



# Hackathon!

## **DinexHackathon – Solutions and Technologies for Recovering and Recycling High Value Metals and Elements from Catalyst Manufacturing**

*Dinex Finland oy is producing catalyst materials, which contain high value platinum group metals and rare-earth elements. Dinex is looking for solutions and technology which allows the company to reduce the amount of waste generated in the catalyst preparation process as well as to recover the critical elements from the industrial residues. The aim of the DinexHackathon is to find more efficient solutions, technologies and business partners for recovering and recycling the high value metals and critical elements from the liquid washcoat slurries and washing waters generated in the process. In ideal case, all these elements would be recovered from the aforementioned waste and recycled back to the process, replacing the need for virgin raw materials. Circular economy at its best!*

## What is it about?

Dinex Finland manufactures catalyst components for exhaust and emission solutions for heavy duty trucks, construction and agricultural vehicles. Dinex is using high value platinum group metals (PGMs) and Rare-earth elements (REE) in preparation of catalysts for exhaust gas purification. Platinum group metals that Dinex uses include mainly Platinum, Palladium and Rhodium, and their prices are comparable or higher to world market prices for gold. The rare earth metals that Dinex uses include e.g. ceria (most important one), lanthanum, yttrium, praseodymium and neodymium.

## Challenge

Some of the prepared catalyst samples in the company's research and development as well as mass-scale production ends up as waste. Waste, produced in catalyst preparation process, can be in the form of liquid wash coat slurries and washing water. The waste can contain a wide range of elements, however the most interesting and critical for Dinex are the above mentioned PGMs and REE. Dinex has the need to find more efficient solutions and technologies for recovering and recycling the PGMs and REE, and in ideal case, all these elements would be recovered from the aforementioned waste, i.e. liquid wash coat slurries and washing waters, and recycled back to the process, thus replacing the need for virgin raw materials.



The wash coat slurry (in Finnish: tukiaineliöte, tukiaine) is basically a suspension of different particles in the solution together with some dissolved salts and some other components. Depending on the catalyst type, wash coat slurries contain mainly aluminum, cerium, zirconium and can contain small quantities of silicon, titanium, barium, lanthanum, yttrium, praseodymium, neodymium and PGMs. Washing water composition is the same as the composition of wash coat slurry, but with lower concentration of the components.

Currently, the liquid washcoat slurry waste and washing waters are sent to third party companies to be either recycled (PGMs) or disposed (all other elements). Naturally, it would be in the interest of Dinex to find a solution for reducing the amount of waste generated as well as for recovering these metals more efficiently in-house, than to be treated by an external third party waste handler.

## To take into consideration

The aim of the Hackathon is to find solutions and technology which allows Dinex to reduce the amount of waste as well as recover the critical elements from the industrial residues. The technical solution should be cost-efficient and there needs to be a possibility to implement it in house. The anticipated amounts of liquid wash coat slurry waste and washing water waste could be in the range of 100 kg -1 tn per batch. The approximated concentrations of PGM and REE elements (without ceria) in liquid wash coat slurry waste could be in the range of 0.05-1 % per batch. The approximated concentrations of ceria elements in liquid wash coat slurry waste could be in the range of 1-10 % per batch. The approximated concentrations of the same elements in washing waters is 10-100 times lower than approximated concentrations of the elements in wash coat slurries. As a target, the final form of recycled elements should be PGM nitrates or REE nitrates to enable re-use of them in Dinex's production process.

## What Dinex offers

Based on gained ideas and solutions, the connections and long-term relationship with companies working in the field can be established. For the best ideas, Dinex offers opportunity for commercial partnership and for testing and piloting the solution in the Vihtavuori plant in Finland. Successful applications can be extended to the other Dinex factory sites in India, China and Turkey. Dinex also offers partnership for product development if needed. Real business opportunities available!

#circulareconomy #recycling #recycledmaterials #chemicalindustry #catalysts #platinumgroupmetals  
#PGM #rareearthelements #REE #sustainability #greentransition #industrialresidues

# Welcome to solve the challenge!



## What is DinexHackathon?

BioPaavo and Kasvu Open, in cooperation with Dinex Finland oy, are opening a hackathon that aims to find solutions and technology which allows Dinex to reduce the amount of waste as well as recover the critical elements from the industrial residues. The aim of the Hackathon is to find more efficient solutions, technologies and business partners for recovering and recycling the high value metals and critical elements from the liquid washcoat slurries and washing waters generated in the catalyst manufacturing process. In ideal case, all these elements would be recovered from the aforementioned waste and recycled back to the process, thus replacing the need for virgin raw materials.

**Dinex Finland oy** develops catalyst washcoats for ceramic and metal substrates. These parts are key units in after-treatment systems of diesel and gas fueled engines to reduce the harmful exhaust emission such as carbon monoxide, hydrocarbons, nitrogen oxides to less harmful compounds such as nitrogen, water and carbon dioxide. Dinex Finland is one of the main tech centers of Dinex company providing new catalyst solutions and innovative products for customers and sister companies. Vihtavuori location in Dinex Finland has R&D facilities such as catalyst preparation and testing laboratories, engine laboratory, piloting laboratory, NPI scale production units and protoworkshops.

Dinex Finland is a subsidiary and part of the global Danish based Dinex Group, which has a long experience for commercial aftertreatment systems since 1982. Dinex is a leading global manufacturer and distributor of innovative engineered exhaust and emission control products and solutions for the heavy-duty diesel and gas fueled engines and industry. The constantly growing portfolio of more than 20,000 part numbers and complete systems represents everything from pipes, silencers, sensors and other exhaust accessories including advanced after treatment systems with own technologies of coating and substrates.

## Participants

Hackathon is open to all interested parties: companies, research institutes, educational organizations and students, as well as other actors. Your team can be made up of representatives of your organization, or you can form a team that crosses organizational boundaries for this very challenge!

**More detailed rules for participation:** <https://www.jamk.fi/en/project/biopaavo/biopaavo-hackathon/hackathon-rules-of-participation>

## Jury

The Hackathon jury consists of representatives from Dinex Finland oy, BioPaavo by JAMK, and representatives from 1-2 other expert organizations.

## Why participate?

- You get to “acid test” your idea and receive instant feedback from a potential customer
- Find new business opportunities: You have the opportunity to build long-term business cooperation, get to pilot your solution and, if needed, to do product development cooperation with the sponsoring company.
- As a finalist, you will have access to the experts’ know-how and professional mentoring free-of-charge
- Get to network with other participants and experts

## Timetable

- Publication of the challenge on Monday August 15<sup>th</sup>, 2022:  
<https://www.jamk.fi/en/project/biopaavo/biopaavo-hackathon/dinexhackathon>
- Submit your application describing briefly your idea and team by **September 15<sup>th</sup>, 2022** at the latest. In the preliminary proposal, we ask you to briefly describe your idea and the capability and the know-how of the team with which you will be involved in the challenge.
- The ideas and teams selected for the follow-up will be published on **September 30<sup>th</sup>, 2022**.
- The Kick-Off event will be held on **Monday October 10<sup>th</sup>, 2022**, 12 noon-4 p.m. EET when the participating teams will meet each other and representatives of the sponsoring company. At the kick-off event, representatives of Dinex Finland oy will tell the participating teams more about the challenge. You can participate in the event at BioPaavo in Saarijärvi (Kauppakatu 5, Saarijärvi, Finland) or online.
- Hackathon Day is organized on **November 10<sup>th</sup>, 2022** (full day event). At the end of the day the winner team(s) will be selected. You can participate in the Hackathon event either in BioPaavo in Saarijärvi or online.



**Sign up!**

Webropol form: <https://link.webropolsurveys.com/S/D4F6309220886319>

## For more information:

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## Organizer

**BioPaavo by JAMK is a Bioeconomy Business Accelerator** that aims to create new business and globally significant solutions to combat climate change in the international bioeconomy environment. BioPaavo's key tasks are to develop bioeconomy business and create sustainable business based on new innovations, utilizing new technologies and digitalization, developing abilities and know-how, and building business networks and ecosystems.

## In collaboration with

**KasvuOpen Ltd.** is a non-profit subsidiary of the Central Finland Chamber of Commerce, whose core idea is to make growth companies and top experts come together. KasvuOpen is a nationwide sparring programme for growth companies. KasvuOpen's sparring process has been applied from the Growth Runway method developed by Mr. Marko Seppä, Professor of growth business operations at the University of Jyväskylä, and his team.

The Bioeconomy Business Accelerator for Saarijärvi project is implemented by the **Bioeconomy Institute of Jyväskylä University of Applied Sciences** and is funded by the Regional Council of Central Finland with the support of the European Regional Development Fund, Sitra and the City of Saarijärvi. During the project, we organize hackathons to pilot and develop the services of the Bioeconomy Business Accelerator, and participation in hackathons is free-of-charge for both clients and participants.



Leverage from  
the EU  
2014–2020



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