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**Analysis of Mechanism of Unsteady Load in Strip Rolling Processes
and Its Control in Commercial Lines**

Konno, Y.; Shibuya, S.; Tanaka, S.

Synopsis :

In hot rolling process, it is a very important subject to improve and maintain the reliability of equipment under severe conditions arising from heat, water and impacts. Especially, the impact load, which appears at unsteady rolling of the leading and tailing ends of a strip, is an inevitable factor. So it is particularly important to analyze the mechanism of the impact load and estimate the impact load quantitatively, for the design and maintenance of equipment. In this paper, a formulation of the horizontal force to a roll, which is given by material at unsteady rolling, has been carried out by using a mechanical approach. Moreover, by using this formula, the mechanism of the roll movement has been made clear, and the impact load, which is produced by collision between roll chock and housing, has been quantified. In this analysis, it was proved quantitatively by using the mechanical model that a mechanical gap was one of the most effective causes of the amplification of this impact load. Furthermore, it was also shown that controlling the mechanical gap decreased the influence of the impact load. Based on the results of the analysis, improvement of the roll restrictive accuracy of the horizontal direction has been achieved and this improvement has contributed to the operational stabilization.

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The body can be viewed from the next page.

Analysis of Mechanism of Unsteady Load in Strip Rolling Processes

Y. OHTSUKI, T. OKADA, T. YAMAMOTO, T. YAMAMOTO*



Synopsis:

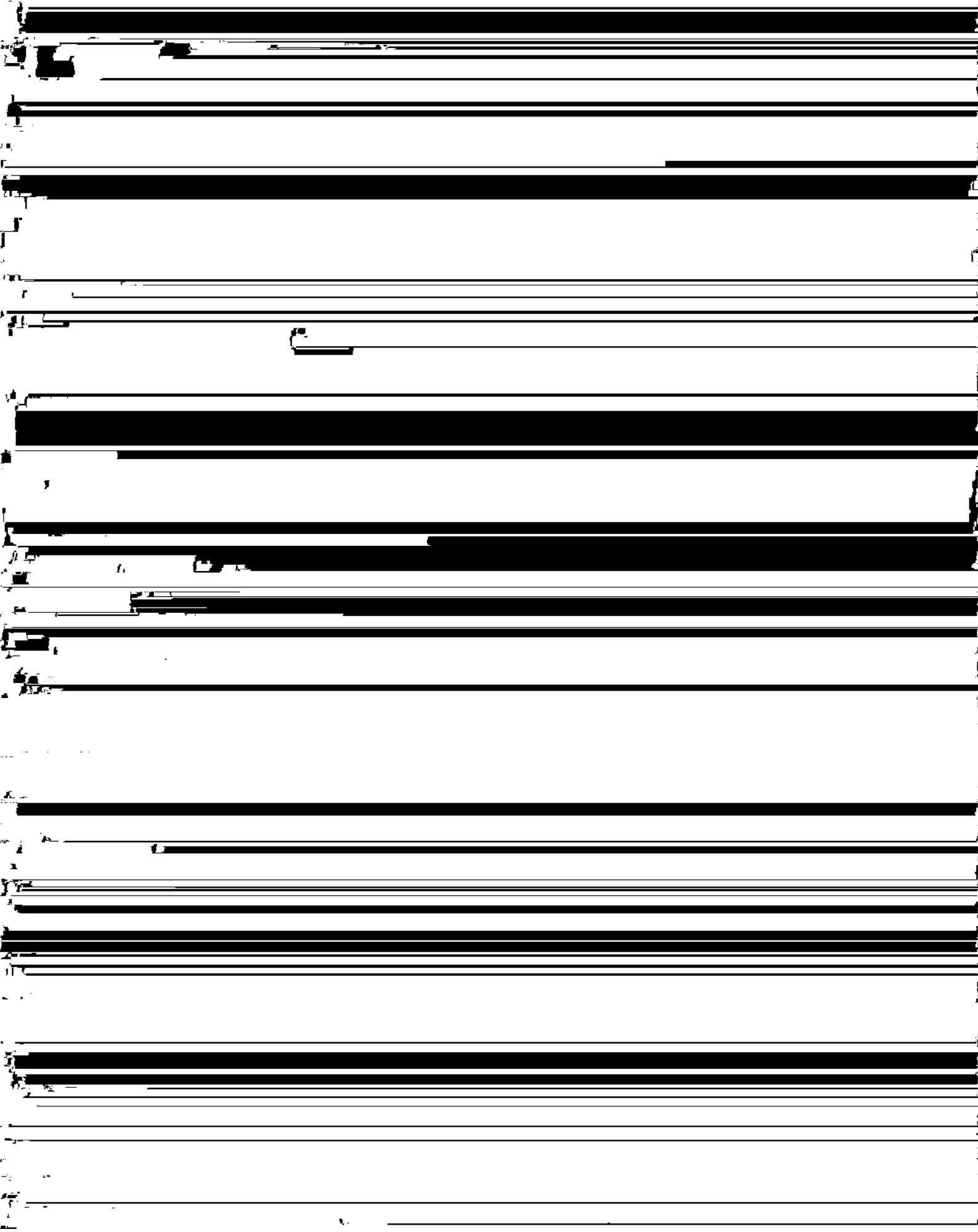
In hot rolling process, it is a very important subject to improve and maintain the reliability of equipment under

Rolling force : $Q/2$



(Dr side)

Hydraulic cylinder



eration of the roll changing rails at the entry and delivery sides (Fig. 4). It should be mentioned that the roll changing rails have a structure that enables vertical movement during roll changes, and these devices also serve as the window block of the lower IMP. A chart of

delivery side and vice versa.

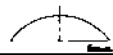
3.2 Model of Horizontal Roll Movement in Steady and Unsteady Rolling

Based on the knowledge obtained by the previous

the vibration acceleration at the roll changing rails is shown in Fig. 5, and a gap displacement chart is shown

ments described in the previous section, model equations that enable dynamic evaluation of the impact phenomena involving the landing and delivery sides

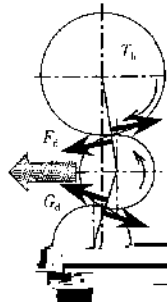
when the transverse rigidity K_h of the housing of a hot



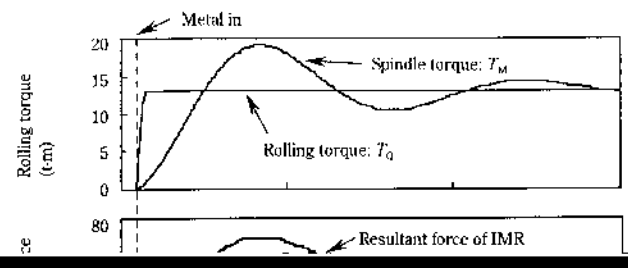
Rolling direction

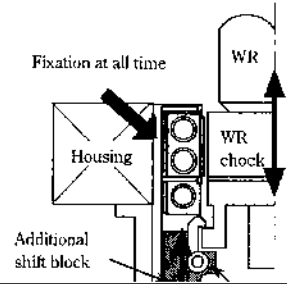
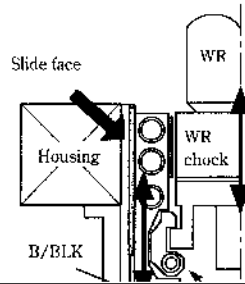
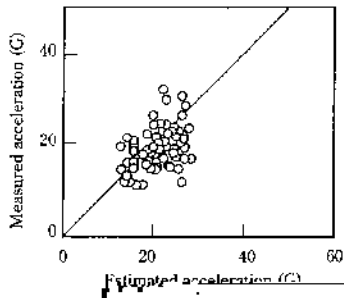


Horizontal force of IMR



I_b, I_i, I_w : Polar moment of inertia of each roll
 $\theta_w, \theta_i, \theta_b$: Angular displacement of each roll
 F_r : Tangential force of reduction torque BUR and IMR
 G_d : Tangential force of reduction torque between IMR and WR





generated in the bending block structure, which had con-

(3) Because pass direction forces are unavoidably gen-

modification of the WR shift device. Following this improvement, the minimum window gap control standard was reviewed, and a stricter standard of less than 1/2 of the conventional value was adopted. This also

was shown theoretically that adopting a stricter standard for the gap is an effective means of reducing impact forces.

(4) A large reduction in the pass direction impact force