Advanced Simulating Software for Continuous Casting

CC-COOL N GAP

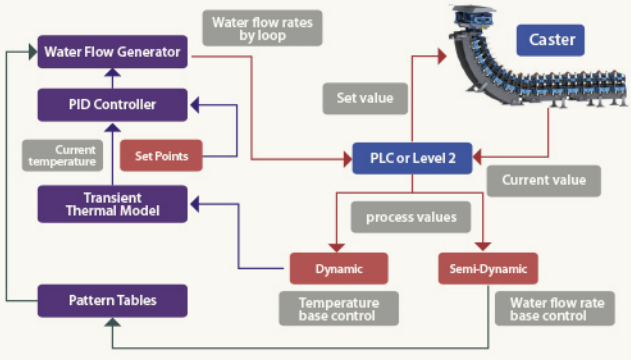
Dynamic control of secondary cooling and roll gap for continuous casting

CC-COOL N GAP was developed to control secondary cooling water flow and roll gap dynamically for continuous casting based on predefined surface temperature profile. Dynamic secondary cooling and roll gap control is very useful for obtaining good qualities of strand consistently. CC-COOL N GAP can be used for on-line control and off-line simulation of secondary cooling and roll gap. Target surface temperature profiles included in CC-COOL N GAP are optimized for minimizing internal/surface crack of strand.

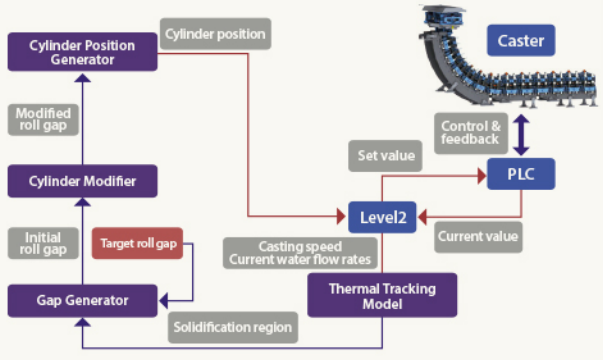
FEATURES

- Using on-line thermal tracking model (based on Finite Element Method)
- Using actual casting conditions (casting speed, cooling water flows)
- Tunable model by user (provide open parameters for tuning of thermal model)
- Using both dynamic mode (target temperature base) and semi-dynamic mode (cooling water flow base)
- Using on/off margin control logic (modifying water flow by width of strand)
- Using movable spray margin control logic (modifying water flow by nozzle height determined by corner margin length)
- Tracking of steel grade, strand width, and cooling pattern
- Using PID control for maintaining surface temperature
- Using stabilizing logic for minimizing fluctuation of water flow (in case of casting start)
- Coupled with dynamic control of strand gap for soft reduction
- Supplying dynamic and semi-dynamic cooling pattern obtained by process optimization based on qualities (internal/surface crack) of strand
- Flexible GUI (Customizing operating and monitoring GUI by user's convenience)

STRUCTURES OF COOLING CONTROL SYSTEM

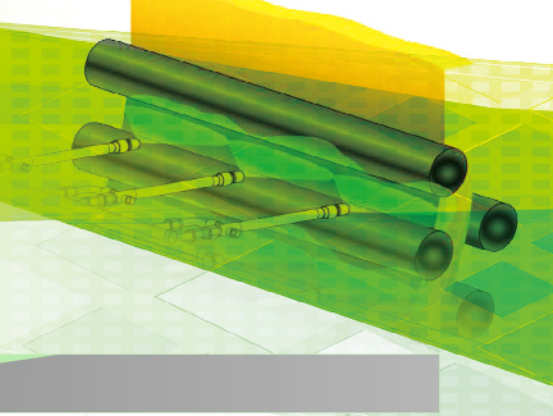


STRUCTURES OF DYNAMIC ROLL GAP CONTROL SYSTEM



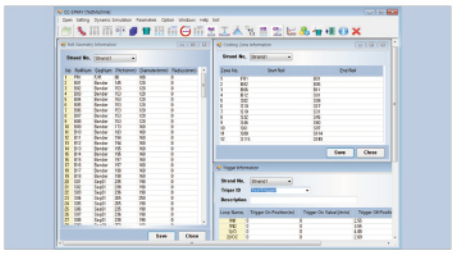
CC-COOL N GAP

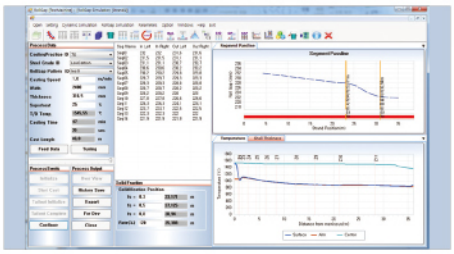
Dynamic control of secondary cooling and roll gap for continuous casting



SIMULATION SYSTEM

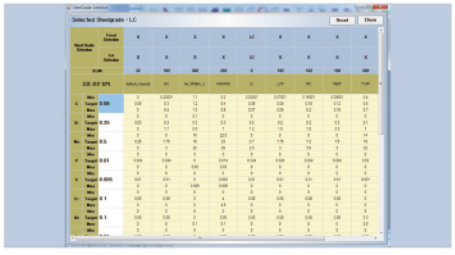
- Set up and off-line simulation at any PC
- Set up machine specifications (roll geometry, cooling zone, loop, segment information, etc)
- Set up several patterns (cooling patterns, trigger points, margin patterns, roll gap patterns, etc)
- Transmission of set up data to on-line control system
- Same functionality with on-line system
- Dynamic simulation for checking patterns in order to optimizing qualities

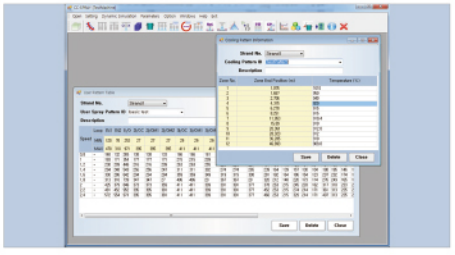


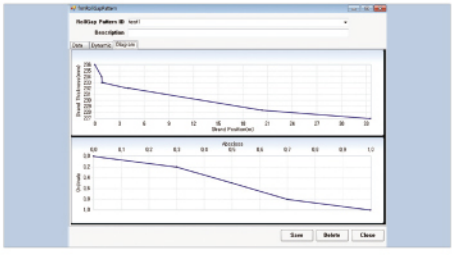


COOLING / ROLL GAP PATTERN

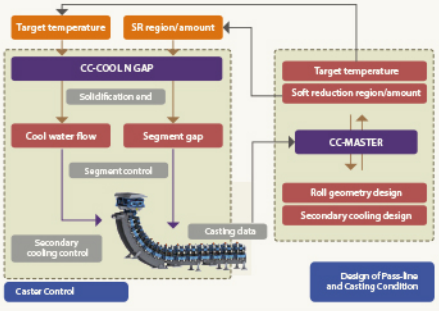
- Grouping steel grade by carbon and special alloy contents within product mix
- Cooling pattern based on target temperature for dynamic mode
- Cooling pattern based on water flow rate for semi-dynamic mode
- Optimizing cooling pattern by steel grade group with process optimizing simulation (using CC-MASTER, not included in CC-COOL N GAP)
- Margin pattern based on surface corner temperature profile preventing corner over cooling
- I/O weight pattern preventing strand thermal bending after final roll position
- Roll gap pattern for soft reduction







ROLE OF CC-COOL N GAP IN CASTER CONTROL



PRODUCT FAMILY

CC-MASTER

Defect Prediction, Process Optimization in Strand

CC-EYE

New CAQC System

CC-MOLD

Defect Prediction, Process Optimization in Mold

CC-DESIGN

Roll Geometry and Cooling Zone Design

EXPRESSLAB+ Communication for Creativity

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