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Analysis of Sheet Metal Bending Deformation Behavior in Processing Lines and Its Effectiveness

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Synopsis :
To meet customers' demand, precise flatness control has recently been required not only for strip rolling but also for strip processing lines, namely, tension leveling, coating, galvanizing, etc. Strip deformation caused by repeated bending with stretching in the processing line is analysed on the basis of incremental-strain theory for the purposes of designing plant specifications and optimization of operation. The developed calculation program can be widely used for analyses as follows; (1) Calculation of curling and residual stress of strip in longitudinal and width directions after tension leveling, (2) correcting-behavior analysis of edge and center waves of strip during tension leveling, and (3) calculation of strip gutters in the continuous color paint coating line. Calculated results give us a great deal of useful information for preventing curling, improving steepness and reducing residual stress of strip.

The body can be viewed from the next page.

Analysis of Sheet-Metal Bending Deformation Behavior in Processing Lines and Its Effectiveness*

Synopsis:

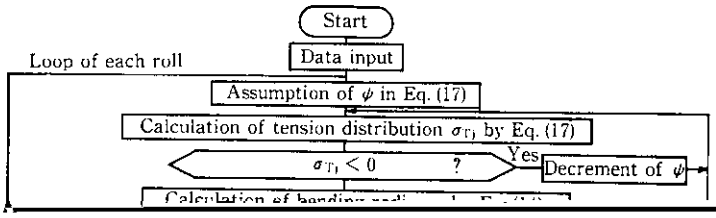
and transverse directions, respectively expressed by the following equation:

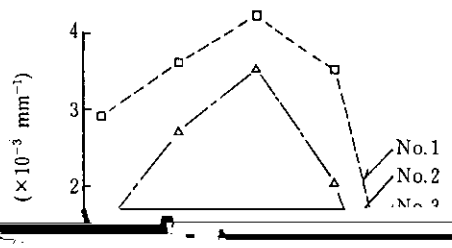
$d\varepsilon_{xp}$, $d\varepsilon_{yp}$, $d\varepsilon_{zp}$: Plastic strain increments in the longitudinal, transverse and thickness direc-

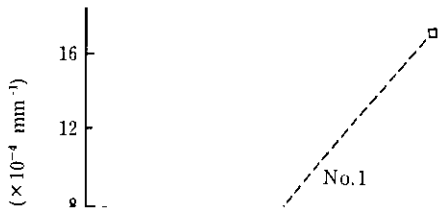
$$d\bar{\varepsilon} = \frac{1}{\sqrt{2}}\sqrt{(d\varepsilon_{xp}^2 + d\varepsilon_{yp}^2 + d\varepsilon_{zp}^2)} \quad \cdots\cdots (2)$$

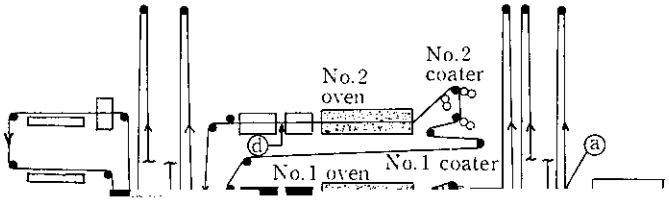
Unloading means that the integrated longitudinal stress through thickness σ_x and the bending moments

The main function of a tension leveler is to eliminate that part of the tensile stress is allotted to a long ela

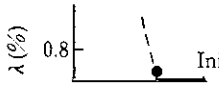

Start
Data input
Loop of each roll
Assumption of ψ in Eq. (17)
Calculation of tension distribution σ_{ri} by Eq. (17)
$\sigma_{ri} < 0$?
Yes
Decrement of ψ


4
3
2
(×10⁻³ mm⁻¹)
No.1
No.2


16
12
(×10⁻⁴ mm⁻¹)
No.1


No. 2
oven
No. 2
coater
ⓓ
No. 1 oven
No. 1 coater
ⓐ

[redacted]



estimation. The authors demonstrated, with some examples, that a calculation for flatness correction is