

9x(i 25d4 )F5e4 •/j b& 'g >+ È Ý î Ò 2A b 5 •>+

Improvement in Continuous Bloom Casting Technique for High Quality Bar Products and Seamless Tubes

ä • 6 (Kanji Emoto) £"â G( Masanori Kodama) Ý - (Makoto Fukai)  
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5d'ö#Ý(ò | b4 5ê †4 u Z A S " ">/4 5ê µ c Û ô 43 ° '\_ > K>\* 8 « ° Û á » [ 200×220  
>|250×300mm b 4 § - - b È Ý î Ò †5ê4 K Z 8 • r S Û ô 48 ° '\_ > K S" 3 4 5ê  
µ c>\* Â î Ò È Û á j > | g È Ý î Ò b Â#Ý µ [ 6 ~>\* È Ý î Ò § - - c9x(i5d b5e4 †  
% \$x \ K Z>\* 300×400mm>\*240×400mm b ± •8 Ô î Ý » † G#Ý K S 9x(i5d \_4 5ê 2 †  
4:#Ý M • \_ 6 S ~>\* f g m €>\* ¼ ; 7W>\*/2 TM%\$ W b Æ4Š m €>\*8 5 " Ó ~"@>\* p ° ë Ò  
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b è0! \_ | ~ G € } 7W c0Ž ~ l €>\*9x(i5d b d&i\$×4 )F5e4 †4) B K S

Synopsis :

The No.1 Steelmaking Shop of Mizushima Works has in operation two unique units of continuous bloom casters; one being an 8-strand curved type caster with mold size ranging from 200×220mm to 250×300mm, having been in service since 1968 as the biggest of its kind at that time with high productivity, and the other a 4-strand curved type caster that was commissioned in 1973 and produces not only blooms but also beam blanks for H-shapes. Blooms cast in the latter extend 300×400mm and 240×400mm in cross section with beam blank 120×400×460mm in web thickness, flange width and web height, respectively. Such largeness of blooms offer great advantage in quaranteeing the reliability of products, especially the internal quality of high grade steels such as for machine structural use, piano wire, steel tire cord, seamless tubes and so on. As a result of positive efforts promoted using these two casters in applying CC-process to killed steel in recent years, almost all the steel grades of bars, wire rods, round billets and structural shapes can be produced through CC-process at present. During the application of CC-process, various problems had to be faced; surface defects such as hot shortness cracks, pinholes, subsurface cracks, slag inclusions, center segregation and non-metallic inclusions. These defects have, however, all been solved by suitable countermeasures, details of which are reported in the paper.

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高級条鋼連続鑄造技術の確立  
——ブルーム品質の改善——

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High Quality Bar Products and Seamless Tubes

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して非金属介在物の浮上に有利な  $300 \times 400\text{mm}$ 、  
 $240 \times 400\text{mm}$  の大断面サイズを採用したことであ

Table 1 Specifications of continuous casters

	No.1 CCM	No.3 CCM
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Bloom size (mm)

Billet size(mm)

Final product (mm)

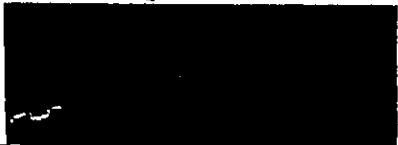
80φ

Bar in coil (Max. 19φ)  
Wire rods (5.5~9.5φ)

Magnetic particle test  
and grinding

Some : Visual test





No. 3 CCM  
Bloom size : 300×400mm

30



$$v = \frac{c}{ab} \left( \frac{\pi}{4} \right) d^2 \sqrt{2gh} \quad \dots\dots\dots (1)$$

$v$  : 鑄造速度

$a, b$  : モールド短辺および長辺の長さ

$d$  : タンディシュノズル径

$h$  : タンディシュ内溶鋼面からモールド内湯面間の有効落差

$c$  : 流量係数

$g$  : 重力加速度

$d$  が同じであっても、ノズル嵌合部から大気が侵入すると(1)式における  $h$  が減少するため鑄造

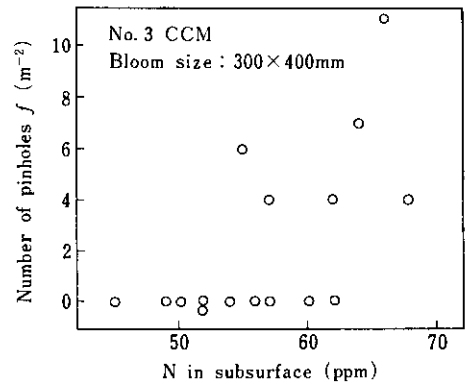
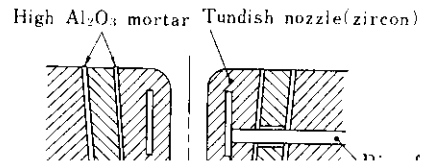


Fig.8 Relation between N in subsurface and pinhole frequency in blooms with 0.43~0.50%C, 0.25



どなくなった。この効果を確認するため、この一体型ノズルの直上にタンディシュトッパーを取付け、その先端から Ar ガスをモールド内に吹き込んだときの気泡欠陥発生状況を Fig. 11 に示す。



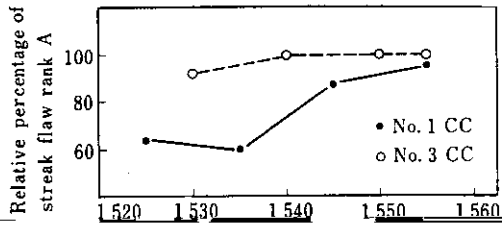


### 3・4 大型非金属介在物

継続構造田岸素鋼 継日無鋼管のビブテキス



Ladle



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