


ArcelorMittal Europe – Flat Products



ArcelorMittal

update

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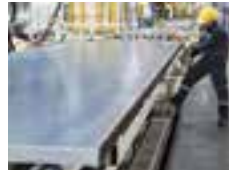
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In each edition of Update, an ArcelorMittal opinion leader speaks out. In this issue we hear from Carl De Maré, head of emerging technologies for ArcelorMittal.

ArcelorMittal invests in bio-fuel plant

ArcelorMittal and its partners LanzaTech and Primetals will soon begin construction of a facility which converts waste flue gas into bio-ethanol. Developed by LanzaTech and trialed in four pilot plants around the world, the technology uses a naturally occurring microbe to convert CO and hydrogen into a biological fuel source. Let me outline the benefits this project will bring for ArcelorMittal and the environment.

The new plant at ArcelorMittal Gent will produce 47,000 tonnes of bio-ethanol a year, enough to fuel half a million cars with ethanol-blended gasoline. The system is an environmentally friendly biological process in which microbes consume the CO and hydrogen molecules in blast furnace gases. Ethanol is produced as a by-product.

Blast furnace gases include around 5% hydrogen and 25% CO. As CO is dangerous if emitted to air, ArcelorMittal has been obliged to burn it until now. The new plant will be fully integrated into the steelmaking process to reuse as much waste gas as possible.

There is huge demand for ethanol. The European Union uses more than 8 billion litres of ethanol annually, mainly in fuels. Compared to oil-based fuels, bio-ethanol has a significantly lower CO₂ impact. Life cycle analysis shows that the bio-fuel from steel waste gas reduces emissions by around 85% compared to fossil fuels. So it is a much more environmentally friendly fuel.

Most ethanol plants use sugar-rich biomass as a feed source and producing bio-fuels can take land away from food production. As our new plant will use waste gases, there is no effect on food production.

As the production of bio-ethanol is a new activity, ArcelorMittal intends to establish a dedicated company to roll-out the technology in Gent and at other ArcelorMittal mills. Financing includes €10.2 million from the EU's Horizon 2020 project which aims to transition great R&D ideas to market-ready applications. Talks are also taking place with potential equity and debt partners.

“New technology organically converts waste blast furnace gas to ethanol.”

The ethanol plant is a perfect fit with ArcelorMittal's strategy to further contribute to more sustainable transport solutions and the EU's goal of lowering emissions from vehicles. Weight reduction of vehicles is the first step, but it is not the most cost-effective way once you reach a certain level of vehicle emissions. So it makes sense to make fuel cleaner. Creating cars with advanced steels and reusing the gas from the production of that steel to fuel our cars is a much more logical solution. It is an interesting technology for automakers and meets European objectives to improve fuel quality and reduce emissions.

Carl De Maré



Louis David, material master expert in vehicle design at PSA Peugeot Citroën

PSA award recognises the value ArcelorMittal adds to the partnership

PSA Peugeot Citroën and ArcelorMittal work together to create the vehicles of the future with the next generation of steel solutions

Louis David is a master expert in materials and processes for the vehicle perimeter at PSA Peugeot Citroën. He spoke with *Update* about the recent supplier award PSA presented to ArcelorMittal, the cooperation between the two companies, and the role of steel in the vehicles of today and the future.

Update: During the 11th PSA Peugeot Citroën Suppliers Awards, ArcelorMittal was named best supplier in the Value Creation category. While we are very proud to have received this recognition,

can you tell us why ArcelorMittal was selected for this specific award?

Louis David: This particular PSA award recognises suppliers who offer groundbreaking technical solutions or new

services. Something which enables us to add value to our vehicles. ArcelorMittal received this award as they invited PSA to work collaboratively during the development of Fortiform® 1050, a steel for cold stamping with excellent mechanical characteristics. It seemed appropriate to recognise the work we do together throughout the year to develop new steel solutions, particularly for weight reduction.



“ArcelorMittal received this award as they invited PSA to work collaboratively during the development of Fortiform® 1050, a steel for cold stamping with excellent mechanical characteristics.”

Louis David, PSA

“By 2020 we expect that we will need to lose another hundred kilos over the entire car. Around 35 to 40 kilograms will come off the BIW including closures. Based on the steel solutions which are in the works, we should be able to reach this target at a reduced cost.”

Louis David, PSA

How is ArcelorMittal creating value for PSA?

With ArcelorMittal and its steels we can achieve weight reductions in our vehicles at zero or almost no additional cost. This is one of the hallmarks of working with steel. Most other weight reduction solutions are fairly expensive and cost us several euros per kilogram gained. The theme of the work we do with ArcelorMittal is related to steel weight reduction at a constant manufacturing cost.

Is Fortiform® on the drawing board for your upcoming models which are still in design?

Fortiform® is part of a panel of steel weight reduction solutions we have developed with ArcelorMittal to lighten our cars. It is not the only solution as we also use steels for hot stamping such as Usibor® 1500. We are also working with ArcelorMittal to further the development of Usibor® 2000. However, using these steels requires a hot stamping process which PSA does not have in-house. An alternative is to use a steel like Fortiform® which does not require hot stamping.

We are now validating Fortiform® through industrial tests and calculations to produce the first part on one of our upcoming models. As Fortiform® is typically used in areas of the car which may be involved in crash scenarios, the first part we will validate is a roof arch reinforcement. This process will help us to acquire data which we will use to estimate the costs of integrating it into our processes according to our technical standards. This will enable us to determine if we can apply this solution to other future vehicles. After it is successfully validated, other Fortiform® parts would be developed for use on our vehicles.

Which materials will you replace with Fortiform® solutions in the future?

We are replacing high strength or advanced high strength steels with Fortiform® as it offers even higher mechanical properties with the same level of formability. We will use these characteristics of Fortiform® to reduce the thickness of the part and thus gain mass. We are following this lead throughout the entire body-in-white (BIW) area which deals with crashes. Reducing the thickness of the steel reduces the weight so the part that is being validated will help reduce the

mass of the BIW. We are replacing steels obviously, but with a steel that offers higher characteristics.

Is Fortiform® economically interesting for PSA?

Yes, PSA can use Fortiform® in our lines because we have not built hot stamping into our industrial processes.

We hope that ArcelorMittal will soon develop Fortiform® 1500 in addition to Fortiform® 1050 which is available now. This would close the gap with the current hot stamping steels that acquire a tensile strength of 1500 MPa after hot stamping.

If we look a little further into the future, what is PSA's strategy in terms of materials?

By 2020 we expect that we will need to lose another hundred kilos over the entire car. Around 35 to 40 kilograms will come off the BIW including closures. Based on the steel solutions which are in the works, we should be able to reach this target at a reduced cost.

Beyond 2020 we need to look for another 50 to 100 kg weight reduction, with a reduction of around 30 to 40 kg on the car's body and closures.



We believe that with ArcelorMittal, we have an efficient R&D programme which will continue to improve Usibor® steels for hot stamping as well as Fortiform® steels for cold stamping. In the longer term, we hope that ArcelorMittal's R&D efforts will push back the limits of steel even further so it can continue to compete with aluminium on its own ground. For example, it might be possible to create rather large thin panels from steel, such as those used for the hoods and fenders. By ensuring they are thinner we don't need to increase the mass of visible parts made with steel.

That's what we hope for and are working towards together. If we don't do that we will need to increase the amount of

means that the car of 2030 may contain a little less steel but it will be a more refined and efficient steel. It will have better characteristics, along with the appearance of today's aluminium and composite parts.

This means there are plenty of challenges ahead for PSA and ArcelorMittal...

Absolutely. Because of the new engines available, and new regulations to reduce emissions, we're really at a turning point. We must call into question a number of technical choices on our vehicles.

But what we now think is that the BIW with closures must try to shed 35 kg by 2020, as I explained earlier. PSA has already started

after 2020 is not yet known, but this will be discussed between now and 2018.

What is remarkable is that China's CO₂ reduction objectives for 2020 are rapidly converging on European values. So is the United States. These regulations are worldwide regulations, hence PSA's interest in working with you to find solutions which can be deployed by ArcelorMittal worldwide. We must find solutions which can be applied equally in Asia, Europe and eventually in South America.

It is impractical to create a different vehicle design for each geographical area. As a manufacturer, we must be able to develop, design and build vehicles globally to the same level. It is important for us and we



aluminium and composites in our cars and this will increase manufacturing costs. There is still some space for steel solutions to reduce mass at a lower manufacturing cost than with aluminium and composites.

We will inevitably hit a limit one day, but this limit is pushed back every year thanks to our collaboration. We still hope to lose another 10 to 20 kg from our cars beyond 2020 thanks to steel solutions.

Many specialists believe that the car of the future, in the 2025 to 2030 timeframe, will have a BIW that is more multi-material than today. That is to say, it will be lighter thanks to steel, but there will be more aluminium than today. There will also be larger composite solutions such as polymers, including plastics.

It will be a slightly different balance than today. Volume manufacturers are still producing BIWs which are up to 90% steel, over 95% in some cases. This

to do that on our newest platforms. Beyond 2020 we will need to shed an extra 40 kg, and half of that will probably come from steel solutions. So that's the order of magnitude.

Thanks to our cooperation, ArcelorMittal's steel solutions are progressing well. This is probably because we share our R&D very early in the development chain. That allows us to measure the suitability of the different solutions you offer us and choose the right ones. It is win-win for ArcelorMittal, for PSA, our vehicles and our customers. This is the right way to do collaborative work, and fits well with our design offices and your people.

Looking beyond 2020, what is the future of emissions regulations in Europe?

Regulations are global. Today they are particularly important in Europe. The next European regulations we know about come into operation in 2020 when CO₂ emissions have to be 95 grams on average for manufacturers. The date or target for the regulation

know that ArcelorMittal is working in this direction. And PSA knows that wherever we produce vehicles in the world, we are using solutions which have been developed very early on with ArcelorMittal. That way we can ensure our response to these regulations converges globally.

PSA PEUGEOT CITROËN

About PSA Peugeot Citroën

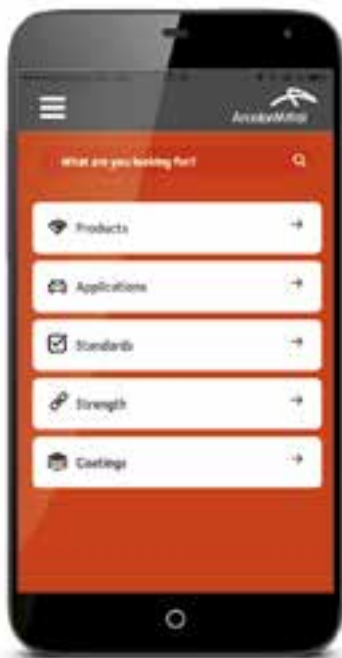
PSA Peugeot Citroën is a global carmaker with production of over 2.9 million units in 2014. With its three brands, Peugeot, Citroën and DS, the Group is present in 160 countries across Africa, Asia, Europe and South America. For more information, please visit: www.psa-peugeot-citroen.com

Louis David is a material master expert in vehicle design. He is attached to PSA's Research and Development Directorate.

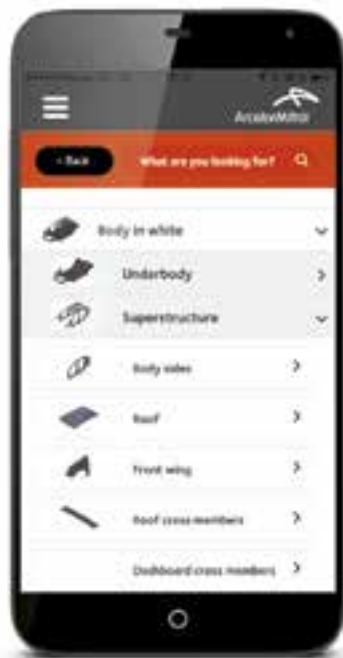
ArcelorMittal launches new Automotive app

As mobile as our customers' vehicles!

ArcelorMittal's European automotive catalogue offers the most extensive list of lightweight steels and coatings for the vehicles of today and tomorrow. We have now launched a new and interactive app which makes the catalogue very mobile! Available for both iOS and Android devices, the app puts the entire catalogue at the fingertips of carmakers, Tier-1 suppliers, engineers, automotive designers, researchers and students, wherever they are in the world.



You can browse the Automotive app by products, applications, standards, strength and coatings.



Steel solutions for every part of the vehicle are available.



Find the best-in-class steel products and solutions for any automotive part.

ArcelorMittal's automotive catalogue is a complete inventory of our comprehensive product range, for carmakers – available in English, French, German and Spanish. "That offer includes everything from mild steels for deep drawing, to advanced high strength steels (AHSS) and tailored blanks," notes Francis Bugnard, technical director, Automotive Europe. "The app also includes comprehensive details of our zinc and thin organic coatings and aluminised steels."

Developed in response to customer demand, the app offers a new way to browse ArcelorMittal's rich automotive product catalogue. "It contains the same information as our online product catalogue, but in a format that is fast, user-friendly and, of course, mobile," explains Francis Bugnard.

You can locate information quickly through the intuitive menu or by searching for key words. For example, you can find ArcelorMittal steel solutions for specific automotive parts by selecting 'Applications' from the main menu. Detailed data is available including mechanical properties, chemical composition, and information on welding, fatigue and impact strength. A list of the best-in-class ArcelorMittal solutions is also shown for each application.

ArcelorMittal has also added details of our tailored blanks (including laser welded and unwelded blanks), steels for electrical mobility and coatings to the online catalogue. In the app these solutions can be quickly accessed through the 'Products' option on the main menu. This section provides a complete overview of ArcelorMittal's extensive offer for the automotive industry.

From the app you can also subscribe to our newsfeed to keep up-to-date with breaking automotive news from ArcelorMittal. New content and features will be added to the app in the coming months.

Download now

The "ArcelorMittal automotive" app can be downloaded for free from the Google Play Store or the Apple App Store.



Download it for
ANDROID



Download it for
iOS



Granite® Impression Cloudy from ArcelorMittal

Granite® Impression Cloudy is part of ArcelorMittal's Nature range of organic coated products which are completely free of environmentally harmful chromates (hexavalent chromium and heavy metals).

Designed as a roofing material, Granite® Impression Cloudy can be processed by cold forming and deep drawing without damaging the top surface. It can be joined using techniques such as clinching, riveting and adhesive bonding. Granite® Impression Cloudy's unique flexibility allows sophisticated and bold designs.

Detail of a Granite® Impression Cloudy roof.

Granite® Impression Cloudy finds a home in South America

Durable solution meets the need for lightweight roofs with a traditional look

ArcelorMittal's Granite® Impression Cloudy organic coated steel has been extremely popular in Europe for a number of years. Used primarily in external building applications such as roofs and gutters, Granite® Impression Cloudy is now providing an attractive and cost-effective alternative to the traditional clay tiles used in Latin and South America. Kubic-Conduit in Ecuador and Formetal in Panama have joined a growing number of companies in the region which offer ArcelorMittal's Granite® Impression Cloudy as roofing tiles. And it's proving to be a popular solution!

When it comes to choosing a roof for their new home, many Latin and South American buyers opt for clay tiles to recreate the look of traditional housing. Customers often seek out second-hand clay tiles which have developed a mottled black-brown patina to make their new home look as though it has been around for decades. Thanks to Granite® Impression Cloudy, local home owners no longer have to choose these expensive and heavy clay tiles to give their home the instantly aged look.

"Granite® Impression Cloudy represents an evolution in our line of metal tiles," notes Esteban Lam, general manager of Formetal. "Our customers like the cloudy effect as it gives them the vintage look they want for their house."

Kubic-Conduit started to import Granite® Impression Cloudy into Ecuador in 2013. "We were searching for a product that emulated clay tiles, a common and popular roofing material in Ecuador," explains Marcelo Burbano de Lara, Kubic-Conduit's lead civil engineer. "Granite® Impression Cloudy is an ideal solution, particularly for roofs where low weight is important."

Organic coated steels: a healthy choice

Cost is also a major advantage for Granite® Impression Cloudy as traditional handmade clay tiles are relatively expensive. "Corrugated cement has been used for a number of years in roofs where cost and weight are issues," says Marcelo Burbano de Lara. "Granite® Impression Cloudy is rapidly replacing this product."

Granite® Impression Cloudy is also a healthier choice. As part of ArcelorMittal's Nature range of organic coated products, Granite® Impression Cloudy is completely free of harmful hexavalent chromium and heavy metals, whether in surface treatments or in primer and finishing coats of paint.

Although Kubic-Conduit is a long-term ArcelorMittal customer, the company initially sourced similar products from Asia. "Unfortunately these suppliers proposed a finish which was not as well accepted as we hoped," Marcelo Burbano de Lara explains. "Then our ArcelorMittal contact here in Ecuador introduced us to Granite® Impression Cloudy. Now the market for our clay-tile lookalike roofing solution is growing very fast. The feedback from customers has been very positive."

Made in Europe

Formetal has worked with ArcelorMittal since 2011. The company utilises ArcelorMittal pre-painted coils such as Granite® Standard and Granite® HD for profiles, and galvanised steels for their heating, ventilation and air conditioning (HVAC) products.



South American homeowners like the traditional clay look of Granite® Impression Cloudy.

level than the other products we have tried. Granite® Impression Cloudy also has the antique patina our customers love.”

A key consideration for tile customers is the fact that Granite® Impression Cloudy is made in Europe says Esteban Lam: “During our sales pitch we stress that Granite® Impression Cloudy is manufactured in Europe, not in Asia. It’s a major selling point for our customers.”

Both companies are enthusiastic about the opportunities provided by ArcelorMittal’s products. “ArcelorMittal is creating value-added products and we need those products!” explains Marcelo Burbano de Lara. “The company regularly introduces us to alternative solutions so that we can stay well ahead of our competitors. We are aiming to be innovative so it helps to have an innovative supplier.”



Granite® Impression Cloudy is also utilised in non-traditional housing.



Anticato Dark is the most popular Granite® Impression Cloudy colour for South American homes.

Granite® Standard and Granite® HD were also applied to Formetal’s roofing solutions, offering customers a large range of colours. “We upgraded some of our products in

2014 and decided to enhance our offer with Granite® Impression Cloudy,” notes Esteban Lam. “Thanks to its 35 micron coating, it offers better UV resistance and a lower gloss

Granite® Impression Cloudy is available in five unique colours

The unique five colours remain stable over time:

- **Anticato Dark:** a dark brown finish which adds an attractive depth to the roof
- **Anticato Light:** a light brown alternative to Anticato Dark
- **Terracotta:** a beige-rose colour which provides a luminous, warm radiance
- **Green and Red:** two warm and attractive colours which add sophistication to any roof

About Formetal

Formetal is a part of the HOPSA group of companies which were founded in Panama in 1946 by Helmer Simons, a Finnish immigrant. HOPSA is still a family-owned company and operates a range of different businesses, mainly in the construction sector.

From its three production facilities in Panama City, Formetal fabricates roofing and accessories, steel doors, and components for HVAC installations.

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

About Kubic-Conduit

Kubic was founded in the 1990s and has worked with ArcelorMittal since beginning operations. In 2012, Kubic acquired Conduit, an older company which produces pipes and tubing. Known as Kubic-Conduit since the acquisition, the business employs over 500 people in Ecuador, Columbia and Chile.

Kubic-Conduit exports to Bolivia, Chile, Colombia, Peru, and Venezuela. The company recently invested over US\$8 million in its new continuous sandwich panel line based in Guayaquil (Ecuador).

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

Shining in the appliance market

Samsung Best Partner award for ArcelorMittal's partnership and outstanding performance

In March 2015, ArcelorMittal proudly accepted our first Best Partner award from Samsung. The award is presented annually to a supplier that has provided Samsung with outstanding service and cooperation. It is recognition of ArcelorMittal's flexibility, reactivity, perseverance and professionalism, as well as the teamwork of our customer support, mill and R&D teams.

"The collaboration between Samsung and ArcelorMittal started in 2010 when Samsung acquired a refrigerator and washing machine assembly line in Wronki (Poland)," explains Arkadiusz Luczak, ArcelorMittal's key account manager for Samsung. "This facility secured Samsung's production base in Europe, enabling the company to lower costs and increase its presence in the European appliance market."

By 2011 Samsung was producing their own models in Wronki. "ArcelorMittal immediately took steps to ensure our steels were certified to Samsung standards," notes Arkadiusz Luczak. "Since then we have successfully completed more than 60 certifications which have allowed us to introduce more of our steels to the customer."

Steel consumption doubles in two years

Samsung's ambition was to succeed in a fast ramp-up for its European production. "Doubling factory output every second year requires a new paradigm in manufacturing. By using our pre-painted steel grades, Samsung has been able to eliminate their own painting lines for cabinets and focus on core production to achieve the productivity surge they were seeking," explains Stéphane Giffard-Bouvier, ArcelorMittal's segment manager for appliances.

The change led to a major increase in orders for ArcelorMittal's pre-painted products as Arkadiusz Luczak explains: "Samsung doubled their steel consumption from 2012 to 2014. In 2015 we expect Samsung will consume almost three times the steel volume they used in 2012."

"By using our pre-painted steel grades, Samsung has been able to eliminate their own painting lines for cabinets and focus on core production."

**Stéphane Giffard-Bouvier,
ArcelorMittal's segment
manager for appliances**

Unlike most other appliance manufacturers, Samsung requires a very wide range of finishes for pre-painted steels. "The technical challenge for ArcelorMittal was quite high," explains Stéphane Giffard-Bouvier. "Our customer technical support (CTS) team picked up the challenge and worked with the development teams in the mills and Global R&D to engineer solutions for Samsung."

Thanks to our global presence, ArcelorMittal has been able to offer Samsung quality products and a tailor-made supply chain. ArcelorMittal undertook investments to extend production of our pre-painted steels.



"By copying pre-painting technology from ArcelorMittal Liège (Belgium) to ArcelorMittal Eisenhüttenstadt (Germany), we could shorten delivery times and reduce transport costs," notes Stéphane Giffard-Bouvier.

ArcelorMittal received a Samsung refrigerator as part of the Best Partner award. "We chose to donate the refrigerator to a hostel for homeless women in Krakow (Poland)," adds Arkadiusz Luczak. "It is already in use so we are not the only ones to win with this award!"

Estetic® Casa extends ArcelorMittal's appliance offer

With the launch of our Estetic® range in the '80s, ArcelorMittal became the first steelmaker to introduce pre-painted steels for domestic appliances. Recognising that OEMs want to push the limits in the design of new appliances, ArcelorMittal has continued to develop the range. The latest addition to the Estetic® family is Estetic® Casa, a selection of four steels with the gloss, surface aspects and modern finishes appliance makers are looking for today.

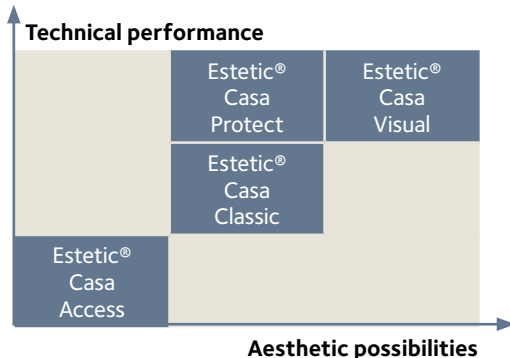
The basis of the Casa range is Estetic® Casa Access. It offers the most cost-effective solution for quality built-in appliances. Like all products in the Estetic® Casa selection, Access is available in a large selection of

Protect in terms of flexibility and hardness. But as the name suggests, Estetic® Casa Visual really excels in its stunning optical performance.

Available from extreme matt (5 to 25 GU), to ultra bright (100 GU), Estetic® Casa Visual will make any appliance stand out from the competition. ArcelorMittal's Global R&D team are working to develop new structures and aspects to further broaden the visual range of this product. If you have a specific project you would like to discuss, please do not hesitate to contact your local ArcelorMittal representative.

The Estetic® Casa range provides appliance makers with a new set of steels to push the limits of product design. With our unparalleled service and global presence, ArcelorMittal will continue to support the efforts of appliance makers to introduce the next generation of appliances.

Estetic® Casa provides the perfect balance between performance and looks



contemporary colours.

The next step up is Estetic® Casa Classic which offers excellent technical performance and a large selection of surface finishes. These include smooth, orange peel, grained and metallic. Gloss can range from 30 and 90 gloss units (GU). Estetic® Casa Classic is a good solution for most domestic appliances.

The best resistance to corrosion and detergents is provided by Estetic® Casa Protect. Improved flexibility means that a broader range of finished shapes are possible. The combination of these properties makes Estetic® Casa Protect the first choice for premium quality appliances.

Estetic® Casa Visual is the most advanced product and even surpasses Estetic® Casa

The Estetic® Casa range at a glance

Product	Advantages	Salt-spray test (SST)	T-bend crack	Technical specifications		
				Chemical resistance	Stain resistance	Gloss units (GU)
Estetic® Casa Access	Most cost-effective solution for quality built-in appliances	192 hours (240 hours*)	2 T	NA	NA	40 to 80
Estetic® Casa Classic	Reference product for applications where standard corrosion protection is required	240 hours	2 T (1 T*)	Good	Good	30 to 90
Estetic® Casa Protect	Offers improved corrosion protection and detergent resistance with optimum flexibility	360 hours	1 T	Very Good	Good	30 to 90
Estetic® Casa Visual	Combines protection, flexibility, and hardness with aesthetics. Opens new creative options for aspect, gloss, and finish	360 hours	0,5 to 1 T	Very Good	Excellent	5 to 100

*Upon request



Sergio Baragaño is director and founder of the [baragaño] architectural practice in Spain.

Steel Envelope inspiring architects

New construction catalogue profiles ArcelorMittal's organic coated steels

At the end of 2014, ArcelorMittal Europe – Flat Products launched Steel Envelope, a new book and website which provide architects and engineers with information about our complete offer of pre-painted steels for construction applications. More than 300 copies of Steel Envelope have been distributed across Europe, and the feedback from recipients has been extremely positive.

“Steel Envelope is very useful when we are starting new projects,” notes Gerrit Gordts, Technical Director at Wereldhave Belgium, a major operator of shopping centres across Europe. “Architects propose materials and we can check them in Steel Envelope to get the technical information we need.”

“We have discovered types of steel we don't usually use thanks to Steel Envelope,” notes Claudio Vanni, Sales Director at Pan Urania which produces construction

panels. “It has made us aware of new aesthetic products. Steel Envelope makes it clear that steel can be used as a standard construction material, like bricks or wood.”

Samples provide tangible benefits

Pan Urania was one of the first companies to use ArcelorMittal's Granite® HDX in construction applications explains Claudio Vanni: “Two years ago we had to take our customers to ArcelorMittal to see Granite® HDX. Now we can just show them the samples in the book.” ArcelorMittal

customers can also request additional samples of products featured in Steel Envelope for their own clients.

“It's a precious document and I'm interested in the samples!” says Pascaline Pobé, an architect in the office of Moatti-Rivière Architects. “They enable us to better understand ArcelorMittal's range and the possibilities these steels offer. Having the samples is very practical, because we have them when we need them – there is no need to order.”

“You can look at the samples, feel the texture, and share them with architects, customers and other people involved in the material decision making process,” notes Gerrit Gordts from Wereldhave Belgium.

“Together we can compare specifications and materials against offers from other suppliers and materials.”

Case studies provide inspiration

Steel Envelope also includes many case studies which show how ArcelorMittal’s organic coated steels for construction have been utilised in other projects. “We were



looking for a material that we could print with a pattern,” explains Brigitte Metra, principal architect at Metra Associates. “In Steel Envelope we found an ArcelorMittal product that we can recommend for a project. It has helped me to understand how to utilise this product and has made an idea real.”

“The number of projects that are in the book really helps,” says Etienne Richard, CEO and co-owner of Inter-Pliage, a leading French manufacturer of siding elements and high-end metal facades. “They show ArcelorMittal’s steels in context and reinforce decisions. Steel Envelope helps to consolidate the choice of steel product and reassures the customer.”

Steel Envelope is inspiring architects to make new material choices as Pascaline Pobé of Moatti-Rivière Architects explains: “Our way of working is to imagine the final appearance or texture of a building. We then look for the closest existing material in books like Steel Envelope.”

*ArcelorMittal Technology Development Centre in Avilés, Spain. © [baragaño] architects
Photography: © Mariela Apollonio*

It is also encouraging architects to choose steel over other materials. “We like steel as we are interested in using single, authentic and tactile materials, rather than fakes and composites which are much less recyclable,” says Martin Schneider, architect and director of m. schneider a. hillebrandt architektur in Germany. “For us steel is a very nice product.”

“We have discovered new organic coated products thanks to Steel Envelope,” notes Sergio Baragaño, an architect based in Spain. “We know ArcelorMittal, we know the products, but we missed the samples until now. Touching and feeling the samples is the most important for us. Last week we browsed Steel Envelope with the team, because we are working on a couple of office building projects. Together we could examine the options that are in Steel Envelope.”

Steel Envelope has quickly become an important reference for Europe’s architects as Martin Schneider notes: “We decided to have a small but fine library, so we only keep interesting information. Steel Envelope is in our library!”



Brigitte Metra is principal architect at Metra Associates.



*Sophysa Production Unit, Besançon (FR). Architect: METRA & Associés
Photography: © Julien Cescon*

Steel Envelope contains a wealth of inspiration for architects and engineers.

More info:

industry.arcelormittal.com/steelenvlope





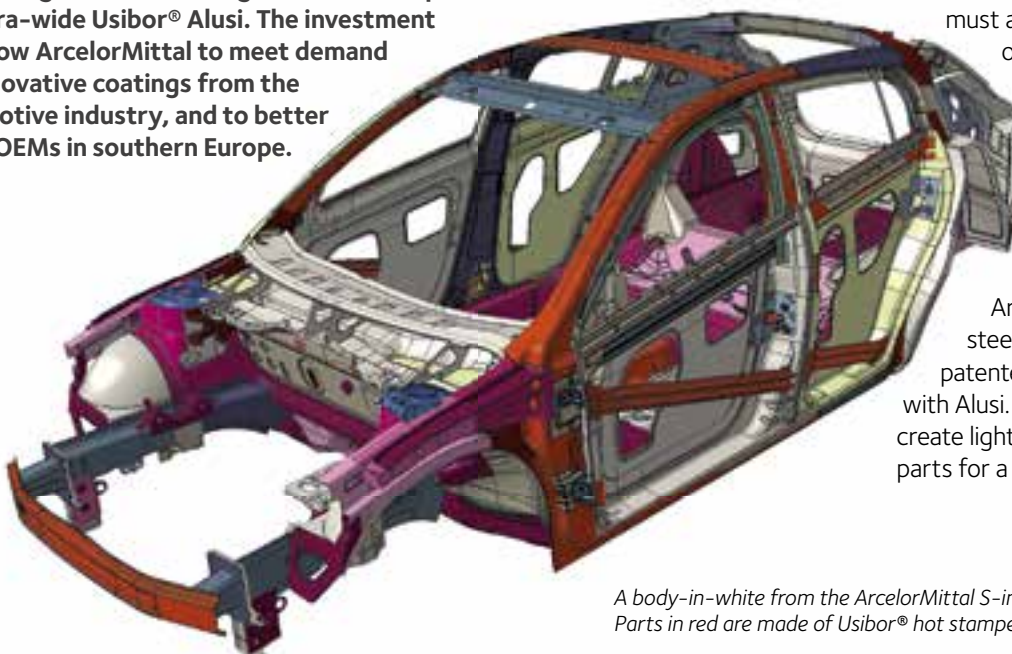
ArcelorMittal increases Usibor[®] capacity in Spain

ArcelorMittal Sagunto is situated on the coast, just north of Valencia, Spain.

Extra-wide Usibor[®] Alusi to be made at ArcelorMittal Sagunto

ArcelorMittal has made investments at its Sagunto mill in Spain to increase production capacity for our aluminium-silicon coated Usibor[®] hot stamping steel. Due to increasing demand from automakers in southern Europe, ArcelorMittal is investing €9 million at Sagunto to enable production of extra-wide Usibor[®] Alusi. The investment will allow ArcelorMittal to meet demand for innovative coatings from the automotive industry, and to better serve OEMs in southern Europe.

Carmakers today face a unique set of challenges. While they must create vehicles which are lighter and have a low environmental impact, OEMs must also ensure that the vehicle's occupants are kept safe. And both of these challenges need to be met at the most affordable cost.



“The demands on automakers have led to strong market demand for ArcelorMittal's press hardenable steels (PHS), and in particular our patented Usibor[®] boron steel coated with Alusi. PHS are typically utilised to create light weight, high strength structural parts for a car – where the properties of

A body-in-white from the ArcelorMittal S-in motion[®] catalogue of steel solutions. Parts in red are made of Usibor[®] hot stamped steel.

After ArcelorMittal's mills in Mouzon and Florange in France, and Dudelange in Luxembourg, Sagunto will be fourth plant in Europe to produce Usibor® Alusi.

Usibor® are most valuable," explains Brian Aranha, head of Global Automotive and commercial coordination.

Second mill in EU to produce extra-wide Usibor®

ArcelorMittal Sagunto is located 30 kilometres north of Valencia in south-east Spain. The mill already supplies the automotive industry with hot dip galvanized and electro-galvanized products including advanced high strength steels (AHSS).

The changes at Sagunto include modifications to the hot dip galvanizing line, adapting the snout, and the addition of a second coating pot. Work began in mid-2015 and was completed in September 2015. The first production and client product approvals are expected to be completed by the end of the year, with production continually ramped-up during 2016 to meet demand.

After ArcelorMittal's mills in Mouzon and Florange in France, and Dudelange in Luxembourg, Sagunto will be fourth plant in Europe to produce Usibor® Alusi. It will only be the second plant to produce large-width Usibor®. "This strategic investment in ArcelorMittal Sagunto reinforces the competitive position of the mill. It will allow us to further enhance the service we provide to the automotive sector in southern Europe and increase our ability to meet the growing demand for Usibor® Alusi in this market," says José Manuel Arias, ArcelorMittal's country head for Spain.

Pablo Avello, site manager at ArcelorMittal Sagunto, highlights the importance of the investment: "This will enable Sagunto to expand its range of high-quality products. And it will give the mill a privileged position in the market compared to its competitors. We will be able to supply our customers, particularly the carmakers, with the innovative and sustainable PHS and AHSS products they need."



An ArcelorMittal Usibor® Alusi coating line

Lightweight vehicle design with Usibor® Alusi

Usibor® is a boron steel which offers very high strength – up to 1,500 MPa after hot stamping. A 2,000 MPa version is due to be released soon. The steel is pre-coated with an aluminium-silicon coating known as Alusi.

Usibor® Alusi offers carmakers the chance to design lightweight vehicles due to its very high strength. Complex parts can be created as Usibor® has no springback. At the same time it offers very good corrosion resistance.

The anti-intrusion properties of Usibor® can be combined with the energy absorption characteristics of ArcelorMittal's Ductibor® to create laser welded blanks (LWB). By putting the right steel in the right place, the properties of LWBs can be tailored to the exact requirements for each part. This offers vehicle designers opportunities for weight savings of up to 30% with parts which exhibit optimal crash behaviour.

Following demand around the world

This combination of properties has led to rapid growth in demand for Usibor® Alusi around the world. To meet this demand, ArcelorMittal plans to increase production further in 2016. In total, capacity will be increased by 800,000 tonnes (132%) compared to 2012 (see map).

ArcelorMittal Sagunto will produce Usibor® Alusi in widths up to 1,850 mm. Until now this width was only produced at ArcelorMittal Florange in France. It will offer ArcelorMittal's southern Europe customers more flexibility in design and production.

Usibor® production facilities



In addition to our sites in Europe, ArcelorMittal also produces Usibor® Alusi in Brazil (Vega), China (VAMA), and the southern United States (Calvert).

Set for regional success

ArcelorMittal and RZK Çelik join forces to create most advanced steel service centre in Turkey

ArcelorMittal RZK Çelik is Turkey's leading steel service centre. Established in March 2015, the project is a joint venture between ArcelorMittal and local steel specialists RZK Çelik. Today the business provides a broad range of strategic steel products to clients from sectors including construction, shipbuilding, tipper truck & crane manufacturers, wind energy, and yellow and green goods.

With 420 employees, six warehouses and two steel service centres across Turkey, ArcelorMittal RZK Çelik is one of the largest steel service centres for the Middle East. It is also the most technologically advanced. "Our facilities are equipped with the most modern, best-in-class machinery to serve the ever-growing demand for steel products in our region," says Süleyman Zakuto,

"After processing they are suitable for the most demanding laser cutting operations, which we can also carry out."

On the flat processing side, the company has oxy, plasma and laser cutting lines which are capable of flame cutting, bevelling and drilling, in addition to shot blasting and painting. The company can process plates in thicknesses up to

130,000 m² warehouse and steel service centre located at Gebze, about 60 km south-east of Istanbul in Turkey's north. "The new facility in Gebze is in addition to our 140,000 m² service centre in Osmaniye," notes Süleyman Zakuto. "We have another six warehouses in strategic locations across Turkey."

Customer service is key to success

ArcelorMittal RZK Çelik also offers long products and associated services. These include 3D laser cutting, coping, castellating, drilling, hollow sections, merchant bars, angles, box profiles, shot blasting and painting.



The company can process plates in thicknesses up to 1000 mm and in widths up to 4000 mm, ideal to service the needs of local shipping and oil and gas businesses.

chief executive officer and chairman of ArcelorMittal RZK Çelik.

Processing and storage solutions available

ArcelorMittal RZK Çelik operates one of the world's most advanced skin passing lines. It is attached to a cut-to-length line which can handle ArcelorMittal's range of ultra high strength steels (UHSS), high strength low alloy (HSLA) steels, and abrasion resistant grades between 1.5 mm – 25 mm. "The result is perfectly flat sheets which have no internal stresses," Süleyman Zakuto explains.

1000 mm and in widths up to 4000 mm, ideal to service the needs of local shipping and oil and gas businesses and able to meet any demanding steel processing requirements. Two automated build-up section lines are suitable for turning sheets and plates into star beams and heavier columns which are suitable for construction and bridge building applications.

In addition to its high-quality and fast processes, ArcelorMittal RZK Çelik offers steel storage solutions for its clients. The company has recently opened a new

Customer service, excellence, teamwork, personal initiative and accountability are at the core of ArcelorMittal RZK Çelik's approach explains Süleyman Zakuto: "We have a Turkish motto – 'Musteri Velinimettir' – which translates as 'The customer is king'. It reflects the culture of our business – the entire team is here to ensure our customers experience the best-in-class products and service. If we get that right, our long-term sustainability and success are almost guaranteed."



Kutlusan's unique systems use Magnelis® to improve durability. Magnelis® helps to protect Kutlusan's systems from corrosion, which in turn reduces the risk of disease.

Magnelis® shines in the ultimate corrosive environment

Turkish producer of chicken farm equipment uses Magnelis® to reduce the total cost of ownership

Kutlusan is a Turkish company which produces equipment for chicken farms. Their EcoPlus line of products is made with ArcelorMittal's innovative Magnelis® metallic coating. Magnelis® offers long-term corrosion protection, even in harsh environments such as chicken farms.

Kutlusan is a business which prides itself on the quality of its products. "We create quality equipment by using quality materials such as Magnelis®," says Hasan Buyukkutlu, General Manager of Kutlusan, Turkey's largest supplier of equipment for chicken farms.

Improving corrosion resistance reduces disease risk

The company utilises Magnelis® on its EcoPlus, Unibro, Residence, Unifor, Enrichable–Enriched, and Centerbelt range of cage systems, and other equipment found on chicken farms. These systems are most often subjected to highly corrosive chicken manure, creating the harshest environment Magnelis® has ever had to withstand.

Magnelis® performs well in agricultural environments as it is able to withstand ammonia and humidity. It also offers very good scratch resistance, an important attribute in chicken farms.

Chicken waste is full of bacteria which can result in disease spreading quickly through a flock of birds if it is not cleaned away properly. "Bacteria typically lurk in the corroded parts of cage systems and equipment," Hasan Buyukkutlu explains. "Magnelis® reduces the risk of corrosion which has a corresponding impact on lowering the risk of infection."

Hasan Buyukkutlu estimates that Magnelis® extends the life of Kutlusan's products by three times compared to the regular galvanised steels the company uses in some of its other ranges. "Our customers are demanding more durable systems which do not corrode," notes Hasan Buyukkutlu. "That's why we started to use Magnelis® on the Kutlusan systems."

The main markets for Kutlusan's products are in North Africa, Asia, the Middle East and Mexico. "Magnelis® gives us a definite competitive advantage, particularly in North Africa and the Middle East,"

says Hasan Buyukkutlu. "There is a cost difference between products treated with Magnelis® and other corrosion protection systems. But Kutlusan, and our customers, are much more interested in the total cost of ownership of our high-value systems."

Kutlusan also promotes the use of Magnelis®, exhibiting alongside ArcelorMittal at exhibitions such as the VIV Turkey trade fair for the international poultry industry.

About Kutlusan

Founded in 1996, Kutlusan produces equipment for chicken farms at its facilities in Turkey. Kutlusan has its own R&D department which designs most of the company's products, paying particular attention to the comfort and welfare of the chickens. Kutlusan operates five research barns where they can study the effect of changes in Kutlusan's equipment on the health of chickens, and the meat and eggs they produce.

Clearing the air

Estetic® Bio Air offers VOC-free steel for interior applications

Following three years of painstaking development, ArcelorMittal is proud to launch Estetic® Bio Air, a breakthrough pre-painted steel for interiors which emits minimal volatile organic compounds (VOCs). Estetic® Bio Air uses a completely organic biological resin to ensure the paint system bonds well to the steel substrate. The result is a finish which looks beautiful, and which is gentle on both the environment and the people who occupy the space.

As the world's leading steelmaker, ArcelorMittal takes the sustainability of our business and our products very seriously. While all of our steels are 100% recyclable at the end of their useful life, we are taking our responsibilities further by ensuring sustainability across the supply chain.

production. The goal was to create a sustainable paint system which would qualify for a Health Product Declaration (HPD). Although they are not yet a norm in Europe, HPDs are provided in addition to a product's Environmental Product Declaration (EPD).

advantage as neither effluents or waste are produced during the surface treatment of the steel.

Initially Estetic® Bio Air is available on ArcelorMittal's hot dip galvanized substrate. However, other substrates will be made available with the new coating in the near future. ArcelorMittal is also working on an exterior version of Estetic® Bio Air.

For more information, see: industry.arcelormittal.com



New 'green' chemistry

To ensure Estetic® Bio Air's sustainability, ArcelorMittal formed a consortium including a leading paint supplier, resin producer, solvent designer, university researchers and a number of companies which specialise in post-coating processing. With funding from the French government, the consortium was able to research and develop a plant-based paint coating which mimics the performance of other organic coatings in ArcelorMittal's Estetic® range. The result is Estetic® Bio Air, a steel solution for interiors which produces very low levels of VOC emissions.

The 'green' chemistry used to create Estetic® Bio Air is completely new. As well as ensuring the end product was almost VOC-free, the team also made the deliberate decision to avoid raw materials which might disrupt food

"We want to shift all of our Estetic® products to this sustainable paint system gradually, but we need to give our suppliers time to grow their capacity," notes André Lavaud, coated products leader for ArcelorMittal Europe – Flat Products. "That's OK because we prefer slow and organic growth for the product, in keeping with the philosophy behind its development. But the many advantages of Estetic® Bio Air and the early responses from customers make us confident that the demand is there."

Full colour palette

Estetic® Bio Air exhibits the same properties as the other organic coated products in ArcelorMittal's Estetic® range and the same colour palette is available. Thanks to its ease of use, our Estetic® range reduces manufacturing and energy use costs. The range has an additional ecological

What are VOCs?

Volatile organic compounds (VOCs) can be manufactured, but they also occur in nature – the scent of a flower is an example of a VOC. Their most common characteristic is that they have a low boiling point which causes them to evaporate into the air.

In poorly ventilated interiors, VOCs can be up to ten-times more concentrated than outside. Long-term exposure to high levels of VOCs can cause health problems for some people including headaches, nausea, as well as irritation of the eyes, nose and throat.

Solano® goes Nature!

Solano®, ArcelorMittal's leading organic coated steel for building envelopes in demanding environments, is REACH compliant.

Along with ArcelorMittal's Granite® and Estetic® coated steels, Solano® has become part of our Nature range. All steels in the Nature range are completely free of chromates and heavy metals. This ensures they comply with the European REACH regulation on the registration, evaluation, authorisation and restriction of chemicals.

Solano® Nature is ArcelorMittal's leading pre-painted steel for roof and wall cladding applications. It has a robust, yet flexible, 200 µm organic coating which has been specifically developed for industrial and coastal environments.

As part of ArcelorMittal's Nature range, the Solano® paint system is now completely free of phthalates, chromates and heavy metals. Solano® can be applied to either a hot dip galvanized or galfan substrate. The latter offers superior corrosion resistance, even on cut edges (RC5 level).



© Richard Seymour

For more information on the Solano® range, please visit industry.arcelormittal.com/solano

Training and software to support sustainability

ArcelorMittal has had a dedicated team studying the life cycle benefits of steel in construction for almost a decade. Located within Global R&D, the team researches the sustainability properties of steel and its construction applications (for example, sandwich panels). The team is responsible for ArcelorMittal's industry leading series of Environmental Product Declarations (EPDs) for our Estetic®, Granite®, and Solano® Nature products.

"ArcelorMittal has a high level of expertise in this field and we understand where steel can add value," explains Anne-Laure Hettinger, sustainability researcher for ArcelorMittal Global R&D. Anne-Laure's team also trains ArcelorMittal customer technical support (CTS) staff: "Whether you need help with life cycle analysis (LCA), EPDs, or building rating systems such as LEED and BREEAM, your Customer Technical Support representative is equipped to advise."

Released in 2014, AMeco 3 is an app and website which provides architects, design offices and students with an



understanding of the sustainability of steels for construction. Anne-Laure Hettinger and her team helped to develop the tool with a consortium of 17 independent steel promotion organisations: "It helps users realise where environmental impacts originate in a building. You can tailor different parameters such as the type of European climate at the construction site. Climate can have a major impact on the steel products selected for a particular project."

AMeco 3 includes a design guide and case studies in addition to the software tool. All materials are in line with the EN 15978 standard used to calculate the environmental performance of buildings.

For more information on the AMeco 3 app, visit: www.sustainable-steel.eu



Ultragal® rolls out to the world

Environmentally friendly coating ensures new cars shine brightly

ArcelorMittal's Ultragal® coating was first developed to meet the demands of carmakers for an excellent paint appearance. Ultragal® limits any increase in waviness during deformation, providing a very stretched surface combined with proven corrosion protection. Ultragal® is also highly compatible with modern compact painting systems, enabling carmakers to improve the environmental performance of their operations.

Demand for Ultragal® began to grow when a leading German automaker decided to improve the paint appearance of their cars. They asked ArcelorMittal to develop an innovative coating which would also reduce costs and the environmental footprint of their painting operations.

Tailored for each OEM

"Other carmakers had similar requests or wanted to move from electro-

galvanized steels to hot dip galvanized steels," notes Azem Ozturk, customer technical director for ArcelorMittal Automotive Europe. "We were able to meet their expectations thanks to the knowledge and the know-how we acquired during the development of Ultragal®."

Using Ultragal® as a base, Global R&D developed a tailored product to match

The stretched surface of ArcelorMittal's Ultragal® coating is clearly visible on the left side of this hood. As a comparison, the right side is coated with Extragal®, another ArcelorMittal coating which offers high corrosion protection and surface quality to both visible and non-visible parts.

the specific needs of each carmaker. "We continue to be flexible and tailor the product to specific customer requirements," says Azem Ozturk.

The Ultragal® coating is specifically recommended for visible parts in the automotive sector. It enables OEMs to limit waviness during stamping, while providing the quality surface and corrosion protection required on parts such as hoods, side panels and roofs. Ultragal® provides the smoothest possible surface for the final paint layer. A major advantage is that carmakers can utilise compact paint processes which reduce the cost and environmental impact of painting.

Suitable for compact paint systems

Ultragal® is suitable for cold rolled automotive steels including drawing and bake hardened grades. "BH180 and BH220 are the most requested steels," notes Cécile Pesci, a product developer for metallic coatings and surface treatments at ArcelorMittal. "We're currently testing Ultragal® with our popular high strength dual phase grades to expand the options for automakers."

With the shift to compact painting systems, demand for Ultragal® has

to ensure the steel meets the requested waviness level after forming. Testing steel in an R&D lab is an everyday activity, but we need to do it on an industrial scale in a real-life production environment."

The waviness criteria of Ultragal® was worked out in close consultation with automotive customers and tested on real-life projects. The result is a coating which can be used with existing stamping equipment. "Our customers do not need to adapt their processes at all,"

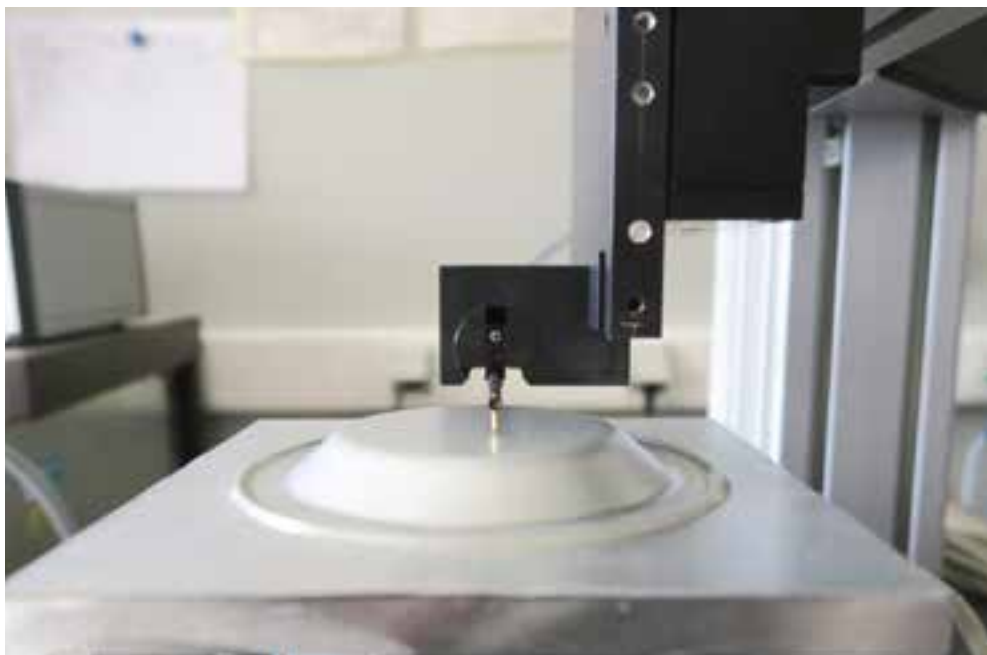
says Azem Ozturk. "They just need to be ready for a better final product!"

"A major advantage is that carmakers can utilise compact paint processes which reduce the cost and environmental impact of painting."

**Azem Ozturk,
customer technical
director for ArcelorMittal
Automotive Europe**



This image shows two panels. The sample on the left has an Ultragal® coating. Note the reflection of the fluorescent light. Waviness in the panel on the right (treated with Extragal®) is evidenced by the distorted reflection.



Stamped Ultragal® samples undergo detailed waviness measurements as part of ArcelorMittal's quality assurance process.

grown around the world. ArcelorMittal Florange (France), where Ultragal® was first commercialised, could not meet the increasing level of orders. To ensure Ultragal® is available locally to OEMs, ArcelorMittal is rolling out the technology globally.

Today Ultragal® is produced at ArcelorMittal mills in Belgium, Spain and Germany as well as France. Ultragal® production facilities are also under development at ArcelorMittal sites in Brazil and Canada. The rest of the world is served by deliveries from Europe with full local support available in Asia, Europe and North and South America.

Tested at every step

"Ultragal® requires very strict process control and specific testing equipment," explains Cécile Pesci. "We equip each line with the extra testing methods required

About Ultragal®

Ultragal® is a coating which limits repeated waviness during deformation. This provides the final part with an extremely flat surface. Ultragal® is primarily used to protect visible automotive parts which require a very high quality paint finish. ArcelorMittal offers Ultragal® with a waviness guarantee after drawing.

The Ultragal® coating is applied to both sides of a steel substrate by feeding the sheets through an adapted hot dip galvanizing line. Most of ArcelorMittal's cold rolled steels for automotive can be coated with Ultragal®.

The Ultragal® manufacturing process requires parameters to be fine-tuned at all stages, from steelworks to skin pass. Ultragal® is subject to rigorous control at every step of this process.

These measures produce an exceptional galvanized coating with a surface optimised for a top-quality paint appearance in automotive body parts.

Ultragal® provides excellent corrosion protection, even if the part is damaged by an impact, gravel, or scratches. The iron-zinc galvanic couple in the coating ensures ongoing protection as the zinc acts as a sacrificial anode.

Ultragal® is suitable for drawing, welding, and adhesive bonding. The coating is relatively ductile, reducing the risk of coating damage to drawing tools. Steels coated in Ultragal® are suitable for phosphating and painting surface treatments.

More info:

Visit our online automotive product catalogue or download the app: automotive.arcelormittal.com

Students electrify the future of motorsport



Formula Student vehicles are a cross between an F1 car and a go-kart!

ArcelorMittal powers Formula Student entry with iCARE® electrical steels

A team from the University of Laval in Canada is using ArcelorMittal's iCARE® Save electrical steel to maximise the power of their vehicle. Designed and built by students, the Laval vehicle uses four in-wheel motors and ArcelorMittal's top of the range electrical steels. The performance is outstanding: the car won – among other prizes – best self-made car, best newcomer, second place for its efficiency, and fourth place overall after the 2015 Formula Student events in Europe.

ArcelorMittal provided the Laval team with our iCARE® Save 20-13 electrical steel. Developed by ArcelorMittal specifically for electric mobility solutions, iCARE® Save 20-13 demonstrates the lowest losses of almost any 0.20 mm gauge electrical steel currently available. "High performance motors are only possible with high performance steels such as iCARE® Save," notes engineering student Simon Roy who designed the motors on the Laval vehicle from scratch.

High power density possible

ArcelorMittal steel enabled the Laval team to improve the efficiency of their traction machines, make them lighter, and generate higher power density. This was important as Laval's vehicle has four in-wheel motors rather than one central engine. "Although it is cheaper to have one motor, we wanted

the extra performance and grip we could achieve with four-wheel drive," explains Simon Roy.

"Four motors allow us to control the vehicle dynamically," notes Emmanuel Bogner who designed the gearbox which sits between the motors and the wheel. "We can effectively control each motor separately. For example, we can direct torque to each wheel to control the yaw rate. That is a big advantage for safety as you can control the car in any situation. The handling is amazing!"

As well as leaving more space for the driver and the battery, in-wheel motors allow more acceleration. Performance is enhanced significantly. While in-wheel motors are a good solution for vehicles which only run on paved roads, they are

unlikely to make their way into future production cars as Simon Roy explains: "There is ongoing research but effectively, each motor is an un-sprung mass. That gives the passengers a very bumpy ride on rough surfaces and increases wear to the suspension and the motors."

The motors use high rotor speed and electrical frequency to generate maximum speed and power. "A disadvantage to high electrical frequency is that losses increase," explains Simon Roy. "We needed steel which demonstrates low iron losses and iCARE® Save meets this requirement." This helped the Laval team win second place in the efficiency category at the Formula Student Austria event.

Oil cooling increases efficiency

One of the unusual features of the electric motor design is the cooling mechanism. Coil windings in the motor are normally water cooled, however, the Laval team chose to use oil to cool the motor. "The cooling mechanism comes into direct contact with the motor winding which increases

heat transfer by 35% compared to water cooling," explains Simon Roy.

The rotor is air-cooled using a fan. When the rotor turns, the fan pushes air into the gap between the rotor and stator to enhance cooling. The design saw the team win the most innovative cooling system prize at Formula Student Austria.



Each wheel is driven by an independent electric motor featuring iCARE® Save.

The result is a vehicle which stands out from the competition due to its extremely high performance. Each motor turns at around 16,000 rpm and has 8 poles which provide a base frequency of about 1 kilohertz at maximum power. "That's equivalent to high performance road vehicles," notes Sigrid Jacobs, ArcelorMittal Global R&D's portfolio director for electrical steels. "The high yield strength of our iCARE® Save grades has been developed to cope with this level of performance."

Working with innovative steels

For both Simon Roy and Emmanuel Bogner, the Formula Student competition has provided a wealth of valuable experience

for the future. "I didn't know much about electric motors before the competition. I've learned design, manufacturing and many other skills. It will be very useful for the future and has already helped me secure my first job in the industry," says Simon Roy.

"New graduates usually have no experience," notes Emmanuel Bogner. "But building an entire powertrain from scratch gives you an overall view of the job of engineering and is interesting to employers. And we get to work with innovative technologies and products such as iCARE® Save."



2015 University of Laval car racing in Europe



2015 University of Laval car racing team with Sigrid Jacobs from ArcelorMittal

"We needed steel which demonstrates low iron losses and iCARE® Save meets this requirement."

Simon Roy,
ULaval Québec

About iCARE®

iCARE® is ArcelorMittal's range of electrical steels for mobility. Produced at ArcelorMittal St Chély d'Apcher (France), the range includes:

- iCARE® Save: steels with very low losses
- iCARE® Torque: steels with high permeability
- iCARE® Speed: steels for high-speed rotors

For more information about iCARE®, please visit automotive.arcelormittal.com/icare

About Formula Student

Also known as Formula SAE, Formula Student is a worldwide competition to design and build a prototype racing vehicle. First run in 1978, the competition uses a scenario in which students are challenged to create a vehicle which would appeal to a weekend racing enthusiast and retail for around US\$24,000. Teams include 25 students from science, technology, engineering, and mathematics. Marketing and business students are also involved to ensure the project respects the scenario behind the competition.

Teams can design or purchase components depending on budget and the expertise of their people. Laval decided to design most components including frame, motors and gearbox. "I feel that buying diminishes the learning experience," notes Simon Roy. "But we did reuse items from Laval's previous Formula Student vehicles."

For more information about Formula Student, please visit: www.formulastudent.com

New videos highlight ArcelorMittal offer

Through a new series of videos, ArcelorMittal is highlighting the contribution our steels can make to create the light-weight, energy-efficient and recyclable applications consumers are demanding today.

I am Steel: the fabric of life

Steel has been an integral part of the fabric of life throughout the ages. It has enabled mankind to change the way we live and work, and to explore the boundaries of our world and beyond. 'I am Steel', a new video from ArcelorMittal Europe, explores how the strength and stability of steel have helped to create the world in which we live.

Thanks to its magnetic properties, which make steel easy to extract from waste streams, steel is one of the most recycled materials on Earth. Because it can be completely recycled without loss of properties, the steel we are using today will continue to make an important contribution to our world for generations to come.

▶ To view this inspiring video, visit: flateurope.arcelormittal.com/iamsteel



© STX

Steel for Packaging: preserving, a way of life

When it comes to keeping food and beverages safe, steel packaging is the perfect barrier to air and light. Steel preserves the nutrients, taste and flavour of canned products for longer, and is completely recyclable.

ArcelorMittal continues to innovate its offer for the packaging market. We are technology leaders in the development of lightweight, high-strength steels for

packaging. In fact, our new generation food cans are 46% lighter than they were 30 years ago.

ArcelorMittal is by far the largest producer of steel for packaging in the world. We are everywhere, and just around the corner. Through co-engineering projects with canmakers, ArcelorMittal is also developing even thinner, yet more robust and durable steel packaging solutions.

▶ To view this video, visit: packaging.arcelormittal.com/packagingvideo



▶ More videos

ArcelorMittal will continue to publish videos about the properties and applications of our innovative steels such as Armstrong® for heavy duty applications. Stay tuned to ArcelorMittal's YouTube channel for the latest videos: www.youtube.com/arcelormittal

Laser Welded Blanks: tailored for safer roads

ArcelorMittal laser welded blanks (LWBs) combine the best properties of our automotive steels to ensure that the right steel is always in the right place in a vehicle. Also known as tailored blanks, ArcelorMittal LWBs help OEMs to create lightweight solutions while ensuring the vehicle's users are always safe.

ArcelorMittal's Tailored Blanks division has a global footprint which matches that

of the world's leading carmakers. We can provide LWB solutions which suit the hot or cold stamping technologies the carmaker already employs, avoiding costly changes in technology. Through our early involvement and unparalleled service, ArcelorMittal Tailored Blanks can help carmakers to develop the lightweight LWBs that will improve safety performance and fuel economy in the vehicles of the future.

▶ To view this video, visit: automotive.arcelormittal.com/LWBvideo

