Flat Carbon Europe

ArcelorMittal

update

Client magazine | May 2012

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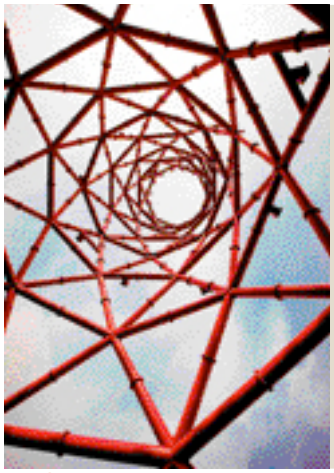

Cover
The ArcelorMittal Orbit

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In each edition of Update, an ArcelorMittal opinion leader speaks out.
In this issue we hear from Jean-Martin Van der Hoeven, who took up the role of Chief Marketing Officer for ArcelorMittal Flat Carbon Europe on 1 January 2012.

Innovating at every step

Continuing doubts about the stability of the European economy have reduced demand for steel since the economic crisis of 2008/2009. These doubts have led to a drop in public works, cautious investments in the industrial sector and slower consumption in the general economy.

Although there has been some recovery, demand still remains about 18% lower than 2007 levels. ArcelorMittal Flat Carbon Europe (FCE) does not expect the market for steel to fully recover to 2007 levels for another five to ten years. FCE's forecast for 2012 reflects this caution, with demand projected to fall slightly again this year.

With full recovery still up to a decade away, FCE must adapt accordingly to ensure we survive in the new steel marketplace. One way to do this is to refocus our efforts on markets that are thriving.

For example, the German economy has already recovered and exceeded its 2007 economic performance. This is driving the economies of Germany's neighbouring trading partners. There are also new markets opening up on the edges of Europe. A centre of activity is developing around Turkey while the Maghreb region in North Africa is also seeing an upturn in economic activity. FCE is already active in both of these areas.

Another initiative we are taking is to improve the already high added value of our offering.

Steel is a semi-processed material and our customers need to do two things with that material: they need to design and create a product; and they need to transform the steel they receive from us into that product. As many of our customers already know, ArcelorMittal has the skills and experience to help with both of those steps and thus add significant value to their businesses.

By proactively responding to the ever-changing economic climate and innovating at every opportunity, ArcelorMittal will continue to create the innovative steel solutions that help customers meet the challenges they face. As an automotive customer in Germany once told me, a customer expects more from ArcelorMittal than the standard steel offering. They want unique Apple-like solutions that truly create value and desire. Only by delivering on this promise will we be able to redefine the steel marketplace and remain a leader.

Jean-Martin Van der Hoeven

Stretching the frontiers

The Dacia Lodgy will be the first vehicle produced at Renault's new plant in Morocco.

ArcelorMittal Flat Carbon Europe strengthens supplies to North Africa to support customer expansion plans.

The Maghreb region of North Africa is becoming an increasingly large market for ArcelorMittal Flat Carbon Europe (FCE) as our customers begin to open factories and facilities in the region. In 2011 alone we shipped more than a quarter of a million tonnes of steels to the Maghreb. ArcelorMittal's involvement in the region became even more important when Renault, one of our automotive customers, announced they would build a factory near Tangier (Morocco) to manufacture vehicles for the North African and European markets.

Renault's new plant is located near the city of Melloussa, about 30 km east of Tangier. It is one of the first automotive manufacturing plants to be established in Morocco, although Renault already operates a vehicle assembly plant near Casablanca, 350 km to the south of Tangier.

Latest high strength grades

The Melloussa site also accommodates a number of subcontractors who will provide parts to the new factory. These include stampers, who will utilise ArcelorMittal's advanced high strength steels (AHSS) to create low weight, high performance car parts for Renault.

As the major steel supplier to Renault's existing plants in Europe, ArcelorMittal Sagunto was asked to supply most of the steel needed by Renault's new factory and its local suppliers. Although ArcelorMittal already supplies steel across the Maghreb, this was the largest single order received from the region and required ArcelorMittal FCE's Renault-Nissan customer team and ArcelorMittal Distribution Solutions (AMDS) to establish new logistics routes to Tangier in order to supply the plant.

Quality paramount

Staff from ArcelorMittal Logistics were temporarily relocated to the Sagunto mill in order to develop the required logistics infrastructure. As well as defining the transport routes, the team had to identify staff and local Moroccan suppliers who could assist with handling in the port, and provide other necessary services.

Ensuring that the steel arrived at the customer's site in ready-to-use condition was a key priority. The logistics team in Sagunto remained in constant contact with our Renault-Nissan customer team to ensure the customer's expectations on quality were being met.

In April 2011 the logistics infrastructure was put to the test when deliveries of steel began to be shipped. The trial orders called for almost 1,800 tonnes of coils to be delivered to Melloussa between April and

ArcelorMittal in the Maghreb

ArcelorMittal is a major supplier of steels to the Maghreb with over 250,000 tonnes of steel shipped to the region in 2011. ArcelorMittal International has an office in Casablanca (Morocco) which services the Maghreb countries including Algeria, Mauritania, Morocco, Tunisia and the Western Sahara.

ArcelorMittal already supplies steel to a range of different industries in the Maghreb. The steels are used to manufacture niche products such as gas bottles, and pipes and tubes for oil and gas transportation. Morocco alone is currently ArcelorMittal's biggest market for thin gauge hot rolled coils.

Regular shipments of steel are made to Morocco from ArcelorMittal's mills in Spain (Avilés, Sagunto, Sestao and Lesaka), France (Fos-sur-Mer) and Italy (Piombino). Steel can be delivered to Casablanca from most of these mills in just four days.

Morocco is one of the potential growth countries of the Maghreb with a big programme of public works underway and planned. This includes a 1,500 km high-speed rail network which will link the country's major cities. Work started on the Marrakech to Tangier link in 2009.

Demand for steel in Morocco grew by 5% during 2011 and is expected to increase by more than 30% in 2012. Algeria increased demand for steel by 4% in 2011 and this rate of growth is expected to more than double in 2012.

August. As a result of the efficiency and reactivity of ArcelorMittal Sagunto during the trials, Renault increased its order of steel from the mill.

Serial deliveries from the mill to Melloussa started in December 2011, more than six weeks before production began. The early ramp-up was designed to meet Renault's requirements.

During 2012, ArcelorMittal Sagunto will dispatch around 40,000 tonnes of coils to Morocco. Forty percent will be cold rolled coils while the remainder will be hot dip galvanised coils. The plant will produce 76,000 vehicles this year, ramping up to a target of 400,000 per year by 2014. ArcelorMittal is already preparing to meet that demand in order to support our customer.

The first coil from ArcelorMittal Sagunto arrives at Renault Tangier.

Paint workshop, Renault Tangier

Strength and adaptability

Amstrong™ is the new name for ArcelorMittal's extensive range of high-performance advanced high strength steels for industry.

Like the pole of a pole vault athlete, Amstrong™ is the strong, high-performance material that enables our clients to reach higher when developing impressive steel solutions. Amstrong™ high strength and advanced high strength steels have superb properties, and deliver considerable advantages with real added value for the mechanical construction and engineering industry.

Amstrong™ was launched at the European Subcontracting and Engineering Fair (ESEF) held in Utrecht (the Netherlands) in March 2012. The range of high strength (HSS) and advanced high strength steels (AHSS) is available in thermomechanically hot rolled, cold formable grades. Optimised micro-alloying and the thermomechanical rolling process create steels with high yield and tensile strengths, combined with excellent formability, toughness at low temperatures and good fatigue resistance.

Suitable for laser cutting

The Amstrong™ grades are an excellent choice for reducing structural thickness and weight whilst improving loadbearing capacity, thereby generating cost savings and securing market advantage. Their surface finish, tight tolerances on thickness and flatness and their suitability for laser cutting and batch galvanisation are additional advantages.

Proven performance

ArcelorMittal's Amstrong™ steels have already proven their added value in three projects from our R&D Industry team.

Tipper

The entire body of the new tipper is composed of Amstrong™ 700MC and Amstrong™ 420MC structural components. A 25% weight reduction was achieved compared to structural steels used for the same application.

The T-bone hook of the trailer was replaced with Amstrong™ 500MC, resulting in a 35% weight reduction and 25% cost saving.

ArcelorMittal can provide full support for your project, from design through to welding.

Due to their low carbon equivalent value, Amstrong™ steels are easy to weld and do not need to be preheated when welding in order to prevent cold cracking.

Amstrong™ high strength and advanced high strength steels can provide considerable advantages in a wide range of applications such as:

- Construction of truck trailers and tippers
- Container construction
- Truck-mounted cranes and construction cranes
- Excavators and construction vehicles
- Agricultural vehicles and machinery
- Concrete mixers and pumps
- Freight and passenger rail cars

Amstrong™ steels are produced by ArcelorMittal at various Flat Carbon Europe (FCE) production sites.

For more information, please visit: www.arcelormittal.com/industry/Amstrong

New levelling technology

ArcelorMittal is the leading supplier of high strength and advanced high strength steels to the mechanical construction and engineering industry. We excel in the development of advanced and innovative steels which offer a wide range of manufacturing options with outstanding economic and environmental advantages.

The increase in the dimensional range of our Amstrong™ high strength and advanced high strength steel coils has also meant an expansion of our levelling capacity for high-quality sheets.

Thanks to the use of this unsurpassed state-of-the-art levelling technology, Amstrong™ steels are guaranteed to have a good degree of flatness and minimum internal stresses in the sheet before, during and after processing. These are important factors and ensure consistent trouble-free laser-cutting and forming operations.

ArcelorMittal FCE is working closely with ArcelorMittal Distribution Solutions (AMDS) in order to offer short delivery times for our Amstrong™ steels. AMDS provides a comprehensive response to the service and co-engineering needs of the mechanical construction and engineering industry. It is also one of the few steel service companies to keep a stock of Amstrong™ steels in standard sizes and coils ready to be cut to customer specifications.

Corn harvester

The threshing capacity of this corn harvester has been increased thanks to a 35% weight reduction with Amstrong™ 700MC and Amstrong™ 420MC. This enabled us to increase the width of the corn head from 8 to 12 rows.

Trailer chassis

A new trailer chassis developed in Amstrong™ 700MC and Amstrong™ 420MC showed a 40% weight reduction compared to a chassis built with structural steel.

Electrifying S-in motion

Advanced high strength steels prove their value in a new lightweight solution for electric vehicles.

ArcelorMittal's S-in motion project has already demonstrated that advanced high strength steels (AHSS) have great potential to lighten the body-in-white (BIW) and chassis of conventional fuel-powered vehicles. But electric vehicles present a completely new set of challenges for automotive designers. ArcelorMittal's Automotive R&D Centre in Montataire sought to discover if the existing S-in motion solutions could be applied to the new generation of electric vehicles.

The project used a typical fuel-powered C-segment vehicle as a baseline. The goal was to modify the baseline vehicle to create an electric-powered car using solutions identified in the original S-in motion study. The project is particularly relevant for carmakers who wish to create electric versions of their conventional vehicles.

Challenge of electric vehicles

Upgrading a vehicle from an internal combustion engine to an electric engine poses many challenges for carmakers. They must accommodate a completely different powertrain which, due to the weight of the battery, is heavier than that utilised in conventional fuel-powered vehicles. The additional weight also has a significant effect on the crash behaviour of the vehicle and this must be mitigated, ideally without adding mass.

The AHSS used to lighten the fuel-powered S-in motion vehicle are an ideal starting point. S-in motion has already demonstrated that these steels can deliver weight savings of around 20% compared to a typical C-segment vehicle.

For the electric S-in motion solution, the BIW was redesigned to accommodate the larger powertrain and create the battery protection required. Extensive use of AHSS (up from 35 to 58%) enabled ArcelorMittal's engineers to reduce the weight of the BIW by 30 kg (11%) compared to the baseline vehicle. The weight saving was achieved even though additional steel is required to protect the battery of the electric S-in motion vehicle.

Reducing the weight of the vehicle also means that less steel is needed. This contributes to a 5% drop in material costs compared to the baseline vehicle (see graph). Processing, assembly and tooling amortisation costs rise slightly because of the use of AHSS. However, the reduction in material costs almost cancels these out, making the electric S-in motion BIW just 2% more expensive than the baseline.

Maintaining crash worthiness

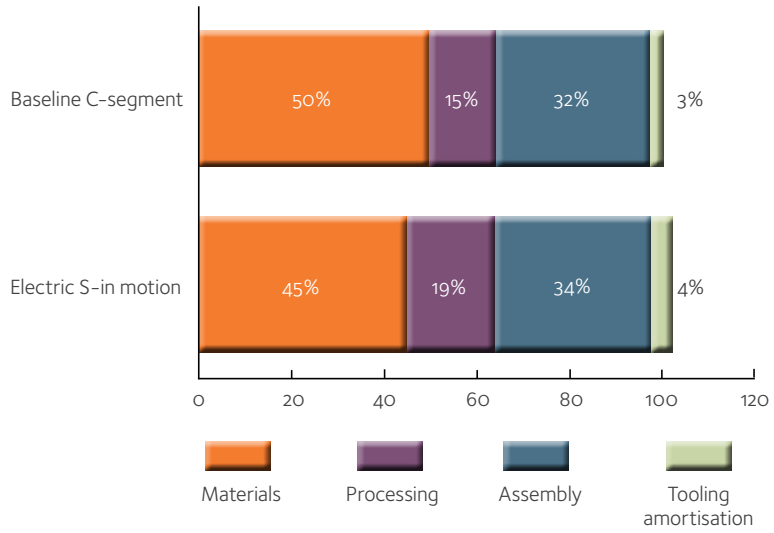
A significant consideration for the design team was the crash worthiness of the electric S-in motion solution. A number of simulations were performed using Euro NCAP and other industry standards to verify the safety of the redesigned BIW.

One of the most critical was the Euro NCAP side pole impact test. In this type of crash, passenger safety requires that energy is absorbed by the vehicle. However, to protect the battery from rupture or damage, no intrusion is allowed into the battery tunnel.

The design team achieved this balance by utilising laser welded blanks (LWB) made from Usibor® 1500P and Ductibor® 500P. Usibor® becomes hard after hot stamping, while the Ductibor® remains ductile. Combining the two advanced steels in the LWB enables vehicle designers to trigger certain behaviours and tune intrusion and crash behaviour very precisely. The electric S-in motion solution makes extensive use

Electric S-in motion showing powertrain

Costs of electric S-in motion body-in-white (BIW) compared to the baseline C-segment vehicle BIW



S-in motion nominated for Ethical Corporation Awards

Thanks to S-in motion, ArcelorMittal is nominated for the Ethical Corporation Awards 2012 in the category 'Most Innovative Company'.

The S-in motion project has been rolled out to all major carmakers, demonstrating ArcelorMittal's ongoing commitment to the automotive sector with a catalogue of steel solutions that can be used to lighten production vehicles today. This nomination is a great reward for responsible business excellence, by the global leaders in sustainability and corporate responsibility. The winner will be announced during the ceremony that takes place in London on 25 June 2012.

Weight comparison of electric S-in motion and baseline vehicle solutions

	Electric S-in motion vehicle	Fuel-powered C-segment vehicle	Electric versus fuel-powered baseline
Powertrain	367 kg	220 kg	+147 kg
BIW	259 kg	289 kg	-30 kg

of hot stamping to control crash behaviour. Compared to the baseline vehicle, the number of hot stamped parts increases from 4 to 29.

ArcelorMittal has again demonstrated that AHSS have the strength and lightness required to create the vehicles of the future, with proven solutions that are available today.

Using the BIW to protect the battery

The battery is the single most expensive component in an electric vehicle. Manufacturers must design their cars so that the battery is completely protected in the event of a crash. Failure to do so means vehicle owners may face increased insurance costs for their cars.

Many manufacturers use a reinforced box to provide the necessary protection. However, this can add unwanted weight to the mass of the vehicle.

The electric S-in motion concept uses the underbody of the vehicle itself to provide the necessary protection. The tunnel is enlarged to accommodate the battery and the battery tray is bolted to the underside of the tunnel and under the rear seat to create a protective tube (see picture). This strategy has already been used successfully in electric vehicles such as General Motors' Chevy Volt.

In the electric S-in motion solution, hot-stamped Usibor® 1500P is used to form the tunnel while the battery tray is made from dual phase DP1180. Both steels exhibit high strength and enable manufacturers to reduce weight.

The tunnel solution provides 360° protection of the battery in the event of a crash. The high strength of the steels used also improves the torsion stiffness of the BIW.

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Extensive use of AHSS (up from 35 to 58%) enabled ArcelorMittal's engineers to reduce the weight of the BIW by 30 kg (11%) compared to the baseline vehicle.

Energizing steelmaking!

New initiative targets process enhancements to reduce energy consumption and improve environmental performance.

Energy accounts for approximately one-third of the cost of a tonne of liquid steel. To reduce this figure and improve our environmental footprint, ArcelorMittal Flat Carbon Europe (FCE) has launched Energize – a project to identify new and existing process improvements which effectively reduce energy use and to implement them at all FCE mills. The goal is to reduce energy costs by 10% over the next four years.

Energize focuses on the consumption and optimisation of energy, and the reuse of energy rich gases (known as off gases) which are produced during the steelmaking process. Off gases can be used as a heat source, to produce electricity in our internal power plants, or can be sold to external energy providers.

The Energize project will also identify where energy losses occur in the production chain. For example, after it is discharged from the battery oven, coke is normally quenched using water and the energy it contains is lost as vapour. However, if a dry quenching process is used, the residual energy can be recovered and used to produce electricity.

During the project, each mill will also undertake its own programme to identify further areas for energy savings. Best practices, such as the case studies in this article, will be shared across mills.

Decreasing energy consumption reduces both production costs and CO_2-equivalent (eq) emissions. The four case studies detailed in this article have reduced CO_2-eq emissions by more than 500,000 tonnes/year. That equates to removing almost 180,000 medium-sized cars from the roads for a year. The positive effects of these best practices will be multiplied as they are shared across all our mills.

Gent recovers flue gases

In the blast furnace of ArcelorMittal Gent (Belgium), iron ore and coal (in the form of coke) are transformed into liquid pig iron. The pig iron contains 4.6% carbon, way above the 0.4% required for quality liquid steel. To remove the excess carbon, it is burnt with pure oxygen.

During the combustion process, a large amount of energy rich flue gases are produced. Previously these gases were burnt off at the top of a chimney. However, since July 2011, ArcelorMittal Gent has diverted the flue gases to a 90,000 m^3 reservoir.

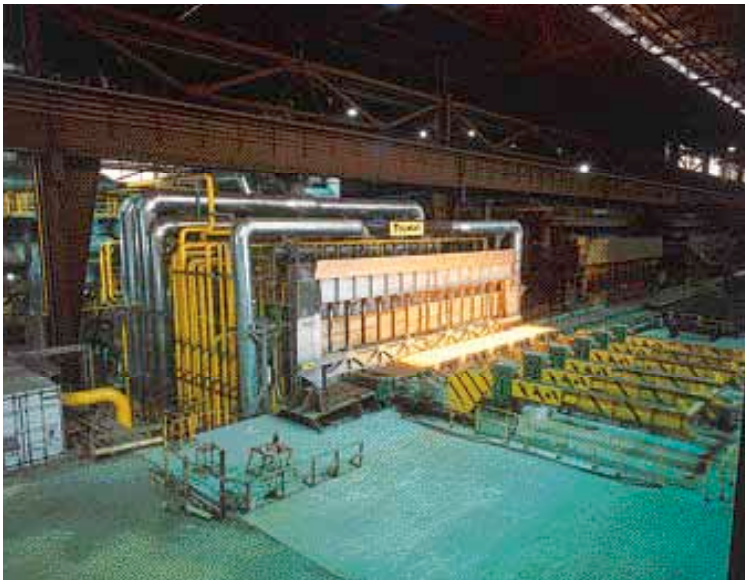
Around half of the saved gas is utilised within the mill, while the remainder is sent to a local electricity generator. ArcelorMittal Gent estimates that this will reduce the mill's overall energy consumption by 3% and decrease CO_2-eq emissions by 170,000 tonnes/year. Reusing the flue gases within the mill has resulted in a drop in energy consumption of 0.7 gigajoules (GJ) per tonne of steel. While the cost of building the system was just over €38 million, ArcelorMittal calculates that this investment will be recovered within two years.

Bremen recovers converter gas

ArcelorMittal Bremen (Germany) has implemented a €41 million project to recover energy, lower dust emissions and reduce nitrogen-oxide (NO_x) emissions. The project saw the construction of a basic oxygen furnace (BOF) gas recovery facility and a convertor dedusting system.

The gas recovery facility will allow Bremen to reduce CO_2-eq emissions by up to 270,000 tonnes per year. Around 80% of the recovered gas will be burnt in the walking beam furnaces of the hot strip mill, replacing the use of natural gas. The remaining recovered gas will be used in the mill's power plant to generate electricity.

During renovations to implement the new systems, the burners of the walking beam furnaces were adapted to reduce NO_x emissions by over 25%. In addition to lower dust emissions and the recovery of energy rich gases, this is the third green effect of this project.



Avilés increases scrap content

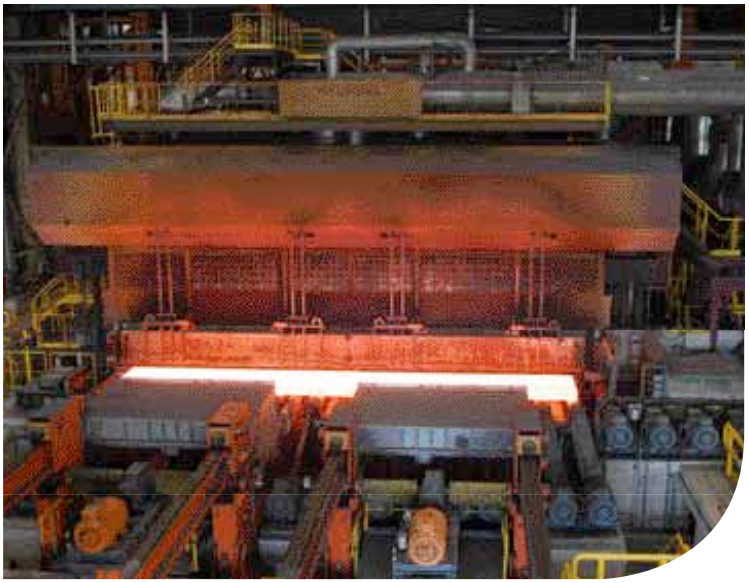
To increase scrap content in its steelmaking process, ArcelorMittal Avilés (Spain) is overhauling its scrap handling capabilities. Modifications are being made to the scrap handling yard, loading crane, transport wagons, the loading bucket and scrap control system.

The changes will ensure that an extra 10 to 15 tonnes of recycled steel can be added to every basic oxygen furnace (BOF) charge. This will enable the recycled content of the BOF to be increased to a maximum of 80 tonnes, or almost 30% per load. Annual CO_2-eq emission savings are estimated to be around 59,000 tonnes.

Eisenhüttenstadt improves hot charging

At ArcelorMittal Eisenhüttenstadt (Germany), an ongoing project to improve the logistics of transporting slabs between the caster exit and the hot strip mill has been completed. Advanced tracking devices are now connected to the line to sense the location of the slabs. Together with new software, the system ensures the fresh slabs retain as much heat as possible. This reduces the need for heating in the hot strip mill.

The target is to transfer at least 25% of all slabs at a temperature higher than 800°C, and another 15% at a temperature above 400°C. Total energy savings are estimated at 160 terajoules/year and CO_2-eq emissions will be reduced by 8,800 tonnes/year.



The ArcelorMittal Orbit

An icon for London 2012 and for the regeneration of East London

Once every four years the Olympic Games grab the attention of the entire world. This year it is London's turn to shine and ArcelorMittal will be there through the ArcelorMittal Orbit – a landmark sculpture which will form an integral part of the Olympic Park. At 114.5 metres high, the ArcelorMittal Orbit provides an unparalleled view of the Olympic site and will become one of London's leading visitor attractions after the Games.

The ArcelorMittal Orbit is also an opportunity for ArcelorMittal to showcase the strength and versatility of steel. With the involvement of our mills across the world, ArcelorMittal Projects, and the contribution of suppliers in France, the Netherlands and the United Kingdom, the sculpture also serves as a great example of ArcelorMittal's extensive logistics network and supply chain.

High level of recycled content

That supply chain became critically important early in the project. Normally the tube maker Condesa would have received the steel for this application from ArcelorMittal's Bremen mill. However, when the order for the tubes was received from the fabricator in mid-August 2011, it specified that they should contain at least 50% recycled steel. While all new steel contains a considerable portion of recycled content, it was impossible to reach 50% at our Bremen mill.

With delivery of the first coils required by 23 September, ArcelorMittal Projects decided to call on our Sestao mill which operates an electric arc furnace (EAF). An EAF is the most efficient way to convert scrap into molten steel. However, Sestao had never produced the required steel grade (S355J2H) with the properties specified for the ArcelorMittal Orbit.

Overhaul at Sestao

The facilities at ArcelorMittal Sestao were revamped in order to produce steel with the toughness and elongation properties required for the sculpture. New process parameters were introduced to control the rolling and cooling temperatures to ensure that the steel has a lower grain size. A low grain size ensures that strength is maintained without compromising the steel's toughness at a thickness up to 12 mm.

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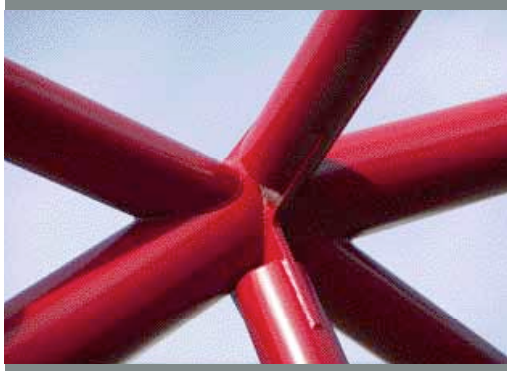
The steel tubes of the ArcelorMittal Orbit are comprised of 60% recycled steel.

Around 2,000 tonnes of steel make up the ArcelorMittal Orbit.



The steel in the ArcelorMittal Orbit weighs as much as 1,136 London black cabs.

The ArcelorMittal Orbit has a height of 114.5 m.

First coils in two weeks

Within two weeks of the order being received at Sestao, the first coils were on their way. In total, more than 500 tonnes of steel were produced by Sestao for the ArcelorMittal Orbit. The recycled content was 60%, well in excess of the 50% requested by the London Organising Committee for the Olympic Games (LOCOG).

Condesa's precision-tube manufacturing plant in France formed the steel into welded tubes before shipping it to Watson Steel in the UK. Watsons designed the connections for the ArcelorMittal Orbit structure, fabricated the different parts and then assembled the sculpture on-site. The company, which also worked on the Olympic Stadium, was chosen for its experience in producing precision-made steel structures.

The completed ArcelorMittal Orbit sculpture was unveiled at the beginning of May 2012, two months before the Games were due to open. It creates a major focal point for the Olympic Park site and is sure to be appreciated by visitors both during the Games and for many decades to come.

Not just tubes

Although a large part of the ArcelorMittal Orbit sculpture is made of S355J2H steel grade, many other steels were supplied by ArcelorMittal for this project. Steel plates, bars, beams, rods and wire were used to build the foundations and other parts of the structure.

Indaten® weathering steel panels form the inner core of the structure and were produced by Industeel in Belgium. Thicknesses range from 10 to 20 mm.

About the ArcelorMittal Orbit

The idea for a sculpture to commemorate the London 2012 Olympic and Paralympic Games came from London Mayor, Boris Johnson and a design competition was launched for the landmark project. Johnson secured the support of ArcelorMittal during a chance meeting with Chairman and CEO, Lakshmi Mittal at the World Economic Forum in 2009.

The winning entry, designed by Anish Kapoor and Cecil Balmond, was unveiled in March 2010. A sculpture and observation platform, the ArcelorMittal Orbit is located between the Olympic Stadium and the Aquatic Centre in the southern area of the Olympic Park.

At 114.5 m, the ArcelorMittal Orbit will be visible from every part of the Park and will provide a sensational overview of the site. It is Britain's largest piece of public art.

The ArcelorMittal Orbit includes two indoor viewing platforms on two different levels, and a visitor pavilion at ground level. The upper level will feature an outdoor walkway and two mirror sculptures by Kapoor.

Access to the viewing platforms is via one of two lifts. While visitors may also descend in the lift, it is hoped that they will choose to utilise the spiral staircase which winds through the sculpture. Up to 700 people per hour will be able to visit the ArcelorMittal Orbit.

Around 2,000 tonnes of steel has been used to construct the sculpture, equivalent to the weight of 1,136 London black cabs.

ArcelorMittal's donation of the ArcelorMittal Orbit to the London Olympics and the people of London resulted in the company being appointed a London 2012 Tier 2 partner. ArcelorMittal is also the official steel supporter of the Games.

For more information, please visit: www.arcelormittalorbit.com

Strong yet flexible

Case hardening steels combine external toughness with a flexible core.

Although a niche product, case hardening steels are vital for applications which require a tough exterior and a ductile core which can absorb energy. Seat adjusters in vehicles are a typical application.

Case hardening steels are vital for applications which require a tough exterior and a ductile core which can absorb energy, such as seat adjusters for car seats.

What is case hardening?

Case hardening steels are delivered to ArcelorMittal's re-rolling customers where they are processed to obtain the desired thickness. The steel is then stamped into the shapes required.

The stamped parts are placed in a controlled, carbon-rich environment and heated so the carbon penetrates the outer surface of the steel. The longer the steel is held in this environment, the deeper the carbon will penetrate. Once the carbon deposition is complete, the part is tempered (heat treated) to create a gradient of hardness from the surface of the steel to the core. The result is an extremely tough outer surface and a ductile core.

Forming the adjuster from case hardening steels enables it to absorb impact stress in the event of a crash without breaking. However, the tough exterior means the adjuster can withstand the abrasions which occur through constant use.

ArcelorMittal's range of case hardening steels has recently been expanded with the addition of a new grade – 16MnCr5. Developed in response to customer feedback, this grade has a very low level of carbon – between 0.14 and 0.17%.

As ArcelorMittal's case hardening steels have excellent internal purity, they can be rolled to very low thicknesses. However, ArcelorMittal can supply case hardening steels with even higher levels of internal purity for specific applications.

Dimensions of ArcelorMittal's case hardening steels

	C10E EN 10084:2008, C12E AM FCE, C15E EN 10084:2008		C18SIKILLED AM FCE C22E EN 10083-2		16MnCr5 EN 10084:2008, 16MnCr5 AM FCE	
Thickness (mm)	Min width (mm)	Max width (mm)	Min width (mm)	Max width (mm)	Min width (mm)	Max width (mm)
1.70 ffi th < 2.00	900	1200	-	-	-	-
2.00 ffi th < 2.25	800	1600	800	1525	800	1200
2.25 ffi th < 2.50		1650				1400
2.50 ffi th < 2.75		1700				1450
2.75 ffi th < 3.00		1750				1500
3.00 ffi th < 8.00		1790				1700
8.00 ffi th < 11.00						
11.00 ffi th < 13.00	Contact ArcelorMittal regarding availability					

More information?

For more information about our case hardening steels offer, please visit our product document centre at www.arcelormittal.com/industry

Aluzinc®

A unique metallic coating combining attractive aesthetics with demonstrated durability

Pharmaceutical plant in Besançon (France) – Aluzinc® façade – Architect: Brigitte Métra & Associates (Photo: Julien Cescon)

Nearly thirty years of production experience, constant monitoring in test laboratories, ongoing improvements and regular on-site inspections ensure that Aluzinc® is a unique coating for the construction industry, especially in roofing and façade applications. Two specific ranges have recently been launched to further enhance this product's reputation throughout Europe.

Aluzinc® retains its natural brightness and shine for years.

Aluzinc®'s natural metallic appearance gives this material a highly attractive and very long-lasting aesthetic appeal. This unique combination of aluminium and zinc offers outstanding corrosion resistance, even in the most severe outdoor environments.

Aesthetically pleasing and exceptionally durable

We are so confident in Aluzinc®'s ability to withstand corrosion that we back the AZ185 coating with a 25-year warranty against perforation due to corrosion! The combined effect of zinc and aluminium ensures that Aluzinc® performs better than steel sheet protected solely by pure zinc or aluminium. This exceptional warranty is a further chapter in the success story that is Aluzinc®, now regarded as one of the most durable and design-oriented metallic solutions.

Reflective, fire resistant and flexible

Aesthetic appeal and durability are not the only advantages of Aluzinc®. This coating also offers excellent thermal and light reflectivity, along with good fire resistance. What's more, Aluzinc® demonstrates considerable processing flexibility (bending, profiling or deep drawing), allowing architects and contractors to create unique shapes for their projects. Finally, Aluzinc® is supplied with chromium-free passivation to satisfy the most rigorous environmental demands, both now and in the future. ArcelorMittal Flat Carbon Europe (FCE) is currently one of the only manufacturers in the European market offering this range of benefits.

Two specific Aluzinc® ranges to satisfy clients' needs better

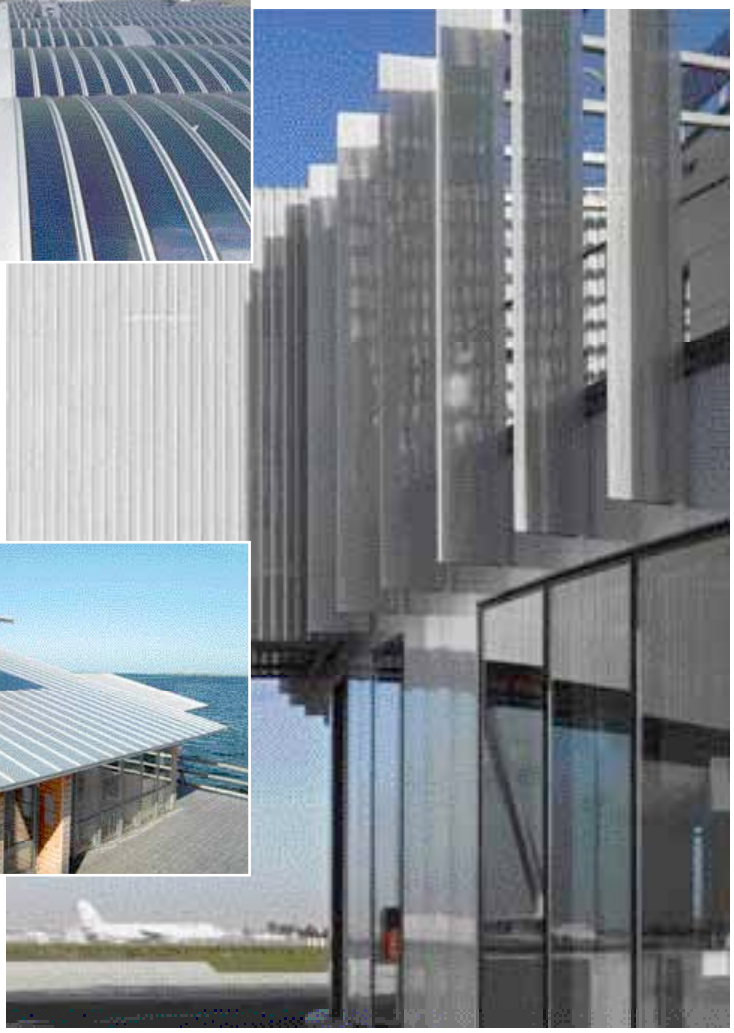
Aluzinc® Florelis: a unique steel for all your creative building needs

Prestigious architecture requires prestigious steel. Aluzinc® Florelis is not your typical steel: it offers aesthetic benefits guaranteed to give a building a prestigious edge. Part of ArcelorMittal FCE's aesthetic range, it offers a one-of-a-kind finish specifically tailored for modern and contemporary façades.

Aluzinc® Florelis adds a creative touch to transform a unique building into a remarkable one. With between 1,000 and 1,800 spangles per dm^2, Aluzinc® Florelis

Extensive photovoltaic roofing system in Tuscany (Italy) – Italpannelli

Standing seam roof on the Swedish coast – Lindab Buildings



Airbus Delivery Centre in Toulouse (France) – Architect: Jacques Ferrier
(Photo: Luc Boegly)

can guarantee a uniform visual effect with a sharp and shiny look. Commonly used for 'show' façades, the Florelis range has an excellent reputation among many European architects. The product's smooth, clean appearance and its extraordinary natural brightness represent significant advantages, allowing architects to constantly push the envelope.

Aluzinc® HFX: extreme formability and exceptional durability

Very good formability and excellent corrosion resistance are just some of the additional benefits offered by Aluzinc® HFX (High Formability eXtended). Primarily intended for use in standing seam roofs and rainwater systems, the HFX range combines extreme steel formability with the outstanding corrosion resistance of Aluzinc®.

The results are amazing. Setting a new standard in roofing, Aluzinc® HFX is a natural replacement for pure zinc coatings. In recent years, the HFX range has become a benchmark for standing seam roofs throughout Scandinavia, for example. The product's extreme formability means that the great majority of roofing projects can be hand-finished on site.

Many uses for Aluzinc® in construction projects

'Show' façades, traditional or perforated, roofs of all kinds, solar shading, indoor uses, photovoltaic applications... There is no shortage of uses for Aluzinc® in the construction industry and many of these are proudly linked to internationally renowned architects or projects. Some of the recent projects that contribute to enhancing the product's reputation in Europe and around the world are shown here.

Metro car park in Toulouse (France) – Architect: Pierre Azéma

More information?

You can find further information about Aluzinc® and its applications on the ArcelorMittal FCE website at www.arcelormittal.com/industry

ArcelorMittal adds value for appliance makers

Our co-engineering approach helps manufacturers identify and test the right innovative steels to save on weight and costs.

Domestic appliance makers are required to deliver quality products at the lowest possible cost in a market known for high levels of competition. Manufacturers who fail to develop economical and innovative products which respond to consumer demands are likely to lose their competitive edge. But ArcelorMittal's appliance customers have that edge: access to some of the most advanced steels on the market and unparalleled support at all stages of the manufacturing process – from concept design to full industrial production.

Appliance makers have traditionally used drawable steels for their ease of formability, or construction grades in applications where strength is required. But smart appliance makers are now using advanced high strength steels (AHSS) which offer both lower weight and higher strength. As less steel is required to create each part, the resulting cost and weight savings can be significant.

The right steel for the right part

Our AHSS are ideal for parts which are subjected to severe impact loads during transport or high levels of wear. The steels have excellent tensile properties, making them suitable for complex deep drawing. They also provide excellent resistance to indentation and strength is maintained or improved, even when the thickness of the steel is reduced.

ArcelorMittal's co-engineering assistance starts during the design phase of the product's life. ArcelorMittal engineers can help manufacturers to identify the right steel for the right part. The same engineers are also involved in research into new steel grades and can advise if one of our steels in development might be more appropriate than an existing solution.

Industry standard simulations

A range of simulations can also be carried out to ensure the materials selected meet the manufacturer's performance criteria. These include experimental strain analysis after deep drawing and finite element stamping simulations. Industry standard drop tests, both with and without packaging, can also be simulated.

ArcelorMittal engineers can also carry out finite element simulations to predict fatigue over the lifetime of an appliance. This is particularly useful to test the performance of high-use parts of the appliance.

Surveys have shown that noise from an appliance is also a major consideration for consumers. ArcelorMittal's vibro-acoustic testing facilities enable manufacturers to optimise the design of the appliance in order to reduce noise. For example, optimising the

Stylish, strong, practical and cost-efficient

ArcelorMittal and students from the International School of Design (ISD) in Valenciennes (France) have worked together on a project to design a revolutionary new washing machine. The design integrated many innovative steel solutions and highlighted ArcelorMittal's co-engineering expertise. The prototype exceeded all four design considerations: style, strength, practicality and cost.

Another detailed technical study focussing on advanced high strength steels (AHSS) has shown that these steels improve fatigue lifetime and enable domestic appliance makers to reduce steel thickness by up to 25%. Manufacturers who switch to AHSS could save more than 17% on material costs alone.

topography of side panel embossing on a washing machine can significantly reduce the sound produced during use.

Expertise and steels that give you the edge

Equipped with ArcelorMittal's portfolio of AHSS, and the design and testing expertise of our engineers, domestic appliance makers can develop affordable, durable and aesthetic appliances for modern living. Why not contact us to find out how we can give your products the edge over your competition.

Adding sparkle to white goods

ArcelorMittal's range of steels for domestic appliances also includes aesthetic solutions which can set a product apart from the competition. Our Aluzinc® steel offers excellent corrosion resistance and a stunning spangled appearance thanks to its coating of aluminium and zinc. Aluzinc® resists corrosion so well it can be used to make the drums of tumble dryers.

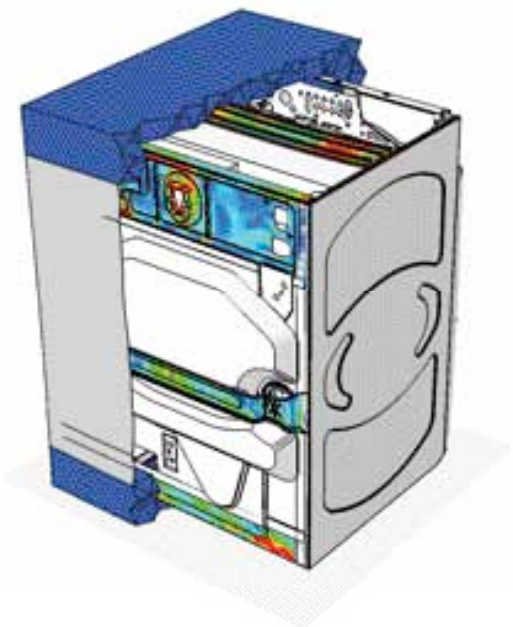
Our new Magnelis® metallic coating has outstanding corrosion resistance. Containing 3.5% aluminium and 3% magnesium, Magnelis® is already being used as a substitute for heavy zinc metallic coatings and batch galvanization.

ArcelorMittal's xcellook® and Estetic® Ambient® Platinium are produced by combining a specific brushing technology and an aesthetic and protective organic coating. The result is a stainless steel-like finish.

In the case of xceldesign®, the finish is produced using a technology known as Electron Beam Texturing (EBT). During the EBT process, small craters are melted into the surface of the rolls which are used to finish the steel. Repeating patterns can be etched into the rolls.

Xcellook® (picture left) and Estetic® Ambient® Platinium (picture below) have an attractive finish which resembles stainless steel. Both products are ideal for applications where aesthetics are key. As well as being resistant to fingerprints and easy to clean, the finish of these products provides good resistance to scratches and stains.

Finite element simulation of a washing machine drop test, showing the stresses in some critical components



Keeping shipyards afloat

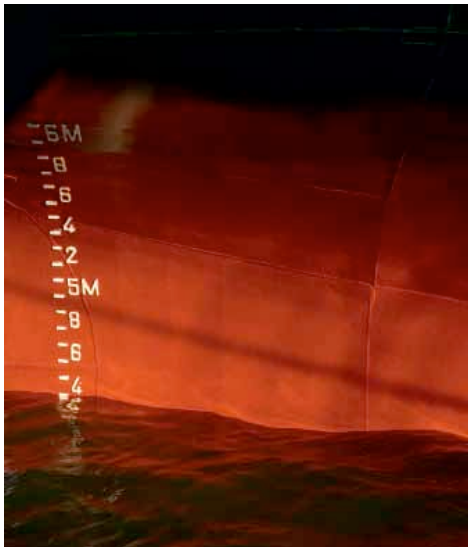
As the shipbuilding industry goes through tough times, ArcelorMittal is responding with a tailored approach, both in terms of service and new products.

The economic crisis of the past few years has had a significant impact on the shipbuilding industry worldwide. Orders for new ships peaked in 2008, and demand has declined significantly since. With full recovery not expected before 2015, shipbuilders are exploring new markets and new ways of working in order to survive. As a leading supplier to the shipbuilding industry, ArcelorMittal is improving its steel offering for the sector and making logistical changes in order to better support the world's shipyards.

In the 20 years between 1975 and 1995, seaborne trade doubled in volume. Unprecedented demand saw it double again in the 13 years up to 2008. For shipbuilders, the boom times meant full order books and a promising outlook for the future.

Niche markets busy

That future largely evaporated when the economic crisis hit in 2008. Existing orders were cancelled and requests for new vessels were few and far between. For European shipyards, the crisis has been particularly difficult. Competition from cheaper locations in Asia had already seen much of the world's shipbuilding move to countries such as South Korea, China and Japan. The current economic downturn has accelerated this trend.



To compensate, many European shipyards have shifted their activities to niche markets such as arctic and deep-sea diving applications. Europe is also the largest producer of cruise ships, accounting for 95% of world production. Despite recent high-profile incidents, demand in this sector of the shipbuilding industry remains strong. ArcelorMittal's steel plates are being used to build these, and many other types of vessels.

We are constantly monitoring the market, adjusting our offering accordingly and tailoring our approach to the specific needs of individual shipyards.

New steels for new challenges

As well as adjusting our service offering to shipyards, ArcelorMittal is also developing new steels to help shipbuilders stay competitive. The market is demanding thinner steels and ArcelorMittal is keeping pace. Many of our steel plates can be delivered in thicknesses between 5 and 8 mm.

Our shipbuilding steel plates are also stronger. For example, the strength of grades EH-36 and EH-40 (introduced in 2011) is above 350 Megapascals (MPa), even at low temperatures. This makes them suitable for many arctic and deep-sea vessels.

Our plates are now also available in larger sizes, reducing the time and cost of welding plates together. Widths of up to four metres and lengths of up to 15 metres are possible. Plates can be delivered in a range of finishes including as rolled, shot-blasted, or shot-blasted and painted.

As a leading supplier of steel for shipbuilding, ArcelorMittal is remaining close to our customers in these tough times. We are constantly monitoring the market, adjusting our offering accordingly and tailoring our approach to the specific needs of individual shipyards.

Reducing lead times

ArcelorMittal has also adapted its level of service. For example, financing the building of a ship is an issue for many shipyards. To alleviate the problem, we can deliver the steel for the ship in smaller lots to reduce need for storage and so payments can be spread. If a project needs 3,000 tonnes of steel for a vessel, it can be delivered in several lots, reducing the impact on the shipyard's cash flow. The plates can also be sorted and delivered by lots, significantly improving the customer's logistics and increasing their productivity.

Competition and the financial crisis have also resulted in shipyards becoming more efficient at building vessels. Instead of requesting two or three years lead time, many shipbuilders are now offering half that. In response, ArcelorMittal has also reduced its lead times in an effort to increase the competitiveness of our customers. As steel is now traded as a global commodity, price changes cannot be negated entirely. However, ArcelorMittal's efforts aim to diminish the negative impact of these variations on the shipbuilder's overall business.

The steps we have taken to help shipbuilders weather the tough times are a demonstration of ArcelorMittal's commitment to this important industry. Over the coming years we will continue to develop our portfolio of shipbuilding steels and innovative services to support shipyards.

That sinking feeling

With orders for new ships scarce, many shipyards are turning to new markets for their livelihood. And surprisingly, some of the products the shipbuilders are creating today are designed to sink, not float.

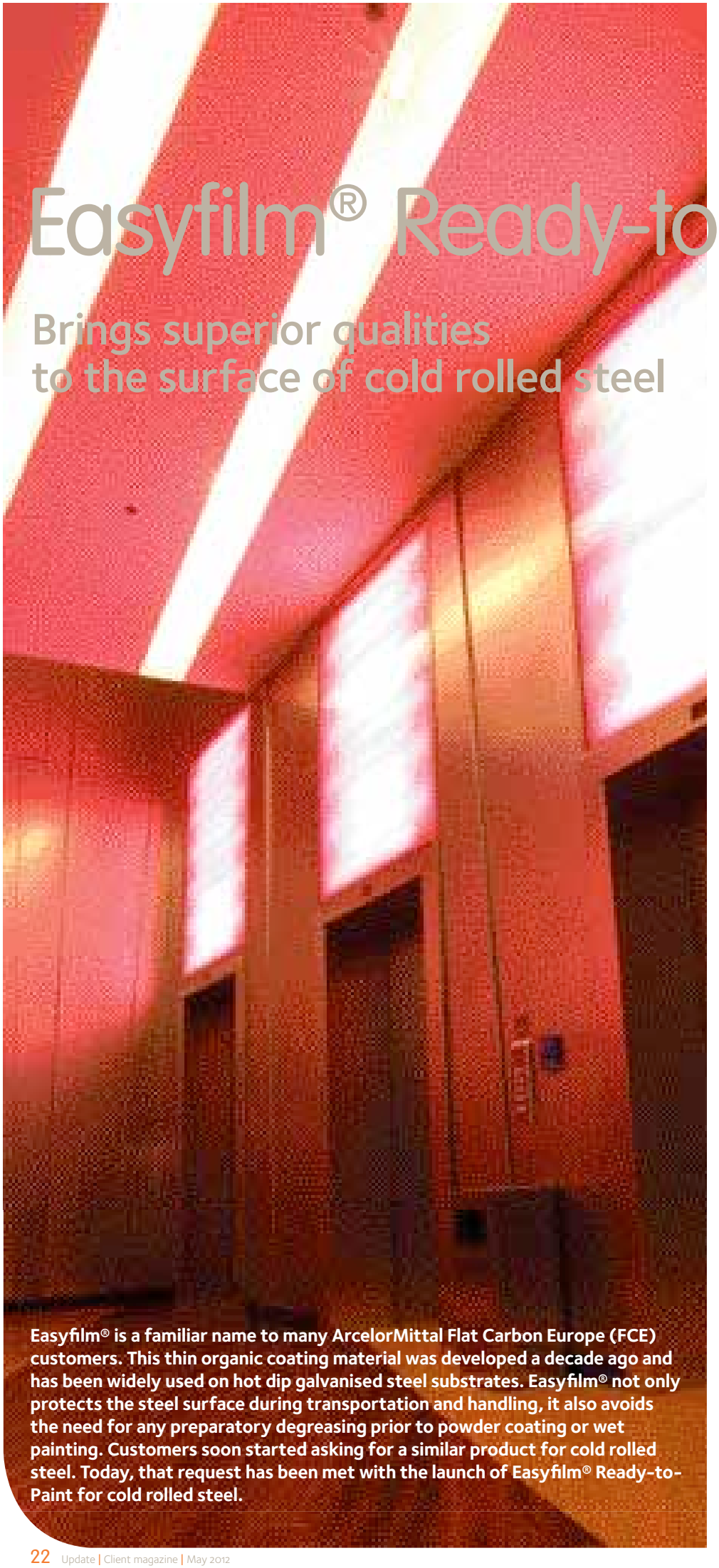
One of these new niche markets is the foundations for offshore wind turbines. Known in the industry as jackets, the foundations are made of the same plates used to build ships. The plates are formed into tubes which are then welded together to form the jacket.

Jackets can weigh up to 500 tonnes and can be over 50 metres high. They enable wind farms to be situated in deep water (over 40 metres) and support extremely large wind turbines.

The jackets are formed onshore, before being floated to the wind farm site on barges and sunk to the bottom. Like all steel products, the jackets can be recovered at the end of their useful life and recycled.

Easyfilm® Ready-to-Paint

Brings superior qualities to the surface of cold rolled steel



Easyfilm® is a familiar name to many ArcelorMittal Flat Carbon Europe (FCE) customers. This thin organic coating material was developed a decade ago and has been widely used on hot dip galvanised steel substrates. Easyfilm® not only protects the steel surface during transportation and handling, it also avoids the need for any preparatory degreasing prior to powder coating or wet painting. Customers soon started asking for a similar product for cold rolled steel. Today, that request has been met with the launch of Easyfilm® Ready-to-Paint for cold rolled steel.

'The demand for an Easyfilm® solution for cold rolled materials came mainly from metallic furniture manufacturers, steel drum makers and producers of domestic appliances,' says David López Granados, a coating and surface researcher at ArcelorMittal Global R&D Gent. 'Until now, we have supplied these customers with oiled coils which must be degreased, phosphated and passivated before they can be painted. Each of these preparatory processes has economic and/or environmental drawbacks. These processes are no longer required if customers switch to Easyfilm® Ready-to-Paint.'

A very pleasant surprise

The benefits of Easyfilm® Ready-to-Paint are impressive. Not only does the new thin organic film guarantee direct paintability, it also contributes to surface cleanliness and offers temporary corrosion protection during transportation, storage and manufacturing. Easyfilm® Ready-to-Paint is compatible with operations such as cutting, slitting, bending, profiling, light stamping, welding and clinching.

'But there is more,' explains Product Development Manager, Philippe Gousselot. 'When it comes to surface quality and durability of the painted parts, the new coating material performs similarly to Tri-cation phosphated ZE 25/25 material and clearly outperforms Fe-phosphated cold rolled steel. That came as a very pleasant surprise to us.' Given that Easyfilm® Ready-to-Paint also costs less than electrogalvanised material, ArcelorMittal expects many manufacturers will switch to the new material. It is a

Easyfilm® Ready-to-Paint can be used for a wide variety of applications such as drums, metallic furniture and elevators.

particularly interesting solution for manufacturers of Heating, Ventilation and Air Conditioning (HVAC) applications, domestic products, metal furniture and movable partitions.

'Customers are always looking for opportunities to reduce costs without compromising quality,' says Claudia Liedl, Product Marketing Manager. 'So, there is clearly a market for Easyfilm® Ready-to-Paint.' Over the past few months, we have conducted various tests with some of our customers. 'We used the new material to make metallic furniture, electrical cabinets, boiler casings, cookers, fridges and control panels of ovens,' explains Liedl. 'In all cases, the use of Easyfilm® Ready-to-Paint has produced great results and paved the way for cost reductions.'

Future alternative

Industrial production of Easyfilm® Ready-to-Paint began early in 2012. Special demonstration kits have been prepared for ArcelorMittal's technical experts and they will be using these to introduce the new material to our Industry customers.

'By applying this new thin organic coating to our cold rolled steel, we have created an ideal substrate for a wide range of applications,' says David López Granados. 'These include various powder coatings such as epoxy and epoxy polyester, and wet paints. Compared to conventional materials, Easyfilm® Ready-to-Paint guarantees superior quality and durability at a remarkably competitive price. In addition it also offers easier process control, greatly reduced waste water treatment costs and an overall reduction in the carbon footprint of the production process.'

Complements electrogalvanised steel

While many customers who are now using electrogalvanised material may want to switch to Easyfilm® Ready-to-Paint, it is not the right solution for every application. 'In some cases Easyfilm® Ready-to-Paint may not prove to be a viable option,' explains Philippe Gousselot. 'On electrogalvanised material, a zinc coating of just 2.5 microns offers edge protection. Even when the surface is disrupted by punching a hole or cutting an edge, the anodic characteristic of the zinc coating will continue to provide protection to the exposed base metal. We will offer appropriate advice to customers who plan to substitute electrogalvanised steel with Easyfilm® Ready-to-Paint.'

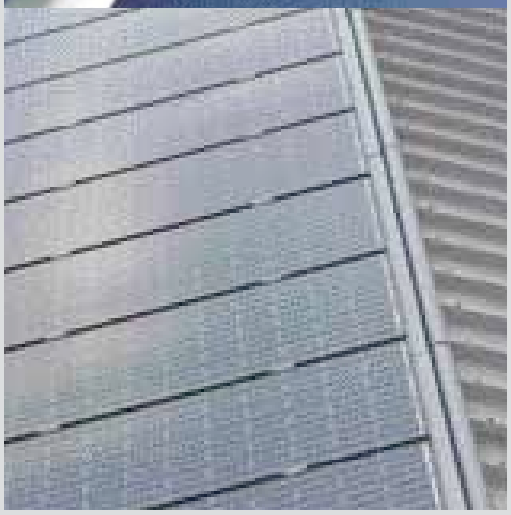
'It has never been our intention to replace electrogalvanised material,' adds David López Granados. 'Our main objective was to help customers avoid degreasing and phosphating processes which are costly and environmentally unfriendly. That goal has been achieved.' A new Easyfilm® Ready-to-Paint version is now available for all ArcelorMittal cold rolled steel grades in thicknesses between 0.40 to 1.00 mm. In the first stage, Easyfilm® Ready-to-Paint material will only be suitable for light stamping. However, further developments will also make it suitable for deep drawing.

'Today, zinc, manganese and nickel phosphates are widely used to promote paint adhesion,' notes David López Granados. 'But the use of nickel will soon be prohibited, making Easyfilm® Ready-to-Paint an even more attractive alternative for electrogalvanised material.' The new thin organic coating clearly provides an answer for manufacturers who seek a green and affordable surface for cold rolled steel.

Clean and green!

- Direct paintability without degreasing, phosphating or other surface treatment
- Dry aspect:
  - Clean workshops
  - Surface cleanliness
- Temporary corrosion protection:
  - Equivalent to slightly oiled cold rolled steels
  - Protection during transport, storage and manufacturing
- Compatible with manufacturing and assembling methods such as cutting, slitting, bending, profiling, light stamping, spot and seam welding and clinching
- Compatible with painting methods including:

New solutions for energy markets



Many steels used in energy applications have been adapted from other industries. To address this, ArcelorMittal is refining its product offering for the energy sector by developing new steels and identifying existing steels which are suited to specific energy applications.

Energy pipes

In recent years, many new pipelines have been built to transport oil and natural gas around the globe and more are planned. Demand for low-cost and safe long-distance gas transmission pipes is driving us to develop ever stronger and tougher steels.

In the previous issue of *Update* we featured an article about ArcelorMittal Flat Carbon Europe's comprehensive product offering for the oil and gas pipe industry. We are further increasing our range of Hydrogen Induced Cracking (HIC) resistant steels which are vital for sour environments and are gaining market share in CO_2 transportation projects. ArcelorMittal's new range of Oil Country Tubular Goods (OCTG) grades has been developed to meet increasing demand for welded pipes in casing, tubing and drilling operations.

Currently we are developing a new heavy gauge steel for spiral-welded energy pipes which is more than 20 mm thick. The new steel is designed for use in intercontinental pipelines and should be available by early 2013.

Solar installations

ArcelorMittal's new Magnelis® steel is a light, but high strength metallic coated steel which is ideal for solar installations. Until now, solar structures have been made from a standard steel grade which is galvanised to provide corrosion resistance. However, if the steel is cut or scratched after galvanisation, the protection is lost and the underlying steel can corrode.

By contrast, Magnelis® is lighter and has corrosion resistance built in. The Magnelis® coating consists of 3.5% aluminium and 3% magnesium. If the cut edges or scratches are less than 3 mm deep, the corrosion-resistant layer reforms to provide protection. Magnelis® enables operators of both thermal and photovoltaic solar installations to create lighter and longer-lasting structures.

Wind turbine towers

ArcelorMittal's R&D engineers are currently studying the design of wind turbine towers to demonstrate how the structure can be lightened without compromising strength or longevity. They are calculating whether a combination of design changes and/or other steel grades from our product catalogue can meet the performance criteria for this application.

Our efforts to develop tailor-made solutions for the energy sector are just part of ArcelorMittal's green approach to product development. That approach creates steels which are lighter and longer lasting, enabling manufacturers to reduce the impact of their applications on the environment.

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