Investigation of galvanizing properties of novel alloy-concepts for hot stamping

A study of the coatability by strip galvanization of third generation Advanced High Strength Steels designed especially for the automotive industry. The studied steels were five different alloying concepts – a dual phase steel, a grain refined steel and three different retained austenite steels.

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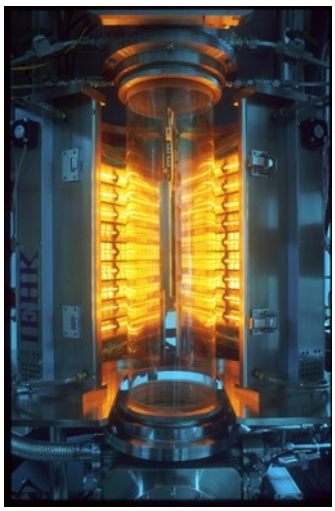

ABSTRACT:

All five concepts contained varying manganese as well as silicon contents. They strongly influence the quality of the coating due to their strong tendency of selective oxidation. The strip galvanization was conducted using the RHESCA Simulator, while choosing diverse dew points. Subsequently, the quality of the coating was investigated. Initially, cross-section polishes were studied in order to establish the layer compositions, as well as to identify potential oxide build-ups.

The low alloyed steel concepts, DP1-3 und KF1-3 showed an especially good coating quality, whenever a low dew point of -30 °C was chosen. However, the high alloyed RA steel concepts showed good coating results whenever the chosen dew point was higher, which in this case was either -10 °C or +10 °C. It was determined that the lower the variation in coating thickness, the higher the quality of the coating.

Using the REM, the layer composition of the zinc coating down to the substrate of the cross-section polish could be shown successfully. Further, the investigation of several top views showed that within the bare spots, silicon, manganese as well as other metal oxides were present. This provides an explanation for the uncoated areas.

Lastly, the top views of the etched samples indicated the formation of the intermetallic phase Fe_2Al_5, which guarantees the adhesion of the zinc. Best results were shown for the dual phase as well as grain refined steels. The coated percentage of these samples lay in the range of 93-94 %, while the uncoated areas could be explained by oxides.