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Summary of the project action B3 “Test series of molds, cores and casts produced by inorganic and organic binder systems”

Results from the production scale test casts in Karhula Foundry (FI) and Valumehaanika (EE)

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The tested inorganic binders were from three different binder producers, with the brand names of:

- **Inotec TM from ASK Chemicals GmbH**
- **Cast Clean from Peak Deutschland GmbH**
- **Geopol® from Sandteam spol s.r.a.**

Inotec TM binder system consist of fully inorganic binder and promotor. The hardening processes in this system need treatment at elevated temperature of 150…200^{o}C.

Geopol® and Cast Clean binder systems consist of fully inorganic binders and organic hardeners (ester solutions). These binder systems harden at ambient temperature, and they are therefore called as “self-setting”

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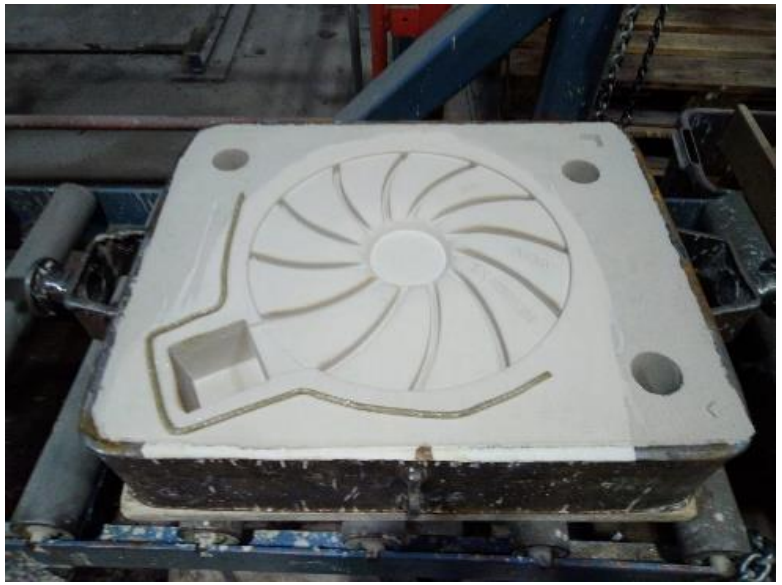
Karhula Foundry in Kotka, Finland

Karhula Foundry produces demanding middle to large size special castings for global markets. The cast materials include wide variety of cast irons, steels and stainless steels. Typical products are e.g. casting for pumps made of duplex stainless steel



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Karhula Foundry in Kotka, Finland

- **Karhula Foundry demonstrated Inotec TM, Cast Clean and Geopol® inorganic binders in mould and core making by using separate test mixers and hand moulding**
- **Pretests were first made with all inorganic binders for finding the feasible recipes of binders and promotors/hardeners and other process parameters**
- **Two of inorganic binders were also used in chamber tests to measure the total emissions from a test mould after pouring. The weight of chamber test casting was ca. 200 kg. The measured emissions were compared with the emissions from organic Alphaset binder mould.**

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Karhula Foundry in Kotka, Finland

The bulk of the demonstration consisted of the manufacturing of several full production-scale series of test moulds with all three inorganic binder systems.

Test castings were typical foundry's products, made of different types of stainless steels.

Weight range of test castings was 15…2500 kg.

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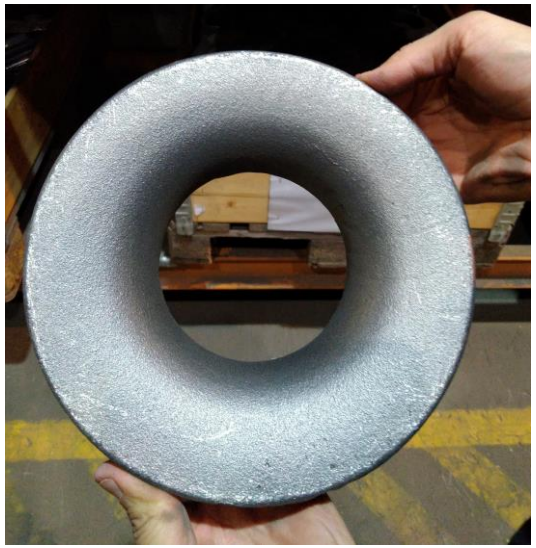
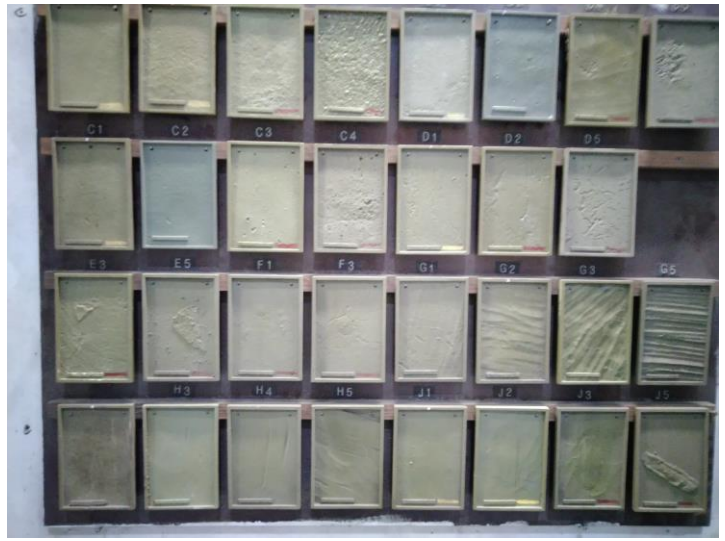
Karhula Foundry in Kotka, Finland

The quality of test castings was measured:

- **Surface quality by using comparison tables**
- **Cracks and gas pinholes by dye penetrant method**
- **More detailed quality tests were made by CTIF in France**





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Results and experiences in Karhula Foundry:

- **It is possible to produce the moulds by the tested inorganic binder systems having the equal quality properties compared to the current organic phenolic Alphaset method**

- **The quality of the castings was as good as with the current products made by organic binder system moulds**

- **The inorganic binder which needs heating to elevated temperature is not feasible for the current production, due to risk of deformation of wooden or plastic core boxes, and prolonged production times. Patterns and core-boxes should be made of heat resistant material e.g. metal**

- **Self-setting inorganic binders can be applied in mould and core making with the current patterns and core boxes**

- **The implementation of inorganic binders in full scale production would require investment of separate mixer line.**

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Valumehaanika in Tartu, Estonia

Valumehaanika AS is an iron foundry locating in Tartu, Estonia.The current organic binder system is phenolic Alphaset system. Typical casting sizes vary between 5…100 kg, and they are used eg. in machines, generators and furnaces and other heating equipment.

Typical products:

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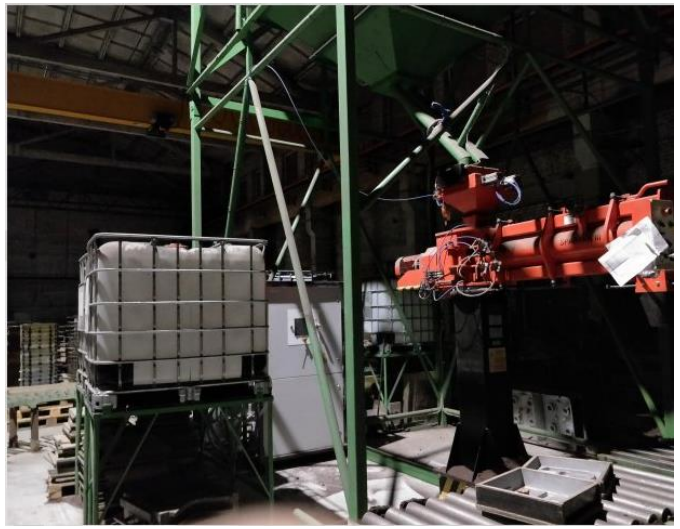
Valumehaanika in Tartu, Estonia

- **“Self-setting” Clean Cast and Geopol ® inorganic binders were tested, by using the current modern continuous mixer line. Hand moulding was applied.**
- **Several production scale test series of moulds were manufactured by both inorganic binder systems. Moulds were painted by alcohol based Zr coatings.**
- **The size range of the test castings was 5…200 kg.**
- **Cast material was the gray cast iron EN GJL-250 and casting temperature was ca. 1450 ºC**



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Results and experiences in Valumehaanika:

- Self-setting inorganic binders can be used instead of organic Alphset in continuous mixer lines

- The quality of the castings was comparable with the casings made by current organic binder system

- The feasible recipes of the binders and hardeners is dependent on circumstances, eg. ambient temperature, in the foundry.

-Valumehaanika is planning to invest a separate moulding line for inorganic binders

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Results and experiences, sustainability:

The results from production-scale utilization of inorganic binder systems in ferrous foundries are promising, the emission reductions are very significant and quality of the castings is comparable with the castings made by organic binder systems.

The project have learned that the extensive use in ferrous foundries requires:

- **Vast knowledge about different inorganic binder systems and their proper implementation into current or new production lines**
- **In most cases investments for moulding, core making and sand regeneration equipment are needed and broad testing should be done before commitment**
- **Traditional nature of the branch: there are not yet enough examples about successful replacements, so that the foundries would dare to start the change**

Therefore a new LIFE project proposal “Green casting LIFE” is applied, for demonstrating very widely the use inorganic binders in European ferrous foundries in full production scale

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Thank you for your attention!

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