



JNE

Automation



ENGINEERED CONTROL SYSTEMS

FOR WORLD CLASS BLAST FURNACE OPERATIONS

WORLDWIDE PROJECT REFERENCES

JNE Automation has been involved with the following blast furnace and iron making projects.

ARCELORMITTAL DOFASCO

- 2018 No. 4 Blast Furnace Automation Improvements
- 2017 No. 3 Blast Furnace Automation Improvements
- 2011 No. 2 Blast Furnaces Pulverized Coal Injection Systems
- 2011 No. 3 Blast Furnaces Pulverized Coal Injection Systems
- 2011 No. 4 Blast Furnaces Pulverized Coal Injection Systems
- 2008 Blast Furnaces Pulverized Coal Injection Gas Enrichment Upgrade
- 2008 Ore Bridge No. 1 and 2 HMI Upgrade
- 2006 No. 2 Blast Furnace Above Burden Probe Installation
- 2005 No. 2 Blast Furnace Complete Furnace Control System Design
- 2005 No. 4 Blast Furnace Mudgun Heating and Cooling Upgrade
- 2003 No. 4 Blast Furnace Dome Spray Upgrade
- 2002 No. 4 Blast Furnace Tuyere Cooling Upgrade
- 2001 Torpedo Car Desulphurization Control system and HMI Upgrades
- 1998 No. 4 Blast Furnace DCS/PLC Control system Upgrade
- 1997 No. 3 Blast Furnace DCS/PLC Control system Upgrade

ESSAR STEEL ALGOMA

- 2008 No. 6 Blast Furnace Material Delivery and Stockhouse
- 2008 No. 6 Blast Furnace Furnace Top Control
- 2007 No. 7 Blast Furnace Stoves Automation

BLUESCOPE

- 1996 Port Kembla No. 6 Blast Furnace

AHMSA

- 2011 No. 5 Blast Furnace Rebuild BLT Controls
- 2011 No. 5 Blast Furnace Rebuild Gas Cleaning System Controls
- 2010 No. 6 New Blast Furnace Control System
- 1994 No. 5 Blast Furnace Complete Furnace Control System Design

ALCHEVSK IRON & STEEL WORKS, DONETSK, UKRAINE

- 2010 No. 2 Blast Furnace New BLT Controls
- 2008 No. 2 Blast Furnace Stockhouse Basic Engineering

U.S. STEEL

- 2011 Serbia No. 2 Blast Furnace Top Gas Pressurization System
- 2009 Serbia No. 2 Blast Furnace Pulverized Coal Injection System
- 2007 Serbia No. 2 Blast Furnace Control System Supervision
- 2007 Serbia No. 2 Blast Furnace Commissioning and Start-Up Assistance
- 2007 Gary No. 14 Blast Furnace Commissioning and Start-Up Assistance
- 2000 (Stelco) E-Blast Furnace Commissioning and Start-Up Assistance
- 1994 Kobe No. 3 Blast Furnace Pulverized Coal Injection System

BLAST FURNACE AUTOMATION SYSTEMS

JNE Automation supplies complete engineered control systems for world class blast furnace operations. Our capabilities and experience provides for tailored automation solutions to meet the exacting needs of the producer.

These solutions incorporate the latest developments in system design and interconnectivity, to maximize process and equipment data to the operator, while minimizing maintenance and downtime.

JNE Automation's experience is demonstrated with more than thirty blast furnaces, over the past twenty years, for which we have provided design engineering and services, partial replacement or full replacement of the control systems.

The control code is structured in a modular format, using standard control circuit design, to provide consistency in the programming. This is of particular benefit to the

maintenance department, as all the code follows a structured format with full documentation embedded in the programs.

A single HMI user interface provides the operator with all the process information required to operate the blast furnace processes, in an easy, user-friendly form, that requires minimum keystrokes to perform the required operational activities. This allows extremely high system availability with various levels of security, redundancy and future expansion.

COMPREHENSIVE DESIGN SERVICES & DOCUMENTATION

JNE Automation can provide any, or all services associated with a blast furnace control system upgrade. We can provide a standard document package or a custom designed documentation set to fit your specific needs.

CONTROL SYSTEM ARCHITECTURE & FEATURES

Our control system design incorporates the latest advances in open network topology, providing a flexible control platform to maximize the data available to the production and maintenance personnel, while reducing the installation cost.



CONTROL SYSTEM MANUFACTURERS

We have experience on most major DCS and PLC systems. JNE Automation control system affiliations are:

- with Endress + Hauser as an Alliance Partner in providing a Safety Rated Leakage Detection System
- with Rockwell Automation as a System Integrator and Process Solution Partner
- with Schneider Electric as an Alliance Partner

FURNACE EQUIPMENT SUPPLIERS

Extensive project experience with technology providers and furnace equipment suppliers which include Paul Wurth Ltd., Danieli Corus Inc., Primetals, Kvaerner and Woodings Industrial Corporation.



PROCESS AREA EXPERIENCE

Although each and every blast furnace is unique, the basic functions are very similar. Our control system can be easily adapted to meet the needs of your facility.

Proven control programs can be modified to incorporate the subtle differences that exist from facility to facility.

The following provides a high level overview of the various modules included in the JNE Automation Blast Furnace Control System.

SERVICES

- Full engineering documentation capability including:
 - Control system standard specifications
 - Piping and instrument diagrams
 - Instrument and I/O lists
 - Instrument specifications and procurement
 - Process electrical, control and I/O schematics
- Complete control system specification, procurement and staging.
- Familiarity with multiple control systems, control languages and platform programming capabilities for Level 1 and Level 2.
- Control system and HMI programming, simulation and factory acceptance testing to provide a "proven" integrated system design.
- Training programs custom designed for plant operations, maintenance and engineering personnel.
- Control system panel design and fabrication.
- Site services from construction supervision to system commissioning and plant start-up.
- Remote support capability.

RAW MATERIAL HANDLING/DELIVERY

Delivery of stockpiled material to the stockhouse via ore bridge systems, highline rail car and conveyor systems, along with material management capability required to meet the varied stockhouse material delivery requirements.

FEATURES

- Intelligent motor control systems, integrated with the control system, provide distributed control and additional maintenance data for increased diagnostics and field equipment performance.
- High speed, open, and redundant capable networks.
- Complete field I/O cabling and design considerations to reduce the installed cost.
- As a minimum, HART instrumentation with HART interfacing capability in the control system.
- An asset management system capable of maintaining all plant assets including the control system.
- Seamless interface to Level 2 applications for process optimization (if not already performed in Level 1) and historical data. Level 2 should easily grow with the Level 1 control platform.
- All Level 0/1 data is stored on the Historian, for use at the HMI, or at Level 2/3.
- Process and Operational Reports.
- Operator and maintenance data/diagnostic systems.

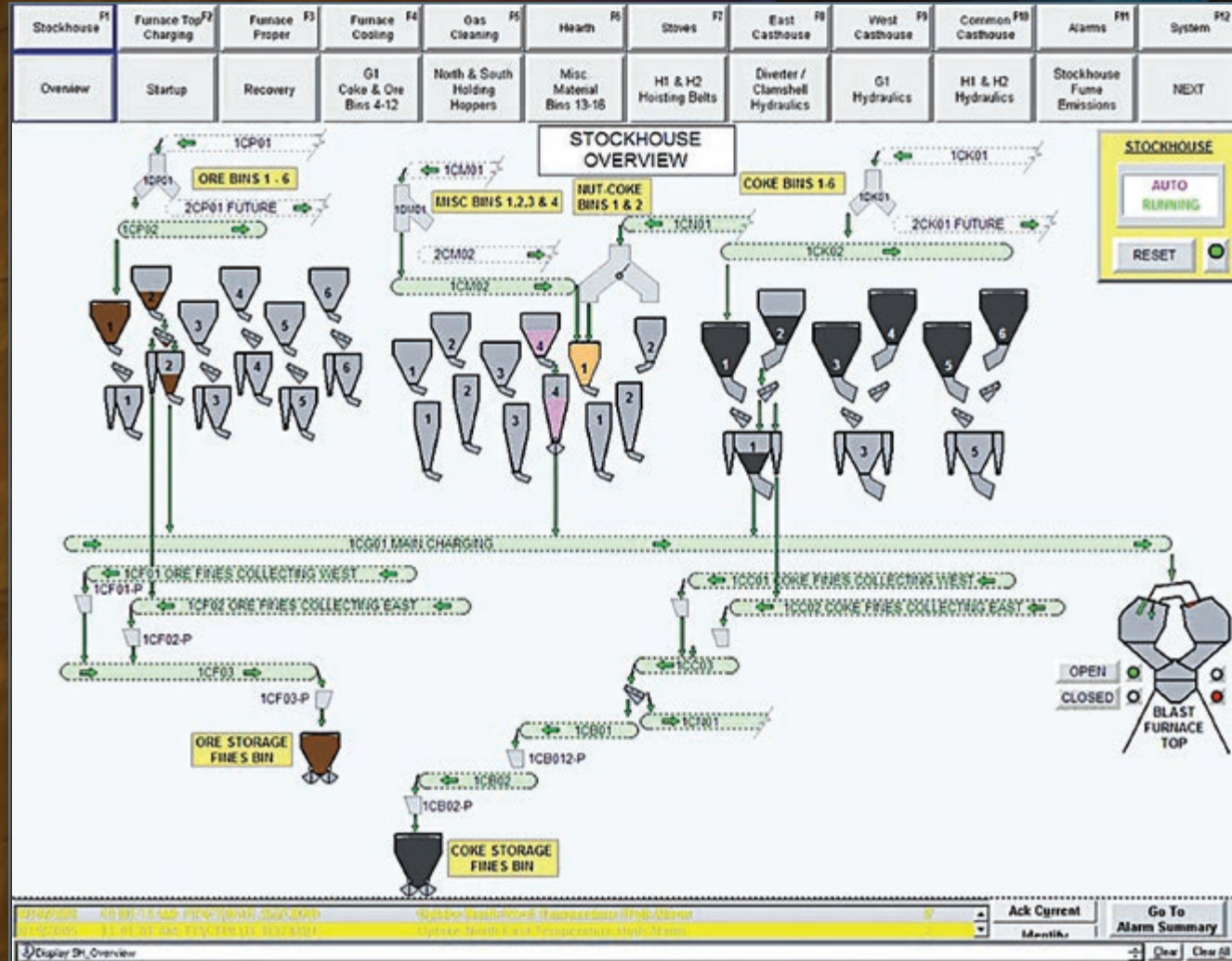


Automated Stockhouse & Furnace Charging

From scale car systems to fully automatic conveyor/screen/feeder systems, providing ore coke and miscellaneous materials to skip or belt fed furnaces.

This includes the ability to create the batch recipes remotely or via the HMI with a fully automated Charge Master program. This program tracks the flow of material from the stockhouse storage bins to delivery to the furnace top, complete with dry weight error correction and weigh error compensation, to maintain correct burden composition and level.

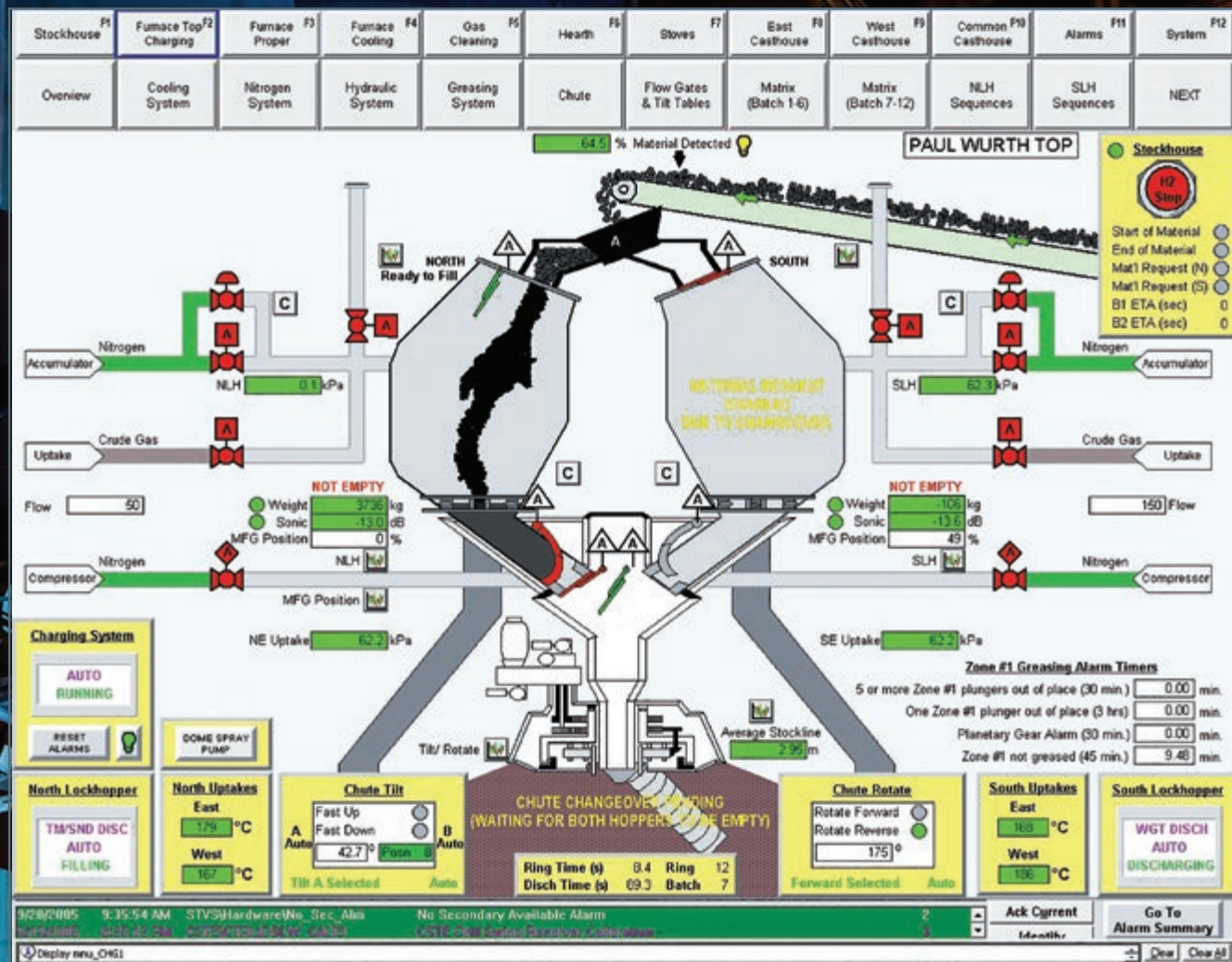
An essential component for a fully automated system is the addition of a dust collection system to remove and extract emissions produced by the material handling process.



Furnace Top Charging

Control system programming of small bell/large bell material delivery as well as bell-less systems.

- Stockline level monitoring and control
- Furnace top pressurizing and relief systems
- Lubrication systems
- As a minimum, HART instrumentation with HART interfacing capability in the control system
- Secure and safe design for the control of furnace top pressure relief bleeder valves, including the associated hydraulic systems

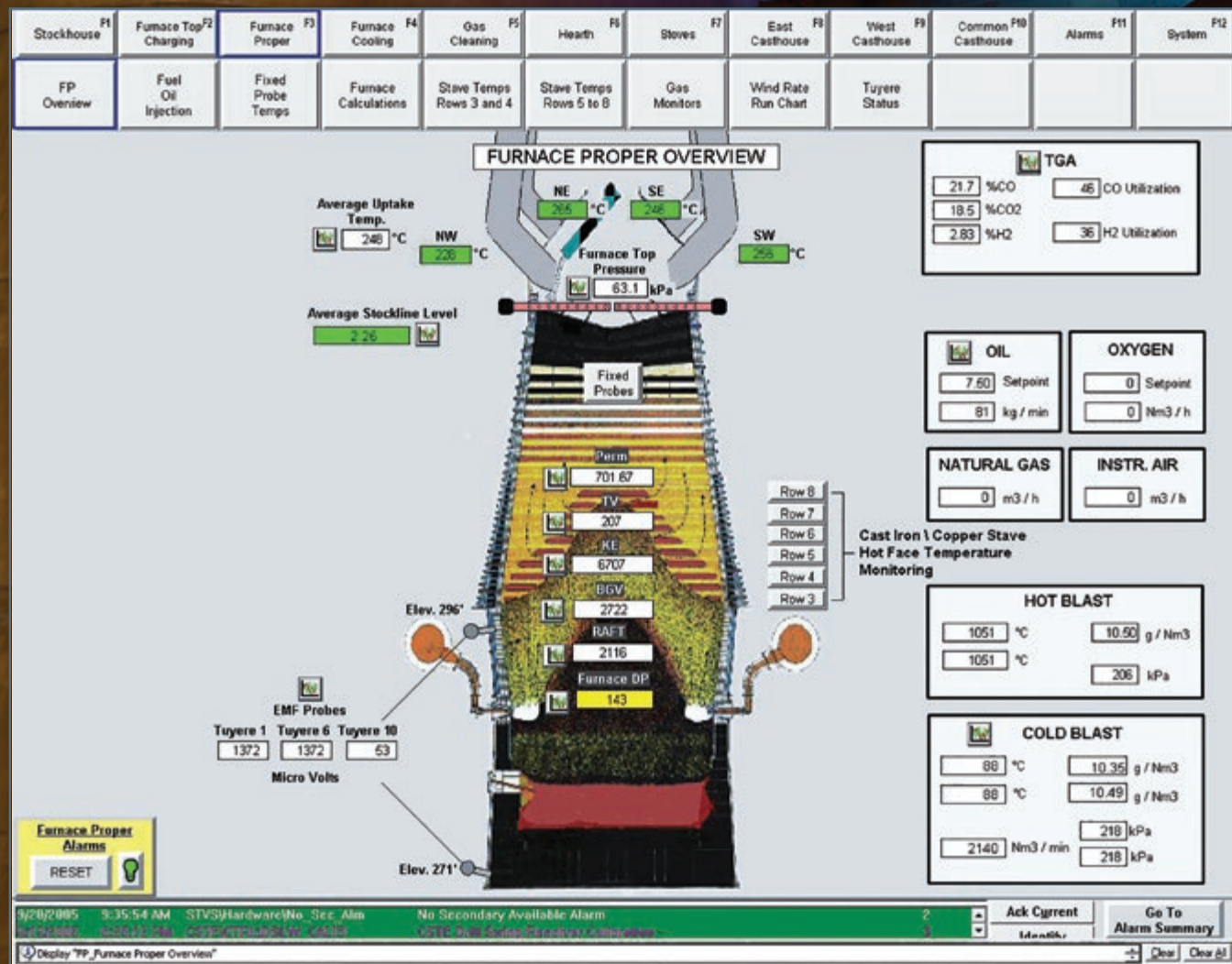


Furnace Proper & Hearth

Controls for process temperature monitoring, trending and alarming, off-gas analysis, and above-burden and in-burden probe systems. As a part of the monitoring system, process and production calculations and third-party models are used to provide operational guidelines.

Some of this data includes:

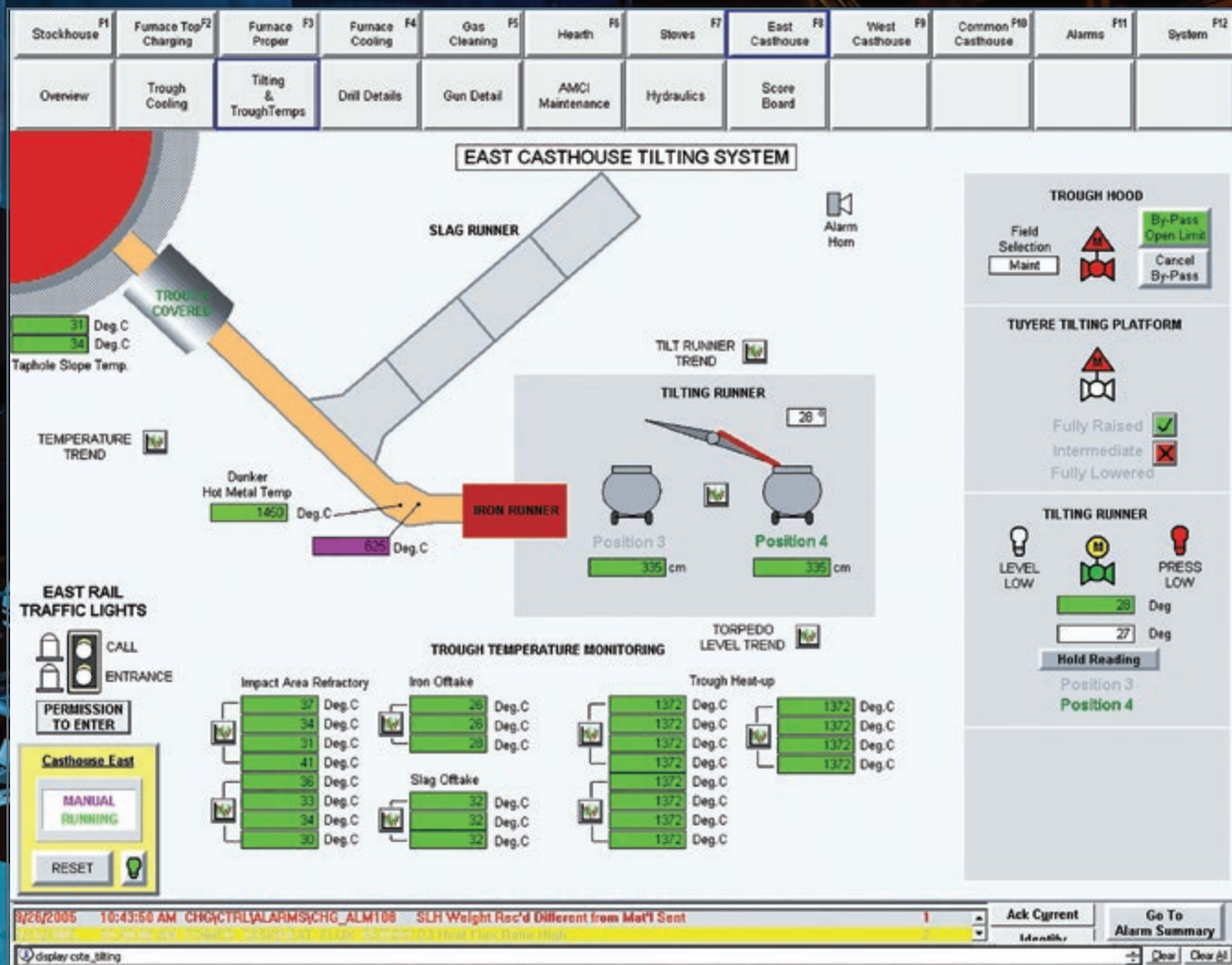
- Hearth and sidewall isotherms
- Burden distribution
- Coal grinding and pulverized coal injection
- Tuyere leak detection and heat loss
- Process calculations such as adiabatic flame temp, permeability, tuyere velocity
- Data to/from Level 2 systems (data historian and process models)



Casthouse

A clean and safe working environment in the casthouse is achievable with good layout, accessibility and ergonomics. Our experience is that the casthouse machines work together to provide this environment. Casthouse automation provides for consistent, safe, operation.

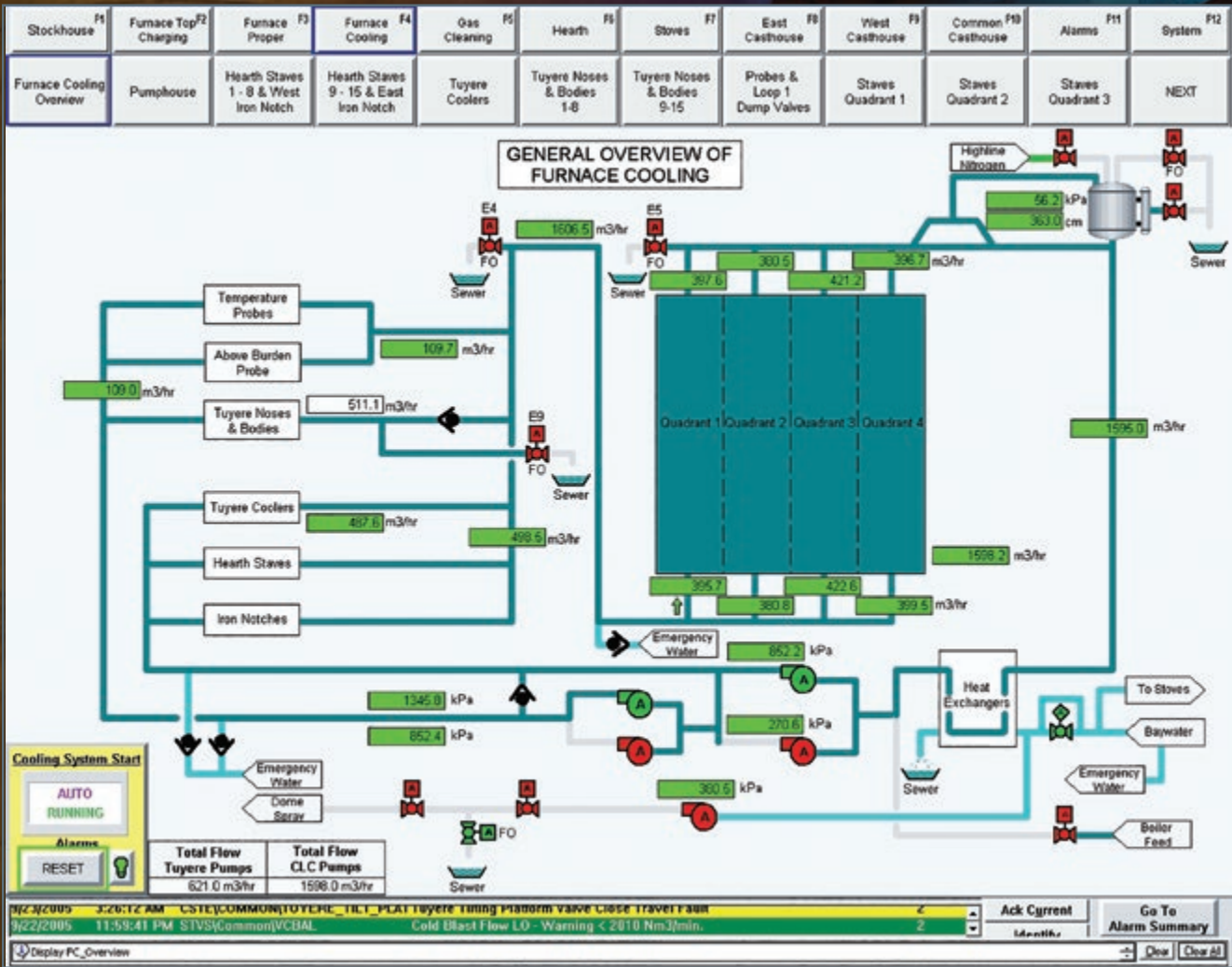
- Experienced with automation of casthouse equipment from suppliers such as Paul Wurth, and Woodings, for control of mud gun and tap hole drill equipment
- Trough and runner temperature monitoring
- Tilting runner operation. Torpedo car level monitoring
- Slag granulation
- Casthouse fume collection systems
- Control schemes include radio operated belly box designs to fully automated gun-up and auto drill logic



Furnace Cooling

From shell plate spray cooling to closed loop stave cooling, the various options for furnace cooling and temperature monitoring and control are managed through a well instrumented and integrated control system.

Heat flux monitoring and water treatment systems are integral to proper furnace cooling operations and longevity.

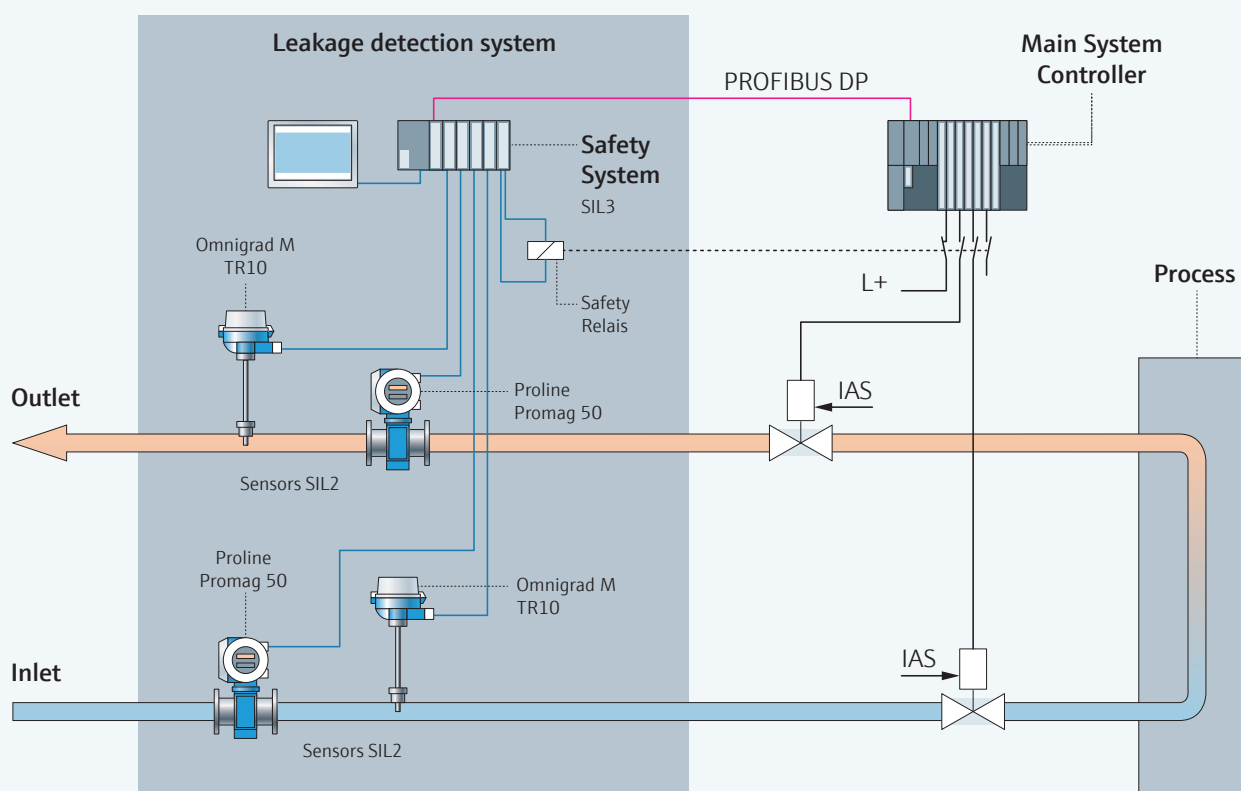


Safety Concept - Leakage Detection System for Critical Cooling Circuits

Risk Consideration: Unless quickly detected, expanding cracks or small water leaks in cooling system pipes can lead to stops in production, damage to plant or in the worst case, loss of life.

Requirements: A system which effectively detects leakage is therefore not just one of the most important parts of a plant's process automation and control system, but more importantly, an integral part of a plant's safety policy. For this reason, the leakage detection from JNE Automation/Endress+Hauser is designed in accordance with the ANSI/ISA-84.00.01-2004 parts 1-3 (IEC61511.MOD) standard or Safety Instrumented Systems for Process Industries Sector.

LEAKAGE DETECTION OF COOLING WATER CIRCUITS



JNE Automation

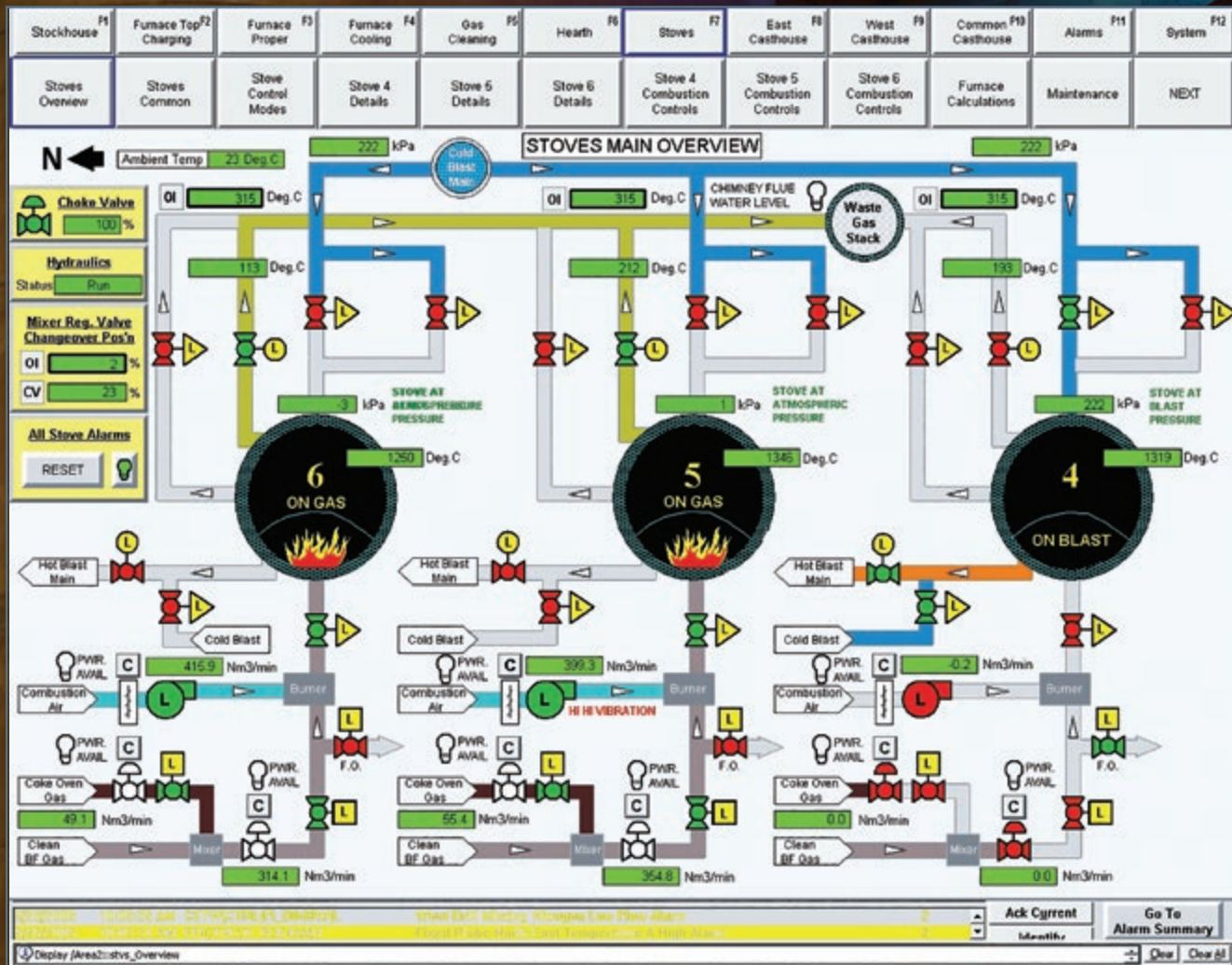
Endress+Hauser 
People for Process Automation

Stoves & Hot Blast Delivery

Stove automation providing automatic cycling of stove valves to supply uninterrupted and consistent hot blast to the blast furnace. Stove cycling systems have been designed for 2, 3, and 4 stove operation.

Control of the Process gasses and firing strategies, including Level 1 control optimization, and burner management capabilities. In addition, preheated air and gas supplies have been used to reduce the amount of enrichment gas used in the stove heating cycle.

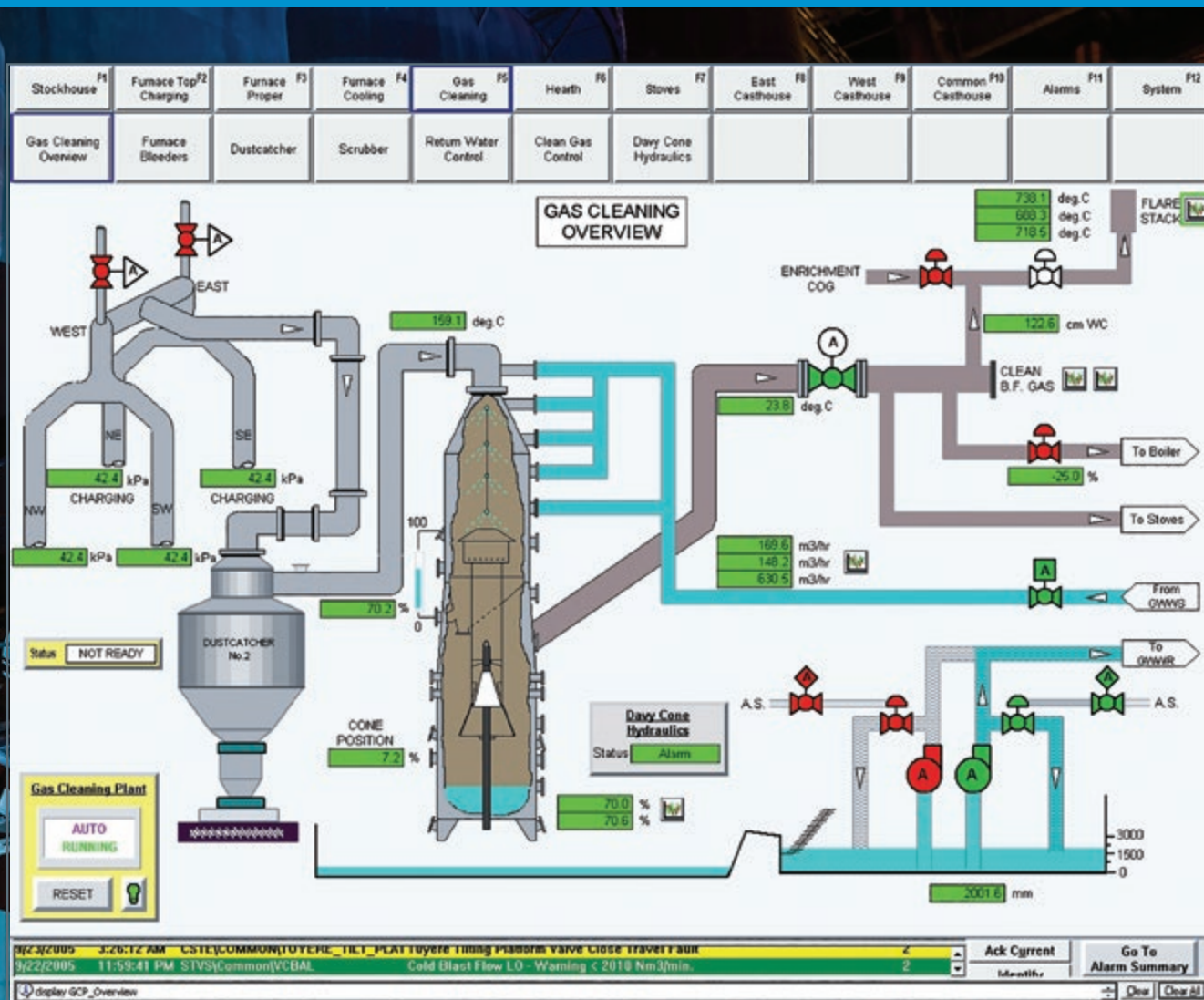
Cold blast monitoring and control and hot blast temperature control, injectant control is included within the hot blast delivery system.



Gas Cleaning Plant

Blast furnace gas is cleaned using a variety of methods including a cyclone or dustcatcher to remove large particles and either annular gap water sprays or electrostatic precipitators. Semi-cleaned gas has also been used to drive a TRT (top gas recovery turbine) system for energy recovery.

In either case, gas cleaning systems provide furnace top pressure control, as well as cleaned gas to be re-used for various processes including stove heating, and for use in the boiler house.



JNE AUTOMATION

Contact us to learn how we can apply our years of experience to your bottom line:

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