Integrated strip stabilisation system FOEN DEMCOJET®

The FOEN® air knife system is well-known as the most advanced galvanising system for the production of all steel grades used in the automotive industry with highest demands on surface qualities. The first integrated solution of an air knife in combination with a strip stabilisation system was also executed with the FOEN DEMCO® system. As a subsequent improvement of this solution the FOEN DEMCOJET® was recently developed minimising the distance between air knife and acting stabilisation point to approx. 500 millimeters in order to achieve the best coating result. Up to now, already 12 FOEN DEMCOJET® systems have been sold in galvanising lines all around the world. The system is or will be integrated soon at first class producers of galvanised strip like Ternium, US Steel, Tata Steel, Nucor, Stelco, HBIS, CSN, voestalpine or Salzgitter.

In principle electromagnetic strip stabilisation systems feature electromagnets which are arranged on both sides of the strip in the same height above the air knives. A position measuring system is installed below on each top side magnet which continuously measures the distance to the strip in a non-contact manner. The strip position determined by this sensor is compared to the target position. By means of variations in the current flowing through the stabilisation coils, the magnetic attraction for the steel strip can be controlled systematically in a way that the strip movements are equalised.

NEW REQUIREMENTS

Strip stabilisation systems are a necessary feature in modern hot-dip galvanising lines, since the requirements on the process and the surface quality are continuously increasing due to various reasons. New industrial standards require closer tolerances, especially for the automotive industry. For example, demands the new European standard for the automotive industry (VDA 239-100) a single area test instead of the formerly used three area test. Thus, the standard is stricter since small deviations have a stronger impact on the evaluation. In addition, the surface quality in general has to be higher and more homogenous, which is only possible with a stable strip run in the air knife. For an economical production, the yield of high-quality material has to be high. Thus, the processing speed has to be as high as possible and cut-outs because of low quality after thickness changes have to be avoided. At the same time, resources have to be saved to keep operational costs low. This can happen with a reduction of over-coating and lower possible wiping pressure due to closer distance between strip and nozzles.

MINIMISATION OF STRIP-TO-NOZZLE-DISTANCE

The main goal of strip stabilisation is a minimisation of the distance between air knife and strip to reach the jet core zone. A low distance will lead to many benefits concerning the galvanising process and fulfill all mentioned requirements. The main condition to lower the distance is a stable strip run within the air knife. If the strip run is stable and smooth, the distance can be lowered systematically without the risk of scratching the strip. Three pre-conditions have to be fulfilled to reach a stable strip run: An efficient vibration reduction is necessary to reduce movements of the strip, cross-bow compensation is necessary to have a proper strip shape, and the distance between strip stabilisation and knife gap has to be minimised in order to ensure a stable strip run not only in the strip stabiliser but also in the wiping system.

CONVINCING OPERATIONAL RESULTS

The operational results have shown that all pre-conditions for a stable strip run within the air knife could be reached with the FOEN DEMCOJET®. Since the highly dynamic control system works with a response time of 1 msec the strip vibrations could be effectively reduced by more than 50%. The moveable magnets of the FOEN DEMCOJET® in combination with the control system compensates and almost eliminates the cross bow. Thus, the main goal could be reached and the distance between nozzle and strip was reduced significantly. The distance could be reduced from 9 to 6 millimeter and lower which was sufficient to reach the jet core zone.

Installations of the FOEN DEMCOJET® at voestalpine or at TATA resulted in many benefits concerning quality,

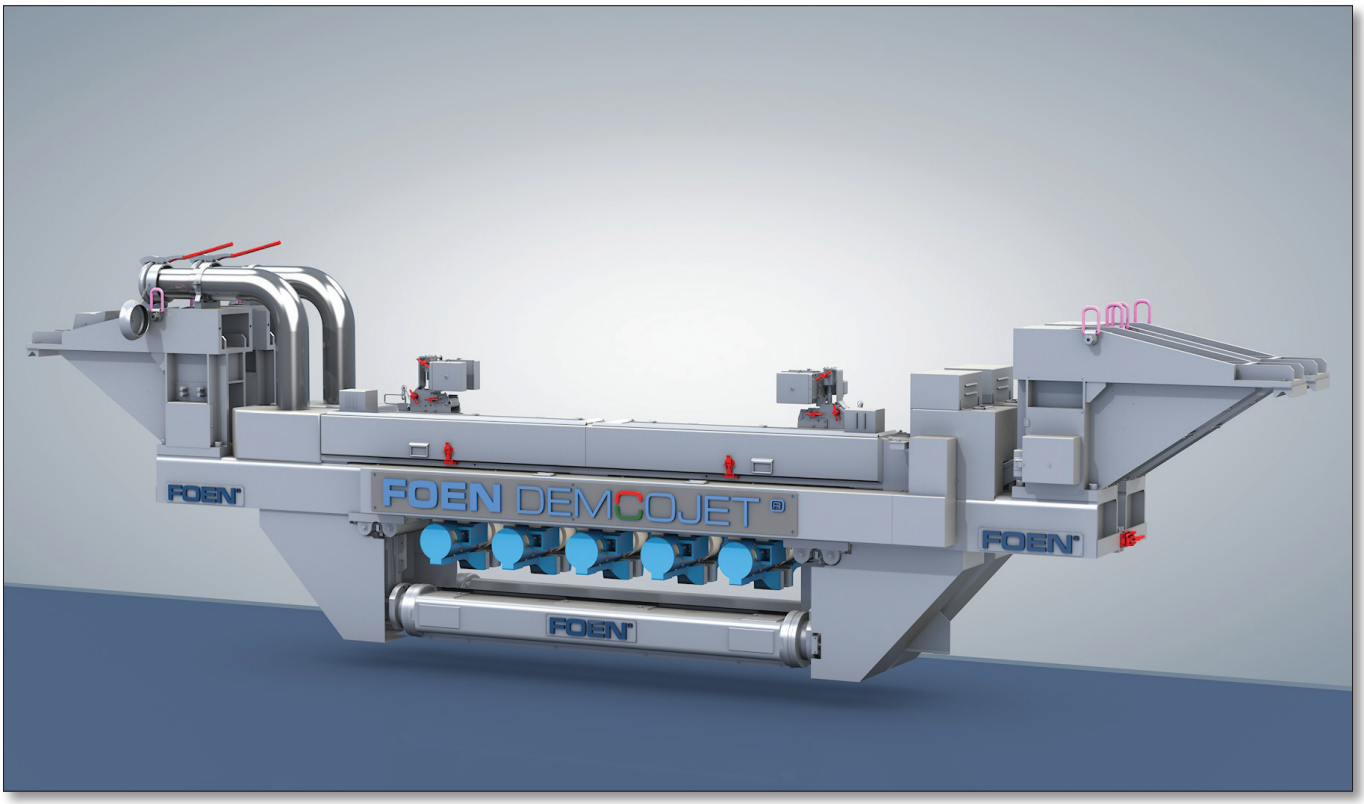

Fig 1 The FOEN DEMCOJET® is an integrated solution which combines the most advances galvanising system with an efficient electromagnetic strip stabilisation system and thus optimises the galvanising process and product quality.

production and operation. The coating uniformity was better, which lowered the zinc consumption. There was an increased yield of high-quality material since the strip losses due to cut-outs at weld could be reduced significantly (approx. 200 meters). In general, the processing speed could be increased up to 20%. Pressure could also be reduced, which lead to energy savings and reduction of dross formation. Another benefit was the reduction of the correcting roll intermesh which went along with less wear of bath rolls, sleeves and end caps.

PATENTED SYSTEM

Based on the comprehensive operational experience FOEN® is now continuously optimising the FOEN DEMCOJET® to increase the performance even more. The technological advantage of the system is secured comprehensively by several international patents. MS