



## Seminar: EAF sensors and measurement techniques

### VALEAF Project Features

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**VALEAF** is a dissemination project on Electric Arc Furnace technology

## What is a dissemination project ?

A dissemination project is a way to **valorise** and **diffuse** the most important results obtained in RFCS research

with direct benefits for European steel industry.

It intends to be also a basis for establishing a roadmap for future technological developments and research work.





## Project partners



## Objectives

1. to promote the knowledge and various outputs derived from the European projects in this sector
2. to supply guidelines for the next developments of EAF technologies, to give indications on priorities for research subjects and suggest a clear road map for the technological development in this field

## Ways and means

- Collection and analysis of ECSC and RFCS projects of the last 15 years
- Seminars and workshop across Europe
- Construction of a web site to support the dissemination procedure

In the frame of the project a number of public events have been planned

## **Seminars**

**To present most relevant results of European research**

The seminars are communication events to diffuse results and to provide information on specific technological subjects

## **Workshops**

**To share and discuss EAF technological issues with stakeholders**

The aims of the workshops are:

- to define the actually available project results, their weak and strong points, their potentials
- to define a road map for the future EAF technology
- to individuate barriers and needs for future research activities

From 1991 up to now, in the context of the research programmes of the **European Coal and Steel Community** and **Research Fund for Coal and Steel** about 70 projects have been dedicated to EAF, 33 of them in the period 2001-2015.

In the various projects all the most important players of European industry were involved (steel industry, engineering companies, suppliers, research centers)

The most relevant technical issues of the EAF process have been faced.

## 1) Process control

- New models (deterministic, analytical, statistic, based on innovative neural network and fuzzy logic techniques) for improved energy efficiency, productivity (end point control) and quality (target composition and temperature)
- New sensors and mathematical techniques for continuous offgas composition and temperature measurements and related use of the derived information to guide process operations
- Sensors for monitoring the status of the charge during melting and the status of the electrodes

## 2) EAF Efficiency and optimisation

- Relationships between energy consumption and productivity
- Control and exploitation of chemical energy
- Techniques (models and sensors) and guidelines for running the EAF in airtight conditions

## 3) Slag control

- Measurements and model calculations of slag status and use of additives for foam control
- Additives for slag reduction to recover alloy elements from the slag

## 4) Scrap treatment and control

- Pre-treatment of scrap to improve quality and to reduce energy consumption
- Innovative (ultrasonic, optical, laser based) measurements of physical and chemical properties of scrap to control quality
- Determination of scrap properties based on statistical evaluations
- Cost optimal charge mix calculation
- Mathematical tools to manage flexible scrap charging

## 5) Environmental Impact

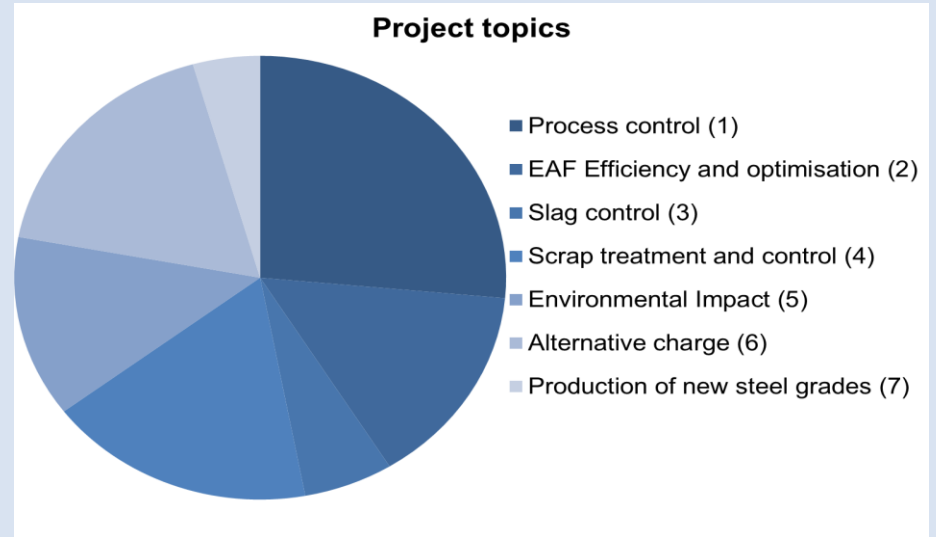
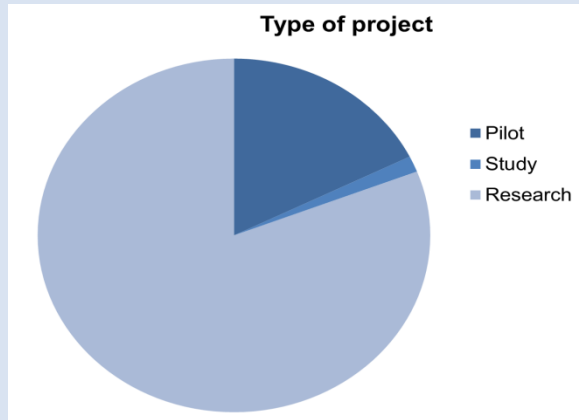
- Measurements and operating practices to reduce NOx emissions
- Pre-treatment of scrap to improve environmental impact

## 6) Alternative charge

- Techniques and guidelines to use alternative iron sources
- Use of char from biomass replacing coal
- Recycling of by-products

## 7) Production of new steel grades

- High Mn steel (ultra high strength steel grades)



Period	Nr. of EAF Projects	EAF sensors and measurement techniques	
1991 - 2014	68	19	28 %

Event	When	Where	Subject
Seminar 1	Nov 7th, 2014	Uni Tor Vergata Rome (Italy)	Advanced modelling
Seminar 2	April 9 <sup>th</sup> , 2015	Milan, (Italy)	Energy efficiency and environment
Seminar 3	April 23 <sup>rd</sup> , 2015	RWTH Aachen, (Germany)	Energy and resource efficiency
Seminar 4	Jun 3-4, 2015	Stockholm (Sweden)	Scrap control
Workshop 1	Mar 12 <sup>th</sup> , 2015	Dalmine, (Italy)	State of the Art of EAF technology

All presentations can be found on the VALEAF web site:

[http://www.c-s-m.it/en/about\\_us/project\\_financing/european\\_projects/valeaf.html](http://www.c-s-m.it/en/about_us/project_financing/european_projects/valeaf.html)



# Agenda of todays seminar on EAF sensors and measurement techniques

- 9:30** Overview on ECSC / RFCS research on sensors and measurement techniques for EAF process (Köchner, BFI)
- 10:00** Laser-based analysis methods (scrap, slag, steel) (Fricke-Begemann, ILT)
- 10:30 Coffee break**
- 11:00** Determination of scrap composition (Moreas, CRM)
- 11:30** Steel bath temperature (Lamp, Minkon)
- 12:00** Visit to BFI sensor labs
- 12:30 Lunch break**
- 13:15** Measurement systems for optimization of the EAF process (Monfort, CRM)
- 13:45** Off-gas measurement techniques and development as support to process monitoring and management (Frittella, CSM)
- 14:15** Use of sensors for EAF online process control (Kleimt, BFI)
- 14:45** Discussion and Conclusions (BFI)
- 15:15** End of event

Event	When	Where	Subject
Seminar 6	Sep 24 <sup>th</sup> , 2015	Bardolino (Italy), SteelSIM 2015	Model-based process control
Workshop 2	Nov 11 <sup>th</sup> , 2015	Düsseldorf (Germany)	Road map for future EAF technology