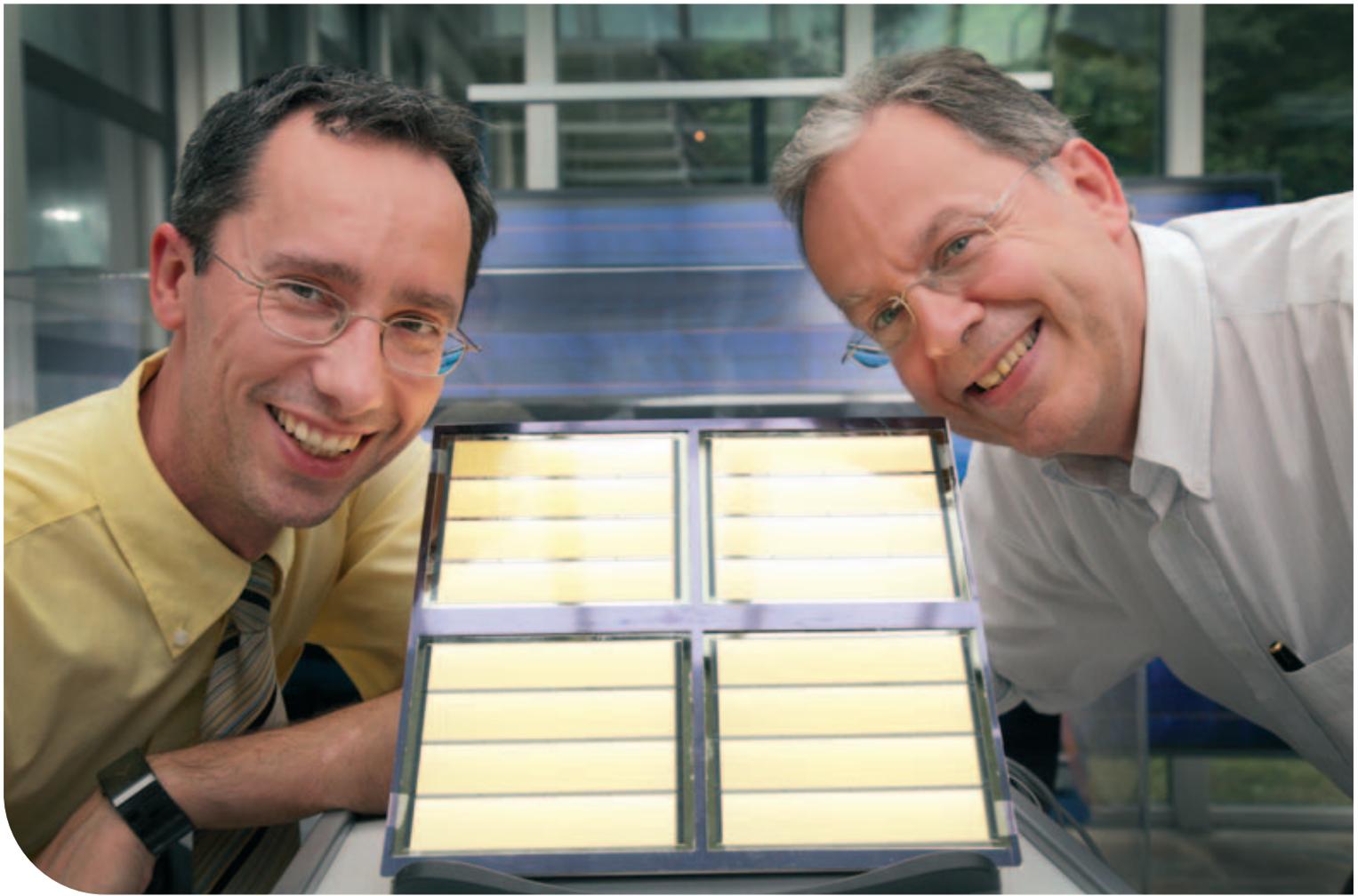
While *Gëlle Fra* will return to Luxembourg City at the end of the Expo, the future of the pavilion is still under discussion. Although designed to be fully recycled, there are plans to repatriate the building back to Luxembourg where it could be utilised for another purpose. Like *Gëlle Fra*, the weathering steel will continue to endure, wherever it ends up.

The Chinese characters representing the pavilion's slogan "Small is beautiful too" are carved into the surrounding wall



Further information

You can find out more about Indaten® in our product document centre on www.arcelormittal.com/fce. Click through to Products & Services > Product document centre Industry and select Atmospheric corrosion resistant steels Indaten®.



Research Centre Managers Sven Vandeputte and Michel Beguin

Tailoring innovative solutions to the needs of tomorrow's world

Not so long ago, when the economy was booming, European companies unanimously recognised the importance of investing in innovative and differentiating products. But in the aftermath of the credit crunch, these same companies are suddenly less prepared to stick out their necks on long-term investments... Unless, of course, they can team up with a strong partner who can help them regain their original R&D impetus. The ArcelorMittal Global Research & Development teams could be just the partner they are looking for. Together with our clients, we can tailor innovative solutions to the needs of tomorrow's world.

Research for industrial clients using flat carbon steel (see text box) is spread over two sites, Ghent and Liège (Belgium). 'Together we constitute a market oriented research centre, with the two sites working hand in hand,' Research Centre Managers Sven Vandeputte and Michel Beguin confirm.

People and resources

Despite the economic downturn, Arcelor-Mittal has been consistently investing in

state-of-the-art equipment. 'As a result, we are now in an excellent position to provide our customers with cutting-edge technology for material characterisation and process development,' Michel Beguin says. 'We can simulate virtually any real-world production situation to perfect our solution and prevent technical problems from occurring in our clients' production facilities. By doing this we substantially reduce our clients' development and production costs, reduce time-to-market, and effectively increase process performance.'

'Our labs are staffed with engineers and scientists of twenty different nationalities,' Sven Vandeputte adds. 'They work in close contact with the other Global R&D labs and universities all over the world and share the same passion for science and market-driven research. Each staff member brings complementary skills and experiences to the table, transforming the team into something far more than the sum of its parts. This has earned us the trust of many leading industrial companies.'

Having all these nationalities on the team also creates communicative advantages. 'It has certainly helped us to establish a stimulating atmosphere,' Sven Vandeputte smiles. 'In addition, it simplifies the interaction with clients anywhere in the world. There is always someone from our staff who has the necessary qualifications and can speak the language of the client.'

‘However necessary and unavoidable cost-cutting may be, developing new differentiating products has proven to be a very effective way of ensuring long term profitability.’

Michel Beguin and Sven Vandeputte applaud the commercial teams’ initiative of regularly inviting clients to the research centres. ‘These visits are excellent opportunities for clients to see for themselves what we can do for them: facilitate their market-driven innovation processes.’

Innovation as a two-stage rocket

‘Our objective is always to help clients find innovative answers to their ever-evolving business needs,’ Michel Beguin explains. ‘We make a clear distinction between incremental and disruptive innovations. Incremental developments are adjustments and improvements to existing technologies and products. They are always well documented in our technical data sheets, magazines and web pages.’

‘Disruptive developments challenge conventional business thinking. Over the years our R&D centre has developed quite a few of these “game changers” which have enabled clients to capture completely new markets and forge ahead of their competitors.’

Truly disruptive developments always require considerable effort on the communication front. According to Michel Beguin, R&D and commercial teams must work closely together to get a new technology adopted. ‘Disruptive developments are like two-stage rockets. First we need to fully develop the technology, preferably with the active

involvement of the client, turning the process into a genuine “open innovation” project. Then we must help our client to conquer the market itself. End customers must be informed about the benefits of the new product or technology. Their rational and irrational resistance must be overcome until they finally make a trial purchase.’

Co-engineering

‘The best way to successfully launch a new product or technology, be it incremental or disruptive, is through co-engineering,’ Sven Vandeputte feels. ‘Clients who are really inspired by one of our innovative ideas or concepts are more inclined to participate actively in the further development of the product and technology. They know that is the best way to obtain the optimum result. All our new developments – even the most disruptive ones – have been at least partially based on the insights of one or more clients.’

‘I know I am going against the tide here by saying that the future of European companies doesn’t lie in commodity products but in unique products with high added value. However necessary and unavoidable cost-cutting may be, developing new differentiating products has proven to be a very effective way of ensuring long term profitability. Therefore, differentiation is key and ArcelorMittal Global R&D can make it much more feasible,’ Sven Vandeputte concludes.

What do we mean by ‘industrial clients’?

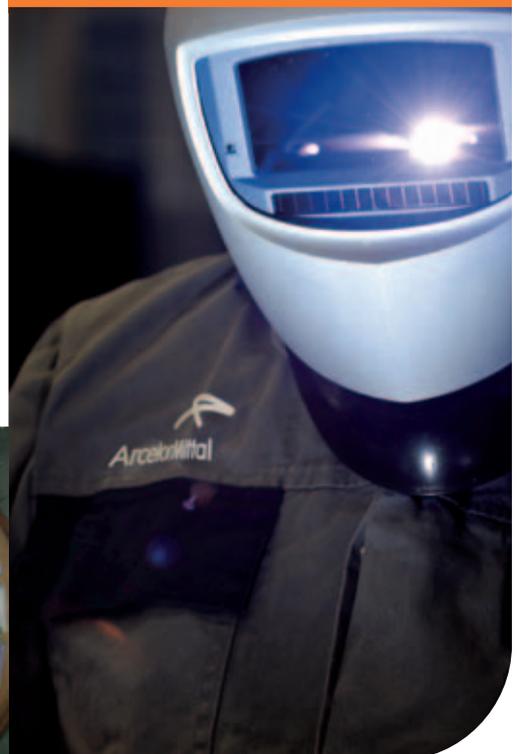
ArcelorMittal’s industry oriented research centres in Ghent and Liège position themselves as R&D partners for companies specialising in construction, domestic appliances, mechanical construction and engineering, heavy plate processing, tubes and pipes, HVAC equipment, drums, furniture, electro-magnetic applications, energy generation, transport and storage systems, off-shore applications etc.

Most of the R&D work executed in Ghent and Liège is for the clients of ArcelorMittal Flat Carbon Europe, but the centre is also involved in collaborative projects with other ArcelorMittal units: Flat Carbon Americas, Tubular Products (for the oil and gas industry), Long Products, Distribution & Solutions and Stainless Europe and Brazil.

Cooling of lab samples

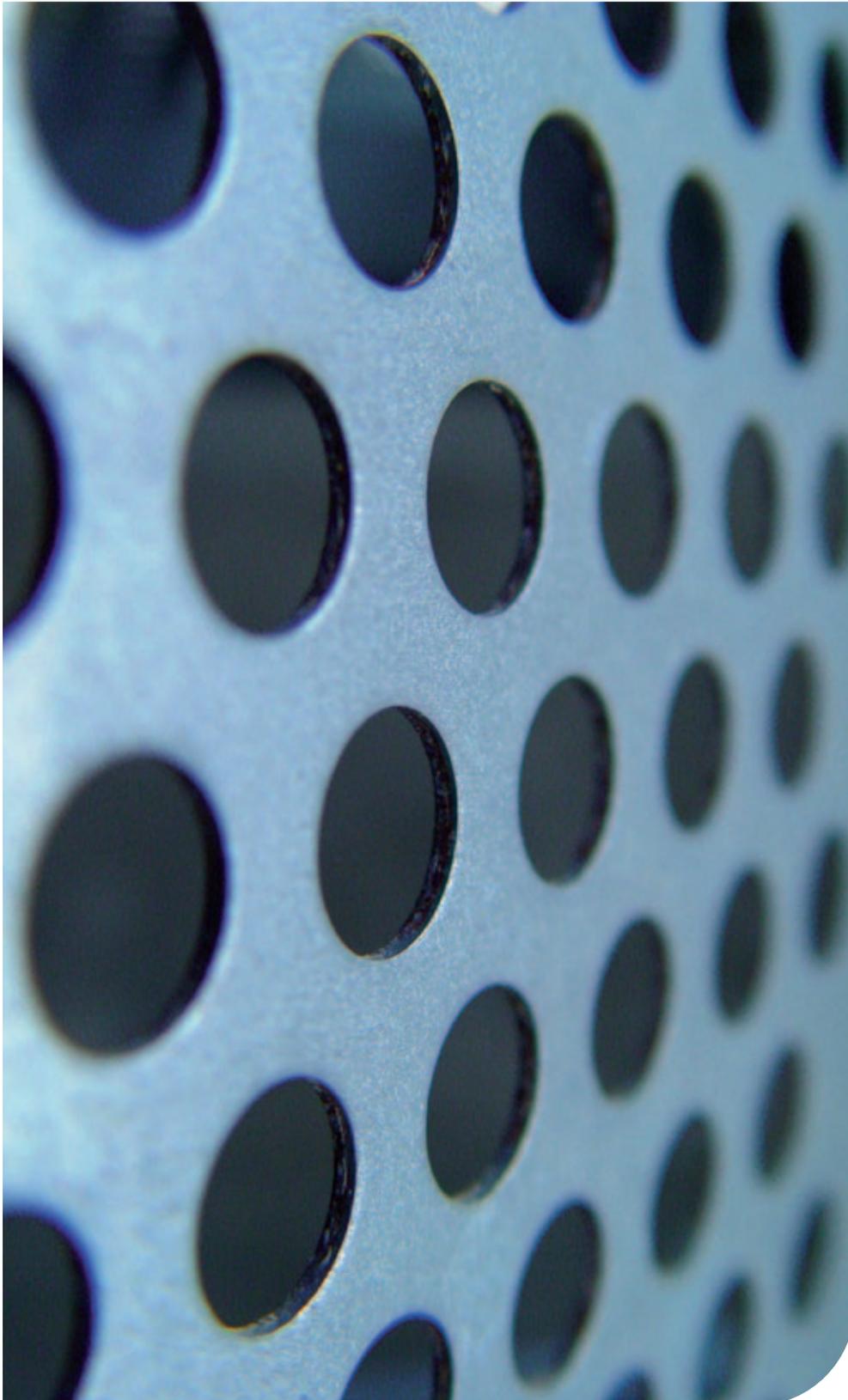


Solar thermal absorbers on copper, aluminium and steel



Magnelis®

The fiercest elements require the toughest skin protection



Innovation is at the heart of ArcelorMittal. Over the years, the steel manufacturer has excelled in the development of metallic coatings that offer a wide range of manufacturing options with outstanding economic, technological and environmental advantages. Its latest innovation – an extraordinary breakthrough in corrosion-resistant metallic coatings – is no exception.

ArcelorMittal's Magnelis® metallic coating ensures optimal surface protection against long-term wear and tear. After having undergone a series of comparative tests, this revolutionary new coating has proven to perform significantly better than alternative European products.

Magnesium is key

Magnelis® is produced on a classic industrial hot dip galvanising line, but is dipped in a molten bath comprising a distinctive metallic chemical composition of zinc with 3.5% aluminium and 3% magnesium. The 3% magnesium is crucial as it creates a stable and robust layer across the entire metal surface, providing a far more effective defence against corrosion than coatings with a lower magnesium content. Magnelis® performs up to ten times better than galvanised steel.

Tried and tested

Magnelis® is the optimal coating to protect against atmospheric corrosion. The destruction of coating that occurs in an ammonia environment, for example, is seven times less with Magnelis® than with a standard zinc coating. In highly alkaline environments – those with a pH between 10 and 13 – Magnelis® corrosion resistance trumps other metallic coatings as well.

Beyond being able to withstand the harshest of environments, Magnelis® both

Magnelis® protects exposed cut edges with a thin zinc-based protective film with magnesium, which prevents corrosive reactions.



Magnelis® is the optimal coating to protect against atmospheric corrosion



Magnelis® is an innovative, ecological metallic coating offering corrosion protection even in the harshest of environments

protects exposed cut edges from corrosive reactions thanks to a thin zinc-based protective film with magnesium, and guarantees a longer-lasting, active coating protection over time.

To demonstrate this efficacy, over an eight-month period ArcelorMittal submitted a range of metallic coated products to salt spray tests. The results clearly highlighted the superior corrosion resistance performance of Magnelis®. In stark contrast to the other samples, no red rust could be observed on the Magnelis® sample.

Economically and environmentally sound

Magnelis® also wields an impressive economic advantage. As the most cost-

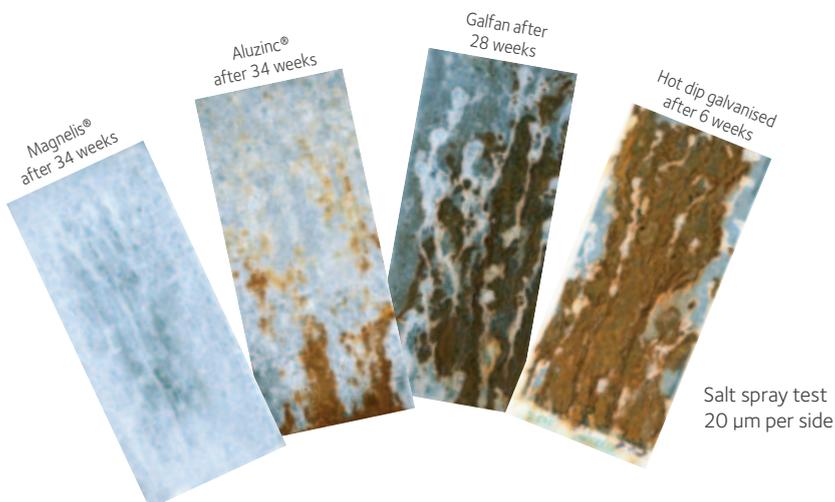
effective alternative to the post-galvanised process, this new coating offers huge benefits over post-galvanised products (with a ZM coating weight greater than 250 g/m²) and even over high value products such as stainless and aluminium. Depending on the environment in which it is exposed, Magnelis® delivers a significant coating weight reduction of two to four times less than post-galvanised products, while still performing significantly better in terms of corrosion resistance.

And finally Magnelis® is an environmentally responsible solution. Its application ensures the preservation of natural resources since it uses less zinc than pure zinc coatings. Moreover, like Aluzinc®, Magnelis® reduces considerably the zinc runoff rate in soils. Thanks to its highly resistant, adherent

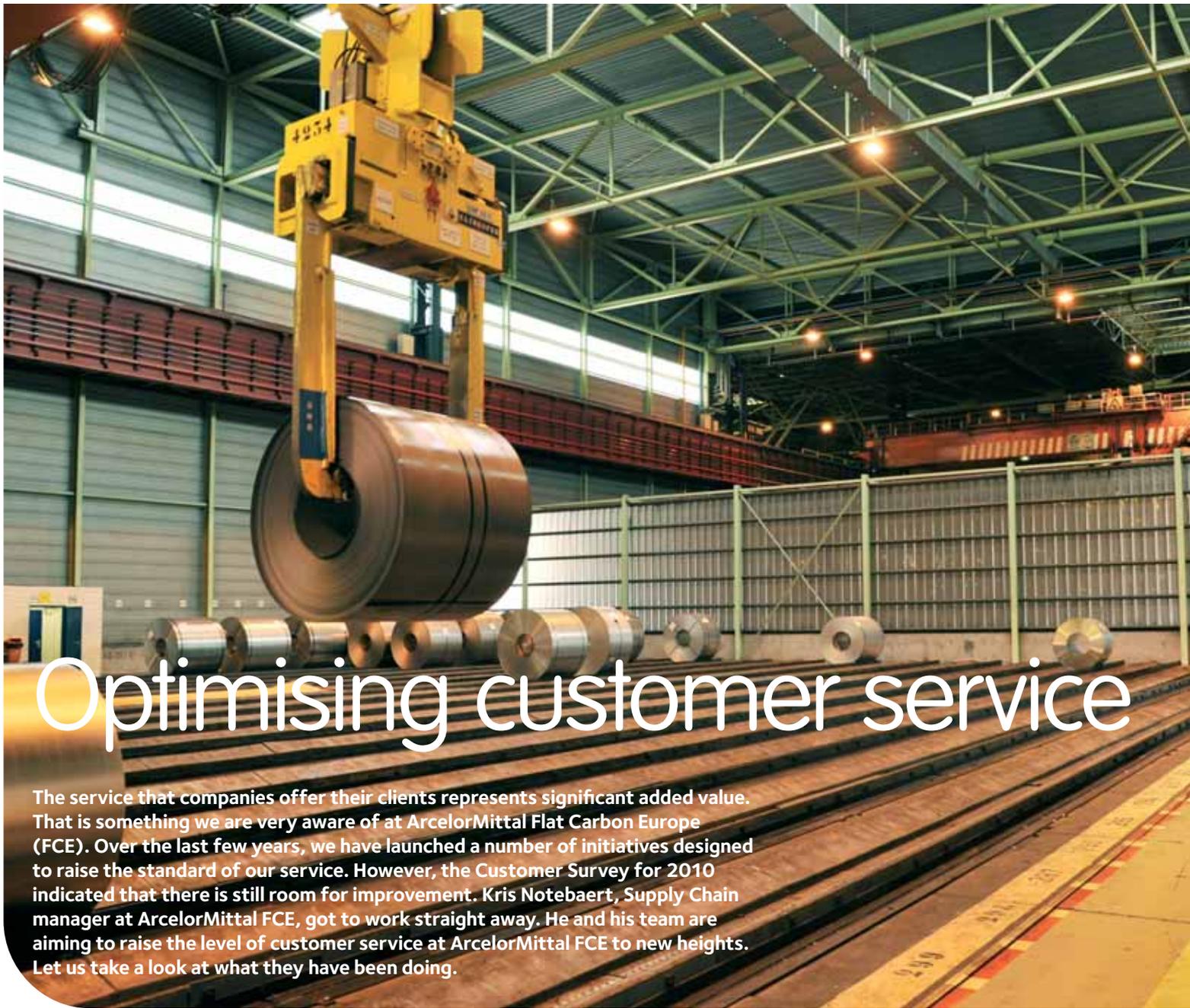
metallic layer, Magnelis® can be formed in a variety of methods, including bending, drawing and profiling. Furthermore by decreasing the amount of metallic coating, while safeguarding corrosion resistance levels, spot welding is consequently improved. A protective oxide barrier covers the weld, preventing the development of red rust. Thinner coating facilitates processing and, once again, delivers substantial savings.

With the development of Magnelis®, ArcelorMittal introduces yet another premium coating solution to the international marketplace. When it comes to protection, durability, longevity, cost-effectiveness and ecological responsibility, Magnelis® ticks all boxes and proves it can weather the toughest of conditions.

The results of a spray test clearly highlight the superior corrosion resistance performance of Magnelis®



Are you interested in Magnelis®?
Get in touch with your local ArcelorMittal sales person and discover this revolutionary product.
Or visit <http://www.arcelormittal.com/fce> for more information.



Optimising customer service

The service that companies offer their clients represents significant added value. That is something we are very aware of at ArcelorMittal Flat Carbon Europe (FCE). Over the last few years, we have launched a number of initiatives designed to raise the standard of our service. However, the Customer Survey for 2010 indicated that there is still room for improvement. Kris Notebaert, Supply Chain manager at ArcelorMittal FCE, got to work straight away. He and his team are aiming to raise the level of customer service at ArcelorMittal FCE to new heights. Let us take a look at what they have been doing.

Up to the end of 2008, virtually all contacts between customers and their steel supplier were conducted through the ArcelorMittal FCE sales agencies, who then arranged with the various production sites how the orders would be dealt with. But in practice, this was not always the best system. When customers had queries about an order, the sales agencies then had to liaise with the production sites. ArcelorMittal FCE therefore decided to give customers the option of discussing their order directly with the production sites. In that way, information could be exchanged faster, without a go-between, and the sales agencies could concentrate on their purely commercial tasks.

New focus on the customer

'Of course, this was a radical change for the mills, who now had to enter into a dialogue

with customers about the execution of their orders,' explains Kris Notebaert. 'In the past, our staff had liaised only with the sales agencies, but a large proportion of them now belong to the *Customer Service Departments* who have to deal with customers directly. The results of the Customer Survey indicate that some problems were encountered in this changeover, and that staff's communication skills and fluency in foreign languages needed to be improved. We shall certainly be addressing this in the next few months.'

Other initial problems cropped up in the introduction of the new cooperation model. The communication and data stream needed to be optimised for customers who prefer to conduct their communication with the mills through a single contact point. 'For these customers, we had indicated one *entry point* for contacts,' says Kris





oriented manner. They will have to ensure that queries are answered better and faster, and that they can meet their customers' needs better and faster too. SteelUser, our e-business platform, will also be upgraded to help us achieve this. Data quality will be improved and the whole site will be made more user friendly.'

Redesign and time frame

After the *Customer Service Departments* had been in operation for a year, the results of the Customer Survey showed that this cooperation model was not equally suitable for all customers. 'We carried out an internal SWOT analysis and that also indicated that it would be better to offer our customers other options as well,' confirms Kris Notebaert. 'Accordingly, we are now redesigning our customer service model.'

Direct contact with the mills is still available, but other cooperation models will also be introduced as alternatives. 'It's more a matter of reintroducing old models,' Kris Notebaert points out. 'We will continue to offer the option of using the sales agencies as the contact point for customers who cannot communicate in their own language with the mills supplying their orders. The sales agencies are in the customer's own country and their staff speak his language. Contacts with customers who are supplied by a number of different mills will also still be conducted through the sales agencies.'

Of course, there will be detailed consultation with the customer before it is decided whether communication will be through a

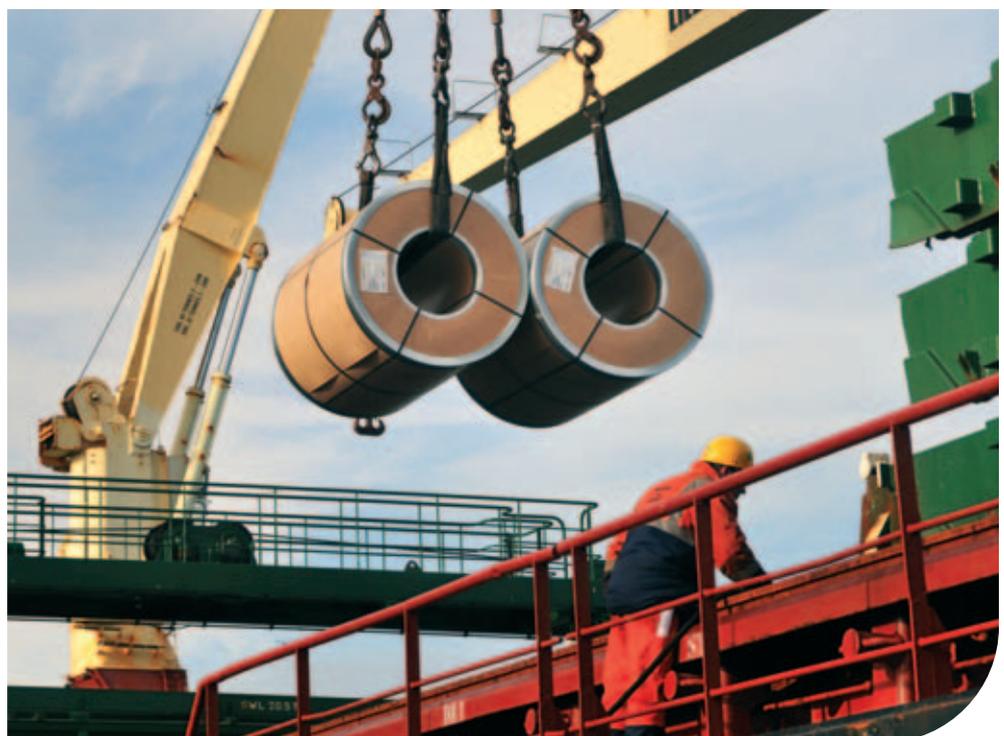
Customer Service Department or the sales agency. 'We are convinced that the *Customer Service Departments* are the best solution for customers who regularly purchase large volumes from a limited number of mills, but we don't want to force anyone to use them,' emphasises Kris Notebaert. 'Our primary aim is customer satisfaction.'

In September 2010, Kris Notebaert and his team finished redesigning the principles on which the cooperation models are based. The results should be felt over the coming months by customers who are supplied from the pilot sites in Ghent and Fos-sur-Mer. 'The comments in the last Customer Survey showed us how we could improve our organisation and we hope that the results of the next Customer Survey will show that our efforts have not been in vain,' concludes Kris Notebaert. 'Our aim is to react quickly when action is needed. That is the only way we can maintain a high level of service.'

'The focus is shifting: the mills will have to work in a much more customer-oriented manner.'

Notebaert, 'and that was usually the production site that supplied most of the steel they ordered. This *entry point* must be a central gateway to information from all the sites that produce steel for the customer in question. In practice, these *entry points* did not always have the necessary data to enable them to answer all their customers' questions immediately. To solve this problem, we are introducing a system whereby all mills that serve a certain customer, supply information proactively to the mill that acts as the *entry point*.'

But providing information to customers is not the *Customer Service Departments'* only task. They must also be able to call for adjustments to production planning at the mills supplying their customer and here too, Kris Notebaert expects some improvements. 'The focus is shifting: the mills will have to work in a much more customer-





'Understanding the customer is the first step to a solution'

Prior to the financial and economic crisis, the roles were strictly divided at ArcelorMittal Flat Carbon Europe (FCE). CEOs of the steel mills were expected to focus almost exclusively on efficiency, productivity and product quality. The development and maintenance of relationships with customers was reserved for their colleagues at the sales agencies and the central commercial organisation. A new policy aims to change this allocation of tasks. The CEOs of the steel mills have recently been instructed to personally strengthen the bonds with their key customers. Update looks at the how and the why of this turnabout in the light of at some examples. In the first article of this new series we focus on Business Division South West.

ArcelorMittal FCE used to be a highly centralised organisation,' Jean-Luc Maurange says. As the CEO for Business Division South West of ArcelorMittal FCE, he is one of the drivers of the new policy which reallocates – and decentralises – quite a few responsibilities. 'The CEOs of our steel mills have been made fully accountable for the performance of their plant and their customers' satisfaction with services and innovations.' Consequently, they must be given more opportunities to listen to key customers' needs and challenges.'

Key customers are not always global customers. 'Most global customers will continue to be centrally managed,' Jean-Luc Maurange confirms. 'Most key customers are local companies that have a long standing relationship with ArcelorMittal FCE and deserve the same service and attention as big international groups. ArcelorMittal FCE wants to better

identify and fulfil their needs and this can be achieved if we organise closer contacts with them, including top management meetings. The importance of these key customers cannot be underestimated. They really push our mills forward on all fronts and help them to progress. A better understanding of each other is also generating some good potential for synergies. This is the underlying thinking behind the new policy initiative.'

'In the last few months, I have visited several of our industrial and automotive customers and learned even more than I had expected.'

José Manuel Arias García,
CEO of ArcelorMittal Asturias

The devil is in the detail

José Manuel Arias García, CEO of ArcelorMittal Asturias, enthusiastically welcomed ArcelorMittal FCE's new policy of sending out mill managers to meet key customers at their own production sites. 'This has given me an opportunity to find out what our clients' real needs are. In the last few months, I have visited several of our industrial and automotive customers and learned even more than I had expected.'





‘Back at the steel mill, I used the client’s own words to explain the advantages of improved logistic services and that got the message over more powerfully.’

Carlos Espina, CEO of ArcelorMittal Fos-sur-Mer and Saint-Chély d’Apcher

One of the customers José Manuel Arias García visited has only very limited storage space on site. ‘As a consequence, the customer needs to know in advance when and in what quantities we will be supplying specific materials,’ José Manuel Arias García explains, ‘because different materials require time-consuming adaptations to be carried out on the customer’s production tools. And until we started announcing when exactly we would deliver which materials, we often made it hard for this customer to control stock efficiently because of the lack of storage space. We never realised this until we went to his premises and saw with our own eyes what was really going on there. Now we let the customer know one or two days in advance which materials are going to be delivered and that was enough to solve quite a few problems.’



‘The devil is in the detail,’ José Manuel Arias García thinks. ‘If you want to make a difference for the customer, you need to really understand his business, his processes and his markets. And you must be willing to face up to problems for which you may have been at least partially responsible.’

As the CEO of ArcelorMittal FCE Méditerranée Carlos Espina heads the sites of Fos-sur-Mer and Saint-Chély d’Apcher. He fully agrees with his colleague.

‘Understanding the customer’s specific needs is the first step to a solution. During a recent visit to a factory in Italy, the customer gave us full insight into his company’s logistic capabilities, including a direct train link. Based on this information, the team in Fos-sur-Mer suggested that the customer could change the system and group small orders until there are enough to ship 700 to 1 000 tonnes in one train load. This resulted in improved logistic efficiency both for the customer and for us. Back at the steel mill, I used the client’s own words to explain the advantages of improved logistic services and that got the message over more powerfully than if I had simply repeated the need for a more client-centred approach. Ever since then, all the coils for that particular client are shipped on a separate train which goes straight to its destination without intermediate stops. This has earned us lots of customer loyalty, which has led to increased sales volumes.’

Commitments

Since the summer of 2010, José Manuel Arias García and Carlos Espina have received quite a few emails and phone calls from customers asking them to find a solution for some problem or other. ‘That’s an interesting side effect of this new policy,’ José Manuel Arias García says. ‘By meeting clients face-to-face to discuss their requirements, I am personally committing myself to maintaining a high quality business relationship with them. I am happy to do that, but my commitment can’t be unconditional. As the CEO of ArcelorMittal Asturias, it is my task to establish win-win relationships with all of our clients. I can only commit myself to an arrangement that is mutually beneficial to both parties and not disadvantageous to other clients.’

ArcelorMittal FCE’s new policy of sending out mill managers to meet customers is not a passing whim. José Manuel Arias García and Carlos Espina are already planning visits for the next quarters. ‘Our closest collaborators are also involved,’ they say. ‘Together we need to find out what is most important for our customers. That is the very essence of our business.’

Cans of fresh ambition

The 'virtual' Packaging Business Unit refines its strategy

For many years, the Packaging entity, which is managed within ArcelorMittal Flat Carbon Europe (FCE), has been the undisputed leader of the European market for tin plate, reflecting the leading position of the Group in the global steel market. In the years to come, ArcelorMittal FCE will be engaging even more in this complex but rewarding business. That is why it has refreshed its global approach to this highly valued business segment and launched an updated and ambitious strategic plan geared to introduce several breakthrough solutions in terms of product developments and supply chain innovations for customers in the packaging industry.

Driven by a distinct ambition

Patrick Van Coppenolle, General Manager of the Packaging team, leaves no doubt about it: 'For many years we have held a leading position in the packaging market and it is our ambition to keep it that way. In emerging countries and Central and Eastern Europe the packaging market is expanding rapidly and we aim to realise growth there. Moreover, the packaging business is quite stable and unaffected by cyclical trends, which makes it even more attractive for us. However, the main reason for our updated strategic plan for the packaging business is

that we are convinced we can continue to ensure significant added value for all customers in this industry, which is a sound basis for future business.'

'Customers welcome any initiative a supplier may come up with to help them maintain or gain a competitive edge,' agrees Franck Thomas, director of the Technical Customer Team. 'Today, we supply our customers with 0.13 mm-thick tin plate and it will soon be possible to reduce the thickness even further, enabling them to produce the same number of cans from fewer tonnes of steel.'

In recent years steel has met with intense competition from other materials making their way into the packaging industry. 'Today we are competing with suppliers of glass, aluminium, plastics and composites of these materials,' says Serge Heurtault, Packaging Portfolio Director at Global R&D. 'They constantly challenge us to renew and improve our products in close consultation with can makers, fillers and food companies. Our innovation efforts are focused predominantly on three domains: (1) reducing the weight and cost of tin plate in comparison to alternative materials, (2) increasing the formability of steel to enable the production of exotically shaped cans and (3) complying with ever more stringent environmental regulations.'

Strengthening the value chain

ArcelorMittal FCE is very conscious of the strategic position it occupies in the packaging industry's value chain. 'Between ourselves and the consumer there is the can maker, the filler, the food company and the retailer...,' says Sales and Marketing Director Pascal Amelot. 'We see them all as partners with whom we need to collaborate. Our objective is to ensure that the finished product – the can on the shop shelf – looks enticing to consumers and meets all commercial, legal and other requirements.'

'Today, the cost of the raw materials for packaging is a substantial part of the total price of the end product on the shelf,' interjects Patrick Van Coppenolle. 'For steel it is considerably less than most competing packaging materials. Steel has many advantages over other materials because it





is a cost-competitive, flexible, available, highly recyclable and technically versatile product and our clients would certainly love to carry on using it. We need to act as their allies to defend the market position of steel packaging. To achieve this, we had to revise our strategy and business model. Our Sales Team and Technical Customer Team are now working along the same lines. Together, they are doing all they can to meet their customers' needs and requirements in full.'

A virtual Business Unit

Not all can makers are part of a large industrial group, but in Europe ArcelorMittal can cater for most of them, regardless of their size and the volumes of tin plate they process. 'Our organisation is geared to respond adequately and rapidly to any customer's request,' Pascal Amelot confirms. 'For detailed answers to all questions, customers can get in touch with their regular contact person at ArcelorMittal FCE.'

'First of all, we have set up a dedicated centrally managed sales organisation,' he says. 'It consists of a Key Account Management team and several Local Account Management teams. The aim is to be as adaptable as possible while preserving the principle of *one face to the customer*.'

'The technical support organisation largely mirrors the commercial one,' Franck Thomas adds. 'Our team of highly qualified engineers supports both multinational and local customers in tight collaboration with

the customer teams. Together they pay over 700 visits to customers every year to make sure the market's needs and requirements are well understood by everyone in the Packaging Business Unit.'

'That is indeed crucial,' Patrick Van Coppenolle concludes. 'ArcelorMittal FCE has four regional Business Divisions. Three of our tin plate producing mills belong to the Business Division North and two belong to the Business Division South West, but in reality these mills form a single, dedicated team serving the packaging market. Governance includes monthly meetings of representatives of the Business Divisions together with their colleagues in sales and marketing. And while operations are managed by the Business Divisions, the Packaging activities as a whole are run like a virtual business. The focus on customer satisfaction is very tangible and at the centre of everything we do. The progress that has been – and will be – made in the fields of logistics, quality, cost cutting and product development, is thus very real. All this is perfectly in line with our ambition to continue to lead the packaging market.'

'Steel has many advantages over other materials because it is a cost-competitive, flexible, available, highly recyclable and technically versatile product and our clients would certainly love to carry on using it. We need to act as their allies to defend the market position of steel packaging.'





From coil to quay

The Trinity Terminal III extension project in the Port of Felixstowe (UK) is a 20 000 tonnes example of how ArcelorMittal Projects has come up with a total ArcelorMittal solution by transforming Flat Carbon Europe coils into a complete end product consisting of several different steel products.

ArcelorMittal steel was used for the complete supply of all steel foundation pipes for the deep water quay extension of 270 meters with the largest cantilever wall ever installed in the UK to date.

1. Base ingredient: coils from Flat Carbon Europe. The coils are transformed into huge foundation pipes.

In total 14 500 tonnes of 2 560 x 19 mm pipes in the X70 steel for pipes grade have been selected. Its specific properties meet requirements such as hydrogen-induced cracking resistance and high ductility at low temperature. The pipes had a weight of

55 tonnes and a length of over 45 meters a piece.

2. After welding the connections for the pipes, ArcelorMittal Projects organized just-in-time shipments by specific-sized vehicles.
3. Installation of the main wall; a continuous row of foundation pipes.

