



Green Foundry LIFE project

LIFE17 ENV/FI/173

Action B5 Replication and transfer of the project results

Deliverable DeB5.3B Replicability and Transferability plan

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1. Introduction

The replication and transferability plan includes the measures to ensure that the results of the project are utilized to the greatest extent possible for the benefit of the European foundry branch. The plan involves activities aimed at increasing the adoption of the innovative solution of the project. Replicability strategy begins within the framework of this project by focusing on the replicability of the solution in other companies in the ferrous foundry industry, by looking in partner countries for other companies with similar processes as the pilot foundries of the project. Subsequently, the consortium will look for the possibility of the replication to other countries. In addition, the transferability strategy envisages the application of the same solutions to other sectors with similar characteristics to the sectors studied in the Green Foundry LIFE project (e.g. bronze foundries).

The plan includes the means to find and contact potential candidates for replication and transfer, as well as methodologies and database to convince candidates about the use of inorganic binders in everyday practice.

2. Potential target groups for replication

Main target group is the European ferrous foundry branch. Project consortium had already at the beginning of the project wide contact network in European ferrous foundry sector. During the project the contacts has been vastly expanded due to the new contacts created in many events where partners have been participated and also during the preparation of the new Green Casting LIFE project application. One example was GIFA fair in 2019, where most of the partners were present. Project dissemination activities have also created new contact. Main example is the project's public Workshop arranged as the Webinar on April 22, 2022 due to Covid pandemic. Of ca. 100 participants many were from ferrous foundries which are interested in inorganic binders. The memo and the minutes of the discussions during the webinar was published in a separate deliverable "De 5.1A Content of the public Green Foundry LIFE project Workshop".

The Covid pandemic caused also that the national seminars, which were originally planned to be organized during the spring of 2022, many of the events were moved to the autumn 2022. In total 7 seminars were arranged by partners in Finland, France and Spain. Project partners will present the results of the projects in the foundry seminars in 2022, in which many significant foundries will participate, and new contacts will be made.

In autumn 2021, a continuation of the LIFE project (Green Casting LIFE) was applied for. Most of the current project partners were involved in the new application, along with ten new partners, including six potential "flagship" pilot foundries. Many other ferrous foundries were also contacted, and nine of them signed a letter of support for the project proposal.

The project consortium has accordingly the necessary contact network to start the replication activities in European ferrous foundries, which are interested in starting to apply inorganic binders.

2.1 Selection of the ferrous foundries for replication

The first action will consist of characterising the most viable foundries from a technical and economic point of view. The selection of future candidates will be based on:

- The technical feasibility considering the know-how of the potential foundries

- The economic viability for achieving a versatile design of the inorganic binder system implementation for being adapted to different ferrous foundry processes
- The foundry's driving forces towards cleaner foundry processes (customers, authorities, employees, surrounding society, ...)
- The interest of the foundry

2.2 The replication methodology

The replication methodology is described in detail in the business plan (DeB5.3A Business plan).

Main steps are described here:

Interview

The potential customers will be approached directly by email and phone call. When the customer expresses interest, a face-to-face interview will be arranged with the key personnel.

The interview will include:

- Existing production processes and products
- Interest and experiences with inorganic binders
- Targets and technical requirements for cores and moulds
- Which product lines are planned to be changed to inorganic binders
- Possible needs for new sand reclamation methods and equipment
- Needs for waste sand treatments eg. mechanical treatment method, composting method, etc.
- Possible need for ventilation

Implementation plan

This plan will be specific for each foundry and will include eg. the following information:

- Type of inorganic binder selected for core and mould making
- Process changes in the relevant areas
- Investments needed in the decided production lines
- The figures for the full inorganic implementation,
- Cost estimations of the investments
- Composting sites and methods
- The design of changes for ventilation

Realization of the implementation plan

The implementation of the customized plan which was made according to needs and wishes of the customers can include eg. the following steps:

- The training of the key group of employees
- The pretests with the most feasible inorganic binders in the foundry or by a sup-supplier
- The investments of the equipment for moulding and other necessary accessories
- The investment of the equipment for the chosen sand regeneration method
- The investment of the ventilation equipment
- The testing and commissioning of the invested equipment
- The implementation of the composting site, including commissioning, testing and sampling
- The consultation with the authorities and the preparation of the environmental permits

3. Transferability

The transferability strategy plans the application of the same solutions to other sectors with similar characteristics to the sectors studied in the project. In the foundry industry, light metal foundries have been pioneers in the use of inorganic binders. In light metal casting, the technical requirements for binders are less demanding due to the much lower casting temperature and lighter specific weight. Therefore, light metal foundries (mainly aluminum) are not the target group of the transfer of the method. But there are metals whose casting temperature and specific weight lie between aluminum and ferrous metals such as brass and bronze. To our current knowledge, there are very few brass and bronze foundries (5-10) in Europe that have experiences with inorganic binders. While preparing the follow-up project proposal (Green Casting LIFE), we were in contact with one Spanish bronze foundry which have started to use inorganic binders. Based on their experience, we expect that the same methods and inorganic binders that can be used in ferrous foundries will also be applicable in brass and bronze foundries. The same procedures as in section 2.2 Replication methodology should be feasible accordingly.

4. Data base

This section describes the most important database and group of expert knowledge created during the project. This is the basic info needed to replicate and transfer the application.

4.1 Project web site

The project's website www.greenfoundry-life.com contains project deliverables on the project's activities and other information, e.g. of events in which the partners have participated and also future activities to be carried out after the end of the project. The reports are open to all partners. Public versions of confidential reports have also been prepared and uploaded to websites.

4.2 BAT report

The BAT report has been prepared and proposals of Best Available Techniques (BAT) and Emerging Technologies (ET) have been sent to BREF TWG working group for feedback in June 2022. The final BAT report is a separate deliverable “DeB5.1B BAT publication” and it is distributed to relevant stakeholders in electronic form.

The main conclusions in BAT report are:

The Green Foundry LIFE project developed concrete proposals for uptake of the respective technologies and processes in the updated version of the Best Available Technology Reference Document (BREF) for the smitheries and foundries industries currently in preparation through the established Seville process as either Best Available Technology (BAT) or Emerging Technology (ET) candidates. The technologies are listed in Table 1 below together with the current status as BAT or ET.

TABLE 1: OVERVIEW OF TECHNOLOGIES COVERED IN BAT REPORT, WITH CURRENT AVAILABILITY STATUS.

Designation of technology	Status
Use of inorganic binders for moulds in iron and steel casting	ET
Use of inorganic binders for cores in iron and steel casting	ET
Thermal reclamation of foundry sand	BAT
Composting of waste foundry sand	BAT
Washing of foundry sand	ET
Ultrasonic treatment of foundry sand	ET
Hydromechanical treatment of foundry sand	ET

The respective technologies and processes are described in detail in BAT report based on a structuring which reflects the BAT template adopted for feeding such proposals into the Seville process.

At this moment we have not yet received feedback from the BREF Working Group.

Project partners Dirk Lehmus from IFAM (the writer of the BAT report) and Juhani Orkas from Technology Industries of Finland have been in contact with the BREF Working Group.

The possibility to include these technologies in the revised **Smitheries and Foundries BREF** would make it much easier to replicate them. It would also put pressure on major binder suppliers to further develop these new types of inorganic binders.

4.3 Project consortium and expert group

During the project activities and preparing the continuation of the LIFE project proposal (Green Casting LIFE), together with the project consortium, we have formed an informal group of experts with extensive knowledge of inorganic binders. This group consists of approx. 50 experts from foundries, suppliers of inorganic binders, suppliers of foundry equipment, R&D institutes, universities and national and international foundry associations. Numerous contacts during the project in different ways (face-to-face, video meetings, e-mails and phone calls) facilitate the sharing of information and the resolution of possible problems arising during the replication and transfer activities.

5. Other actions for replication and transferability

5.1. Follow up seminars

After the project, follow-up seminars/meetings will be organized. Typically, seminars are held in conjunction with annual national foundry meetings or international foundry seminars, conferences or trade shows such as GIFA. These events bring together a large group of foundry people and the project experts can share information about the project and also tell about subsequent success stories to attract new foundries to start to use inorganic binders. Partners are committed to continue

the dissemination of the project activities and results also after the end of the project by their own work contribution. Close cooperation will continue with partners and follow up activities are planned to continue the work for implementing the inorganic binders in ferrous foundries.

5.2. Training courses

Training courses for the personnel of iron and steel foundries will be also arranged parallel the pretests of the inorganic binders in the foundries. Training sessions are planned to be carried out in at least 50 ferrous foundries by project partners within 4 years after the end of the project. Training sessions can be arranged also parallel the relevant events and annual foundry seminars.

6. Number of foundries using inorganic binders

The estimate of the current situation is that roughly 1 % of European foundries (= ca. 40) use inorganic binders. Acc. Foseco, most of them are aluminum foundries. Based on the information received from the producers of inorganic binders, there are of only 5...6 ferrous foundries in Europe which have started to use inorganic binders in everyday practice, at least in part of their production.

The advantages of using inorganic binders also in iron foundries (environmental, health and economic benefit) are significant. The pressure from customers, authorities, employees and the surrounding communities of the foundries to switch to "greener" production is constantly increasing. Future version of BREF for Smitheries and Foundries will most probably include BATs and ETs related to inorganic binders, which will induce more R&D of the new type of inorganic binders. Therefore, when preparing the new Green Casting LIFE project proposal, we estimated that after 5 years of the project, i.e. 8.5 years from now, 400 European ferrous foundries have started using inorganic binders in at least some of their operations. This number is about 24% of the current number of iron foundries in Europe.