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Networking for advancing excellence and capacity in light-weight castings for Foundry 4.0 in Poland

Environmentally friendly foundry molding sands as a part of Green Deal policy

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Green Deal policy

In 1972, the first United Nations Conference on the Human Environment was held in Stockholm. It recognized environmental issues as a central international problem and approved the principles of environmental stewardship, including the Stockholm Declaration and the Environmental Action Program. In 1992, the "Earth Summit" was held in Rio de Janeiro. Many important declarations were adopted at the summit, such as Agenda 21, the Rio Declaration, the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity. The above activities on the international arena resulted in the adoption of the following European treaties:

- ✓ In **1972**, the European Council meeting in Paris declared the need for a Community environmental protection policy to accompany economic policy.
- ✓ In **1987**, the Single European Act introduced a new Title VII, "Environment," which provided the first legal basis for a common environmental policy.
- ✓ In **1993**, the Maastricht Treaty made the environment (Title XVI) an official EU policy area.
- ✓ In **1999**, Article 3c of the Treaty of Amsterdam mandated the integration of environmental protection into all EU sectoral policies.
- ✓ In **2007**, climate change and sustainable development became a priority under the Treaty of Lisbon.

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https://www.europarl.europa.eu/factsheets/pl/sheet/71/polityka-ochrony-srodowiska-ogolne zasady-i-podstawowe-ramy; access 19-02-2025

Green Deal policy vs. foundry molding sands

Ensuring the appropriate technological properties of the mold and core and high process efficiency are very important conditions for the development of molding sands. The high economic efficiency of the process consists of its productivity, including the speed of mold and core making, the prices of raw materials, the costs of production, the costs of knocking-out, finishing and cleaning castings, and the costs of employing workers, including qualified personnel.

The need to meet high environmental standards is nowadays the dominant factor in the development of molding and core technology, which is even being done at the expense of reducing the technological properties of the materials.

Forsight Technologiczny Odlewnictwa Polskiego, pod redakcją J. Tybulczuka, Instytut Odlewnictwa, ISBN 978-83-88-770-42-5, Kraków, 2009

Green Deal policy vs. foundry molding sands

Due to the trend towards meeting high environmental standards, the molding material technologies that have been used successfully in foundry production processes for decades now need to be replaced by more environmentally friendly solutions. These include:

- **coal dust,**
- **alcohol protective coatings,**
- **molding sands with ethyl silicate,**
- **furan molding sands,**
- **cold-box technology.**

Major-Gabryś K., Odlewnicze masy formierskie i rdzeniowe przyjazne dla środowiska, Archives of Foundry Engineering Press, Katowice-Gliwice, 2016

Development trends – own research

Development trends in the field of foundry molding and core sands, which, in addition to taking into account the technological quality and economics of the manufacturing process, must also take into account environmental protection requirements. In Molding Materials Department of AGH University FFE For many years researchers have been dealing with issues related to the production of environmentally friendly molding and core sands. The following was elaborated:

- **Molding sands with sodium silicates with increased collapsibility.**
- **Molding sands with sodium silicates with better quality of reclaim obtained after their regeneration.**
- **Molding sands for ablation castings.**
- **Molding sands with inorganic binders for 3D printing.**
- **Ecological friendly molding sands with organic binders.**
- **Green molding sands (sands with clays) with reduced harmfulness.**

Conclusions

The following conclusions were drawn based on data analysis and own research:

1. Strict regulations in the Green Deal policy force the search for new technologies in the field of foundry molding sand.
2. Inorganic binder systems (silicates, aluminosilicates) are environmentally friendly technologies that can partially replace organic binder systems, ensuring excellent properties of the produced castings.
3. The introduction of a biodegradable additive to molding sands with organic binders can solve the problem of post-regeneration dust in foundry plants & waste management.
4. Due to the high potential of green sands, it is necessary to conduct research aimed at replacing environmentally harmful carbon additives with other materials ensuring high quality of casting surfaces.

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Thank you for your attention!

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