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(324) The Concept of "Continuous" Straightening (Development of the "low-strain" slab caster -- I)

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1. Introduction:

Strain at the s/l interface is the commonly applied criterion for the origin of solidification cracks in the continuous casting of steel (1). Thus it is important to control the total of strains resulting from mechanical and thermal stresses.

Connected with the steadily increasing casting speeds, one vital aspect is the control of strain due to unbending with liquid core. Hence, it is attempted in the present investigation to provide an optimum solution for slab casting whereby the effect of shear forces (2) is carefully considered.

2. Investigation Procedure:

A rubber slab simulating the strength properties of the strand shell with liquid core (Fig. 1) has been bent over a certain radius. The deformation of the slab section was checked by a grid-system.

3. Results and Discussion:

Fig. 2 shows the deformation of the slab which proves that strain distribution is non-linear as a consequence of shear forces. Consequently, the ideal bending curve resulting in a constant low moment is conceived by the design of a "continuous" straightening unit (3) with floating rollers (Fig. 3) which eliminates shear stresses in the unbending zone. Furthermore, misalignment of the fixed side-passline is safely avoided, and roller forces are small due to ferrostatic load only.

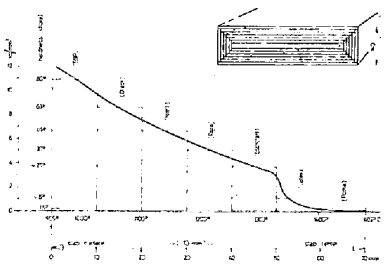

Fig. 1 Hardness / temperature-curve of simulation slab

4. Conclusion:

To minimize s/l interface-strain during unbending with liquid core, continuous straightening with floating rollers is a most favourable approach on account of eliminated shear-stresses and prevention of misalignment. This approach can also be applied to bending with liquid core.

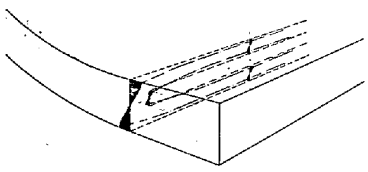

Fig. 2 Strain distribution in the simulation slab

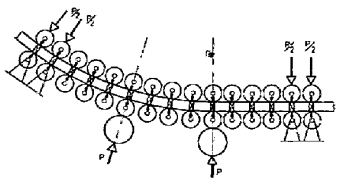

Fig. 3 Continuous straightening unit with floating rollers

References:

(1) H. Fujii et al.: Trans. ISIJ 18 (1978) 510-518.
(2) T. Matsumiya, Y. Nakamura: 65th NOH-BOSC AIME, Pittsburgh 1982.
(3) S. Ibbetson et al.: 4th IIS-Congress, London 1982.