PIKE AUTOMATION

# CASTER AUTOMATION

## INTRODUCTION

PIKE AUTOMATION has long term experience in design, development, implementation, testing and commissioning of extensive caster automation projects for customers around the world.

Generally, we have know-how to deliver automatic systems for complete continues caster production control and management. PIKE offers delivery of **level 1 basic automation** and **level 2 process automation** in one package as one integrated complex system or separate solution for partly upgradation. Our major objective is to support the customer to make high quality products with required aim parameters –width, height and thickness spending minimum **cost** and **time**.

PIKE AUTOMATION real-time systems are running 24 hours a day, 365 days a year with 24 hours remote support. Our experience can be proved by our Process Automation reference list.

**BASIC AUTOMATION**

On the basis of the specification and analysis we develop (using the standard tools) the control programs for the PLCs. We have also the experience with the commissioning of the programs developed by other parties. The part of the control systems is also the visualization. Our employees have the ability to implement the visualization sub-systems using the standard systems (depending on the customers' request).
The main task of the Basic Automation system is to control and visualize casting process.



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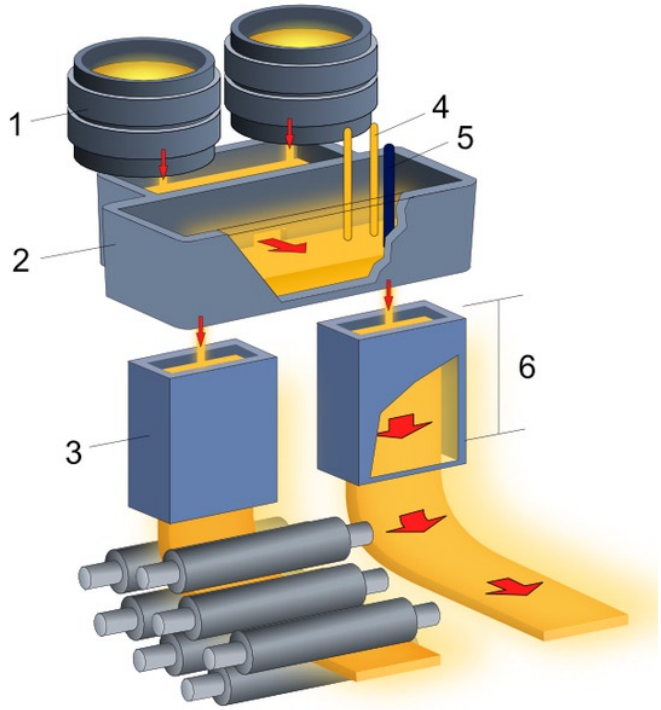
Basic Automation Systems are mainly:
- Strand Guide System (tracking and drive control)
- Mould Level Control
- Hydraulic Mould Oscilation control
- Remote Adjustable Mould
- Segment adjustment or Segment Clamping
- Casting platform equipment control (ladle turret, tundish cars, dummy bar system)
- Water and Air Cooling (Spray, Mould, Air mist, etc.)
- Auxiliary systems (Argon, Media, Compressed air, Water treatment plant, etc.)




PIKE uses the following hardware and software instruments for basic automation:

| | | | |
|---|---|---|---|
| Simatic S7, TDC | ProfiBus | DotView | |
| PCS 7 | | ProfiNet | WinCC |
| GeFanuc | TCP/IP | Simplicity | |
| Logicad | ISO/OSI | InTouch | |
| Rockwell | | Citect | |
| IBALogic | | Factory Link | |



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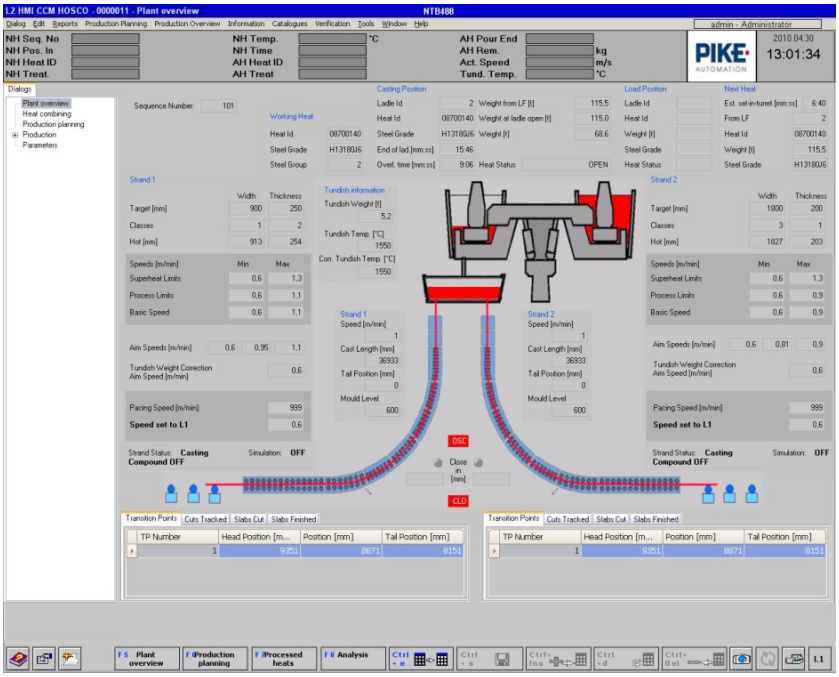
## PROCESS CONTROL

Main goal of process control is process tracking, measured values acquisition and processing, caster mathematical models calculation and setup values distribution. Our Process Control solutions are based on our own platform PIKE Process Framework (PPF).

Our employees have wide-range experience in Process Control. According to the customers´ needs, PIKE can implement complete Level 2 systems, mathematical models or encapsulate the models supplied by the technology supplier (or even the customer), customize caster models and implement HMI for Level 2 systems.




We offer a complex know-how in the following function units:

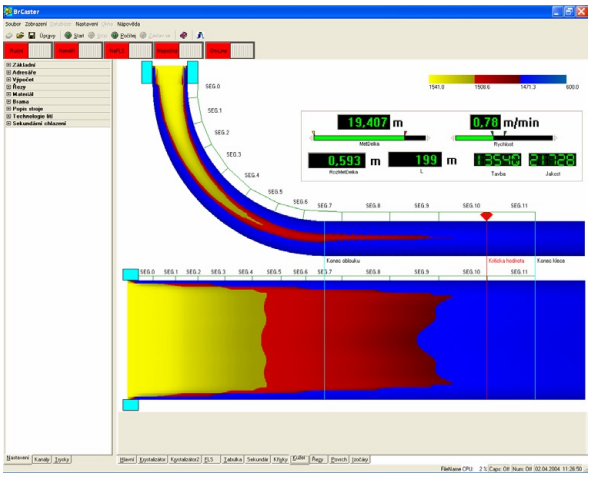
- Application Framework
- Communication to other systems
- Heat and sequence scheduling
- Heat and Slab Process Tracking
- Equipment life tracking
- Treatment patterns
- Grade definition
- Slab thickness and width control
- Casting speed optimization
- Spray cooling control
- Solidification control
- Cut length optimization
- Break out prevention
- Quality evaluation and prediction
- HMI including Reports

PIKE Caster system is provided with advanced supporting and diagnostic tools to be able handle maintenance by the users. This is furthermore supported by PIKE service center and Help Desk.
As mentioned above one of the very important component is visualization system for easy process control and operation and of course diagnostic system.

### Solidification Model

Solidification and cooling of a continuously cast steel slab and the heating of the mould is a very complicated problem of transient heat and mass transfer. This original three-dimensional (3D) numerical model is capable of simulating the temperature field of casted strand/slab.

The on-line version is used for process control and operator information as standard part of the Level 2 system.

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The off-line version will be utilized further for various analyses within the caster operation independently of the real melting process, product range, cooling intensity, shift rate, etc. The on-line version of the model enables an increase in the speed with which the temperature field of the concasting is computed both with the introduction of more sophisticated software as well as hardware. As a result of this, it is possible to monitor the formation of the temperature field within the entire caster in real time.

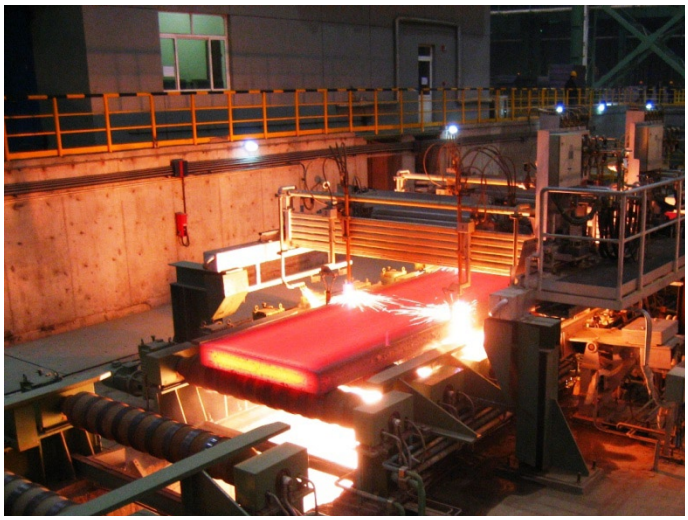
The model adjusts the casting parameters (especially the shift rate, the oscillations of the mould, the cooling of the mould and the cooling intensity of the cooling jets) according to the real time data acquired and the calculated values.

**Cut Length Optimization**
The task of the Cut Length Optimization (CLO) is to calculate values for control of the strand width, thickness and slab cuts with respect to the production plan and to minimize losses of the steel. CLO's results are useful especially in situations when the production plan cannot be followed to all the details because of irregularities in production process.

For example:
- The real heat weight is higher or lower than it was planned
- Unplanned cut was made
- Unplanned width or thickness change was made
- Tundish was closed earlier than planned
- Part needs to be removed (transition area etc.)

On input the CLO gets production plan and status of the casting process (process values, e.g. current width, thickness, etc.). Based on this information CLO creates:
- **casting schedule** defining optimized sequence of slabs to produce. Schedule is visualized for the operators.
- **setpoints** to control the strand width and thickness and cuts of slabs. Setpoints are sent in the right moment to basic automation (level 1 system).

When creating a cut schedule – i.e. searching for the best solution - the CLO applies different strategies and creates more alternatives of the cut schedule. Finally the CLO quantifies quality of each alternative of the cut schedule and selects the final one, which will be applied.





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