Automatic Flatness Control System in Tandem Cold Rolling Mill for Ultra-thin Gauge Strip*

Synopsis:

In April 1988, a new flatness control system was

B : Delivery-side coolant (bending force : 0)

Rolled material

Mild steel

+ Decrease bender (−35 tf/chock)

Table 3 Specifications of shape-sensor

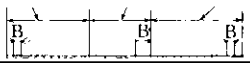
Accuracy (2σ)	(I-unit)	2.6
Period of output	(s)	0.35
Number of channels		
52-mm wide channel		10
26-mm wide channel		30
Total		40

$$\Delta\sigma_i = \frac{F_i - \bar{F}}{\bar{F}} \times T \quad \cdots\cdots (1)$$

$$I_i = \frac{\Delta\sigma_i}{E} \quad \cdots\cdots (2)$$

F_i: Output at i channel
$\bar{F}$: Average of F_i
T: Actual tension (kgf/mm^2)
$\Delta\sigma_i$: Distribution of tension (kgf/mm^2)
E: Young's modulus (kgf/mm^2)
I_i: Difference of elongation at i channel

B×Zone:



Helper

Figure 3 shows the steepness comparison results between off-line and on-line measurements. The on-line

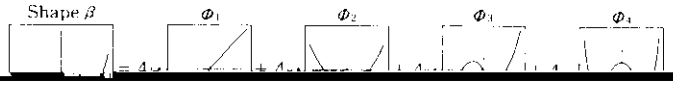
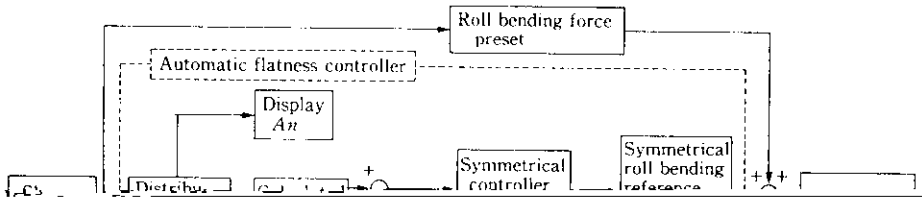
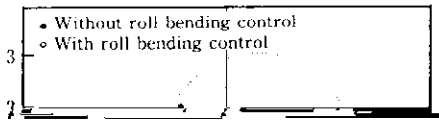


Fig. 5 Recognition of shape pattern





effects on controlling center buckles compared with the entry-side coolants. In addition, Fig. 9 shows that the maximum steepness is decreased to less than 0.8% (i.e.