

# Fundamental Consideration of Optimal Relationship between Magnetic Force and Location of Permanent Magnet Installed in Edge Direction of Thin Steel Plate

by

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## Abstract

In a factory, a continuous thin steel plate subjected to iron and steel processes supported by rollers tends to experience plate vibrations that lower the quality of the surface finish. In the plating process, the steel plate is conveyed 20-50 m in the vertical direction for drying, during which the steel plates are negligibly supported by rollers and other mechanisms. Therefore, plating nonuniformity due to the generation of vibrations and other factors prevents an increase in productivity. To solve this problem, we developed a noncontact guide system in which electromagnetic forces are applied at the edges of the steel plates. Moreover, the control performance achieved by replacing the electromagnet with a permanent magnet, thus eliminating the running cost, has been examined. However, the negative effect caused by the negative spring force of the permanent magnet has, to date, not been examined. In this study, the optimal relationship between the magnetic flux density of a permanent magnet and the gap between the steel plate and the surface of the permanent magnet was examined.

**Keywords:** Steel Plate, Noncontact Guide, Permanent Magnet, Magnetic Field, Spring Constant, Evaluation Function.

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