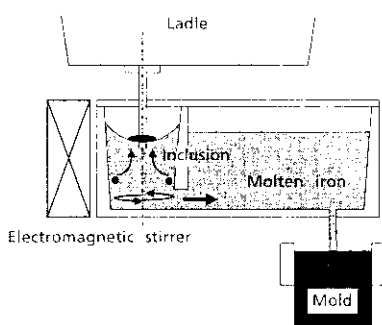
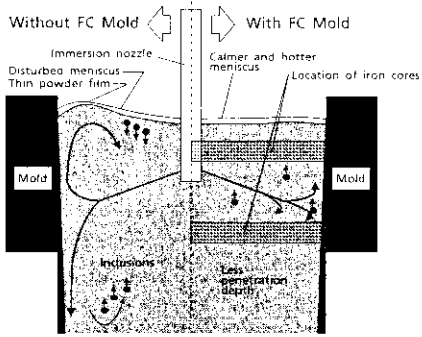
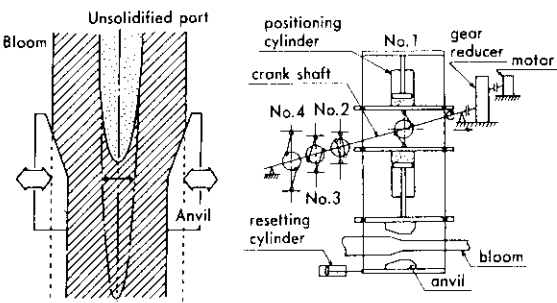


Engineering Business Activities of Kawasaki Steel in the Field of Continuous Casting*

1 Continuous Casting Technologies Marketed by Kawasaki Steel

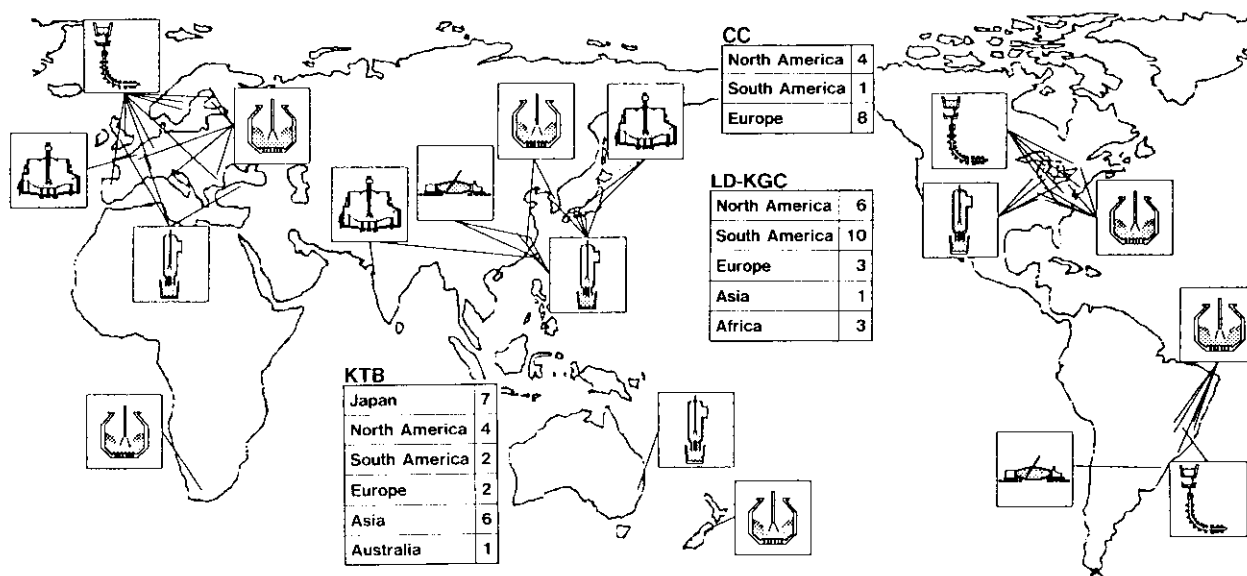
Quality Improvement Technologies		
Process Area	Technical Items	Representative Examples
Ladle-Tundish	<ul style="list-style-type: none"> • Ladle slag cut system • Optimum tundish specification design • Nonoxidizing atmosphere sealed tundish • Hot tundish recycling • In-tundish refining techniques (Centrifugal separation tundish, tundish heater, in-tundish alloy addition techniques) 	<p style="text-align: center;">Centrifugal Flow Tundish</p> 
Tundish-Mold	<ul style="list-style-type: none"> • System for gas blowing in immersion nozzle • Immersion nozzle design technology • High-accuracy meniscus level control system (Observer control, H_z control, others) • Electromagnetic flow control device for bath in mold (FC mold) • Optimum mold design and mold cooling techniques • Optimum mold powder design techniques 	<p style="text-align: center;">Flow Control Mold (FC Mold)</p> 
Caster proper	<ul style="list-style-type: none"> • Optimum machine profile design • Optimum secondary cooling control system design • Electromagnetic stirring system (EMS) • Segregation control technology for unsolidified part of cast strand (Continuous forging process) • Beam blank forging machine 	<p style="text-align: center;">Continuous Forging Process</p> 
Technical guidance	<ul style="list-style-type: none"> • Ultra-clean steel (DI can steel, ULC steel, bearing steel, others) • Stainless steel, special steels, others 	

* Originally published in *Kawasaki Steel Giho*, 28(1996)1, 66-67

Efficiency Improvement Technologies
<ul style="list-style-type: none"> • High-speed casting techniques • High-speed, high-accuracy continuous width-changing equipment • Break-out prediction device • DHCR-related technology • CC-rolling synchronization technology • Long-life immersion nozzle • Double-torch cutter type high-speed slab cutting • Techniques for working ratio improvement by high-reliability equipment (Life-extension techniques for copper mold plates and segments, bearing maintenance techniques using oil-air system, SUS630 roll introduction) • Real-time equipment condition monitoring and diagnosis system • Time-saving techniques for mold exchanges (Automatic connection/removal of mold piping/wiring, automatic opening and closing mold cover, remote automatic changing equipment for bending unit and segment thickness, automatic segment connection)

Automation and Labor Saving Technologies, etc.
<ul style="list-style-type: none"> • Automatic powder charging device • Immersion nozzle exchange device • Hardware insertion device for heterogeneous steel grades • Fully-automatic equipment for hot tundish recycling (Automatic discharge device for steel remaining in tundish, fast automatic equipment for sliding nozzle refractory replacement at casthouse) • Centralized monitoring and operation system for ladle and mold auxiliary equipment • Automatic slab-handling crane • EIC integration system • Fast quality evaluation system • Blade-oscillation type torch-burr removal device • Tundish castable refractory techniques • Automated tundish repair equipment

2 Record of Technical Cooperation and Sales in the Field of Steelmaking



3 Sales Arrangements

- (1) Full-turn key and turn key contracts
- (2) Basic engineering, construction management, operational guidance, and training
- (3) Hardware, detection systems, equipment diagnosis systems, refractories
- (4) Production control/material handling control system
- (5) Owner consulting

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