



Q&A on the Mobile Kaamera Installation

1.1. General information about Kaamera

1.1.1. Kaamera

Kaamera is a new bio-based raw material that is extracted from the sludge granules that form during the Nereda® purification process. Due to its unique properties, Kaamera lends itself for multiple applications. It can repel and absorb water and it is fire retardant. It is also very suitable for coatings and composite materials. Currently, applications in agriculture prove to be very promising.

The first Kaamera plant in the world is located in Zutphen, the Netherlands. It is operated by the Rijn en IJssel Water Authority and has been producing Kaamera from the process water of the dairy industry since October 2019. The second plant in Epe by the Vallei en Veluwe Water Authority also produces Kaamera using sewage water mainly from households.

1.1.2. Partnership

The recovery of Kaamera from wastewater takes place within the National Kaamera Development Programme NKOP. In this programme, the Vallei and Veluwe Water Authority, Rhine and IJssel Water Authority, the Dutch Foundation for Applied Research in Water Management (STOWA), the Royal HaskoningDHV engineering consultancy, biotechnology company Chaincraft and Delft University of Technology work closely together.

All parties contribute part of the knowledge and expertise needed to recover, process and market the new raw material. From laboratory research to full scale recovery. In this way, the Water Authorities, the scientific community and the business community work together on a sustainable, circular economy.

1.1.3. Credentials

Kaamera is made possible in part by subsidies from the European Union (LIFE), the Ministry of Economic Affairs and Climate Policy of the Netherlands and the Province of Gelderland, with the cooperation of FrieslandCampina and the Energy and Raw Materials Factory, which is a collaboration of Dutch Water Authorities.

2. Description of the mobile installation; what will it be used for?

The WATER-MINING pilot follows in principle the same scheme like the successful Kaamera extraction installations in Epe and Zutphen (The Netherlands).

The installation consists of four mobile containers (see illustration below). The heart of the installation is a 20ft container with separation equipment (disc centrifuge / decanter centrifuge). This container is stacked on a 40 ft container with general equipment like pumps, tanks and control cabinet. A 10 ft container harbours a steam generator to heat the sludge and a 20ft container harbours the chemical storage and dosing equipment. Two reactors for warming and alkalisation of the sludge and for cooling and acidification of the Kaumera are part of the installation.

The pilot for WATER-MINING is containerized, transportable and due to batch process easily adjustable to various conditions encountered at various waste water treatment plants (such as granular sludge and wastewater properties)

In parallel the possibility to integrate phosphate recovery in the Kaumera extraction process and to produce green gas from an organic rich waste stream from the extraction will be evaluated on lab scale in the WATER-MINING project. This is however not part of the actual installation but might be integrated at a later stage of the project.

3. Why have the partners built this installation? What are the goals?

Kaumera from warm and cold climate regions should be compared. Are properties of Kaumera and of Kaumera products the same or do individual applications have to be defined? For the evaluation on the product site significant amounts of Kaumera have to be produced. Quantities from lab scale are not sufficient.

The installation serves to promote Kaumera and the Kaumera extraction technology on the Iberian Peninsula, the WWTP Utrecht, The Netherlands and perhaps beyond. Stakeholders should be able to visit the technology and see that it works reliable.

With the data from the pilot, reliable and plant specific mass balances for electricity, Kaumera yield, chemicals, water, waste streams can be made which are the basis for further scale-up considerations like business plans or environmental evaluations.

4. Why is it installed in Utrecht?

The owner and operators of the WWTP Utrecht are very interested in innovative technological solutions recovering raw materials with multiple market applications, making a major contribution to national's objective of sustainability and circular economy and reducing the total sludge discharge of the WWTP.

All Kaumera experts (operators, designers, scientists, product developers) are close by and give advice in starting up the pilot installation.

5. Where will it go in the future?

The plant will go to the WWTP Faro/Olhão, Portugal in the second half of 2022. The owner of the WWTP has similar interests as their Dutch colleagues in Utrecht.

For the future business development of Kaumera it is important to know if Kaumera produced from wastewater treatments located in different climate zones with different wastewater characteristics differs and if individual applications have to be defined.

The pilot is transportable and it can be brought to further Nereda® plants to evaluate and promote Kaumera extraction technology.

6. Which partners are involved?

Official WATER-MINING Partners:

- TUD coordinates work in this work package of the WATER-MINING project including research on phosphate recovery, alkaline fermentation and the evaluation of Kaumera properties / Kaumera applications.
- Águas do Algarve: Owner and operator of the WWTP in Faro/Ólhao.
- ACCIONA is licence holder for the delivery of the granular sludge Nereda® technology for Portugal and Spain and has an interest in the Kaumera developments on the Iberian Peninsula.
- Lenntech: Detail design, assembly and commissioning of pilot in Utrecht.
- RHDHV supports all research / engineering in the work package.
- Wetsus: Research on combining Kaumera and phosphorus recovery

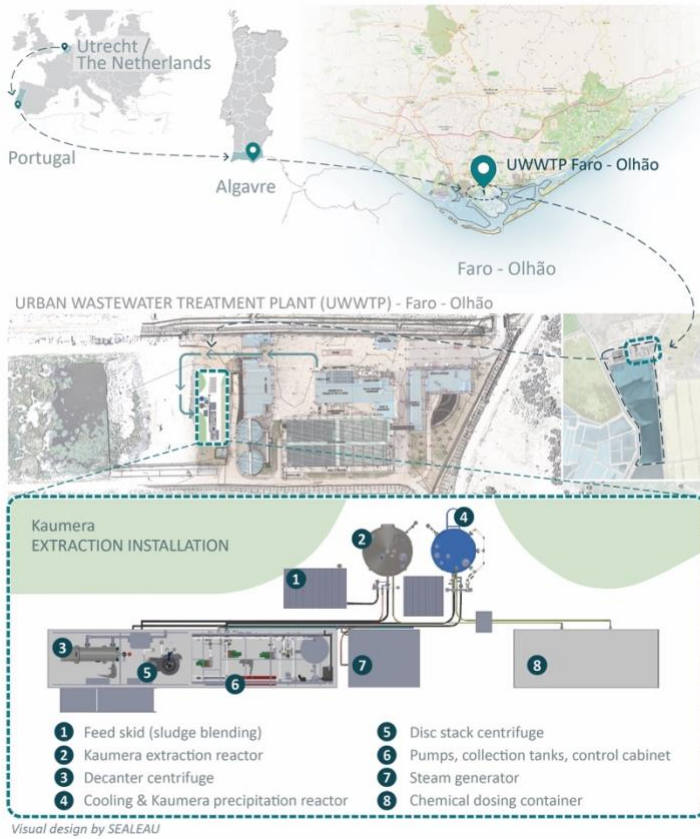
In association with:

- HDSR: has provided a letter of intent for WATER-MINING expressing their support to the project by providing access to their facilities and space for the set-up
- We collaborate with Hogeschool Utrecht. They have 4 students working with us: 1 is doing final BSc thesis and supported assembly, start up and will support operation. A student group is looking into Kaumera extraction differences between Faro and Utrecht sludge.
- GEA: Technology provider and commissioning for disc stack centrifuge and decanter centrifuge. Involved in optimizing the technology for the past three years.

7. What is the long-term vision about Kaumera?

High value applications and replacement of petrochemical polymers in various applications.

Produce Kaumera at all Nereda installations to produce a local, environmentally friendly alternative for oil derived products, stimulating local industries.



Images from SEALEAU



ABOUT WATER-MINING

WATER-MINING is an EU-funded multidisciplinary research project that creates water management solutions using a circular economy approach. The project's consortium consists of 38 public and private partners and four linked third parties from 12 countries and is led by the Delft University of Technology. WATER-MINING works with pilot sites in Cyprus, Spain, Portugal, Italy and the Netherlands to demonstrate new and efficient ways to reclaim nutrients, minerals, biopolymers, energy and freshwater from desalination, and industrial and urban wastewater. To successfully integrate these value-added products into resource supply chains, the project produces science-based, market-oriented policy recommendations, designs circular business models, and engages stakeholders, leading to sustainable management of water resources.

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