Abridged version

KAWASAKI STEEL TECHNICAL REPORT
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Pipe Flow Control System in the Finishing Line for Medium-Diameter Seamless Pipe

Yutaka Funyu, Takanori Fujiwara, Kazuyuki Sakurada, Mikio Aratama, Kiyomi Yamanoto, Yoshinobu Shoji

Synopsis :
A process computer system installed at the finishing line of the medium-diameter seamless pipe mill of Chiba Works not only controls the entire finishing line even covering automatic warehouse and conveyor systems, but also serves for a high-level quality assurance by controlling the flow of pipes in multiple types and small lots. To this end, the process computer is equipped with a high-reliability piece tracking system and a pipe flow control system which uses several models based on evaluation coefficient, with the soundness of these models having been verified by computer simulations. The system largely contributes to improvements in quality assurance, productivity, and labor saving.

The body can be viewed from the next page.

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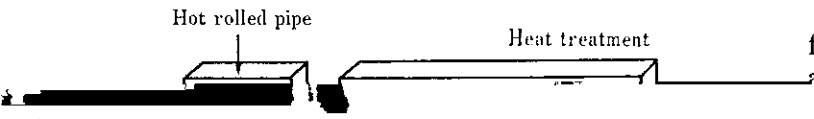


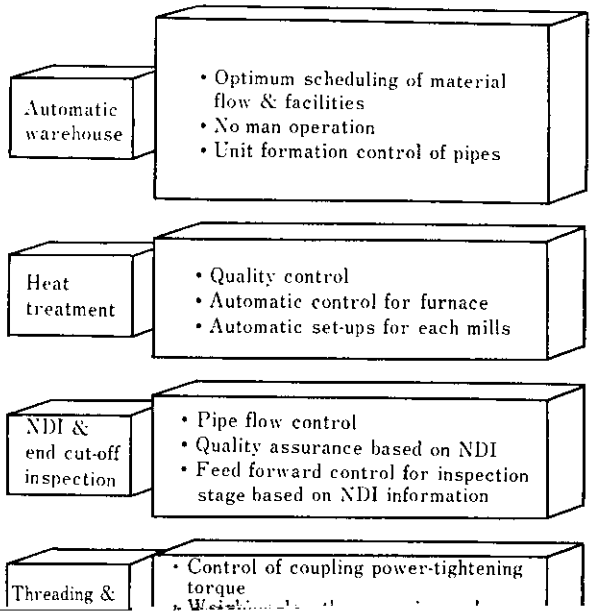
It is nearly impossible to control manually the finishing line characterized by these features accurately and efficiently. So, we introduced a process computer

(4) The conditions of inspection, repair and cutting-off in the finishing process are to be grasped comprehensively. and fed back to the rolling process—improvement of yield.
(5) The conditions of production at various facilities in the finishing line are to be monitored constantly and the finish-production plan is to be optimized through the on-line link with the center computer —improvement of productivity.

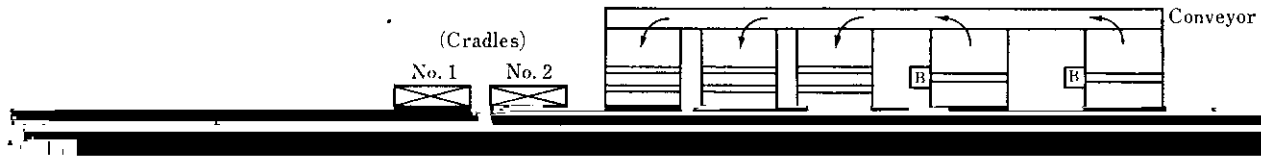
The purposes such as quality assurance and productivity improvement based on these basic policy and the means of their implementation on the computer system are collectively illustrated in **Fig. 2.**

3.2 Configuration of Process Computer System

The configuration of the process computer system is shown in **Fig. 3.** Based on the features of the finishing line mentioned above, the following considerations are taken.

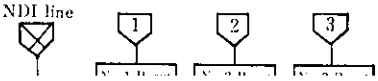


(Inspection tables) (Pipe end cut-off machines)



where A, b and C are constants.

Vector X represents a pipe flow route with the order of pipe flow taken into consideration. If there are n



c. Size change time for changing pipe wall : that pipes were fed into the line at fixed time intervals

d. Size change time for changing pipe diameter shown in **Fig. 7.**

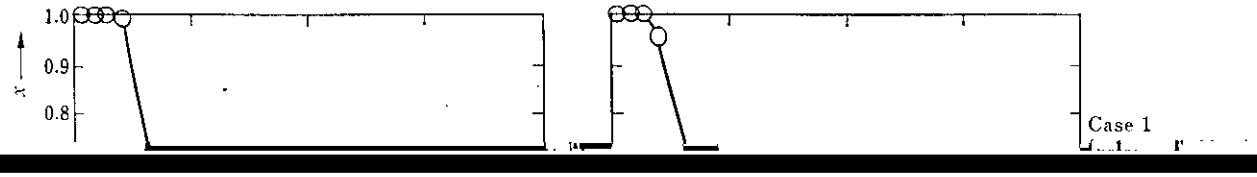
f. Shut-down time due to failure

g. Exit table capacity

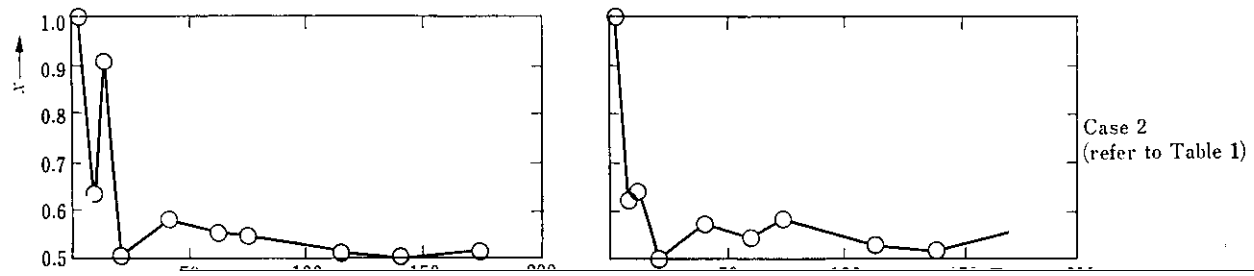
5.2 Results of Simulation

Table 1 Simulation conditions of pipe flow control

tables, and the ordinate the number of accumulated



Case 1



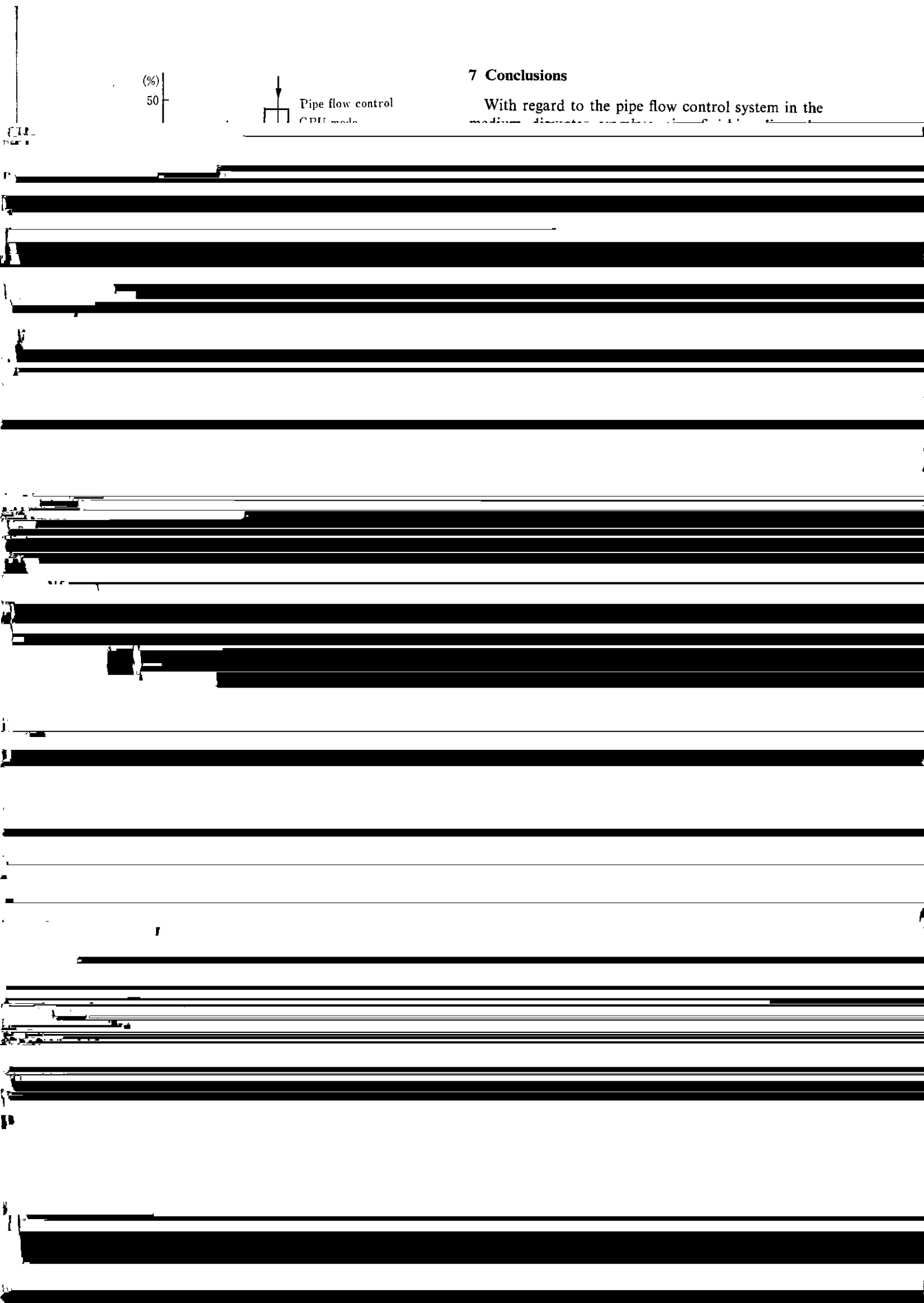
Case 2
(refer to Table 1)

$\longrightarrow N$
Number of pipes

(a) Pipe flow control for ends cutoff machines

(b) Pipe flow control for inspection tables

$x = n/N$
$n = \max(n_1, n_2)$
$N = n_1 + n_2$
n_x : Number of pipes through



7 Conclusions

With regard to the pipe flow control system in the