



# Agristeel increases the payload for farmers

High strength and ultra high strength steels helping to lighten the workload

Increasing the maximum payload of agricultural equipment is an important objective for many farmers. With a larger payload, loading and unloading operations are reduced, more goods can be transported and costs are lowered.

To explore the use of high strength and ultra high strength steels in agricultural applications, ArcelorMittal undertook a study for an agricultural skip. The goal was to quantify whether lightweight construction techniques could be applied to agricultural equipment to improve their environmental and cost performance. The concept study was carried out in collaboration with the International School of Design (ISD) in Valenciennes (France).

Typical agricultural skip vehicles are comprised of a chassis and a skip and are used to transport produce, equipment, and farm supplies. As the skip is the largest part of the vehicle it was the focus of the optimisation study. The specifications for the new Agristeel skip included a reduction in vehicle weight and a 5% reduction in cost.

An analysis of existing agricultural skip designs showed that traditional steel types such as S235JR and S355JR were typically used. The resulting mass of the reference skip was 3000 kg.



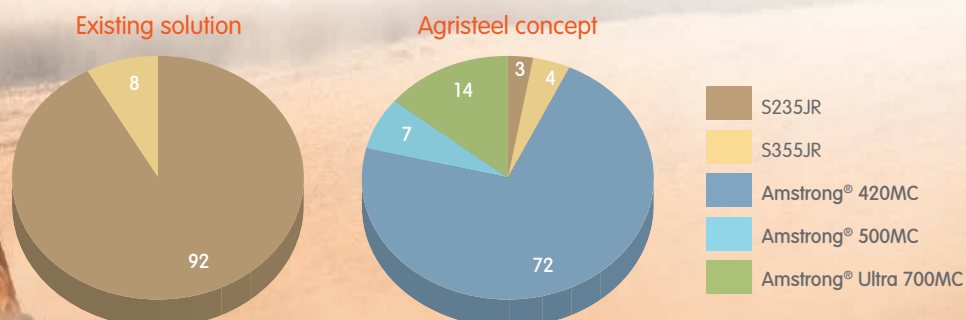
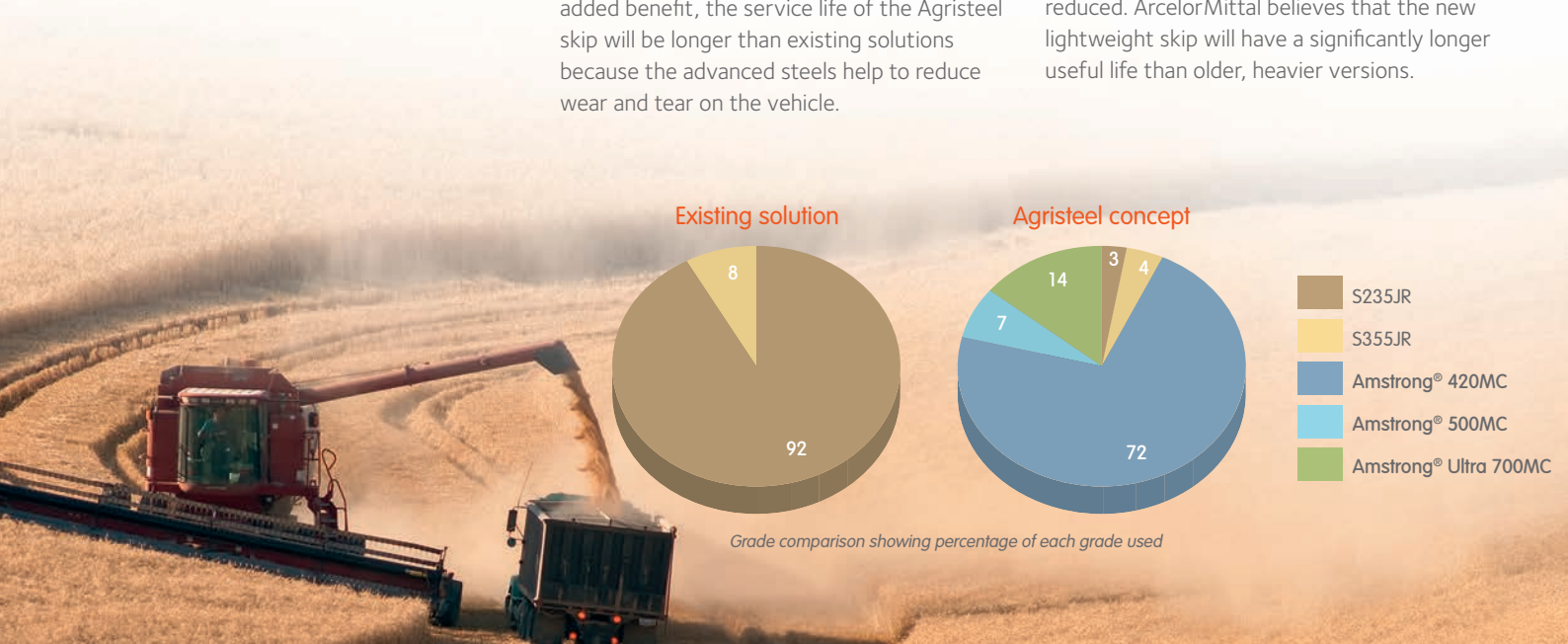
Using **Amstrong®** and **Amstrong® Ultra** steel grades, various solutions for a new agricultural skip were developed by the team. The lightest concept showed that the mass of the skip could be reduced by 20% to 2400 kg using these grades (see pie chart below). The significant weight saving enables the skip to carry a greater payload, and also means that less fuel is consumed when the vehicle is being moved in its unloaded state.

The Agristeel team calculated that an 8 tonne reduction in CO<sub>2</sub>-equivalent emissions could be achieved with the new design. And as an added benefit, the service life of the Agristeel skip will be longer than existing solutions because the advanced steels help to reduce wear and tear on the vehicle.

## Longer useful life forecast

Agricultural skips are subjected to extreme forces during use. While the skip could be made lighter, it was also necessary to verify that it could resist the wear and tear of farm work.

Computer simulations enabled the designers to test the Agristeel solution and to compare it with the reference skip. The results showed that the selected **Amstrong®** and **Amstrong® Ultra** steel grades performed much better than the steels in the reference skip. For example, the sag of the loading surface in critical loads was significantly reduced. ArcelorMittal believes that the new lightweight skip will have a significantly longer useful life than older, heavier versions.



Grade comparison showing percentage of each grade used

## New lightweight header application

Using high strength low alloy steels such as **Amstrong® 390MC**, ArcelorMittal's research teams have developed a new concept for the header of a combine harvester.

The new header design increases the number of reaping arms on the header from 8 to 12, while reducing the weight of the unit by 12%. The costs of the header are also reduced because less steel is required and assembly costs, such as welding, are reduced.



### Cost reduction exceeds target

With a cost reduction target of 5%, the design team explored a range of options. Due to the extremely high strength of the steels selected, ArcelorMittal and the design team were able to reduce the number of components and the amount of steel used.

The optimised design for the new skip will enable manufacturers to reduce joining operations. ArcelorMittal estimates that the total length of the welds will be reduced by 80 m. As the **Amstrong®** and **Amstrong® Ultra** steel grades used are thin, they also require less welding.

When added together, the reduction in steel and components and the improvement in welding operations add up to a total cost reduction of around 15% compared to the reference skip. This far exceeded the initial 5% target.

The lightweight construction techniques developed for this project are already finding additional uses in other farm equipment (see the boxes on the header application and connector arm). The Agristeel project demonstrates how advanced and ultra high strength steels can deliver tangible financial and environmental improvements.

### Do you want us to start up a new co-engineering project together with you?

Contact us at  
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Or contact your local account manager or technical representatives.

## Amstrong® high strength low alloy steels add value

ArcelorMittal's range of high strength low alloy steel grades add value to every application. Higher strength steels:

- Enable manufacturers to create high-tech products with **high performance** and **low weight potential**.
- Combine **high strength** with **excellent toughness**, even at low temperatures.
- Provide **excellent processing performance** including:
  - **Outstanding weldability** due to their low carbon content,
  - **Easy formability** and a **range of cutting options** (laser, gas or plasma),
  - Reduced thickness which simplifies the processing of the steel, **saving manufacturing costs and time**.
- Resist damage due to wear and abrasion making them **extremely durable**.
- Have higher strength and **improved fatigue properties** due to their fine grain size and low sulphur content.
- **Withstand higher stresses** than conventional steel grades.

### Find out more

For more information on our **Amstrong®** high strength and **Amstrong® Ultra** superior ultra high strength steel product range please consult our online product catalogue (data sheets A20 and A22) or our product document centre on [industry.arcelormittal.com](http://industry.arcelormittal.com)

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## Impressive weight savings on the connector arm

Agricultural skips are typically connected to a tractor or other motor with a connector arm. By replacing conventional steels with **Amstrong®** and **Amstrong® Ultra** steels in this application, significant weight savings are possible depending on the grade selected (see table).

Grade	 Weight savings
<b>Amstrong® 500MC</b>	<b>30%</b>
<b>Amstrong® Ultra 700MC</b>	<b>45%</b>

*Weight reductions for connector arms using different ultra high strength steel grades*



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