

# Valorisation and dissemination of EAF technology

## VALEAF

1<sup>st</sup> Workshop

State of the Art on EAF technology

Introduction

Dalmine 12<sup>th</sup> March 2015

Presentation of VALEAF Project

Workshops - aims and contents

1<sup>st</sup> workshop - State of the Art of EAF technology

Introduction: evolution of EAF technology

Major contributions from RFCS projects

Specific subjects presented in the workshops

Links among the subjects

The future of EAF technology

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 researches with direct benefits for European steel Industry.

It intends to be also a basis for establishing a roadmap for future next research works.



## What is VALEAF ?



### 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 organisation of ECSC/RFCSC Projects of the last ten years  
Seminars and workshop across Europe  
Construction of a web site

# Presentation of VALEAF project Seminar and Workshops

In the project a number of public events are planned

## Seminars

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

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

## Workshops

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

The aims of the workshops are:

- to better define the really available results, their weak and strong points, potentiality, criticalities, trends
- to define a road map for the future EAF technology
- to individuate barriers and needs for research

The workshops intend to assess the status of the technology of EAF, to identify trends and needs and to individuate a road map for establishing a solid and robust European electrical steel industry.

Two planned workshops

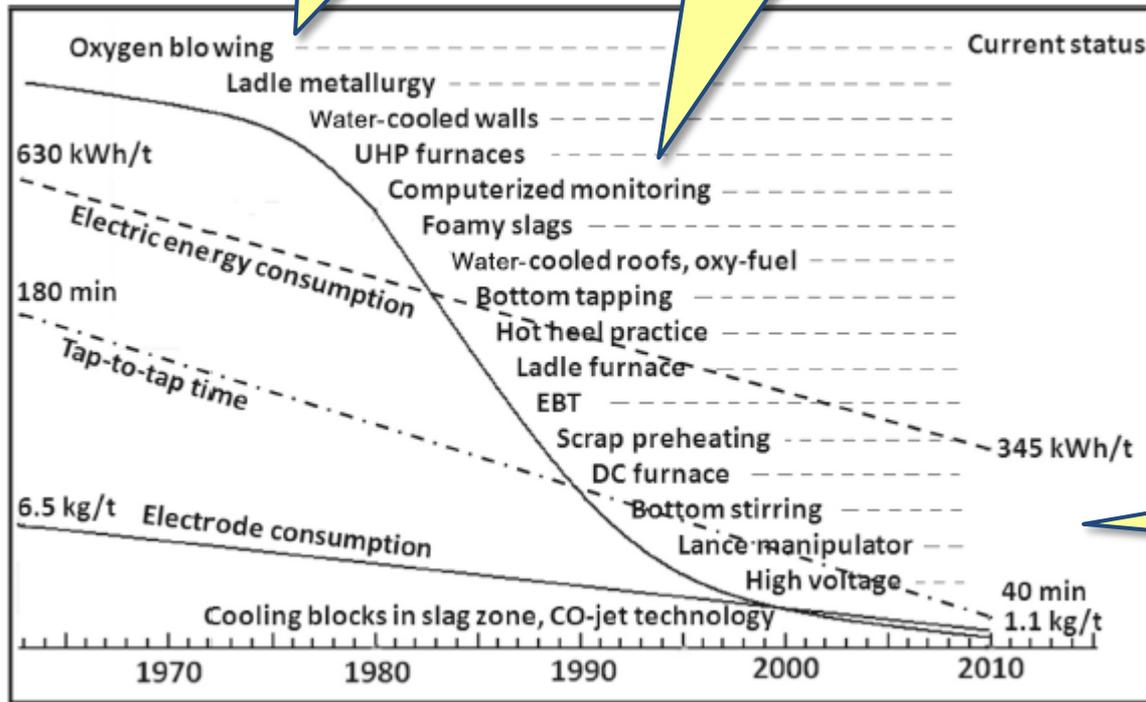
- 1) State of the Art on EAF technology
- 2) Definition of a road map for EAF technology

For this first workshops a number of technological issues have been identified as the most important in the recent evolution of the EAF.

# Evolution of EAF technology

1) From small furnace for special steel to large only-melting units

2) Plant, operating techniques and components to reduce consumption



1) Initially the EAF was a furnace for melting and refining special steel.

2) In the second half of 20<sup>th</sup> century the evolution was to reduce consumptions and tap-to-tap time.

3) In the last decade together with further improvement on consumption and productivity, clear trends have been:

- higher automation,
- charge control and flexibility,
- lower environmental impact.

3) Process Automation, Flexibility and environment

H.-B. Lungen, M. Peters, P. Schmöle: AISTech 2012 Proceedings, 2012, pp. 109-119.

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, 34 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)

All the relevant technical issues of EAF process have been faced.

# Major contributions from European projects - Relevant topics

## 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)

# Specific subjects presented in the workshops

The partners of VALEAF project selected a set of subjects to present and discuss in this workshop

Process control

- Sensors technology
- Process automation

Charge

- Flexible charge
- Alternative charge
- Batch and continuous charge

Airtight EAF

# Program

- 9.00** Welcome -Introduction (project features)
- 9.15** Process control : sensors technology (BFI)
- 10.00** Batch vs continuous charge (CSM)  
Coffee break
- 11.00** Process control : process automation (BFI)
- 11.45** Alternative charge (Aachen University)
- 12.15** Flexible charge (CSM)
- 13** Lunch
- 14** On line measurement and control (CRM)
- 14.45** Air Tight Furnace (CSM)  
Coffee break
- 15.45** Common discussion - concluding remarks
- 16.30** End of the event