

Flat Carbon Europe




ArcelorMittal



update

Client magazine | November 2011

- 
- 04 Inspired by Nature
 - 06 S-in motion: a lifetime of savings
 - 14 Steel for oil and gas pipes
 - 22 Laser welded blanks just got stronger and lighter



Contents

08 FreightRail: On track for savings

ArcelorMittal's ultra high strength steels slash the weight and maintenance costs of freight wagons.

10 High added value with high carbon steels

ArcelorMittal's high carbon steels offer low inclusion density, small crown values and good flatness.

12 Precision tubular solutions for automotive applications

Tubular Products Automotive provides the competitive edge for carmakers.

16 The future steel vehicle

WorldAutoSteel programme points the way to future reductions in the weight of battery electric vehicles.

18 Let the customer's voice be heard!

Meeting the customer: the experiences of the mills of Business Division North.

20 Steel, the sustainable packaging material

Lighter and stronger steels are making cans more durable, and environmentally friendly.

24 Solutions for tomorrow, today

Recent products and solutions have been developed to exploit the advantages of steel.

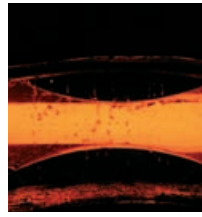
04 Building a better future for all



Introducing **Nature**, ArcelorMittal's new collection steels for the building industry, which offers exceptional technical advantages and is well-placed to

respond to present and future environmental regulations. **N**spired by **Nature**, the range does not contain hexavalent chromium or heavy metals, such as lead or hexavalent chromium complex.

14 Steel for oil and gas pipes



With over 20 years experience in producing steels for oil and gas pipes, it is no surprise that ArcelorMittal Flat Carbon Europe supplies more than 450,000

tonnes of hot rolled coils each year to the global oil and gas pipe industry. Our customers use the steel to manufacture large diameter pipes for hydrocarbon transportation in both sweet and sour conditions. ArcelorMittal's steels have superior properties in order to meet the most stringent strength and toughness requirements.

06 S-in motion: a lifetime of savings



Recent studies highlight the flaws in the European Union's strategy to reduce greenhouse gas emissions from vehicle transport, focusing only on the

emissions during the use phase of a vehicle. Using a full Life Cycle Analysis approach is the only way for carmakers to accurately measure, and reduce, the total energy consumed during the production, use and recycling of their products. It enables them to implement effective, global solutions rather than quick fixes.

22 Laser welded blanks just got stronger and lighter



While Usibor® 1500P, a light, ultra high strength steel, has performed above expectations as a structural material in automotive applications, its

corrosion-resistant coating prevented effective welding. At first sight this prevented the steel from being used as a material for laser welded blanks (LWBs). However, ArcelorMittal overcame this challenge with a patented solution that is to become the industry standard for LWBs.

Cover

Nspired by **Nature**: the new offer of organic coated steels for the building industry

Copyright

All rights reserved. No part of this publication may be reproduced in any form or by any means without prior permission in writing. Although care has been taken that the information in this publication is accurate, ArcelorMittal does not accept any liability for errors or omissions.

Photography

ArcelorMittal and:

- p. 3, 18-19: Jeroen Op de Beek
- p. 2, 5: Patriarche & Co, A+ Architecture Agency, Archi5 and B. Huidobro
- p. 10: Tom D'Haenens
- p. 11: Patrick Pauwels
- p. 13: Renault
- p. 14-15: Alain Chauvet, Alain Sauvan, Corinth Pipeworks, S.C.C. Nigeria Abuja, Butech Bliss
- p. 16: WorldAutoSteel
- p. 20-21: David Laurent – wide.lu
- p. 22-23: Audi AG
- p. 24: IKO, Shutterstock images

Design & production

Geers Offset nv

Editorial responsibility

ArcelorMittal Flat Carbon Europe S.A.
Vanessa Vanhalst
19, avenue de la Liberté
L-2930 Luxembourg
www.arcelormittal.com/fce

Editor-in-chief

Dieter Vandenhende





In each edition of Update, an ArcelorMittal opinion leader speaks out.

In this issue, Carl De Maré, Chief Technology Officer for Flat Carbon Europe, focuses on sustainability as a core value.

A lifetime of sustainability

Of all the materials used by mankind, steel has one of the lowest levels of emissions during its production. If the steel is created from raw materials (iron ore and coal), emissions required to produce one tonne of steel will range between 2 and 2.5 tonnes of CO₂. To an untrained observer, this may seem high.

However, steel is a unique material and its production releases significantly less emissions than other materials with comparable functions and durability.

In fact, ArcelorMittal estimates that using one tonne of steel avoids another tonne of CO₂-equivalent emissions during the use and end-of-life phases of the application's lifecycle. That's because today's lighter, stronger steels enable manufacturers to create innovative applications that use less energy. The steels are also hard-wearing, reducing maintenance requirements. And, when the application is no longer effective, all the steel it contains is 100% recyclable.

Steel is already the most recycled material in the world: over 85% of steel is recycled at the end of its useful life. At ArcelorMittal, we reuse more than 25 million tonnes each year. That reduces emissions from our operations by more than 36 million tonnes.

Yet we are doing much more than just recycling. In 2009, ArcelorMittal announced that we would target an 8% reduction in emissions by the year 2020. When achieved, emissions from our steel production will be reduced by 170 kg per tonne, one of the lowest in the industry.

To date we have spent over €200 million on research and development facilities in order to reach that goal. In addition, FCE has already invested €70 million on energy and scrap-recycling projects during 2011.

While improvements to processes take time, ArcelorMittal continues to develop new lightweight high strength steels and steel solutions. They are also available today.

ArcelorMittal projects, such as S-in motion, are developing practical and affordable solutions for a range of industries. While S-in motion focuses on automotive applications, our FreightRail project has developed a lighter and hard-wearing wagon that will make the greenest form of freight transport even greener. ArcelorMittal's new **Nature** range of organic coated steels is providing both inspiration for the building industry and peace-of-mind for building users.

When the full lifecycle is taken into account, steel-based applications offer considerable emission and cost savings compared to other materials. ArcelorMittal remains committed to ensuring that competitive advantage is improved, and that steel continues to offer a lifetime of sustainability.

Carl De Maré

Building a better future for all

Introducing Nature, ArcelorMittal's new collection of sustainable organic coated steels

For the past 15 years, ArcelorMittal has been developing and testing a new range of organic coated steels which fulfil steel's promise as a strong and durable building material. To be known as **Nature**, the new collection of steels for the building industry offers exceptional technical advantages and is well-placed to respond to present and future environmental regulations. **Inspired by Nature**, the range does not contain hexavalent chromium or heavy metals (such as lead or hexavalent chromium complex).

100% sustainable

Steel is an entirely natural product which is infinitely recyclable. However, in the building industry, steels are sometimes treated with coatings to meet fire regulations or improve the appearance of the metal. In rare cases, the coatings may contain ingredients which can leach into the environment or cause harm to humans.

ArcelorMittal's new **Nature** collection of organic coated steels already complies with current and future European Union REACH regulations on the Registration, Evaluation, Authorisation and Restriction of Chemical Substances. REACH aims to improve the protection of human health and the environment through better and earlier

identification of the intrinsic properties of chemical substances. Changes to REACH, which will restrict the use of Substances of Very High Concern (SVHC), are expected. Anticipating this, ArcelorMittal has already ensured that the **Nature** collection is 100% free of hexavalent chromium and heavy metals.

This is not the case for many imported organic coated steels brought into Europe. The quality of imported steels can be poor and they often contain SVHC.

Extensive testing programme

The durability and versatility of organic coated steel has led to its wide use in the building industry. External applications

include wall cladding, roofing, and guttering. Internal applications include wall panels, suspended ceilings and lighting.

ArcelorMittal's **Nature** range includes steels for both internal and external applications (see Table). Depending on environmental conditions, the steels are guaranteed for up to 30 years against corrosion and peeling.

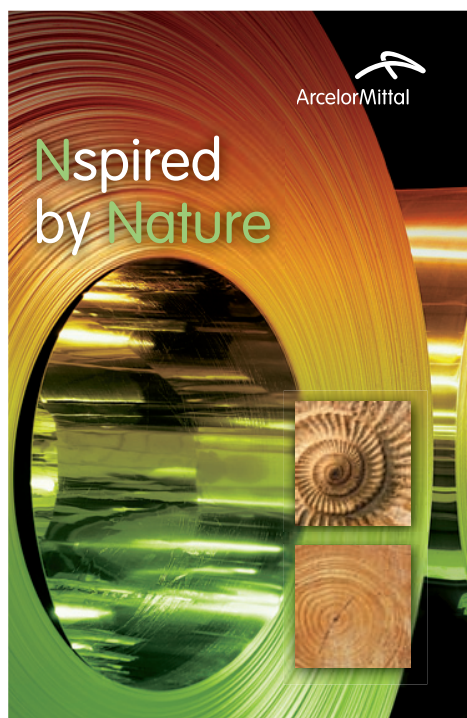
Nature has undergone an extensive testing programme over several years. The steels have been exposed to different sources of corrosion and weathering conditions at locations around the world. The results were excellent, especially with regard to corrosion resistance (including edge corrosion), paint peeling and film integrity.

Here to help

ArcelorMittal is there to provide you with the tools and **Nspiration** you need to design and engineer each project. A team of expert R&D engineers are available to help you choose the right product and understand the impact your building will have on the environment. They will work with you to identify the right solution to reduce the environmental impact of the construction. They can also help you optimise the structural use of profiles or purlins, calculate load tables, and provide fire resistance data.

Thanks to ArcelorMittal's **Nature** organic coated steels, the future of our built environment will be healthier, flexible, and more beautiful. Just like nature itself.

For more information about the **Nature** range, please visit www.arcelormittal.com/industry/Nature



ArcelorMittal's Nature collection

Outdoor use	Indoor use
Granite® Standard	Estetic® Ambient®
Granite® Boosted	Platinum
Granite® Diamond	Estetic® Clean
Granite® Farm	Estetic® Flex
Granite® Forever	Estetic® Lighting
Granite® HD	Estetic® Mat
Granite® HDS	Estetic® Tex
Granite® HDX	Estetic® Standard
Granite® HDX PV	
Granite® HDX Cool	xcelcolour®
Granite® PVDF	xceldesign®
Granite® Shutter	xcellook®
Granite® Tex	
Granite® Wood	
Granite® Cloudy	
Granite® Comfort	
Granite® Deep Mat	
Granite® Flex	
Granite® Rain	



The Montpellier Arena; Montpellier, France (image courtesy A+ Architecture Agency)

The durability and versatility of organic coated steel has led to its wide use in the building industry.



Marcel Sembat High School; Sotteville-lès-Rouen, France (images courtesy Archi5 and B. Huidobro)



Naturally in harmony with the environment

ArcelorMittal's **Nature** coated steel products are unique in both texture and appearance. They also have special properties which enhance their appearance or contribute to the comfort of the building.

One example is **Granite® Wood** which comes in several wood patterns and colours including oak and palisander. With four layers of paint and a 35 µm outdoor paint coating, the warmth and the aesthetic of the wood finish combine well with the sustainable advantage of the steel.

Granite® Comfort greatly enhances thermal comfort in warm climates. The organic coating reflects sunlight and radiant heat back into the atmosphere. It absorbs significantly less heat than

current organic coated steels. Interiors are immediately a few degrees cooler, helping to save as much as 15% on electricity for air conditioning.

Steel is also the natural choice when it comes to generating renewable energy. For photovoltaic installations, **Granite® HDX PV** provides resistance to UV weathering and corrosion, even in severe climatic conditions. It is also aesthetically pleasing, blending perfectly into the surrounding environment. With a long guarantee against perforation, Granite® HDX PV is perfectly suited for photovoltaic roofing systems.



S-in motion: A lifetime of savings

When it comes to greenhouse gas emissions, steel is the right choice for vehicles – and the planet!

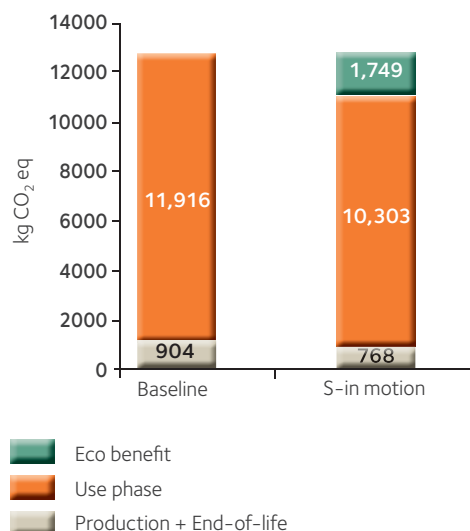
By 2015, carmakers in the European Union will need to ensure their vehicles meet strict new carbon dioxide emission targets or they will face the threat of heavy financial penalties. However, the limits only consider the emissions from a vehicle during the use phase of its life. A study carried out by the University of California at Santa Barbara (UCSB) on behalf of the WorldAutoSteel group, shows that when the production and recycling phases of a vehicle's life are included, steel has significantly less environmental impact than competing materials.

The findings of the UCSB/WorldAutoSteel study confirm the results from a life cycle analysis (LCA) of ArcelorMittal's S-in motion project. The LCA study showed that the use of ultra high strength steels (UHSS) in a typical C-class car would lead to a 15% reduction in greenhouse gases (GHG) emitted during the vehicle's production and end-of-life (EOL) phases. Emissions are reduced by 14.5% over the vehicle's entire life, with a drop of 6.2 grams of CO₂/kilometre during the use phase (see Figure 1).

The UCSB/WorldAutoSteel study found that advanced high strength steels (AHSS) offer considerable reductions in the mass of the body-in-white (BIW) when compared to conventional automotive steels. Over the life of the vehicle, GHG emissions would be 5.1% lower, at little or no additional cost.

Figure 1: Contribution of body-in-white and hang-on parts to CO₂-equivalent emissions from a baseline C-class vehicle and the S-in motion vehicle

(Source: ArcelorMittal)



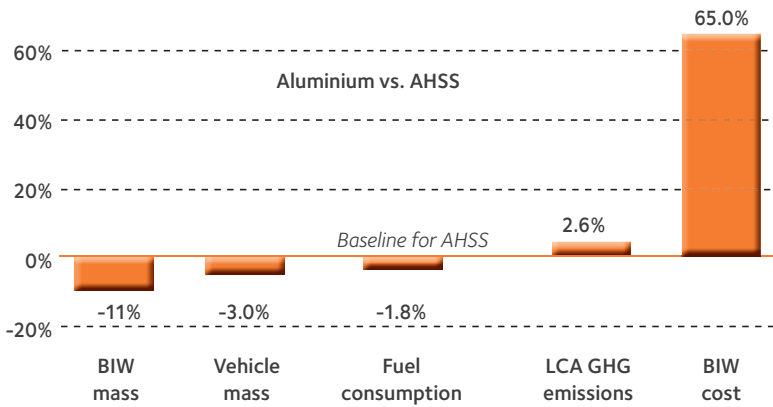
When compared to aluminium, AHSS offer savings in both GHG emissions and cost. Over the life of an aluminium vehicle, GHG emissions are 2.6% higher than when AHSS is used and costs are up to 65% higher. Figure 2 shows the variations in costs and emissions between a baseline AHSS solution and an aluminium one.

Flawed strategy

Both studies highlight the flaws in the European Union's strategy to reduce greenhouse gas emissions from vehicle transport. From 2012, a defined percentage of each OEM's new vehicles must meet emission targets set by the EU. This target will rise each year until 2015, when EU fleet-average emissions must be lower than 130 g of CO₂/km for all new cars. Emission reduction targets have already been set through to 2020, by which date the EU expects average emissions to drop to 95 g of CO₂/km.

If cost is not an issue, it is relatively easy to meet these targets by using lighter materials such as aluminium and carbon fibre-reinforced polymers (FRP). However, such low-density, GHG-intensive materials may have the unintended consequence of

Figure 2: GHG emissions and costs increase if aluminium is used instead of advanced high strength steels. The baseline for the comparison is the emissions and costs of AHSS. (Source: WorldAutoSteel)



increasing GHG emissions during the vehicle's total life cycle.

Steel production creates relatively low levels of emissions and, at the end of its life, the steel in the vehicle can be completely recycled without loss of properties. The use of recycled steel to create new steel lowers emissions even further.

Types of emissions

By comparison, emissions from other materials are quite high during the production phase (see Figure 3). Producing one kilogram of aluminium for example, creates between 4.5 and 6.3 times the greenhouse gases emitted during the production of the same quantity of steel. For carbon FRP, emissions are between 8.4 and 11.5 times higher, while for magnesium, emissions are between 7.2 and 22.5 times higher.

The types of emissions are also important. The only GHG emitted during the production of steel is carbon dioxide. Producing aluminium on the other hand contributes perfluorocarbons to the atmosphere, while magnesium is responsible for the emission of sulphur hexafluoride. A full LCA study captures these environmental costs and is the responsible approach to measuring the environmental impact of a vehicle over its entire lifetime.

In an effort to limit the amount of waste going to landfill or incineration at the end of the vehicle's life, the EU has set a minimum reuse and recycling rate of 85% per vehicle (End-of-Life Vehicles Directive – 2000/53/EC) as from 2015. That target is easy to achieve using steel which is 100% recyclable. However, some materials used for car production are difficult to recycle and must be incinerated or placed in landfill sites.

About S-in motion

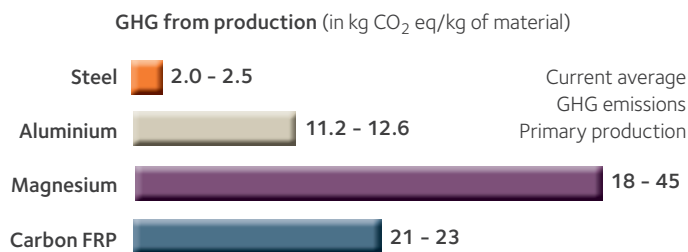
S-in motion is a new concept for carmakers who wish to create lighter, safer and more environmentally friendly vehicles for the 21st century.

For more information, please visit the dedicated S-in motion website at www.arcelormittal.com/automotive/s_in_motion

Using a full LCA approach is the only way for carmakers to accurately measure, and reduce, the total energy consumed during the production, use and recycling of their products. It enables them to implement effective, global solutions rather than quick fixes. Regulatory bodies would do well to adopt the same LCA approach to ensure that their goal of reducing emissions effectively is actually achieved.

The results of these studies confirm that steel has both a bright future in the automotive sector, and an active and vital role to play in preserving the future of our planet.

Figure 3: CO₂-equivalent emissions from the production of materials used in vehicle manufacture (Source: WorldAutoSteel)



Using a full LCA approach is the only way for carmakers to accurately measure, and reduce, the total energy consumed during the production, use and recycling of their products. It enables them to implement effective, global solutions rather than quick fixes.



About WorldAutoSteel

WorldAutoSteel is a consortium of steel companies, established by the World Steel Association, to explore innovative steel solutions for future, low-carbon vehicles. For more information on the consortium and the studies mentioned in this article, please visit www.worldautosteel.org

FreightRail:

On track for savings

ArcelorMittal's ultra high strength steels slash the weight and maintenance costs of freight wagons

A typical European gondola-style freight wagon has a useful life of between 30 and 50 years. By the end of that lifetime, the wear and tear on various parts of the wagon will have required it to be almost entirely rebuilt. That is a significant cost burden for rail freight operators. ArcelorMittal's R&D Industry division took on the challenge of finding an ultra high strength steel (UHSS) solution that ensured low maintenance. Using UHSS also lightens the weight of the wagons, making freight transport by train even more sustainable.

Damage to gondola freight wagons typically occurs when they are being loaded and unloaded. Cargo hitting the inside of the wagon causes dents and fractures in the floor and wall panels and can, in extreme cases, entirely destroy the wagon.

Reducing weight and improving performance

ArcelorMittal's R&D Industry engineers selected an E71-type gondola wagon as a reference. The E71 wagon is widely used across Europe and is typically built using grade S235JR, a structural steel with good corrosion resistance properties.

The empty (tare) weight of the standard E71 is around 27 tonnes. The wagon has a volume of 70 m³ and can weigh up to 80 tonnes fully loaded. The goal was to find a UHSS solution that would reduce tare weight while allowing the potential load to be increased.

Three grades of steel were selected for the new wagon. S420MC and S500MC are high strength low alloy (HSLA) grades while S700MC is an ultra high strength low alloy steel. All three have excellent strength-to-weight ratio and offer good potential for lightweighting (see Table 1). Using UHSS to build the wagons leads to additional savings in CO₂-equivalent emissions. Not only are the wagons lighter, fewer emissions are produced during use, and they require less steel which reduces emissions from production and transport.

Advanced steel solutions

S420MC was selected for the chassis of the gondola primarily for its rigidity, but also due to its high strength-to-weight ratio and fatigue resistance. Rigidity was an important consideration as the chassis of the gondola is subjected to significant bending stress, particularly during loading.

For the walls of the gondola, S500MC was chosen for its outstanding mechanical properties, and in particular, its toughness and ability to withstand the stresses to which it is subjected during loading and unloading.

Of all the parts of the gondola, the floor panel is subject to the most damage. For this application, ultra high strength S700MC was selected due to its ability to resist impacts and absorb energy (see Figure 2). The high strength of this grade makes it possible to achieve substantial

Table 1: Steel grades selected for the advanced high strength steel gondola

Grade	% used (in weight)	Yield strength (MPa)	Ultimate tensile strength (MPa)	Type
S420MC	30	≥ 420	480-620	High strength low alloy
S500MC	53	≥ 500	550-700	High strength low alloy
S700MC	17	≥ 700	750-950	Ultra high strength low alloy



The solution ensures that rail will remain the most environmentally friendly mode of freight transport.

Figure 1: Usage of grades selected for the new high strength gondola wagon

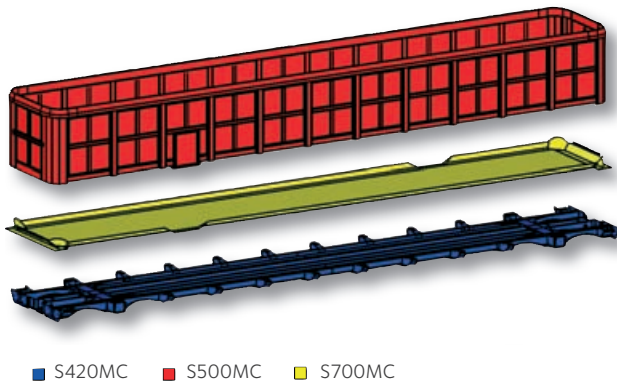
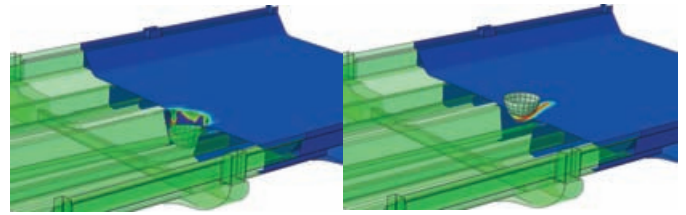


Figure 2: Results of impact tests on S235JR (left) and S700MC (right)



weight reductions by reducing the thickness of the steel while maintaining overall performance and safety.

Reparability improved, costs lowered

As damage to a wagon may occur in remote locations, the R&D engineers only selected steels that are easy to weld and can be repaired with existing equipment.

Overall, material costs of the new wagon were lower than for the E71. Although the price of the advanced steels is higher than

S235JR, less steel is required. Industrial formability is also improved, leading to further cost reductions.

Full industrial feasibility studies were carried out to determine whether the new wagon met formability and sheet forming requirements. The R&D engineers also rebuilt the back wall panel of an existing wagon in one of the UHSS steels to test its performance in a real-life situation. After two years of constant use, no damage has been noted to the panel or the welds.

With its potential to save both costs and weight, the new UHSS solution for freight wagons has already attracted the attention of rail wagon builders and operators (see ERMEWA case study). The solution ensures that rail will remain the most environmentally friendly mode of freight transport for many decades to come.



Case Study: ERMEWA – Upscaling the solution

If the capacity of the wagon could be increased, emissions would be reduced even further. It was with this idea in mind that French wagon builder and operator ERMEWA approached ArcelorMittal's R&D team. Their goal? To create a wagon with even higher volume and load weight potential than the original E71 gondola.

Using the same advanced steels selected for the new E71 gondola wagon, ArcelorMittal's engineers were able to increase the fully loaded weight of the wagon to 90 tonnes, an increase of 12.5% on the E71 model. Maximum load weight was increased by 27% to 67.5 tonnes, while load volume rose from 70 to 100 m³, an increase of 43% (see Table 2). ArcelorMittal estimates that the larger wagon solution will lead to a reduction of around 40% in CO₂-equivalent emissions per tonne of goods transported.

Table 2: Results for the upscaled ERMEWA wagon

Specification	E71 reference	Solution 1 (same volume as E71)	ERMEWA solution (43% increase in volume)
Weight of wagon empty	27 t	18 t (-33%)	22.5 t (-17%)
Weight of load (max)	53 t	53 t	67.5 t (+27%)
Total weight	80 t	71 t (-11%)	90 t (+12.5%)
Load volume (max)	70 m ³	70 m ³	100 m ³ (+43%)
Material costs		-34%	-5%

High added value with high carbon steels

ArcelorMittal's high carbon steels offer low inclusion density, small crown values and good flatness

ArcelorMittal's high carbon steels are the first choice for many re-rollers because of their excellent internal purity, transversal profile and stable chemistry. ArcelorMittal offers a full range of standardised high carbon grades, but complements its offering with special grades in order to satisfy our high carbon steel customers. And for customers who need a high carbon steel with particular properties, ArcelorMittal's R&D teams are ready to help.

ArcelorMittal's high carbon steels typically contain between 0.3 and 1.1% carbon. The higher the level of carbon, the harder and stronger the steel will become after heat treatment.

The hardness and strength of high carbon steels make them ideal for repetitive and intensive mechanical applications such as flexible tape measures, saws, screws and secateurs. The automotive industry uses them extensively in new cars to make clutches, seat rails, seatbelt buckles and springs. High carbon steels are also used in rail transport to make wheels, rails, axles and the fasteners that secure the rail to the sleeper.

Four countries consume over 95% of ArcelorMittal's European output of high carbon steels (see Figure 1). However, the quality of ArcelorMittal's high carbon steels ensures they are in demand around the world. Our Dunkirk plant has even shipped orders to Eastern Europe, China and the US to meet customer requirements.

The hardness and strength of high carbon steels make them ideal for repetitive and intensive mechanical applications such as flexible tape measures, saws, screws and secateurs.



High internal purity for better quality

ArcelorMittal's high carbon steels are delivered to re-rollers as hot rolled substrate. The steel is designed to be cold rolled and/or subjected to heat treatment. The exact processes depend on the application for which the steel will be used. Quenching and tempering are typically used by the customer to strengthen the steel and improve its mechanical properties after it has been cold rolled. The result is a tougher and more durable product.

For high carbon steel customers, the type and amount of inclusions formed during the making of the steel are critically important. Inclusions can introduce weakness into the steel, especially during forming and processing. ArcelorMittal's high carbon grades have a guaranteed low inclusion density, ensuring that the steel can be re-rolled without fracturing (see Table 1). The low levels of inclusions guarantee the extremely good quality of ArcelorMittal's high carbon steels.

As most high carbon steels are re-rolled after slitting, ArcelorMittal can supply coils with an extra flat profile. Indeed, a crown value lower than 60 µm can be guaranteed and, if required by the customer, ArcelorMittal can even provide steels with lower values (30 µm can be reached in certain circumstances).

Figure 1: Main European markets for ArcelorMittal's high carbon steels (% of total for 2011 to date)

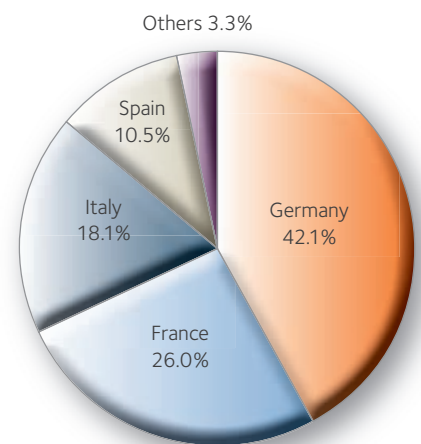


Table 1: Average inclusion ratings for ArcelorMittal's high carbon steels according to the NFA 04.106 standard.

Zero indicates the lowest level of inclusions. The scale progresses from 0 to 3, with a rating of 4 indicating the steel has too many inclusions.

Inclusion type	Sulfuric	Oxidic (Aluminium)	Oxidic (Silicate)	Globular oxidic
Rating (maximum)	1.5	1	1	1.5

Table 2: Dimensions of ArcelorMittal's high carbon steel grades.

Details of our C35E AM FCE, C70S AM FCE and C80S AM FCE grades are available on request.

Thickness (mm)	C40E EN 10083-2, C40E AM FCE, C45E EN 10083-2, C45E AM FCE		C50E EN 10083-2, C50E AM FCE		C60E EN 10083-2, C60E AM FCE, C67S AM FCE, C75S AM FCE		C100S AM FCE		
	Min width	Max width	Min width	Max width	Min width	Max width	Min width	Max width	
2.00 ≤ th < 2.25	1000	1330	1000	1330	1000	1330	1000	1330	
2.25 ≤ th < 2.50		1360		1360		1360		1360	
2.50 ≤ th < 5.00		1390		1390		1390		1390	1390
5.00 ≤ th < 8.00							-		-
8.00 ≤ th < 10.00		-		-		-	-	-	-
10.00 ≤ th < 12.00		-		-		-	-	-	-

Better thickness tolerances to satisfy customer needs

ArcelorMittal's high carbon steels are usually offered with thicknesses tolerances equal to 75% of those specified in EN 10051:2010. For specific applications, ArcelorMittal can offer products with 50% or even 33% of the normal thickness tolerances.

While our high carbon steels are usually provided in coils, ArcelorMittal is also able to deliver cut sheets. High thickness coils can also be delivered slitted and can be ordered pickled or black.

With fifteen grades of high carbon steels, ArcelorMittal's range can already be used in a wide variety of applications. ArcelorMittal is increasing its offer by developing new high carbon grades such as 51CrV4.

ArcelorMittal's high carbon grades have a guaranteed low inclusion density, ensuring that the steel can be re-rolled without fracturing.



More information

You can find more technical data about high carbon steels on the leaflet available from www.arcelormittal.com/industry > Products & Services > Product document centre Industry

Precision tubular solutions for

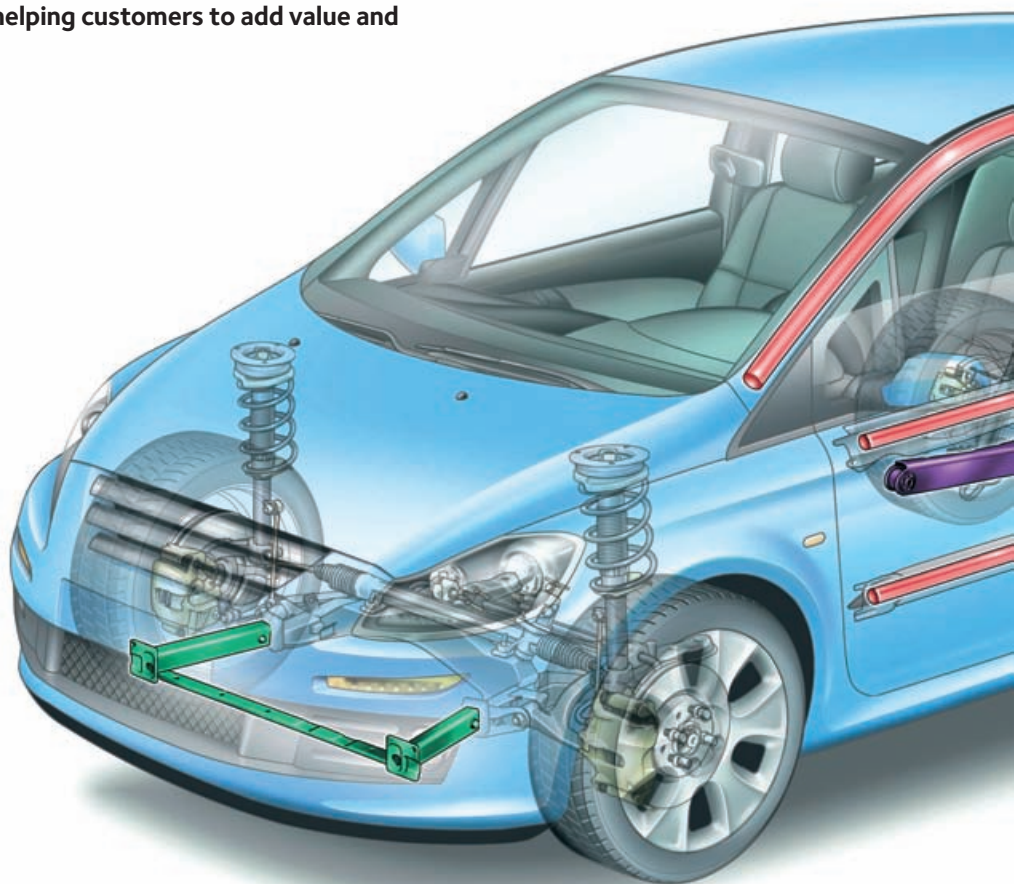
Tubular Products Automotive provides the competitive edge for carmakers

Tubular products have a wide range of existing and potential applications in vehicles. Their high strength-to-weight ratio creates many opportunities for carmakers to light weight their vehicles while maintaining safety standards. ArcelorMittal's Tubular Products Automotive Europe division works hand-in-hand with our automotive customers to create unique solutions for their vehicles. The team has many years of experience in helping customers to add value and provide them with a competitive edge.

Applications throughout the vehicle

High strength, low weight precision tube solutions have already been developed for body-in-white (BIW) applications such as door beams and the crash management system. Tubular products are also used in suspension systems where they form twist beams, trailing arms, shock absorbers and the engine cradle. Inside the vehicle you will find tubes in seat frames, airbags and the steering system.

There are many other potential uses for high-precision steel tubes in vehicles. One application being explored is the use of hydroformed tubes for space frames or body reinforcement parts. The main advantage is that these components can be formed as a single part which has low weight and better stiffness.



Advantages of tubes

Tubes offer great potential for light weighting of vehicles. While solid bars are stronger, the strength-to-weight ratio of hollow steel tubes is significantly better.

Tubes can also provide significant weight savings over solid bars. For example, replacing a 25 mm bar with a tube of the same diameter and a 2.5 mm wall thickness will reduce weight by 63%.

Steel tubing has been proven to lower costs, improve strength, and reduce the number of welds in automotive applications. Tubular parts can dramatically decrease overall mass, which improves fuel efficiency and saves time and money on key manufacturing processes.

Dedicated specialists

Tubular Products Automotive Europe is a highly specialised division of ArcelorMittal which is dedicated to the supply of precision tubes to the automotive industry. It forms part of the larger Tubular Products division of ArcelorMittal which enables the tubular automotive team to leverage shared resources and knowledge.

Engineers work closely with their colleagues in Tubular Products and ArcelorMittal's worldwide network of automotive R&D centres to bring new products to market. Resident engineers are available to assist with technical advice, while ArcelorMittal's metal service centres provide prototyping and testing services for new designs.

Replacing a 25 mm bar with a tube of the same diameter and a 2.5 mm wall thickness will reduce weight by 63%.

automotive applications

Eastern expansion

ArcelorMittal's precision tubes for automotive are already in production at three plants in Europe: Hautmont and Chevillon in northern France; and Karvina in the Czech Republic.

Automotive tube capacity at the Karvina plant has been increased in response to moves by our customers to expand their footprint in Eastern Europe. Through our strong, reliable and long-term partnerships with these carmakers, ArcelorMittal is well positioned to assist.

In order to offer a competitively priced product, coils are sourced locally. For carmakers, ArcelorMittal's integrated local supply chain ensures that they receive the same quality products, wherever they are located.

The Karvina plant now has two welding lines for the production of precision calibrated automotive tubes as well as facilities to produce drawn tubes. The plant also produces mechanical tubes for non-automotive applications.

The increase in capacity at Karvina is another demonstration of ArcelorMittal's willingness to make the investments needed to ensure we remain the supplier of choice to the automotive industry.

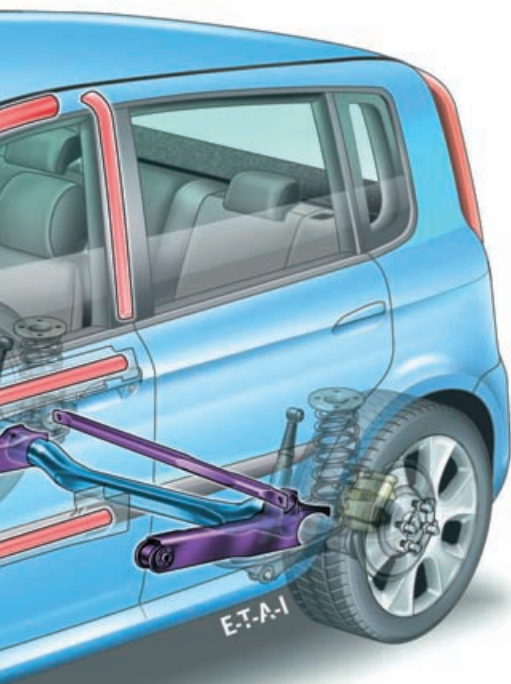
New ultra high strength tube solutions offer carmakers significant weight savings.

New solutions

The automotive industry is constantly innovating to reduce its environmental footprint, and create safer and better vehicles for consumers. Tubular Products Automotive continuously works with carmakers to develop new precision tube applications and production processes that can help achieve these goals.

Using advanced high strength steels, the division has already developed tubes that require no heat treatment. This has enabled our clients to remove a number of steps from the production process, creating a leaner production route and reducing the cost of their parts.

New grades of steel for tubes are also under development by the team. The ultra high strength tube solutions will offer carmakers significant weight savings, better surfaces and improved mechanical properties.



Typical tubular parts in a modern vehicle

Sub assembly for the Renault Mégane III showing tubular twist beam (in red on rear axle), shock dampers (red, front group), front cradle (black, front group), and crash component (silver, front group)



Tubular twist beam for Renault Mégane III rear axle



More information

The Tubular Products division of ArcelorMittal is one of the world's largest and most diversified producers of pipe and tube products, servicing markets around the world from 24 different operating locations in 13 different countries. Tubular Products produce and market the full spectrum of tubing products in an unparalleled range of sizes. The division is active in the automotive, energy and mechanical markets. For more information about ArcelorMittal's Tubular Products Automotive division, please visit www.arcelormittal.com/tubular



Steel for oil and gas pipes

(image courtesy of Corinth Pipeworks)

Experience and worldwide capabilities make ArcelorMittal a leading provider of steel for oil and gas pipes

With over 20 years experience in producing steels for oil and gas pipes, it is no surprise that ArcelorMittal Flat Carbon Europe supplies more than 450,000 tonnes of hot rolled coils each year to the global oil and gas pipe industry. Our customers use the steel to manufacture large diameter pipes for hydrocarbon transportation in both sweet and sour conditions. ArcelorMittal's steels have superior properties in order to meet the most stringent strength and toughness requirements.

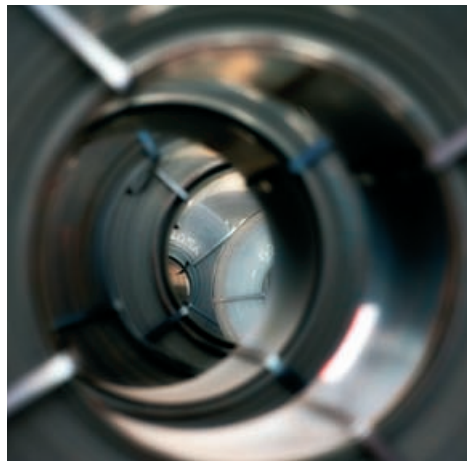
Wide capacity

ArcelorMittal Flat Carbon Europe understands that on-time delivery is critical for our customers. Once a contract is awarded in the oil and gas industry, the successful

Slab being loaded from the continuous casting exit table at Fos-sur-Mer. (image: Alain Chauvet)



Hot rolled coils can go heavy (up to 45 t) and wide (up to 2150 mm). (image: Alain Sauvan)



ArcelorMittal offers enough reliable capacity to fulfil very large orders from our customers. (image courtesy of S.C.C. Nigeria Abuja)



companies are required to start producing the linepipes at full capacity within a short timeframe. With their combined production capacity and direct access to seaports, ArcelorMittal's plants at Bremen and Fos-sur-Mer are well-equipped to meet this challenge. This year, ArcelorMittal's Kraków mill has also begun to produce linepipe steel grades, enabling us to expand our capacity and improve our proximity to customers.

Premium processing

Good steel starts with good slabs. ArcelorMittal's steels for oil and gas pipes are manufactured using the best metallurgical processes. In sour environments, hydrogen induced cracking (HIC) occurs at the location of inclusions. Reducing the impurities in the steel is essential to avoid HIC. To achieve this, the sulphur level in the steel is kept below 20 ppm.

The process is permanently monitored and controlled via a supervision system that is independent of production. Cross-section characterisation tests of the full slab are performed by macro-etching to maintain a low level of central segregation.

The slabs are re-heated and thermo-mechanically rolled with accelerated cooling to reach the required thickness and homogeneous mechanical properties. ArcelorMittal's steels have a very fine and homogeneous microstructure which

provides an optimised combination of strength and toughness.

A specialised team

Steel strips for the manufacture of large diameter pipes are delivered with extra strength. This compensates for the apparent loss in yield strength between the as-delivered coil and the manufactured pipe. The magnitude of the drop in yield strength is greatly influenced by the type of pipe (longitudinal- or spiral-welded), grade and dimensions. Our team of specialists will assist our clients to select the most appropriate solution.

Over the past 20 years, ArcelorMittal Flat Carbon Europe has built up an oil and gas centre of excellence which is staffed by metallurgists, mechanical and welding technicians and engineers, most of whom having recognised skills in tubular applications. The specialised team can provide detailed feasibility studies for each specific project, as well as technical support on any pipe-related issues.

Whether you are developing a new product or utilising one of our existing grades, ArcelorMittal's multilingual technical teams are available to help. They can provide support both remotely and on-site, wherever in the world your project is located.

Slab oxycutting at Fos-sur-Mer. Refined ladle metallurgy techniques and finely tuned continuous casting conditions enable us to reach a very low level of segregation, qualifying our products for sour service. (image: Alain Sauvan)



In late 2010 our Bremen mill unveiled the world's largest crop shear which can shear transfer bars up to 76 mm thick prior to finish rolling. The crop shear also opens up the possibility of creating new properties. (image courtesy Butech Bliss, USA)



Mills and capabilities

ArcelorMittal Flat Carbon Europe's steels for oil and gas pipes are produced at three plants in Europe: Fos-sur-Mer (France), Bremen (Germany) and, more recently, Kraków (Poland). Outside Europe, pipe steels are also produced in Brazil and North America.

Blast furnace #2 in Fos-sur-Mer was completely renewed during 2011. Fos-sur-Mer has recognised expertise in desulphurisation and severe internal soundness requirements and is our leading mill for HIC resistant grades. All three mills can produce steels with thicknesses up to 25.4 mm. The maximum width of coils produced at Bremen and Fos-sur-Mer is 2150 mm, while Kraków can produce coils up to 2050 mm wide.

Family of solutions

Steels for oil and gas pipeline applications are typically grouped into three families:

1. API (American Petroleum Institute) 5L linepipe: Used for oil, gas and, more recently, CO₂ transportation at high pressure (up to 150 bar). Strength, toughness and weldability ensure the integrity of an installation using these steels for more than 60 years.
2. API 5CT OCTG: Available as either black or pickled hot rolled coils, Oil Country Tubular Goods (OCTG) steels are used to manufacture reliable welded pipes which can be used to replace seamless pipes in demanding drilling and extraction applications.
3. Well Intervention Grades: Typically used in coiled tubing applications. This family of steels is available in pickled and oiled hot rolled coils, and in very thin gauges.

More information

To obtain our new brochure covering ArcelorMittal's range of steels for energy pipes and our handy steel selector tool, please contact your local ArcelorMittal representative or e-mail energypipes.fce@arcelormittal.com. You can also obtain more information from the product document centre at www.arcelormittal.com/industry.



Possible Future Steel Vehicle design

The future steel vehicle

WorldAutoSteel programme points the way to future reductions in the weight of battery electric vehicles

WorldAutoSteel recently completed a three-year programme which delivers fully engineered, steel intensive designs for electric vehicles. Known as the Future Steel Vehicle (FSV), the project features steel body structure designs that reduce the mass of the body-in-white to 188 kg and reduce total life cycle emissions by almost 70%.

Unlike S-in motion, ArcelorMittal's own light weight solution for today's vehicles, the FSV study concentrated on solutions for cars which will be produced in the 2015 to 2020 timeframe.

Cleansheet designs

The FSV project was launched at the United Nations Framework Convention on Climate Change which was held in Bali during 2007. With eight years until the vehicles were expected to go into production, FSV was able to consider cleansheet designs. However, the concept body structures corresponded to the standards for existing A-, B-, C- and D-class vehicles.

Three different powertrains were studied as part of FSV:

- Battery electric vehicles (BEV)
- Plug-in hybrid electric vehicles (PHEV)
- Fuel cell electric vehicles (FCEV)

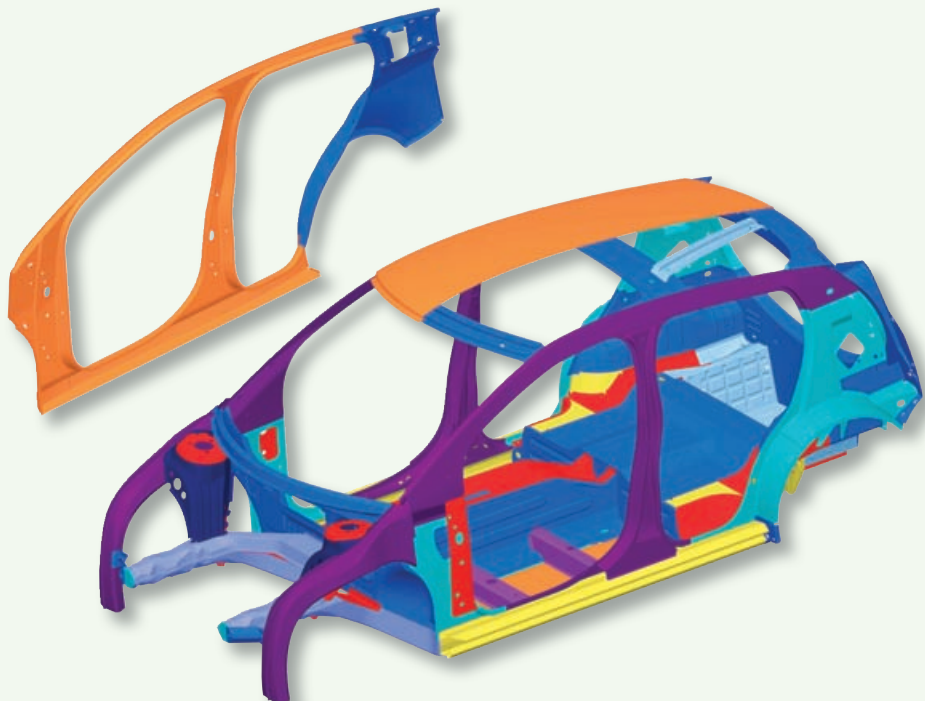
The FSV engineering team chose a B-class BEV as the focus of the programme. With such a long lead time, FSV was able to consider new layouts and structures for the body-in-white which could accommodate the batteries. The resulting optimised shapes and component configurations mimic Mother Nature's own design efficiency, where structure and strength are placed exactly where they are needed.

New steels in development

FSV was also free to consider the use of steels that will only become commercially available in the 2015 to 2020 technology horizon. The FSV material portfolio includes press-hardened (PHS), dual phase (DP), transformation induced plasticity (TRIP), complex phase (CP) and twinning-induced plasticity (TWIP) steels, many of them with yield strengths that are higher than 1000 MPa.

The catalogue of solutions developed for S-in motion already includes PHS with tensile strengths up to 1300 MPa for components such as the rear twist beam

The information gained from FSV opens the door for ArcelorMittal to adapt S-in motion solutions for this new generation of vehicles.



Structure of the Future Steel Vehicle body-in-white

axle. In this application, the use of PHS enabled savings of 2.7 kg (15%) compared to the baseline.

All S-in motion components have undergone feasibility tests to ensure each component can be manufactured efficiently and integrated into the car making process. The industrial validation was performed in parallel with a cost analysis.

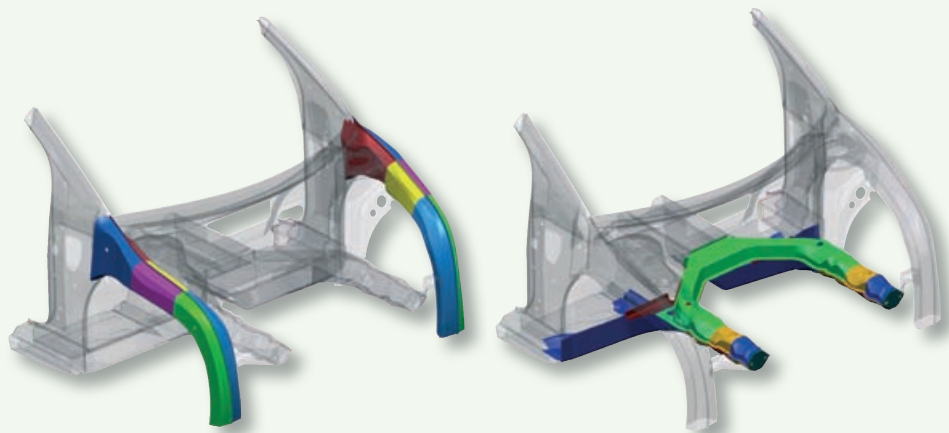
The comparisons showed that there was no cost increase based on 2010 prices for steel. This is because traditional steels that have been used for these parts require a thicker, heavier grade of steel. The newer PHS and AHSS grades used in the S-in motion parts are stronger, yet lighter, than traditional automotive steels.

S-in motion project provides carmakers with solutions to reduce vehicle weight by 20%, with no increase in material or production costs for the lightest solution. Results of a life cycle analyses of the S-in motion BIW showed that CO₂-equivalent emissions would be reduced by 13.5% during the use phase of the vehicle's life and by 15% during the production phase. The savings translate to a reduction in emissions of 6.2 grams/kilometre for S-in motion vehicles (see the article *A lifetime of savings* in this issue of *Update*).

FSV on the other hand, has been designed through an initial manufacturing feasibility analysis. This also takes into account life cycle greenhouse gas emissions; noise, vibration and harshness (NVH); and cost.

Future S-in motion solutions

As FSV is a concept vehicle based on a numerical study, the WorldAutoSteel team was able to explore new, non-intuitive



The Future Steel Vehicle team were able to consider new structures such as this 'shot-gun' front assembly (right).

possibilities for the structure of the car body. Examples include a new front rail system, as well as new 'shot gun' and rocker sub-systems.

Crash simulations for the new parts utilised a combination of global safety requirements including both European and US NCAP test criteria which meet expected 2015-2020 crash performance targets. As the S-in motion solutions could be fitted to cars in production today, they were verified against actual standards for Europe, North America and Japan.

The FSV study showed that impressive savings are possible on the weight of the

body-in-white of a future electric-powered vehicle. The information gained from FSV on the specifics of electric vehicle design, crash behaviour and weight increase (due to batteries) opens the door for ArcelorMittal to adapt S-in motion solutions for this new generation of vehicles.

Let the customer's voice



Last September a delegation from Citroën drove up to the Liège mill in a brand new car model. They offered a sneak preview to the staff members of the Liège and Gent mills, which both supply high added value steels for this new model.

Back in November 2010 Update started a series of articles about CEOs of steel mills taking more time to meet with their key customers. A new policy of ArcelorMittal Flat Carbon Europe (FCE) encouraged them to do this more systematically. In the two previous editions we reported the enthusiastic reactions of CEOs of the Business Divisions East and South West. In this third instalment of our series we focus on the experiences of the CEOs of Business Division North.

'A couple of years ago, when I was in charge of a Polish mill, I started having quite regular contacts with customers,' Wim Van Gerven says. 'Since my appointment as CEO of ArcelorMittal Gent, I see the new policy as an encouragement to go on communicating with my customers as much as I possibly can. I believe this to be an essential part of our job.'

'It most certainly is,' Dietmar Ringel, CEO of ArcelorMittal Bremen, agrees. 'In my experience the most dangerous criticisms and questions are those that don't come to the surface by themselves. As a CEO I need to facilitate communication with customers.'

'Knowing our customers' business and even their customers' business provides us unique insight into what is required regarding service, quality, products and price setting,' says Geert Van Poelvoorde, CEO of Business Division North. 'This helps us offer real added value which goes far beyond the delivery of steel. We aim for long-term partnerships with our customers. Although ArcelorMittal is a large global company, each and every customer should get the feeling that we are his local and most trusted supplier, where he knows people and people know him.'

Working out solutions

When asked where and when they meet their customers, the mills' CEOs first cite trade fairs and special customer events as excellent occasions to exchange information. 'Customer events like the ones we had in the Baltics and at the occasion of the Batimat and Blechexpo trade fairs, as well as local social events like the UK Golf Days and other sports events, are indeed quite popular with customers and mills' CEOs,' confirms Antoine Van Schooten, CMO of Business Division North.

'You can have fairly in-depth conversations with several customers at such venues,' Wim Van Gerven adds. 'They provide a time-efficient way to keep in touch.'

Whenever there are technical, logistical or commercial matters to discuss, I prefer to invite customers to pay a visit to our mill. That makes it so much easier to work out solutions.'

'In some instances, it is best to visit the customer's premises to see with your own eyes what should be done to help solve problems,' adds Thierry Renaudin, CEO of ArcelorMittal Lorraine. 'Some time ago I visited a customer whose main concern was the unpredictability and irregularity of the orders placed by his individual buyers.'



'Although ArcelorMittal is a large global company, each and every customer should get the feeling that we are his local and most trusted supplier, where he knows people and people know him.'

**Geert Van Poelvoorde,
CEO of Business Division North**

be heard!



A Jaguar Land Rover delegation and our customer team during a mill visit at ArcelorMittal Gent

He tried to be extremely flexible but felt his efforts were constantly thwarted by the long lead times of our steelmaking process. He ended up making rough quantitative estimates of the steel that would be needed over longer periods of time, knowing quite well that any misjudgement could lead to a vast surplus of steel in his inventory. After a long, enlightening meeting we decided to put in place a decoupled inventory at our mill from which late specifications could be drawn according to the needs encountered in the customer's market. This system took some time to refine, but we managed to solve the problem and earned great loyalty in the process.'

Henri-Pierre Orsoni, CEO of ArcelorMittal Atlantique, relates a similar experience: 'During a visit to one of Toyota's plants, I found out that this customer had developed a comprehensive quality management system to help assure consistent product quality. So, we agreed to let two of ArcelorMittal Atlantique's employees follow a special training programme at the customer's site. This gave us the opportunity to better tune our galvannealing process to match each of our customer's requirements.'



Renault Trucks at a safety meeting to benchmark with ArcelorMittal Liège

Playing it safe

'Reinforcing the bonds with key customers doesn't always need to be about solving technical or logistical problems,' João Felix Da Silva, CEO of ArcelorMittal Liège, observes. 'Very recently one of our key customers, Renault Trucks, approached us with a request to benchmark safety systems with us. We invited them to the Liège mill to explain our Health, Safety and Environment programme and demonstrate

the follow-up tools we use. It turned out that this customer was working to obtain OHSAS 18001 certification, which we already have. Helping our customers to achieve their goals – even if they fall outside the normal scope of a customer-supplier relationship – is a great way to strengthen an alliance.'

'When it comes to creating engagement in the workforce, customers' words often mean far more than anything foremen and managers can say,' Wim Van Gerven confirms. 'That is why it is important to let the customer's voice be heard on the shop floor. If a customer says that some problem has to be solved, everyone from top management to shop floor level in the mill is made to feel personally responsible.'



Steel: the sustainable packaging material

Lighter and stronger steels are making cans more durable, and environmentally friendly

Research by the Association of European Producers of Steel for Packaging (APEAL) has revealed that recycling rate of steel for packaging in the European Union rose to 72% in 2009. While steel is well ahead of other packaging materials in terms of recycling performance, ArcelorMittal and the packaging industry are continually working to create new packaging solutions that are lighter and that require less energy to produce. The goal is to reduce emissions at all stages of the packaging's life while maintaining the can's technical properties.

Steel is utilised for packaging in four main markets: food; beverages; general line (for example, cans for edible oils, biscuits or fancy cans) and industrial (essentially paints). Steel is also used to make aerosols and closures. In Europe the food sector accounts for half of the steel produced for the packaging industry. One of the main reasons for this high level of utilisation is that most other packaging materials cannot withstand the sterilisation process used for food cans.

By recycling steel cans after use, consumers are helping to reduce greenhouse gas emissions significantly. Steel is 100% recyclable and all available steel scrap is recycled. Each recycled steel can saves one and a half times its weight in CO₂-equivalent emissions. The more steel that is recycled, the greater the reduction in emissions. Around 2.5 million tonnes of steel beverage and food packaging are recycled in Europe each year. This equates to a 49% reduction in CO₂-eq emissions into the atmosphere.

Global proximity

ArcelorMittal is a leading supplier to all sectors of the packaging industry. Our global packaging footprint includes production facilities in Belgium, Canada, France, Kazakhstan, South Africa, Spain and the United States. Service centres are also located in Italy, Spain, Turkey and Ukraine.

The R&D Packaging centre in Metz (France) is ArcelorMittal's global research facility for the industry. The centre develops new grades of steel for packaging, and provides advice and support

to our worldwide packaging customers. R&D Packaging is able to help customers improve their industrial processes for better product control and higher throughput.

Innovation continues

ArcelorMittal continues to strengthen the properties of our advanced family of steel for packaging. We have already launched two grades in the family: Creasteel® and Maleis®. Developed by R&D Packaging, the grades allow can makers to meet packaging industry expectations in terms of convenience and differentiation. Creasteel® enables can makers to create hyper deep-drawn cans with unique and attractive shapes. The Creasteel® trays are microwaveable and can also be reheated in a water bath or a traditional oven. Creasteel® is also ideal for producing rectangular, easy-open ends.

Maleis® has added ductility, enabling can makers to produce thinner cylindrical ends. Cans made from Maleis® are easier to open and the ring-pull system is much stronger.

ArcelorMittal's steel for packaging already offers can makers an unparalleled range of choices when it comes to design and light weighting. With ongoing development of lighter, stronger and more appealing steel for packaging, there is no doubt that steel will continue to be the material of choice for the packaging industry, long into the future.



Around 2.5 million tonnes of steel beverage and food packaging are recycled in Europe each year. This equates to a 49% reduction in CO₂-eq emissions into the atmosphere.



Different steels for different packaging needs

ArcelorMittal offers an extensive range of products to serve the different packaging sectors. Our offers includes:

- Tinplate, tin-free steels (ECCS) and electrogalvanised steels (EZ)
- A large spread of mechanical properties from 230 to 750 MPa
- Gauges from 0.49 to 0.13 mm and below
- EZ 0.28 mm and below for tabstock

Our steel for packaging is delivered in coils which can be coated or uncoated. The coils can be slit or cut into sheets depending on the customer's requirements. Further information can be found on our website www.arcelormittal.com/packaging

ArcelorMittal is a leading supplier to all sectors of the packaging industry.

Laser welded blanks just got stronger and lighter

New patented welding technology from ArcelorMittal will see Usibor® become an industry standard for tailored blanks

Usibor® 1500P is a light, ultra high strength steel that was developed by ArcelorMittal for use in car bodies, principally for the structural parts of vehicles. When it became available, Usibor® generated a revolution in the automotive market. The material combined an ultra high strength steel with an effective corrosion-resistant coating, characteristics never seen before in the same automotive steel. While the grade has performed above expectations as a structural material in automotive applications, its protective coating prevented effective welding. At first sight this prevented the steel from being used as a material for laser welded blanks (LWBs), a challenge which ArcelorMittal overcame with a patented solution.

Laser ablation to remove AlSi coating

When the steel is welded without any special pre-treatment, the presence of aluminium in the coating influences the weld microstructure and creates a brittle joint. This negatively affects the ultimate tensile strength of the steel and its elongation.

As a reminder: Usibor® has a thin aluminium-silicon (AlSi) coating layer which protects the steel from corrosion both during and after hot stamping. An intermediate layer is created when the coating is deposited on the Usibor® steel during the manufacturing process. This layer alone retains high enough corrosion resistance.

A joint development team, made-up of engineers from ArcelorMittal Tailored Blanks and R&D Montataire, was created to find a method of removing the AlSi coating without affecting the intermediate layer which is just 3 to 6 µm thick. After months of research and development, the engineers developed, tested and industrialised a laser de-coating process that uses pulses of laser light to heat the coating and then vaporise the AlSi layer.

Using such a high-tech laser process enables the coating to be removed with a precision level of 1 to 2 µm in depth. This ensures that the intermediate layer is not compromised (see Figure 1).

Audi is already using Usibor® LWBs by ArcelorMittal Tailored Blanks for use in the side member of its Q5 vehicle and the rear rail of the A4 model. Both LWBs consist of two Usibor® 1500P blanks. (images courtesy of Audi AG)



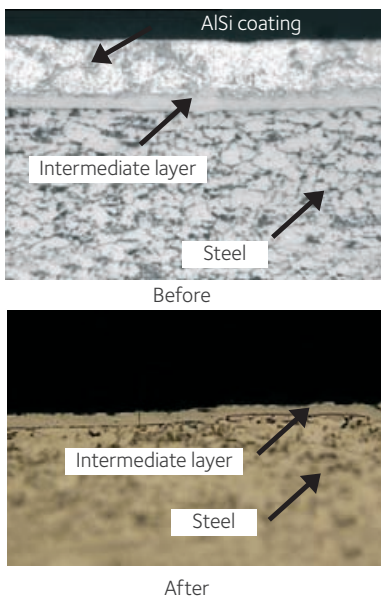


Figure 1: Usibor® 1500P before and after the AlSi layer is removed.

Unlimited possibilities

The new technology has been patented by ArcelorMittal, making the company the technology leader in the field of LWBs for hot stamping applications. For carmakers, the ability to use Usibor® in LWBs will enable them to save even more weight in their vehicles. It also opens up new design possibilities as different hot-stamped steels can now be combined with Usibor®.

Almost all carmakers are currently looking at ways to incorporate Usibor® into the bodies of their future vehicles. Volvo, a company known for its safety commitment

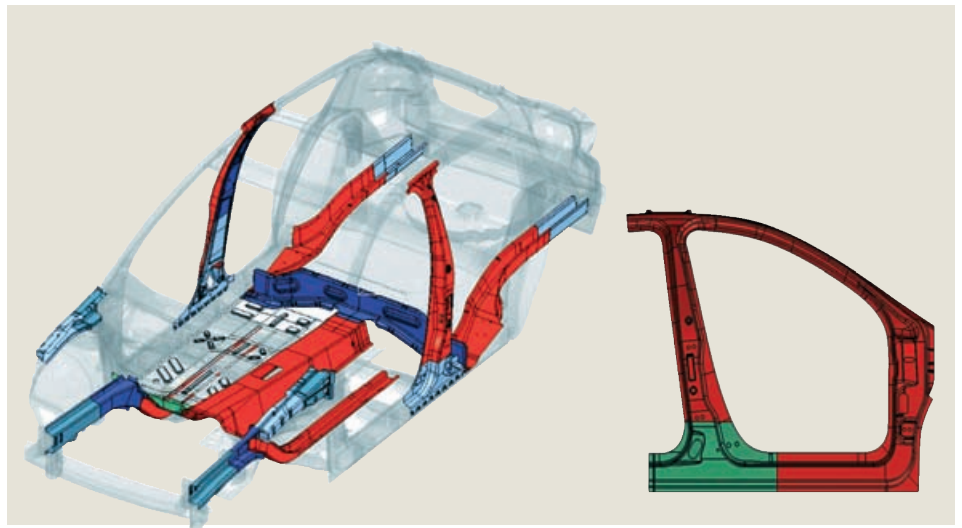


Figure 2: S-in motion LWBs for the body-in-white and door ring

and advanced technologies, expects that around half of the body-in-white (BIW) could be made with Usibor®. It should even be possible to create whole body sides with the steel.

S-in motion savings

Seven Usibor® LWBs have also been developed for the BIW of ArcelorMittal's S-in motion concept vehicle. These include the anti-intrusion bars, energy absorption parts, the front and rear rails, B-pillars and the tunnel (see Figure 2). ArcelorMittal engineers believe significant weight savings may be possible if these components are created with Usibor® LWBs.

A new concept for the door-ring of the S-in motion vehicle has also been developed using both Usibor® 1500P and Ductibor® 500P. The weight saving in this application is calculated to be around 20% (12.9 kg) compared to the current solution. It also provides superior safety performance and reduces assembly costs.

Usibor® clearly opens a world of possibilities for carmakers who wish to lighten the weight of their vehicles and improve safety. When utilised with the new laser welding technology, Usibor® will offer even greater design possibilities and significant material cost and weight savings. ■



For carmakers, the ability to use Usibor® and Ductibor® in LWBs will enable them to save even more weight in their vehicles.

About Usibor® 1500P and Ductibor® 500P

Usibor® 1500P is a press hardened steel which has outstanding mechanical properties after hot stamping. It is able to withstand lateral crashes, even at higher speeds than today's standards require for passenger safety. Compared to high strength steels, Usibor® 1500P offers weight reductions of up to 50%.

Derived from Usibor®, Ductibor® 500P is a ductile steel which offers excellent energy absorption and weight reduction possibilities. Ductibor® 500P has a high elongation percentage, enabling it to absorb much of the energy produced during a crash. Ductibor® also utilises the same AlSi coating as Usibor®.

Using the new laser welding process developed by ArcelorMittal, Usibor® and Ductibor® can be combined to create lightweight LWBs. The Usibor®, which will not deform in a crash, can be used to protect vehicle occupants, while the Ductibor® can be used in areas away from the passengers.



Solutions for tomorrow, today

The world's population currently stands at around 7 billion people. To meet their minimum expectations for a comfortable life, we already need the equivalent of 1.9 planet Earths. By 2050, when the global population is expected to top 9 billion, we will require the resources of at least three Earths to meet their needs.

This is a challenging statistic for the global steel industry. Today, an integrated mill producing four million tonnes of steel a year consumes the same energy as a town of a million people.

Of all the materials used by mankind, steel is already one of the most cost-effective, recyclable and environmentally efficient. Over the entire lifecycle of a steel application, benchmark emissions are extremely low compared to other materials. Steel products are also affordable.

This edition of *Update* features some of the recent products developed by ArcelorMittal that exploit the advantages of steel. For

example, S-in motion has already identified UHSS and AHSS solutions that can be deployed in today's vehicles. The catalogue of S-in motion solutions can be used to lighten vehicle weight while maintaining safety standards for occupants. A life cycle analysis (LCA) study of the S-in motion catalogue (see pages 6-7) confirms that steel is the right choice for vehicles if the entire life cycle is taken into account.

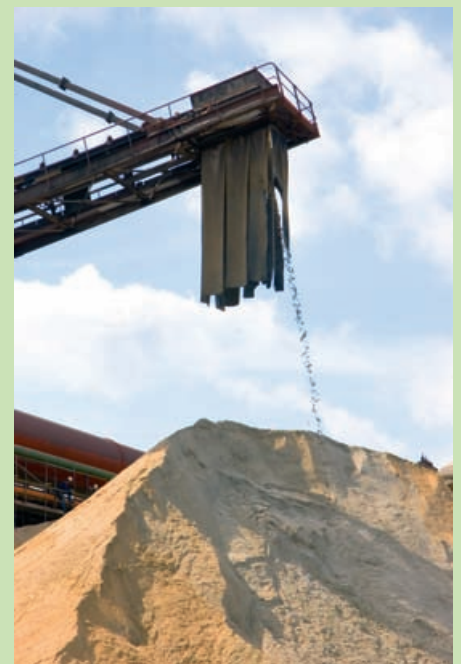
In the construction sector, ArcelorMittal has recently announced its *Nature* range of organic coated steels (see pages 4-5). The innovative roofing and cladding solutions (sometimes including photovoltaic elements) will help to reduce energy

New electrical steels for wind turbines maximise the amount of power generated.

consumption in buildings and create a beautiful built environment that is both sustainable and healthy for its users.

The use of steel in energy applications is also increasing. In renewable energy generation, ArcelorMittal has developed new electrical steels for wind turbines which maximise the amount of power generated. New grades have also been developed for use in thermal power plants. Their resistance to high temperature and pressure enables steam turbines to function more efficiently.

Meeting the needs of future generations requires us to use resources more efficiently, and to find new solutions to old problems. As you will have seen in this issue of *Update*, steel and ArcelorMittal are uniquely positioned to be an important part of those solutions.



From waste to energy: transporting granulated slag directly from the blast furnace to the cement mill ensures lower CO₂ emissions and high-quality cement.

As well as improving our steel products and solutions, ArcelorMittal is working hard to improve our processes. Our aim is to reduce our environmental impact even further. More information on our process improvements will feature in the next edition of *Update*.