Improved Set Up Strategies for Steel Strip Straightening Machines

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Abstract. Straightening Machines are used in a variety of applications to level metals in semi-manufactured form before it is fed to subsequent forming operations. Roll-type straightening machines are designed to process either strips or bars e.g. The straightening process is based on flexing of the strip upon passing between rolls arranged in two staggered rows. This strengthens the material with increasing plastic deformation by means of strain hardening and implies undesirable reduction in formability when processing high strength materials in particular. However, conventional straightening processes do not adapt to the local varying distortion of coiled strips. The longitudinal bow as variation from a straight line in the vertical plane usually varies according to the related radius of the coiled strip. Thus, first turns imply small radii which increase with distance to the center of the coil. Conventional straightening processes usually adapt to the minimum resulting radius of the strip and, thus, overcompensate the longitudinal bow of the outer turns of the coil. This is accompanied by diminishing mechanical characteristics as formability in particular. Innovative self-correcting process control techniques which adapt to the initial geometric characteristics of the strip are a promising approach to fix this issue optimizing the leveling process. This Paper displays an innovative strategy to improve straightening of high strength steel materials (1.4310). The strategy involves optimized set up techniques which adapt to the current geometrical characteristics of the strip as longitudinal bow in particular. This implies optimized leveling adding minimal plastic deformation and, thus, strain hardening. The improved formability of the leveled strip promotes downstream forming operations to manufacture high performance parts with complex geometries at high strength such as plug contacts e.g.