

Experimental and Analytical Study of Strip Centering in Flotation Dryer

Hirokazu KOBAYASHI⁽¹⁾, Yukio TAKASHIMA⁽¹⁾

(1)Rolling and Processing Research Department, Steel Research Laboratory,
JFE Steel Corporation

Abstract

Flotation dryer systems are widely used to dry liquid layers on substrates such as film, paper and steel strip, and many reports discussing design optimization for better heat transfer characteristics and strip stability are available. As an advantage of this system, surface defects caused by contact between a support roll and the strip are prevented by floating the strip with a jet flow. However, since the friction force between the jet flow and the strip is smaller than that between a support roll and strip, flotation systems are prone to strip walking. Thus, it is important to improve the strip centering force. To our knowledge, no systematic in-depth study on prediction of the strip centering force with flotation dryers exists in the literature.

In the present study, the centering force acting on a steel strip in a flotation dryer was investigated by experiments and simplified fluid analyses in order to evaluate the influence of side plate geometry and the off-center value from the center of the flotation dryer on the centering force. In the experiments, a steel strip with a width of 120mm and one floater with two countercurrent flow nozzles in the strip length direction were used. Laser displacement meters were used to measure the cant angle of the strip. The centering force can be calculated from the cant angle. Two types of simulations were investigated. In one, the strip was fixed at the initial position, and in other, the strip was not fixed and was assumed to be a free-floating rigid sheet. The centering force can be calculated from the pressure distribution under the strip surface and the strip cant angle. The results of fluid analysis showed a good correlation with the experimental results. The results of this research demonstrated that a simplified fluid analysis can predict centering force accurately.

Hirokazu KOBAYASHI (Senior Researcher)

Rolling & Processing Research Dept.

Steel Research Laboratory, JFE Steel Corporation

1 Mizushima, Kawasaki-dori, Kurashiki-shi, Okayama, 712-8511, Japan

E-mail : hirok-kobayashi@jfe-steel.co.jp Tel : +81-86-447-3902