

Project website

WP11. Communication and Dissemination

DELIVERABLE

11.2

VULKANO
Novel integrated
refurbishment solution
as a key path towards creating
eco-efficient and competitive furnaces

From July 2016 to December 2019

Grant agreement
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Prepared by: CIRCE



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DELIVERABLE FACTSHEET

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INTRODUCTION

This document describes the Project website prepared under the Project VULKANO EC-GA contract no 723803.

The deliverable 11.2 is under the following tasks within the DoA of the VULKANO project:

Task 11.2 Creation of dissemination material

The intended audience of this report is each individual participant of the project consortium and the associated partners, as well as any potential stakeholder or individual interested in the activities and outputs of the project VULKANO.

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1 SUMMARY

VULKANO public website has been implemented in month 4 of the project, and will be maintained over the lifetime of the project.

The internet portal works as communication platform to assist the coordination of the project and its activities.

An individual domain has been acquired to host the website. The link to this VULKANO website is:

<http://www.vulkano-h2020.eu/>

Within the design phase of the website, perspectives from both specialized and non-specialized visitors have been considered in order to develop the interface.

The website will be the main communication tool for the project, where all the dissemination materials will be published in a timely manner. The website is an interactive environment that will give access to all the publishable development of VULKANO. It will give a very direct link to the main results and to the hottest project news.

Besides, this website gives a link to the objectives, partnership, activities and events related with the project, and it is planned to give access to all the aspects regarding the new technologies, best practices and recommendations for energy efficiency gathered from the project development. Moreover, direct link to the project intranet is available from the homepage. Contributions from the partners will be highly important to maintain the project's website updated, in order to improve the website positioning in search engines and to reflect an active attitude to Internet users. In addition, partners are asked to link their website and platforms to the website of VULKANO project. In this sense, a SEO positioning analysis will be performed to ensure higher visibility in web search engines.

The following points describe the different sections and functionalities of the website, supported by screenshots to better understand its use.

2 HOME

The “home” area of the website is composed of different sections:

Top bar and upper area: structure of the website including a pull-down menu. The tabs and sub-tabs included may be modified over the project lifetime according to the needs of VULKANO.

Besides direct link to the project intranet, contact and related links representatives are included.

As a very first impact, visitors see three dynamic slides giving key messages of the project.


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Figure 1. Screenshot: VULKANO homepage (upper area)

Central area: there are two main sections at the moment: pilots 'description and technology solutions to be implemented in the project. These are considered as key topics for the visitors.

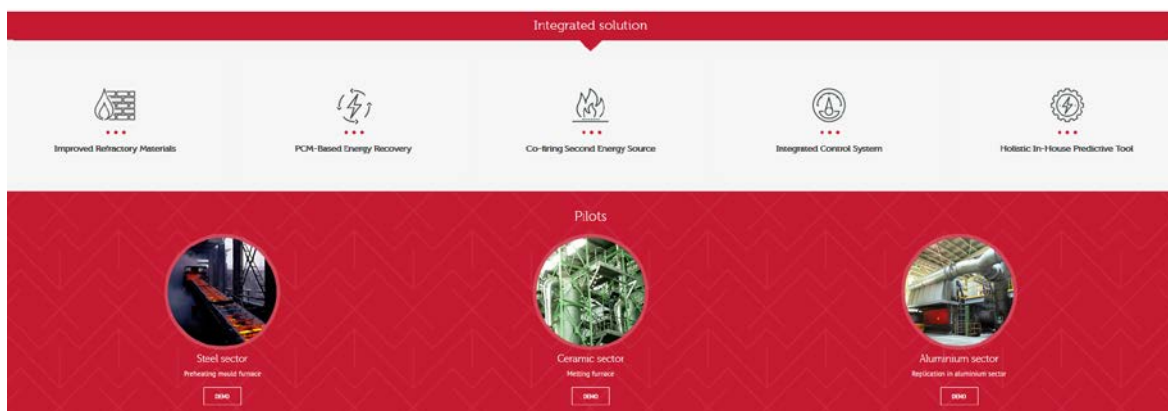
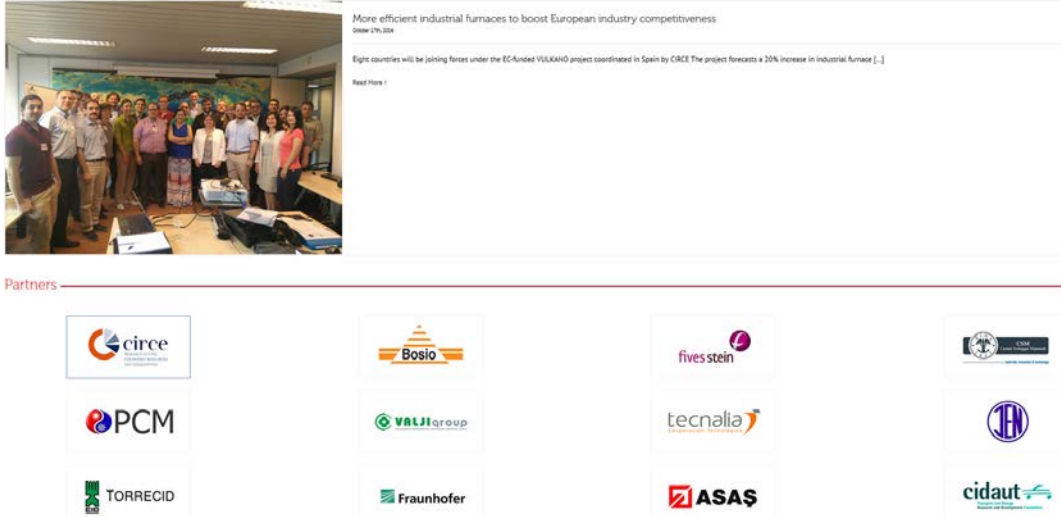


Figure 2. Screenshot: VULKANO homepage (central area)

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Bottom area: the hottest news will be posted in this area, together with the logo of the partners of the consortium.





News and events







More efficient industrial furnaces to boost European industry competitiveness
2016-270-2016

Eight countries will be joining forces under the EC-funded VULKANO project coordinated in Spain by CIRCE. The project forecasts a 20% increase in industrial furnace [...] [Read More](#)

Partners










Figure 3. Screenshot: VULKANO homepage (bottom area)

3 SECTIONS

3.1 The project

This sections is broken down in three tabs: motivation, objectives and integrated solution.

Motivation

Intensive Industries are continuously facing new challenges in order to increase the efficiency, reliability and flexibility of their processes. In particular, due to being one of the most energy intensive processes, industrial furnaces have been the focus of multiple researches in order to address radical improvements in the competitiveness and energy, environmental and cost performance at system level. For that purpose, the development of improved designs based on new materials, alternative feedstocks, equipment and the integration of permanent monitoring and control systems into new and existing furnaces seem to be essential instrument to meet those demands.

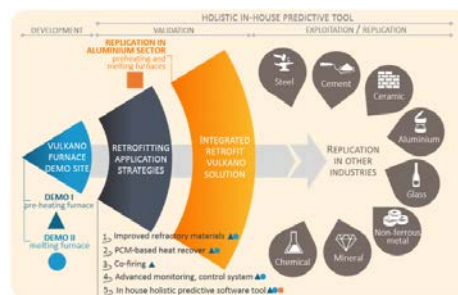



Figure 4. Screenshot: motivation tab

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Objective

The overall objective of VULKANO project is to design, implement and validate an advanced retrofitting integrated solution to increase the energy and environmental efficiency in existing preheating and melting industrial furnaces currently fed with natural gas. This will be achieved through implementing combined new solutions based on high-temperature phase change materials (PCMs), new refractories, optimized co-firing, advanced monitoring and control systems and a holistic in-house predictive tool.

Specific objectives of the project

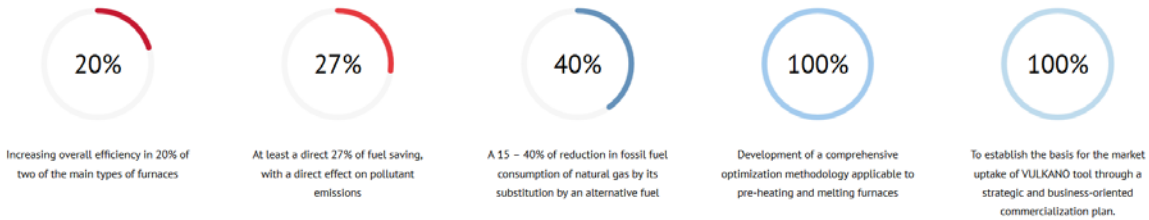


Figure 5. Screenshot: objectives tab

Integrated Solution

1. Improved Refractory Materials
2. PCM-Based Energy Recovery
3. Co-firing
4. Integrated Control System
5. Holistic In-House Predictive Tool

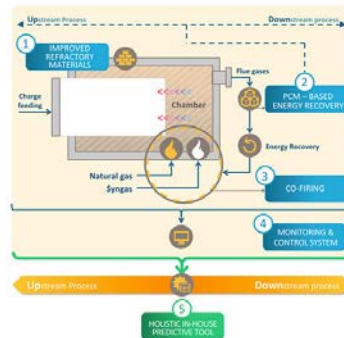


Figure 6. Screenshot: integrated solution tab

3.2 Project partners

Information from all entities can be consulted either by country. In addition, a map with all entities and their locations has been included.

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Consortium



Figure 7. Screenshot: consortium tab, map.

Project partners

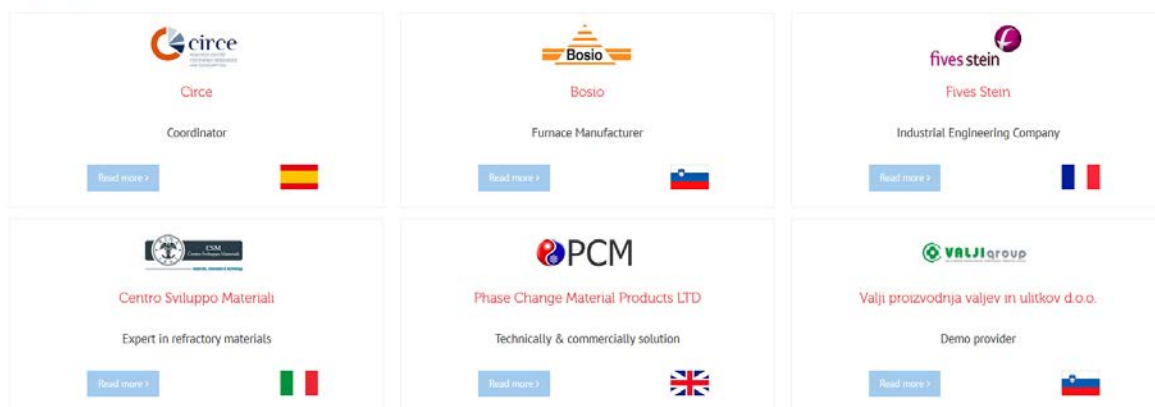



Figure 8. Screenshot: project partners tab.

3.3 Pilots

A description of the three pilots corresponding to the three sectors involved in the project is included. The retrofitting solutions to be applied in each case is described.

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Steel sector

Preheating Mould Furnace

N° energy sources

1

Operating Temperature

From 100°C to 400°C

Refractory materials

Ceramic fibers on walls, doors and roof

Type of fuel

NG + Syngas from biomass - VULKANO

Number and type of burners

3 (option 5) x 450 kW

Estimation of process efficiency

70%

Type of process

Batch process

Energy Consumption

135 Nm³/hour (Natural Gas)

Heat recovery equipments

None

Description

The load is placed in the oven where it is heated for 2 hours arising to 70 °C. Then the mould is taken from the oven and placed in a pit for the molding of the final cores. Mould is brushed and formed. The whole process takes from 2 to 4 more hours, depending on the size of the mould. When this procedure is completed the mould is returned to the furnace. The temperature of the mould in this moment drops to approx.20°C.

Following the mould is heated up to 120°C during at least 3 hours. The mould is taken again out of the furnace to coat the final core from 5 to 5 times depending on the quality of the cylinder. Coating takes from thirty minutes to one hour, during this time the temperature falls about 10°C.

After this, the mould is loaded again into the furnace turned by 180° around the horizontal axis and in this position is heated to 220°C during 3 more hours. After this preheating process the mould remains for one hour with the furnace switched off and closed in order to achieve the equalization of the temperature throughout the mould.



Figure 9. Screenshot: steel sector.

Ceramic sector

Melting furnace

N° energy sources

1

Operating Temperature

1500 - 1580 °C

Refractory materials

Electro-AZS, alumina-silica brick, insulating brick. Absence Silicon carbide particles and aluminium metal. No pre-treatment of the mixture.

Type of fuel/s

Natural Gas

Number and type of burners

Two type of burners. Main burner gas-air or gas-oxygen, the other one oxygen-gas side</>

Estimation of process efficiency

40% to 45% gas-air furnace. 75% to 80% gas-oxygen furnace

Energy consumption

1,952 kWh

Type of process

Continuous

Heat recovery equipments

Output stream on which it is done: Heat recovery to preheat the combustion air from the combustion fumes.

Type equipment and number: 2 equipment per oven; 1 heat recovery for combustion air, 1 heat exchanger to cool fumes before the filter.

Current use of recovered heat: Preheating of combustion air; the heat exchanger expels air to atmosphere.

Description

The process is continuous in the furnace, where the feeding material is melted at 1.500 °C to 1.580 °C (depending on the raw material) and goes out by overflow. The feeding flow rate is 800 kg/h.

The combustion is made normally by natural gas (NG) with air. The flow rate of NG is 165 Nm³/h and the air has a 10 to 15% excess. Additionally, the air is preheated up to 600 °C thanks to the energy recovery system installed in the fume gases (1.500 °C - but a particle filter is needed beforehand). The energy recovery system has reached a maximum technology performance, and although some attempts to increase energy recovery have been done, it has not been successful. Currently, gases are thrown at high temperature to the atmosphere. Frit melting furnaces produce waste heat at 800-1000 °C, gases that are loaded with dust and undergo treatment by dust collectors. Previously due to the high temperatures cooling is required. Waste exhausts consist on steel panels covered internally with insulating fiber.

Downstream the process, the melted material is thrown to a water tank, in which it becomes vitreous, necessary for the product features. This material is following milled to reach required particle size, which is between 200 and 600 micrometres. Heat consumption is given, depending on the material, before or after the milling process, to ensure complete drying of the product to continue the process.



Figure 10. Screenshot: ceramic sector.

Aluminium Sector

Replication in aluminium sector

ASAS, aluminium manufacturer, is involved in the project to assess the replicability of the retrofitting solutions in the aluminium sector by means of CFD simulations in one of the furnaces, as well as evaluating the suitability of the in-house holistic tool towards decision making in the retrofitting actions and prediction of overall performance in two furnaces. ASAS is a big aluminium manufacturer, and its facility counts with the following elements: 4 melting furnaces of 24 tonnes each, two homogenization furnaces, seven gas furnaces on extrusion process and finally, five aging furnaces with a total capacity of 250 tonnes per day of aging. In total, the production of the plant is 75.000 ton/year of aluminium profiles, 25.000 ton per year of PVC panel production, 10.000.000 m² per year of composite panel production. The actions expected within the project are the following:

- Selection of one melting furnace suitable for the analysis of retrofitting solutions developed in VULKANO in an integrated approach, so that to validate, at CFD simulation level, the feasibility of those solutions in the aluminium sector and therefore the real replication potential they have.
- The validation of the holistic in-house predictive tool as a support for decision making in the retrofitting of furnaces for the aluminium sector, validating the cross-sectorial approach and providing, if necessary, modification parameters to finalize the in-house predictive tool in the same two types of furnaces involved in VULKANO (preheating and melting).

The involvement of the aluminium sector is crucial to enlarge replication potential, and ensure that cross-sectorial approach is fully covered within VULKANO



Figure 11. Screenshot: aluminum sector.

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3.4 Publications

Within this section different public documentation will be posted, keeping the website updated with the results obtained. In particular, the following materials are considered to be uploaded in this section:

- Dissemination material
- Project public deliverables
- Publications

3.5 News and events

Any new related to VULKANO project will be posted in this section, either prepared internally by the consortium or any external news linked to the project topic.

More efficient industrial furnaces to boost European industry competitiveness

Eight countries will be joining forces under the EC-funded VULKANO project coordinated in Spain by CIRCE

The project forecasts a 20% increase in industrial furnace efficiency in the steel, ceramics and aluminium sectors, as well as a 27% reduction in the use of fossil fuels

Energy intensive industries are constantly facing challenges to enhance their process efficiency, reliability and flexibility. This is especially true for processes that involve industrial furnaces due to their high energy consumption rates, placing them under the spotlight of much research to make the whole system more sustainable and competitive.

The VULKANO project emerged with this objective in mind, with the aim of designing, implementing and validating innovative solutions, and applying them jointly so as to **boost and increase the efficiency**, both in terms of energy and the environment, of industrial furnaces supplied by natural gas and of their related processes. The initiative has been allocated close to 7 million euros by the European Commission and is coordinated by the Centre of Research for Energy Resources and Consumption (CIRCE). During VULKANO's planned three-and-a-half-year duration, CIRCE will be heading up a consortium of 12 partners from Slovenia, France, Italy, UK, Poland, Germany, Turkey and Spain with a view to bolstering Europe's industry.

The VULKANO project will focus on modernising the two most widespread kinds of industrial furnaces: those used during the pre-heating and fusion phases, which are used in two **energy-intensive sectors** (steel and ceramics). It will then analyse the feasibility of replicating them in another key sector: aluminium. VULKANO expects to achieve a 20% increase in the global efficiency of these furnaces, and at least 27% fuel savings, which would lead to a lower associated environmental impact.

The partners will be able to achieve these objectives by developing and integrating five innovative strategies. Firstly, they will develop technology based on **phase-change materials** in order to store and reuse the power obtained from the process both up-and downstream from the furnace, as well as **new refractors** with which to overcome the current limitations on these materials in terms of durability and to improve the furnace's specific energy efficiency. It is also estimated that up to **40% less natural gas** will be used and replaced with alternative or renewable energy sources. To do so, either a new burner will be designed or current furnaces will be adapted to run on syngas obtained from biomass or other gases recovered from the process itself. Secondly, they will develop a system to monitor and control the process in order to enhance overall efficiency by solving the problems that individual subsystems have in terms of integration.



Figure 12. Screenshot: first new posted on the website.

4 CONCLUSIONS

Due to the timing of the project, no conclusions have been obtained so far.