Inorganic binder system to minimize emissions, improve indoor air quality, purify and reuse of contaminated foundry sand

Green Foundry

(LIFE17 ENV/FI/000173)

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The main objective of the Green Foundry project is to decrease the environmental impact of the European foundry industry by introducing novel technologies for sand molding systems. The general idea is to demonstrate new inorganic binder systems in ferrous foundries.

The application of modern sand molding systems based on inorganic binders would have a significant positive environmental and economic impact leading to increased competitiveness of the industry. To reach the main objective, the consortium of highly skilled European experts behind the Green Foundry project have defined seven specific objectives to be reached within the framework of this project:

1. **Decrease hazardous air emissions from the casting process** – the project aims to replace the currently used organic binders with new inorganic binders
2. **Improve the indoor air quality for a safer work environment** – organic binders emit hazardous casting fumes and fine particles like binder aerosols
3. **Improve the use of natural resources** – using inorganic binders would allow foundries to use the foundry sand more efficiently. Project aims to demonstrate different methods for purification and re-use of surplus sand.
4. **Provide encouraging examples for the industry on an EU level** by implementing the new inorganic sand molding systems in iron and steel pilot foundries.
5. **Produce the necessary practical tools for the industry** with required information on the implementation of inorganic sand molding systems in ferrous foundries.
6. **Disseminate the results on EU level** for immediate implementation of the best practices
7. **Provide Smitheries and Foundries BREF with BAT publication** including technical solutions of inorganic binder systems in ferrous foundries.

Main actions:

1. **Small scale tests casts** will be made in Finland and Poland to measure the emissions of the casting processes. The measurements will made for ferrous castings using both organic and inorganic binder molds. Chamber test methods and tests in laboratory foundry will be applied. Responsible partners: AGH University in Poland and Karhula Foundry and AX in Finland.

2. **Total emissions** of five pilot foundries will be measured and compared. One stainless steel foundry using organic binder system (FI); two cast iron foundries, one using organic binder system (FI) and one using inorganic binder system (water glass, SE); two aluminium foundries using new inorganic binder systems (FR). Responsible partner: AX will do all measurements.

3. **Indoor air quality** will be measured and compared in four of the foundries mentioned above. Responsible partner: AX.

4. **Full production scale test series with inorganic binder system molds** will be made in two ferrous foundries. Inorganic binder suppliers will be contacted in early stage of the project to receive the newest information about the state-of-art and to choose the best inorganic binder options for the tests. Karhula Foundry in Finland is demonstrating stainless steel castings in size range of 4…20 tons using different inorganic binders and sand types. Binder-sand combinations based on the recommendations from the binder suppliers will be pretested using test sample molds. FOM Tacconi in Italy is demonstrating alloyed iron casting in size range of 3 kg using different inorganic binder cores and molds. The properties of the cores and molds as well as the quality of the castings will be widely tested

5. **Foundry sand recycling** options will be tested and compared for inorganic and organic binder sands. Thermal treatment and ultrasonic + microwave methods for sand reclamation will be demonstrated. Recycled sand will be tested also in core making. Responsible partner: CTIF in France and Association of Finnish Foundry Industry in Finland.

6. **Purification methods for surplus foundry** will be demonstrated. Waste sands from organic and inorganic binder systems will be tested using composting (FI, ES) and washing (ES). The goal is to find ways to reuse surplus foundry sand e.g. in geo construction or soil mixture instead of land filling. The cleaning of surplus foundry sand by composting method was developed and tested with organi binder system sand in previous LIFE project called “Foundry Sand” (LIFE13 ENV/FI/000285) in 2014-2018, coordinated by Meehanite Technology. This LIFE project is now focused on reuse of inorganic binder system sand.

7. **The results of the project** will be disseminated widely. National seminars for all relevant stake holders will be arranged by partners. Technical papers will be published on relevant magazines and will be presented on conferences, seminars and fairs. Information package including BAT publication describing the implementation of inorganic binder system in ferrous foundries will be made. Training courses for interesting foundries will be arranged.

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