

EXPRESSLAB 2021



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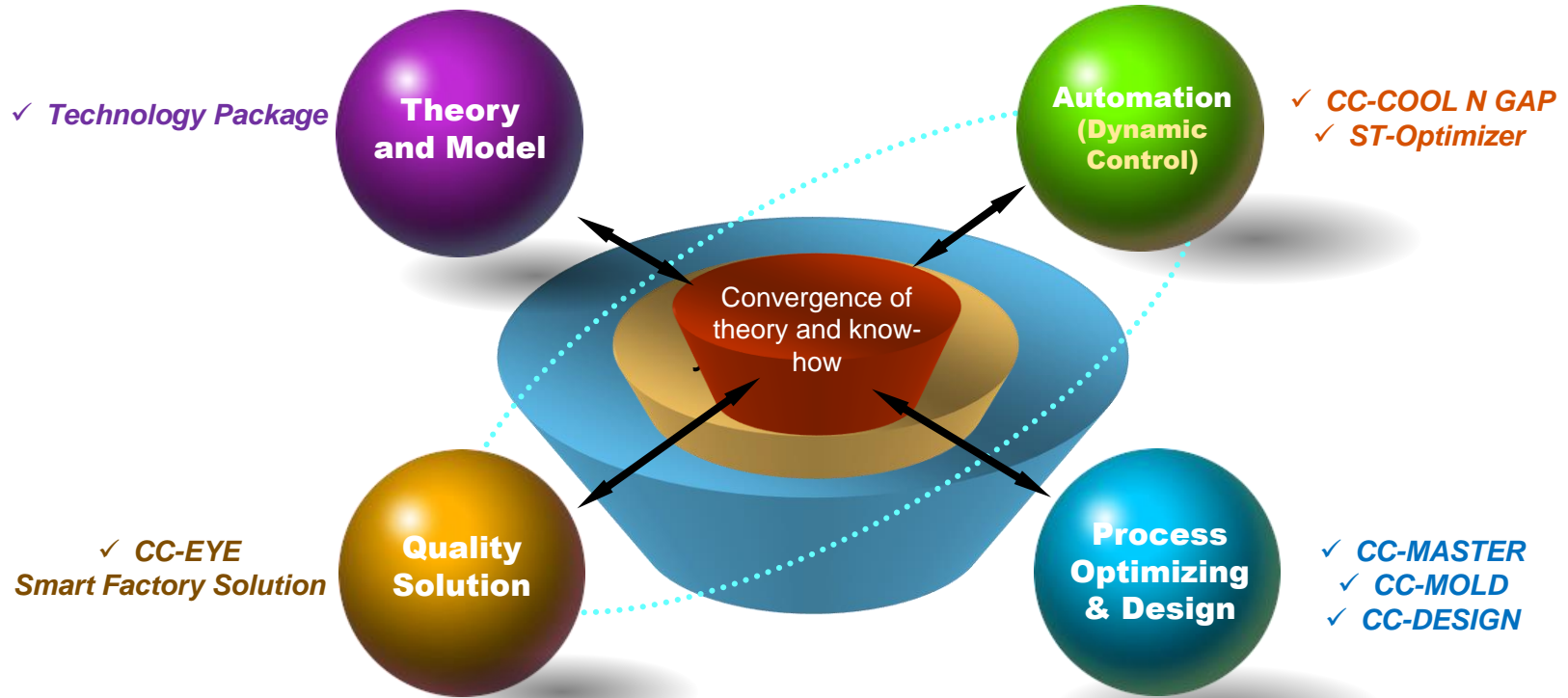
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Business Strategy

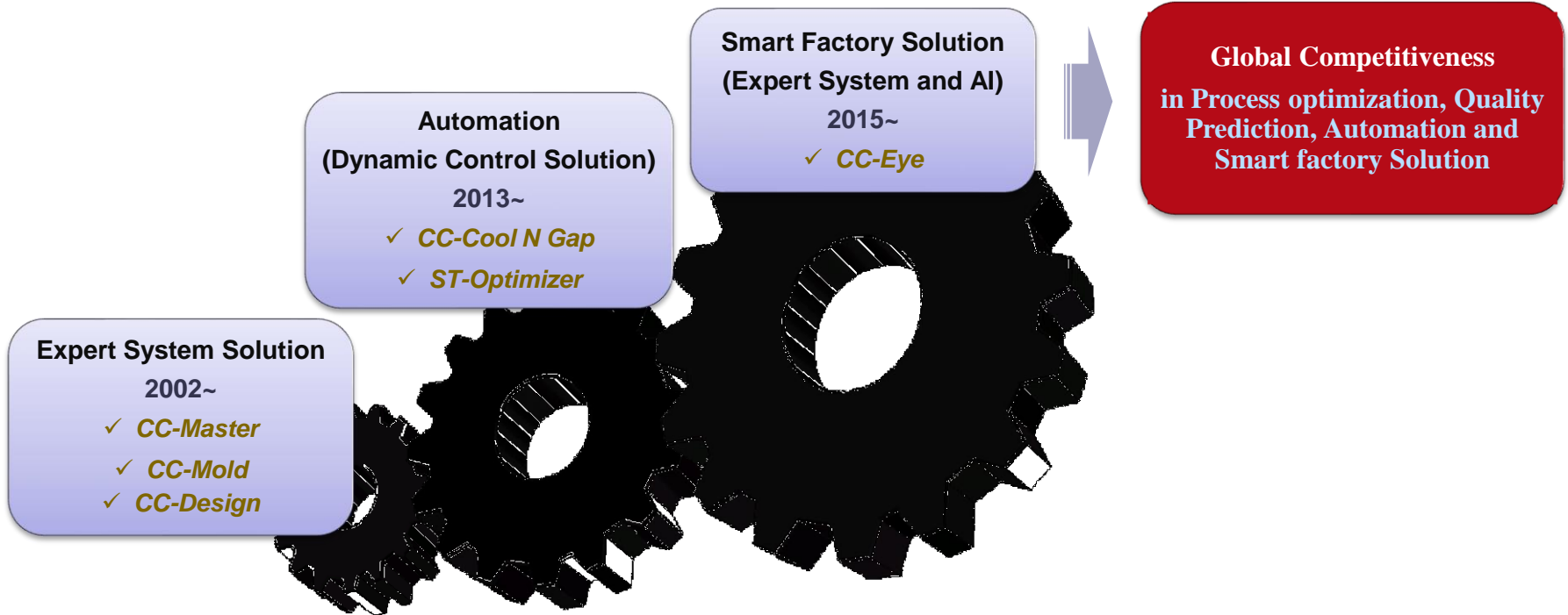


Products

Business areas	Products and features
Process optimizing & Design (Expert system)	<p>✓ CC-Master Professional tool for the optimization of continuous casting strand(below mold) Process simulation and defect evaluation Heat transfer / Internal crack / Transverse surface crack / 2ndary cooling pattern / Center-segregation / Real condition module</p> <p>✓ CC-Mold Professional tool for the process evaluation and optimization of continuous casting mold Compact heat transfer / Transverse crack / Longitudinal crack / Process simulation / Monitoring</p> <p>✓ CC-Design Design of roll geometry under which internal and surface cracks are prevented. Checking the feasibility of and editing roll geometry Roll geometry and cooling zone / Coupled with CC-Master / Roll geometry design against internal and surface crack / Roll pitch against mold level fluctuation by dynamic bulging / Guidance for roll bearing and layout of driving rolls</p>
Automation (Dynamic control)	<p>✓ CC-Cool N Gap Dynamic control of secondary cooling water and soft reduction roll gap based on predefined surface temperature profile Dynamic mode(target temperature) and semi-dynamic(cooling water) / On/off or movable spray margin control / Target temperature design against internal and surface crack / Coupled with dynamic control of soft reduction roll gap</p> <p>✓ ST-Optimizer Dynamic control of cold-rolled strip temperature in CGL furnace On-line thermal tracking / Automatic tuning by learning module / Feed-back control for current coil and Feed-forward control for next coil / Covering heating , soaking, and cooling section / Efficient and accurate control for transient process conditions</p>
Smart factory (Expert system and AI)	<p>✓ CC-Eye Smart factory system of continuous casting On-line quality(internal, surface transverse and surface longitudinal crack, center-segregation) and casting abnormalities prediction system Using CC-MASTER and CC-MOLD as system solver / Real time evaluation of soft reduction segment(or roll) matching with solidification end / On-line defect prediction using Artificial Neural Network (option)</p>

History of Solution Development

Advanced Solutions for Steel Making



Contract (1)

Business areas	Contract contents	Related products	Customers			
Process optimizing & Design (Expert system)	<u>2011</u> Slab quality evaluation method with steel grade (H) Thermal analysis software for Large ingot continuous caster (LICC) in POSCO (P) Quality index development for Kwangyang works in POSCO (P) 2ndary cooling design and crack prediction for POSCO pilot caster (P) Monitoring system for AI billet (R) Soft reduction process design for new steel grade development (H)	CC-Master CC-Mold CC-Design	POSCO (P) POSCO e&c (EC) POSCO ICT (ICT) Hyundai Steel (H) Hyundai Rotem (HR) Seah Besteel (S) Seah Changwon Special Alloy Steel (SC) Dongbu Steel (D) Korea Gas Corporation (K) POSTECH (PU)			
	<u>2012</u> Quality index development for continuous caster in new steel making plant (P) Bulging prediction system (P) Bleeding prediction system (P) Critical strain of internal crack for CEM (P) Quality prediction for high-alloy bloom (S) Quality evaluation for minimill in Dongbu steel (D) Quality analysis system for continuous casting in Hyundai steel (H)					
	<u>2013</u> CC-Design (Eductual version) (PU) Surface crack prediction system in Pohang works of POSCO (P) Continuous casting simulation software (D) Slab quality analysis system (H)					
	<u>2014</u> Crack prediction system in mold (P) Development of 2ndary cooling control system of continuous caster for thick plate (H) Analysis program for continuous casting (CC-Master) (H)					
	<u>2015</u> Development of CO2 pipe-line evaluation software (K) Mold simulator (Eductual version) (PU) Continuous casting process diagnosis for 80ton-steel making plant (H)					
	<u>2014</u> Development of continuous casting 2ndary cooling and roll geometry design technology (EC) Mold process monitoring system for 1-2 machine in Kwangyang works of POSCO (P) Development of 2ndary cooling control system of continuous caster for thick plate (H) Automation by 2ndary cooling dynamic control for no.3-2 machine in Kwangyan works of POSCO (P)			CC-Cool N Gap ST-Optimizer	RIST (R)	
	<u>2015</u> Math model development for STS CAPL strip temperature control and its application to the plant (EC)					
	Smart factory (Expert system and AI)			<u>2015</u> Internal quality prediction system for bloom caster in Pohang works of POSCO (P) Development of process analysis system for mold region (S) Development of crack prediction model by integrating mold and strand regions (H)	CC-Eye	

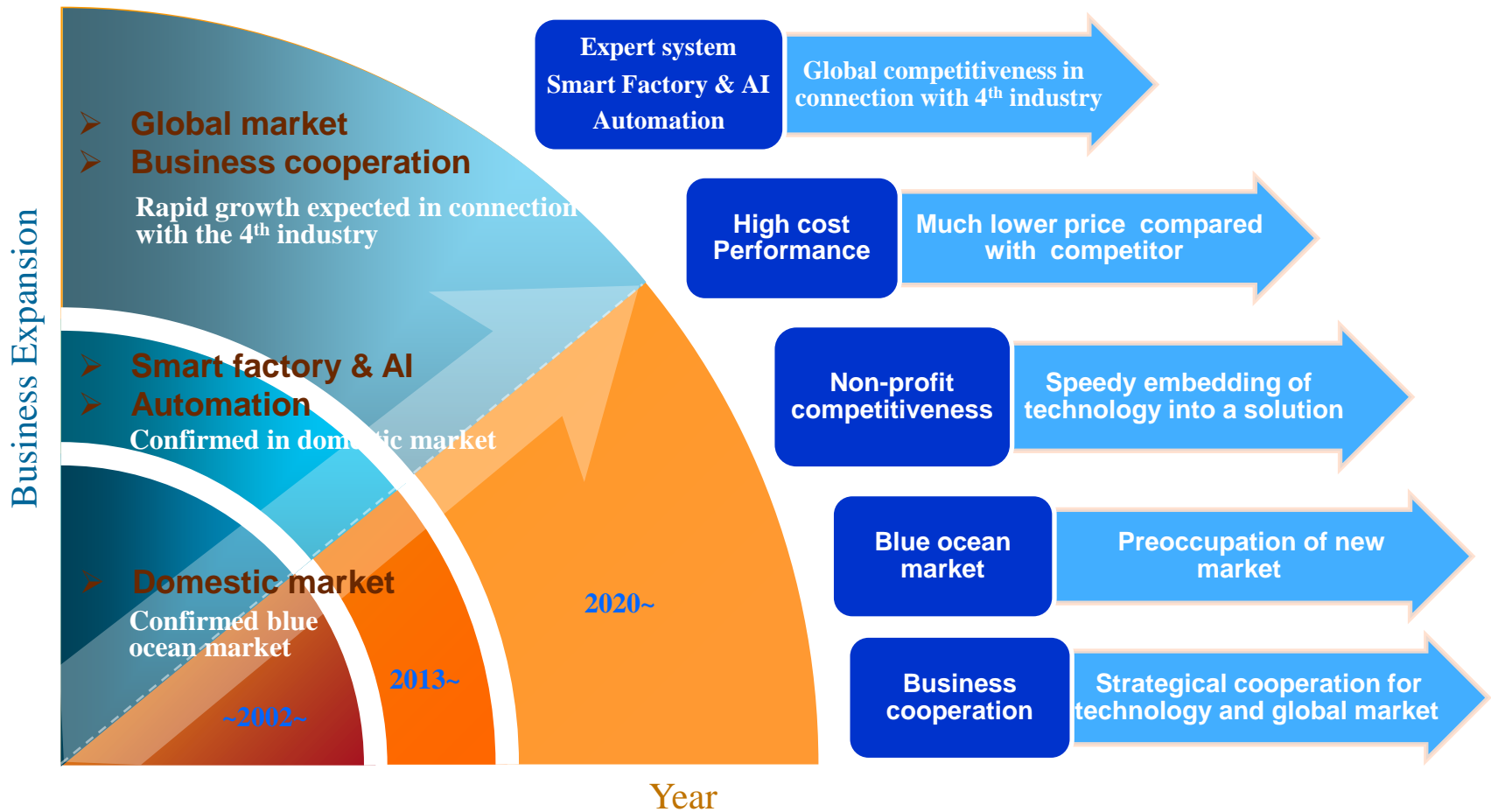
Contract (2)

Business areas	Contract contents	Related products	Customers			
Process optimizing (Expert system)	2016 Deep sea pipe-line evaluation system software(1) (K)	CC-Master CC-Mold CC-Design	POSCO (P)			
	2017 CC-Mold simulator 2.0 S/W (PU) CC-Master for 2ndary cooling control design in Pohang works of POSCO (ICT)					
	2018 Evaluation of 2ndary cooling nozzle configuration in CSP caster in Dangjin works of Hyundai Steel (H) Deep sea pipe-line evaluation system software(2) (K)					
	2020 Soft reduction effect on solidification end (P) Development of solidification shrinkage simulator(1) (PU)					
	2021 Development of solidification shrinkage simulator(2) (PU) Development of SSC technology (H)					
	2022 Solidification and thermal analysis for ? steel continuous casting (H) CC-Master and CC-Mold (T)					
	Automation (Dynamic control)			2016 Dynamic 2ndary cooling control for slab in Tang Steel (China) (ICT) Automation by 2ndary cooling dynamic control for no.1-3 machine in Kwangyan works of POSCO (P)	CC-Cool N Gap ST-Optimizer	Hyundai Steel (H)
2017 Math model for strip temperature control automation in POSCO Thailand (EC) CGL strip temperature control automation system (EC) Thermal tracking model (ICT) Automation by 2ndary cooling dynamic control for no.2-2 machine in Kwangyang works of POSCO (P)						
2018 Strip temperature control automation for 2CGL of No.1 cold rolling in Dangjin works of Hyundai Steel (H) Math model for strip temperature control automation (HR)						
2019 Strip temperature control automation for 2CGL of No.2 cold rolling in Dangjin works of Hyundai Steel (H) Strip temperature control automation for 4CGL_AI system in Kwangyang works of POSCO (ICT) Strip temperature control automation for 1CGL of No.1 cold rolling in Dangjin works of Hyundai Steel (H)						
2021 Strip temperature control automation for cooling region of CGL line (H)						
Smart factory (Expert system and AI)		2016 On-line quality evaluation system for continuous-casted slab in Dangjin works of Hyundai Steel (H) Quality prediction system for continuous-casted bloom in Dangjin works of Hyundai Steel (H) Upgrade of crack prediction model by integrating mold and strand regions (H)	CC-Eye	Korea Gas Corporation (K)		
		2017 Surface crack prediction software for continuous-casted billet in Seah Besteel (S)				
	2018 Surface crack prediction on-line system for continuous-casted billet in Seah Besteel (S) Development of crack prediction system for continuous-casted bloom by integrating mold and strand (H)					
	2019 DATA management system for continuous-casted individual billet (SC) Automation system for slab quality evaluation in Dangjin works of Hyundai Steel (H) Depression evaluation system for continuous-casted STS billet in Seah Changwon Special Alloy Steel (SC) Automation system for slab surface crack evaluation in Dangjin works of Hyundai Steel (H)					
	2021 Segregation predicting system (P)					
					Turkey A Company (T)	

Contract (3)

Products	Customers	Application
CC-MASTER	POSCO	Pohang Works : Slab 3 M/C, Bloom 3 Machines, Pilot Caster / Gwangyang Works : Slab 3 Machines
	HYUNDAI STEEL	Slab 5 Machines, Bloom 1 Machine, Beam Blank 3 Machines
	SEAH BESTEEL	Bloom 2 Machines, Billet 1 Machine
	POSCO SPECIAL STEEL	Bloom 2 Machines
	SEAH CHANGWON	Bloom 1 Machine, Billet 1 Machine
	DONGBU STEEL	Minimill 1 Machine
	PT. Krakatau POSCO	Slab 1 Machine
	POSTECH	20 Licenses (Academic Ver.)
	Turkey A Company	1 License for 3 Slabs
CC-MOLD	POSCO	Pohang Works : Slab 3 Machines, Bloom 1 Machine / Gwangyang Works : Slab 1 Machines
	HYUNDAI STEEL	Slab 5 Machines, Bloom 1 Machine, Beam Blank 3 Machines
	SEAH BESTEEL	Bloom 2 Machines
	SEAH CHANGWON	Bloom 1 Machine, Billet 1 Machine
	POSTECH	22 Licenses (Academic Ver.)
	Turkey A Company	1 License for 3 Slabs
CC-EYE	POSCO	Pohang Works : Slab 3 Machines, Bloom 1 Machine / Gwangyang Works : Slab 1 Machine
	HYUNDAI STEEL	Slab 4 Machines, Bloom 1 Machine
	SEAH BESTEEL	Bloom 2 Machines
CC-DESIGN	POSCO e&c	5 Licenses
	HYUNDAI ROTEM	3 Licenses
	POSTECH	15 Licenses (Academic Ver.)
CC-COOLNGAP	POSCO	Pohang Works : Slab 1 Machine / Gwangyang Works : Slab 5 Machines
	TangSteel (China)	Slab 1 Machine
ST-OPTIMIZER	HYUNDAI STEEL	Dangjin Works : CGL 3 lines / Suncheon Works : CGL 2 lines
	POSCO	Gwangyang Works : CGL 1 line

Growth Prospect



Thank you!