

# STEELMAKING



# INTRODUCTION

Over the past decades SMS Concast enlarged its technological product portfolio from continuous casting technology to the full range of long product steelmaking systems.

This development was continually driven by the tradition of excellence and outstanding performance of the meltshop systems. Nowadays, SMS Concast is the competence centre of long product steelmaking and continuous casting within the SMS group.

Outstanding EAF performance, which means reliable product quality at cost minimised operations, requires the accurate set-up of the EAF with its mechanical design, process & safety tools, power input control, emission control, as well as the automation in general.

Beginning with the first Electric Arc Furnace (EAF), commissioned in January 1997, up to the current projects and into the future, SMS Concast sets benchmarks with the EAF installations worldwide.



Electric Arc Furnace

# RAW MATERIAL

The steelmaking route has been developed to the full range of iron containing input materials. SMS Concast provides EAF solutions for all individual metallic input materials, as well as their combinations.

**Scrap** as the main metallic charge material predicts the main features of the EAF. Where in most instances a two bucket operation was required, SMS Concast successfully implemented also single bucket operated EAFs. Our single bucket charging concept minimises mainly the power-off time, but also features highest energy input rates, due to optimised diameter/height-ratio of the shell.

**DRI & HBI**, are becoming more and more important metallic charge material for minimills. Depending on the percentage of the DRI in the charge either a batch charge by the bucket together with scrap or continuous charging through the furnace roof is implemented. The conti-charge of either cold or hot DRI requires the proper set-up of the material feeding line of DRI/HBI together with lime, dolomite lime & carbon, the right shell design and optimised power-input. The operational sequences are controlled by means of the fully integrated automation system.

**Hot metal** charge in the EAF offers lowest electrical power consumption by using the chemical and thermal energy from the liquid iron. The CONSO oxygen technology system of SMS Concast leads to maximised de-carburisation rate with high utilisation of the used oxygen. The liquid iron charge concept guarantees operational safety combined with reliable process control during the whole charging process.

**Handling of alloys & slag builders:** Our state-of-the-art EAF set-up features throughout automated charging of the additions to the required charging location in due time, whereas feeding and conveying principles are used in accordance with the kind of the aggregate and its dosing.



Scrap yard



Aggregate



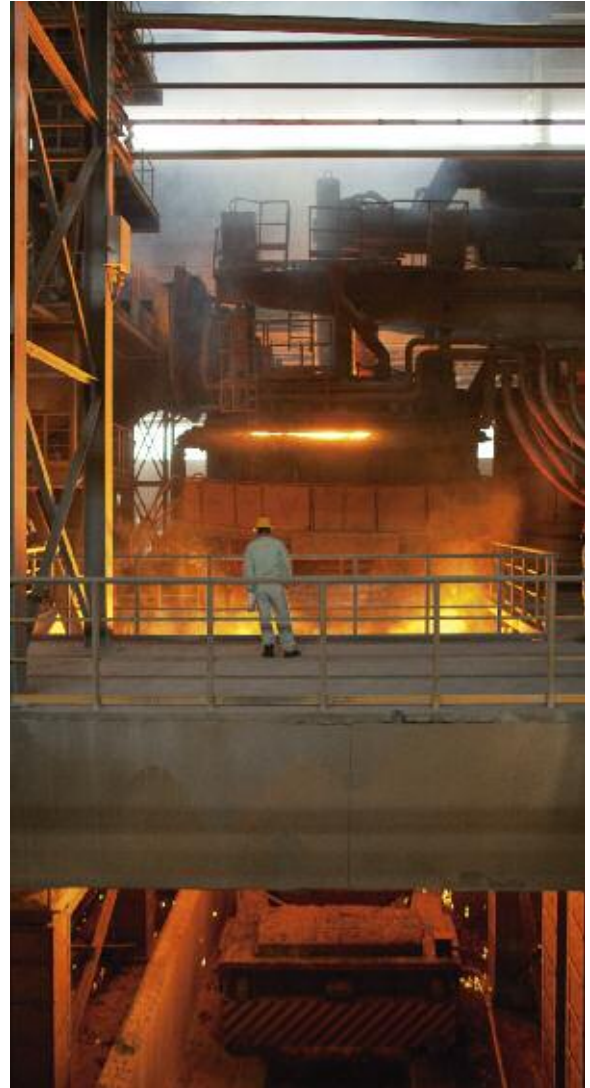
Hot metal charging

# EAF CONCEPT AND DESIGN FEATURE

The Electric Arc Furnace provides the heartbeat of the meltshop by serving the downstream equipment for steel treatment, casting and rolling with steel at the adequate temperature.

Our passion for process leads to maximised productivity with highest energy and input material yield.

Our proven and continuously updated design of the EAF with features like full-platform tilting, split shell, water cooled panels in steel and copper, 3-point roof lifting system, current conducting electrode arms, electrode regulation and CONSO oxygen technology, leads to highest power-input rates with highest utilisation of the used energy and media. SMS Concast EAFs with integrated automation offers the freedom for continuous operational optimisation to achieve lowest operation costs.



Tapping of a 110 ton EAF

Depending on the steelmakers' requirements, SMS Concast develops jointly with the customers the appropriate concept from the charging up to the tapping, to implement the optimal EAF for each meltshop.

# PROCESS TOOLS

## CONSO Technology

- Combined burner & oxygen injection functions in the very same injector
- Injectors are installed in the EAF side wall or in the horizontal EBT-panel
- Burner capacity up to 8 MW, oxygen injection capacity up to 4'500 Nm<sup>3</sup>/h per unit
- Carbon and lime injection through side wall lances. Each line individually controlled
- Fully automated operation, linked with the electrode regulation and foaming slag control

## The new developed EAF safety tools:

- Enhanced Slag Door (ESD), for automated cleaning of the sill-breast area enables also real closed door operation
- Guaranteed reliable access for automatic sampling and temperature measurement manipulator

With its highly reliable and productive process tool, SMS Concast guarantees for achieving highest quality standards.

The Level 2 control system features process optimisation through definition of the individual process steps and its operation documentation and analysing tools.



Enhanced Slag Door



CONSO oxygen burners

# ECONOMY AND ENVIRONMENT

The focus of SMS Concast is on continuous improvement in steelmaking.

SMS Concast gives greatest attention to its research and development activities to have every single technological key factor under the company know-how umbrella.

High attention is given for the Dust Emission Control DEC system of the EAF. SMS Concast offers complete systems for meltshop dust emission control:

- EAF primary off-gas systems with high temperature quenching or hair pin cooler
- Hot cooling system in the primary off-gas line for heat recovery
- Filter units with pulse-jet bag filters to achieve lowest dust contents in the clean gas
- Dust handling systems

Also the Noise Emission Control NEC is an important issue for the set-up of an EAF. Either a Dog-House or an Elephant-House solution for the EAF can be implemented in the meltshop.



Axial cyclon of main duct

# AUTOMATION

SMS Concast is regarded as a leading provider of innovative, integrated automation and process control solutions for the steelmaking industry.

With a proven record of satisfied customers and successful installations, we have gained a considerable expertise, which, together with the constant focus on understanding and meeting customers' needs, makes our team our most valuable asset.

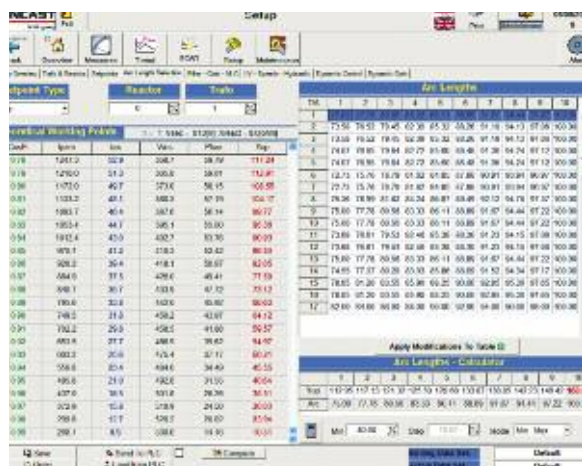
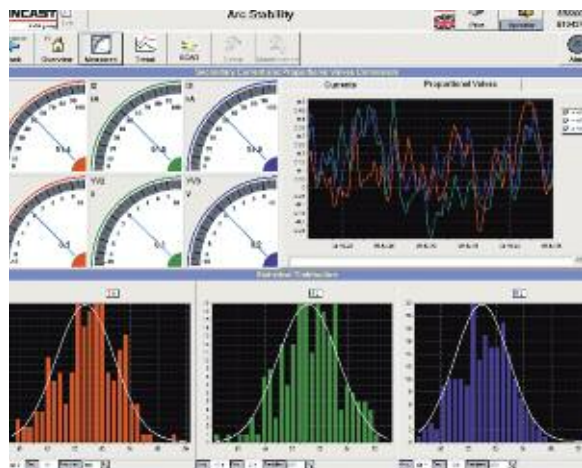
The control design of the Electric Arc Furnace is based on an integrated architecture where the automation collects all the data valuable for the estimation of material and energy flows in the furnace.

The information gathered is processed by a set of control packages, to achieve the highest process efficiency with the optimisation of raw materials, minimisation of energy consumptions and production delays.

The dynamic melting profile, included in the Level 2 control system, automatically recalculates the machine set-points on the basis of the current process status and transmits them the PLC automation, closing the control loop and allowing a prompt and flexible reaction to specific process conditions.

The technological packages dedicated to EAF include:

- Control packages for advanced electrodes regulator for AC and DC furnaces
- Foamy slag detection and control
- Carbon injection
- CONSO supersonic oxygen technology
- Scrap yard inventory management
- Automatic, real-time tracking of the scrap buckets charging process
- Scrap charging optimisation
- Scrap yard cranes wireless operator interface
- Heat and mass balance models
- Dynamic melting profile
- Tapping alloy addition model
- Process analysis and simulation
- Metallurgical data management



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**PASSION** for **PROCESS**