

KAWASAKI STEEL TECHNICAL REPORT

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Artificial Intelligence and Wire Rods and Steel Bars

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Production of High Quality Rod and Bar by Applying a Continuous Forging Process

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Synopsis :

A continuous forging process invented by Kawasaki Steel is capable of producing rods and bars with no center segregation. This process is employed in a continuous forging machine that is used with the No. 3 continuous bloom caster at Mizushima Works. The method also makes it possible to control the chemical composition in the central region of continuously cast blooms, and has resulted in a noticeable improvement in the drawability of high-carbon steel rods and in the ease of drilling in the central region of carbon steel for machine structural use. By eliminating the segregation problem, this method makes it possible to increase the super-heat at the tundish and thus reduce the number of nonmetallic inclusions; improved rolling-contact fatigue life has consequently been obtained for bearing steel.

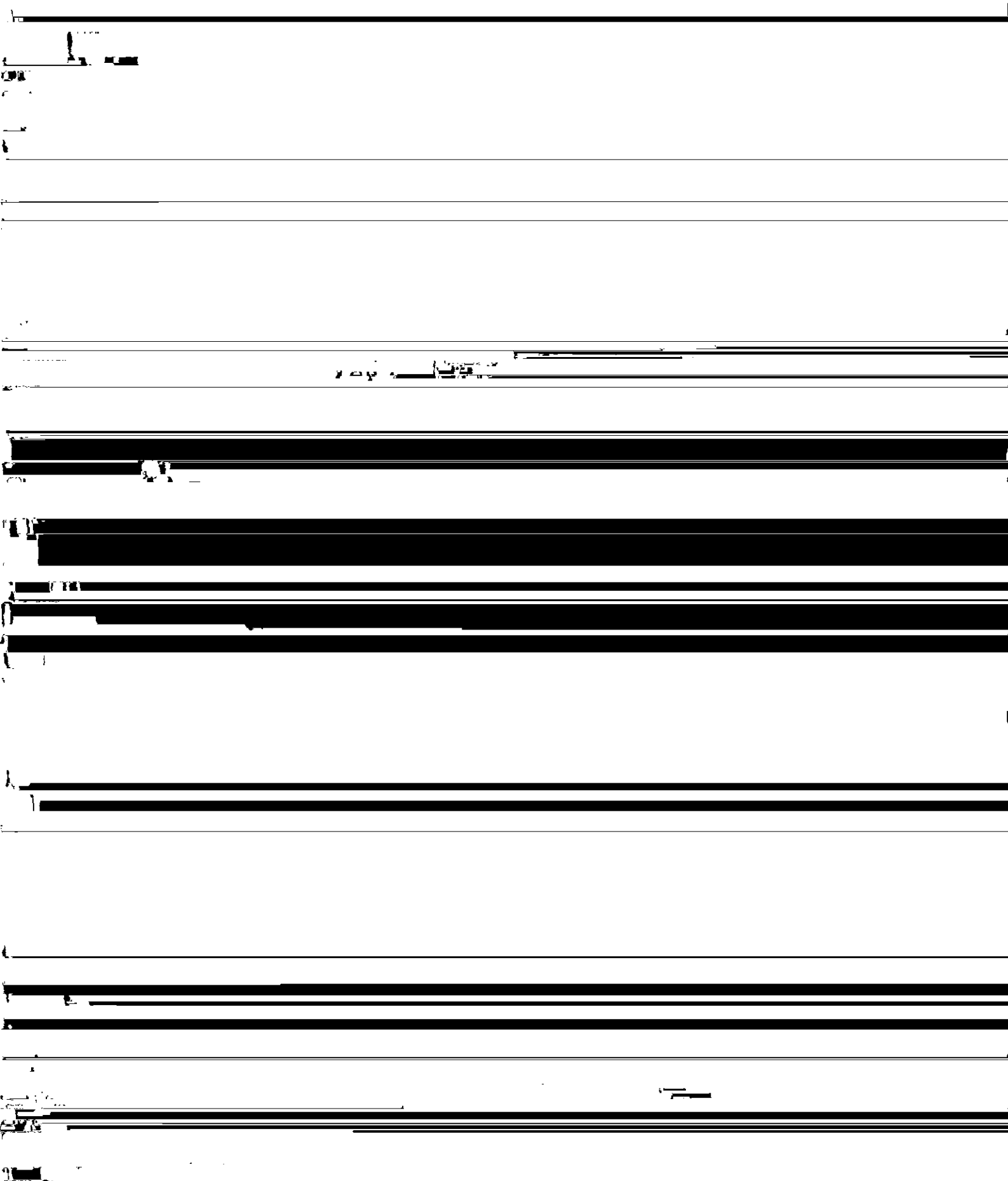
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**The body can be viewed from the next page.**

Development of a New Type of Steel for Automobiles

The authors are currently developing higher added-value rod and bar products by applying the continuous

conventional techniques for reducing centerline segregation cannot completely eliminate the problem, in addition to other quality deterioration so that





2.6

Ca Ladle analysis

Conventional

bearing steel

(mass %)

2.0  
1.8

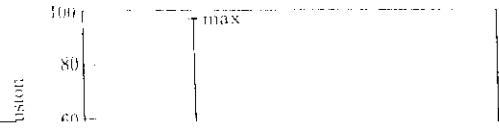
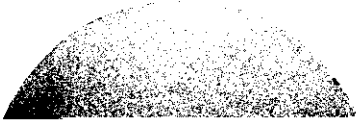
the conventional bloom show high negative segregation ratios in the continuously forged blooms. It seems that this is because the molten steel, which is more concentrated

Continuous  
forced



back  
Conventional





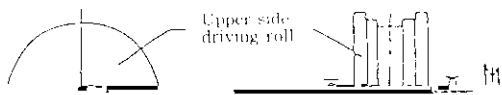
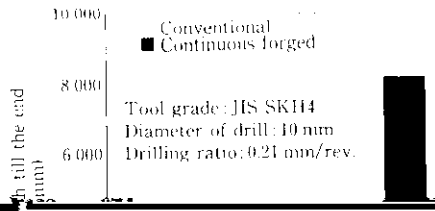


Table 5 Ladle analysis of carbon steel for machine structural use (mass %)

Chemical composition (mass %)	
Element	Mass %
C	0.25
Mn	0.35
P	0.015
S	0.005
Si	0.03
Cr	0.005
Ni	0.005
Al	0.005
Fe	Balance





of the solidification period to forcibly discharge the molten steel concentrated in the central region of the bloom. In June 1990, forging equipment was installed with the No. 3 continuous bloom caster at Mizushima Works.

An investigation was made into the quality of rod and