

Skinpass Mill and Tension Leveler for Ultrahigh-Strength Steel

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This presentation introduces the latest technologies of skinpass mill and tension leveler in continuous annealing line (CAL)/continuous galvanizing line (CGL) for ultrahigh-strength steel, and hot skinpass mill with tension leveler for green steel. Recent flat products, including ultrahigh-strength steel for automobiles, are improving in performance and are processed with special treatments such as heat treatment, so flatness tends to be worse. Therefore, more powerful and more accurate flattening facilities are required. New technologies for skinpass mill and tension leveler have been developed and installed in the CAL, CGL, hot skinpass mill and pickling line.

Introduction

Recently, the demands for ultrahigh-strength steel (UHSS) materials for the automotive industry have increased. UHSS is an alloy steel with a yield stress above 1,000 MPa, which is used to reduce weight and ensure safety. The production process of UHSS requires extremely rapid cooling, which results in undesirable flatness and/or excessive residual stress of products. On the other hand, flatness-improving performance of a conventional leveler is insufficient for UHSS. Therefore, special and high-performance tension levelers, roller levelers, and skinpass mill lines have been developed for UHSS to meet market needs.¹

JP Steel Plantech Co. has supplied over 212 tension levelers, 75 skinpass mills and 43 plate levelers all over the world and has achieved the flatness desired by its customers for a variety of materials, including hot- and cold-rolled steel sheet, aluminum alloy sheet, and special alloy sheet. This article will introduce three examples of the latest straightening technology, tension leveler, hybrid leveler and skinpass mill line for UHSS.

Tension Leveler for UHSS

As shown in Fig. 1, the faster the cooling rate in the water quenching, which is the production process

of ultrahigh-strength steel (UHSS), the worse the sheet shape becomes. Conventional continuous annealing lines (CALs) and continuous galvanizing lines (CGLs) are equipped with the skinpass mill as leveling equipment, but its mill is insufficient in leveling performance and uniform residual stress distribution suitable for blanking.

There are several important factors to determine the quality of rolled steel products, such as flatness, residual stress, surface quality, etc. As shown in Fig. 2, there are three types of shape defects in the steel material. Partial waves and sheet bows occurred due to the reduction rolling and/or heat treatment process, and bows are sometimes generated by the leveling equipment. Actually, these shape defects occur due to a complex combination. Additionally, the residual stress may cause the steel sheet to be warped after blanking or slitting to the narrow band.

For UHSS sheets, the conventional skinpass mill can level the partial waves, but it cannot level crossbows and coilset bows. A conventional tension leveler has great capability to improve partial waves and sheet bows, but its capability to control residual stress is not sufficient suitable for blanking. The tension leveler for UHSS developed by JP Steel Plantech