After Life Communication Plan

Re-use of foundry sand by composting

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LIFE13 ENV/FI/285

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AIM OF PROJECT

The aim of the LIFE Foundrysand project was to clean the surplus foundry sand by composting method and to keep contaminated foundry waste sands away from landfills. In coming years landfills have less capacity and therefore the aim was to improve acceptance of this generally valuable cleaned and recycled soil material to be used for geo-engineering or agriculture applications.

In Europe, around 18 M tons of foundry waste sand is left over every year and in many cases big landfills do not have enough capacity to deposit those large amounts of waste sand. In most countries several smaller landfills are being closed and replaced by large so called "EU landfills", so the distances and transport costs to the landfills are also increasing for the foundry companies and alternative ways of treating those wastes in a more environmental friendly way have to be found.

The main idea is to study the quality of the surplus foundry sand specimens to fulfil the compost end-product requirements for re-using the cleaned foundry sand in geo-engineering applications. Therefore, the specific objectives are to:

- develop a new method for cleaning and re-using foundry sand through composting;
- produce a surplus foundry sand quality control and sand samples process manual for foundries;
- produce guidelines on practical level for foundries and suppliers of the cleaning service in Europe;
- improve acceptance of this valuable material (the cleaned foundry sand) for geo-engineering applications, especially in areas of low humus content in soils this can be a valuable exercise to create soil as an artificial layer in order to improve fertility, and to substitute synthetic fertilizers.

There is a future vision of this sustainable composting system (or service) that can be transferred to the areas where several foundries operate in the same region to clean the surplus foundry sand for reuse purposes. There are about 4000 sand foundries in Europe – estimated 200 of them could apply this new method by 2020 and 1000 in Europe by 2025. At the moment only the foundries equipped with the thermal sand reclamation can treat surplus sand in sustainable way. They do it in recycling but not in disposing yet while this is expensive and not obligatory.

Project started in August 2014 and ended in December 2017.

PROJECT RESULTS

Different types of surplus foundry sand specimens were tested and cleaned by this innovative composting method. Furan, phenolic, green sand surplus foundry sand types were mixed with organic materials. Surplus foundry sand specimens containing heavy metals cannot be treated by composting method.

All sand specimens from pilot foundries were analysed before composting tests. The degradation of harmful organic substances from the surplus foundry sand composting material was analysed throughout the tests. Samples were collected and analysed in the beginning, middle and end of each test. Environmental impact assessments were also carried out including emission measurements, odour modelling and waste water analyses.

Figures 1 and 2. Composting material samples and waste waters from the pilot site.

In total 20 composting test heaps size of about 20-40 tons each were constructed and tested in Finland. Eight test heaps were constructed and tested in Spain. The aim was to carry out the composting tests under different climate conditions. Also winter time period composting test trials were carried out in Finland (December 2015-June 2016). The composting test period was 4-5 months after which the post-maturing time of about 6 months is always needed.

In total 960 tons of surplus foundry sand composting material was cleaned during the project in Finland and Spain.


Figures 3 and 4. Emission measurements of the composting test heaps.

The results demonstrate that the harmful organic substances of surplus foundry sands such as phenols, BTEX, fluoride and PAHs were effectively degraded during the composting tests. The cleaning efficiency of 97% was reached e.g. with phenols and PAHs. The compost end-product fulfilled the national limit values set in Finland and Spain. The *Decree of the Ministry of Agriculture and Forestry on Fertiliser Products (24/2011): Substrate – Mixture soil (5A2) in Finland and the Royal Decree 506/2013 of 28 June on Fertilizer in Spain*. These regulations set limit values and demands for heavy metals of the end-product, pathogens (Salmonella and *E. coli*) and impurities (weeds, garbage). The cleaned foundry sand end-product can be used in geo-engineering purposes.

Figure 5. Sieving of the compost end-product at the end of the composting.

Environmental acceptance of surplus foundry sands requires reliable knowledge on the sand composition and its variation especially regarding environmental properties. A quality control system is needed if the certification of used foundry sand as a composting material is aimed for. Reliable analyzing methods for waste characterization and quality control and the importance of

the sampling procedure are emphasized in re-use of surplus materials. The surplus sand quality control and sand samples process manual was produced in the LIFE Foundrysand project. This guideline provides a clear and contemporary advice to foundries, compost manufacturers and local authorities to ensure the consistency in quality of the surplus/waste sand produced in foundries.

In addition general composting field construction recommendations were produced including environmental impact minimization activities and estimations of the investment costs.

Dissemination after the LIFE project

Events

1) Workhop at FEAF (SPANISH FEDERATION OF FOUNDRY ASSOCIATIONS) in 2018. Presentation by Tecnalia.
2) 73rd World Foundry Congress (WFC): Starting on 23rd of Sep and finishing on 27th of Sep 2018 at ICE Krakow Congress Centre. Tecnalia will participate in this event.
3) BAT techniques in foundries: SVY päivät in February in 8-9th of Feb in 2018 in Tampere. Arranged by Suomen valimotekninen yhdistys in Tampere. Prof. Juhani Orkas will arrange this event.

Publications to be published in 2018

1) Tecnalia will produce articles in the Empresa XXI / Tecnalia Research & Innovation Fundacion magazine and WFC 2018 congress publication in 2018.
2) Meehanite will produce one article in Valimoviesti magazine (Suomen valimotekninen yhdistys) in 2018.
3) AX will produce one article in AX magazine in 2018-2019.

Other activities

Meehanite Technology and other partners will disseminate the results in future events and happenings related to the applicability of composting method in cleaning the surplus foundry sand and producing compost end-product which can be reused in geoengineering purposes.

Networking activities with other LIFE project in 2018

The FOUNDRYTILE project (LIFE14 ENV/ES/000252). Exchanging experiences and discussing of the results from both LIFE projects. Valorization of iron foundry sands and dust in ceramic tile production process. Planning future cooperation activities related to reuse of foundry waste sands and dusts.

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Project data

Project title	Re-use of foundry sand by composting
Project location	Finland
Project start and end date	08/2014-03/2018
Project duration	44 months
Total budget	2,051,644 €
EC contribution	996,070 €
Project website	www.life-foudnrysand.com
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