

TCO Scan MagiZinc

Lowering total cost of ownership

Background

Today's consumers expect vehicles to be safer, more durable and more fuel efficient than ever before. To meet these competing objectives, the materials used need to be lighter to reduce fuel consumption, yet stronger to compensate for a reduction in material thickness, while still meeting the required safety performance. At the same time manufacturers are under pressure to reduce their own total cost of ownership (TCO) – the balance of performance, lightweighting and cost of their components – in order to keep their volume car production as competitive as possible. An important contribution to lowering TCO is improving the efficiency of this production process.



Tata Steel's new generation of hot dip galvanised steel, MagiZinc® Auto offers a solution to this challenge. MagiZinc Auto is already available for structural parts and will soon be available for exposed panels as well. The innovative zinc-magnesium alloyed coating of this steel increases corrosion protection, allowing for thinner coating layers and therefore lighter parts. As well as reducing the weight of parts, the properties of this new coating improve production performance by reducing tool pollution and galling behaviour during processing in the press shop.

To provide manufacturers the opportunity to evaluate how this new steel can reduce their total cost of ownership, Tata Steel offers customers its TCO Scan. This advanced engineering service helps Tata Steel's customers identify potential bottlenecks in their production processes and subsequently optimise such processes by fine tuning substrate, coating and lubrication. In particular TCO Scan MagiZinc supports manufacturers in quantifying the TCO reduction potential of using MagiZinc Auto in their own specific processes and applications, avoiding a 'one size fits all' approach.

Press shop performance is key

Maintenance stops waste time and money, and as a result a stable manufacturing process is important for reducing press shop costs. Press shop performance is affected by a number of customer-specific factors including the individual type of press (for instance mechanical, hydraulic, servo), the part geometry, the required press forces and the lubricants used. For this reason there is a strong need to understand how a specific steel product (material and lubrication) behaves in an individual customer's press shop on a case-by-case basis.

The press-shop performance of zinc-coated sheets is influenced by a number of factors, including die temperature and tool pollution. Since MagiZinc Auto offers more robust processing, the coating can improve part-production yield and increase press up-time. The extent of this improvement depends on a number of customer-specific conditions.

TCO Scan MagiZinc evaluates press-shop efficiency by carrying out live trials on the customer's production lines to calculate the processing benefits of the MagiZinc Auto coating compared to a conventional zinc (GI) coating. The TCO Scan calculates exactly how much more efficient the customer's pressing process could be made by substituting a conventional coating with MagiZinc Auto. It does this with minimal impact on running production, as a reliable, quantitative result can be achieved after pressing just 300 parts.

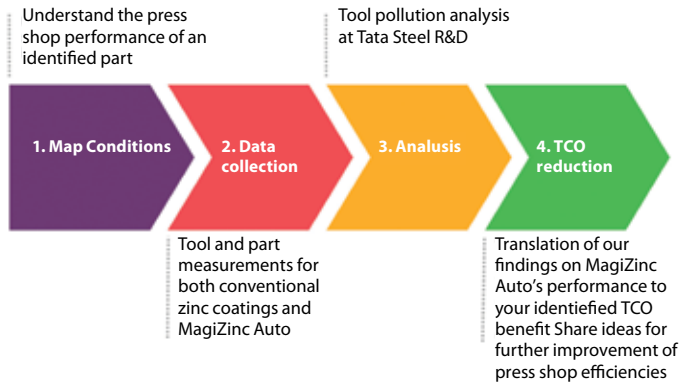
TCO Scan MagiZinc analysis

A high level of tool pollution is often evident where high friction occurs during processing. There are two types of tool pollution: adhesive sheet wear and abrasive sheet wear. The former refers to the adhesive transfer of zinc particles, which causes galling, while the latter is the scraping off of zinc particles. Galling results in scratches on the surface of the steel, and the removal of zinc particles causes pimple defects, both affecting the appearance of the component after painting.



Roughness measuring of parts to indicate galling

The first step of the TCO Scan MagiZinc analysis is to identify galling-sensitive locations on the steel. This is done by measuring the roughness of the part's surface and the tool temperature. Next, a trial pressing of a minimum of 300 parts is performed, comparing the difference in galling behaviour of the product currently used by the customer against MagiZinc Auto. Particles from the material are collected by using a specially-developed tissue and oil treatment, which involves wiping the tools for further analysis.



Process steps of TCO Scan MagiZinc

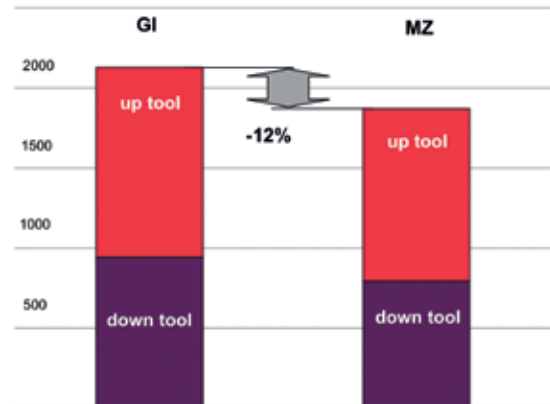
After the press trial, the results are analysed in Tata Steel's own research and development centre. The difference in particle distribution between MagiZinc Auto and the existing product – or reference product – is determined, and the difference in mass is measured on a 0.1 mg accuracy scale to quantify the differences in tool pollution. This is done by using chemicals to separate the particles from the oil and tissues, after which the mass fractions and chemical composition are determined with Inductive Coupled Plasma (ICP) and Optical Emission Spectroscopy (OES). Large amounts of Fe-particles are indicative of cutting-line pollution rather than pressing pollution. The size of zinc particles are also important during the analysis process; smaller zinc particles indicate general dust, whereas larger particles indicate adhesive wear.

Quantifying the TCO benefit

Tata Steel analyses the data from the study to determine the cost benefits that can be achieved by replacing the current product with MagiZinc Auto. This is done by determining the increased production time that can be achieved by using MagiZinc Auto, followed by a cost calculation using an advanced press-shop cost model. By working in partnership with its customers, the cost model can be further adjusted to reflect the customer's specific situation. Using MagiZinc Auto, TCO improvement in terms of increased up-time ranges between 10% and 30%, depending on the particular production line and parts studied. This depends on:

- The complexity and roughness of the pressed part. MagiZinc Auto offers even bigger improvements for the outer panels, than for the structural parts, since appearance is more important
- Whether the metal is washed before pressing. The advantage of using MagiZinc Auto increases for unwashed parts. A TCO Scan carried out

Tissue & oil treatment measures



Tissues, oil and coating weight in mg after 300 pressings, indicating tool pollution

GI = conventional zinc coating
MZ = MagiZinc

TCO Scans so far show that MagiZinc Auto improves TCO in terms of increased up time between 10% and 30% depending on the specific part and tool conditions

- on a tailgate where the parts were washed, resulted in a 30% reduction in TCO – the potential for unwashed parts is even higher
- Tuning of tools. Spots of high-wear occur when tools are misaligned. Past studies have shown that tens of thousands of euros can easily be saved, per part, on a yearly basis.

Summary

Through MagiZinc Auto, Tata Steel offers customers a new steel product to meet the expectations of today's automotive market. When taking into account cost critical performance in the press shop, MagiZinc Auto provides a clear advantage over conventional coatings, offering up to a 30% reduction in tool pollution. This improvement means that the dies do not need to be cleaned so often, leading to reduced down-time. This effect is particularly strong in the case of outer body panels, leading to a significantly higher yield of production runs without failures, lowering the total processing costs. Tata Steel's advanced engineering service, TCO Scan MagiZinc, offers customers an in-depth understanding of areas of improvement in their own processes and applications, and outlines how using MagiZinc Auto can support this improvement.

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Tata Steel
Automotive
PO Box 10000
1970 CA IJmuiden
The Netherlands
connect.automotive@tatasteel.com
www.tatasteelautomotive.com

CT0515:AM:750:ENG:0614