

Getting Closer To Green Casting Foundry - Sustainable Development

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Abstract: The article presents the main assumptions of the activities carried out as part of the European project GREEN CASTING LIFE (LIFE21 ENV/FI/101074439) ^[1], which is an initiative to assess the potential benefits of inorganic binder systems in European ferrous alloy foundries. GREEN CASTING LIFE project aims to improve the environment and working conditions in European iron alloy foundries by introducing cleaner and ecological production methods using new innovative inorganic binders ^[1-3]. The Green Casting Consortium ^[1] includes 16 partners from 8 European countries such as Finland (Project Coordinator – Meehanite company), Spain, Poland, Italy, Czech Republic, Germany, France and Estonia including 6 flagship foundries ^[1]. The work carried out as part of the GREEN CASTING LIFE project will enable the implementation and validation at the industrial level of the use of inorganic binder systems for the production of molds and cores in iron alloy foundries, achieving the level of Technological Readiness Level TRL8 ^[1]. In addition, the new knowledge obtained will be included in the new version of the Reference Document on Best Available Techniques (BAT) in the Smitheries and Foundries Industry (BREF), which is expected to be published in 2024, as a future reference BAT for all EU finds. ^[4].

Keywords: green casting, innovative technologies, green production, sustainable development,

1 Introduction

LIFE programme is the EU Programme for Environment and Climate Action ^[1]. It's one of the key contributor programme to the European Green Deal (COM(2019) 640 final) which aims ^[1]: To transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use; To protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment and climate related risks and impact.

GREEN CASTING LIFE project aims to demonstrate the technical and environmental feasibility of using new inorganic binders, instead of traditional organic ones, in ferrous foundries ^[1]. Casting represents one of the major sources of dust and Hazardous Air Pollutants releasing to

the atmosphere hazardous compounds (NO_x, SO₂, PM_{2.5} Polycyclic Aromatic Hydrocarbon, BETX, etc) and thus affecting directly to the occupational risk of the workers and air quality indicators at urban areas ^[1]. In addition, casting processes produce a huge amount of undesirable waste representing 6 million tons of spend foundry sand in Europe per year, being mostly landfilled ^[1]. Arising from promising results obtained in a funded ongoing LIFE project: LIFE17 ENV/FI/000173 GREEN FOUNDRY LIFE (2017- 2022), where harmful emission reduction between 70% and 90% was achieved in indoor air quality and sand circuit stack emissions ^[1, 5]. However, the implementation of the inorganic system in a foundry goes beyond this emission results and needs to be carefully planned, dealing with technical and process challenges ^[1]. In GREEN CASTING LIFE project, 6 heterogeneous and complementary European flagship ferrous foundries from Spain, Poland, Estonia, Finland and Italy have joined the consortium to implement at industrial scale the inorganic system on their production process implying major changes starting with the selection of the suitable inorganic system, changes in processes and investments in new equipment ^[1]. In parallel, different sand reclamation methods will be demonstrated and external reusing applications will be studied ^[1]. Based on the results obtained, the foreseen techniques will represent an outstanding knowledge for BAT technologies participating to tackle environmental problems and to produce greener products in the European market ^[1, 4].

2 Conclusion

The main objective of GREEN CASTING LIFE is to demonstrate that the implementation of tailor-made inorganic binder systems in Ferrous foundries is a very relevant positive Environmental impact solution for European foundries industries ^[1]. Using inorganic binder systems can decrease hazardous emissions from casting processes, improve indoor air quality and quality of waste sand and improves waste sand reuse applications ^[1]. To achieve this main goal, Green Casting Life is divided into the following specific objectives ^[1]:

Technical objectives ^[1]:

To develop tailor made inorganic binder systems solutions for iron and steel foundries;

To successfully implement and validate tailor made inorganic binder systems at industrial scale, for the first

time in Europe, in 6 flagship foundries from 5 European countries;

To demonstrate three different type of sand reclamation methods for inorganic binder system sands (thermal, mechanical and wet methods);

To develop the mixed inorganic and organic foundry sand regeneration systems by demonstrating different regeneration methods for the flagship foundries to reach an amount of recycled sand of min 75% in the moulding processes;

To enhanced exploitation and replication potential by analysing the status of European foundries, guiding and assisting selected follower European foundries;

Providing the results and experiences for the preparation of the Reference Document on Best Available Techniques in the Smitheries and Foundries Industry (BREF document) ^[4];

To ensure an efficient communication and dissemination of the project activities and results to the general public and relevant stakeholders at European level ^[1].

Environmental objectives [1]:

To reduce total hazardous airborne emissions from casting processes by 90-95% by targeting the following figures for the most critical compounds eg. benzene, toluene, ethylbenzene, xylenes (BTEX), SO₂, NO_x, formaldehyde etc.;

To create a healthier environment for the workers by improving indoor air quality in foundries by 70-80% for the most critical compound eg. BTEX, formaldehyde, polycyclic aromatic hydrocarbons (PAHs), etc.;

To reduce the harmful substances in waste sand by 80-90% in following compounds: dissolved organic compounds, phenol, fluoride, BTEX;

To reduce total hazardous airborne emissions from casting processes of the 6 flagship foundries by 90-95%.

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