



Multi-Purpose Onsite Phase Separator (MOPS)

Fra MUDP projekt til oprensning af generationsforureninger

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Fortum Group is a major European
clean power and gas company with
activities in more than

40 countries

19,000

experts worldwide

We provide our customers with electricity, gas, heating and cooling as well as smart solutions to improve resource efficiency.

Together with Uniper, we are the third largest producer of CO₂-free electricity in Europe with growing portfolio of wind and solar.

With approximately 19,000 professionals and a combined balance sheet of approximately EUR 58 billion, we have the scale, competence and resources to grow and to drive the energy transition forward.

Fortum's share is listed on Nasdaq Helsinki and Uniper's share on the Frankfurt Stock Exchange.



How we work: Safety, People, Operational Excellence

We think **safety first**

For us, excellence in safety is the foundation of our business. We strive to be a safe workplace for our employees, contractors and service providers.

In 2020, Fortum's Lost Time Injury Frequency (LTIF) for own personnel and contractors was 1.3. We aim at zero severe occupational accidents. In 2020, there was one severe occupational accident in the operations.

The new safety target is measured as Total Recordable Injury Frequency (TRIF) for own personnel and contractors, and the ambitious goal is to be below 1.0 by the end of 2025. In 2020, Fortum's TRIF was 2.3.

IN 2020 RECYCLING & WASTE OWN PERSONNEL AND PARTNERS LOST TIME INJURY FREQUENCY (LTIF) WAS 9,5.

Global megatrends affecting Fortum's operating environment



CLIMATE CHANGE



TECHNOLOGY



ACTIVE CUSTOMERS



RESOURCE EFFICIENCY

**FOR A
CLEANER
WORLD**

Our purpose is to drive the change for a cleaner world.
We are securing a fast and reliable transition to a carbon-neutral economy by providing customers and societies with clean energy and sustainable solutions.

Fortum Recycling & Waste



Fortum Recycling & Waste Operations

We have around 750 employees in the Nordics and a comprehensive network of 30 offices and treatments centers in Finland, Sweden, Norway and Denmark. We offer service throughout Europe and are constantly expanding our operations to better meet the customers' needs.



Waste-to-Energy plants
to treat municipal solid
waste and industrial waste and to produce
energy

High temperature incineration
to treat hazardous waste and to
produce energy

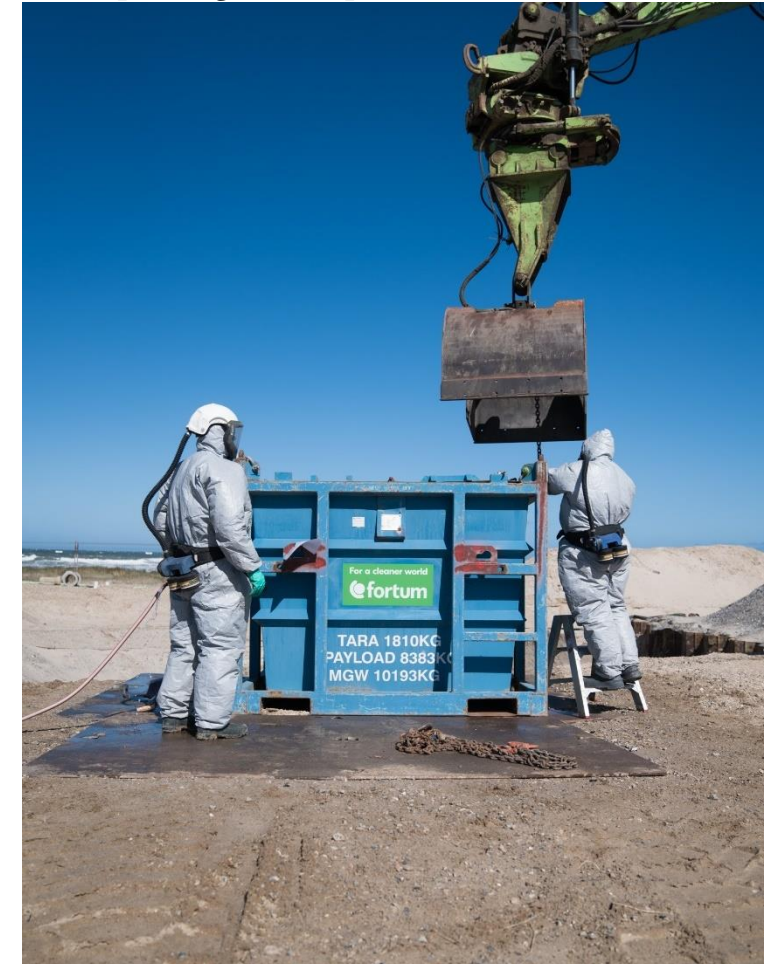
Recycling facilities
to recycle plastics,
metals, ash and lithium-ion battery
chemicals

Pilotanlæg opført i hal ved FMC i Q2 2019

Tests udført Q3 2019 – Q2 2020



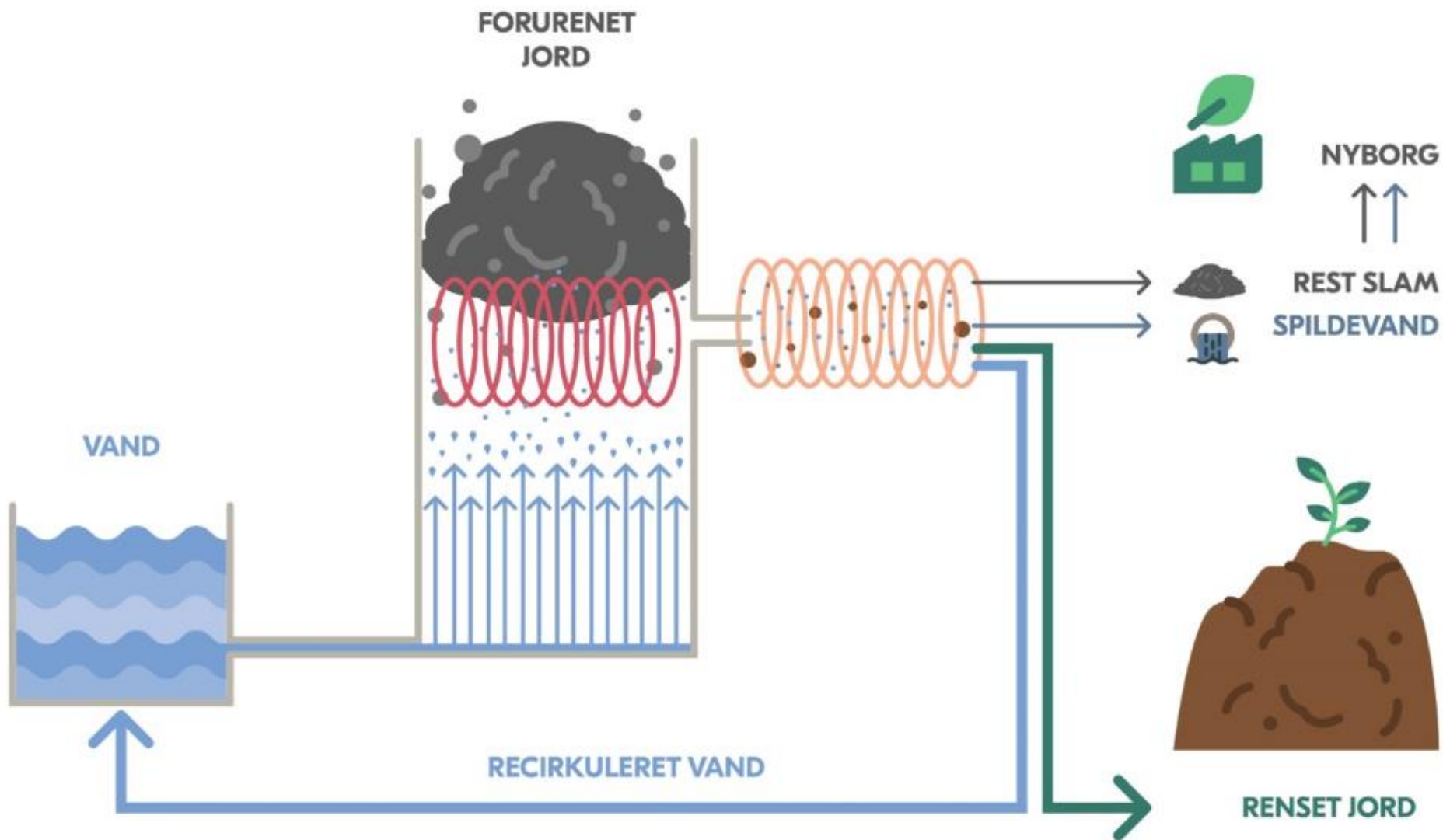
- 90 ton forurennet sand fra Høfde 42 depotet gravet op



Join the
change

fortum

MOPS

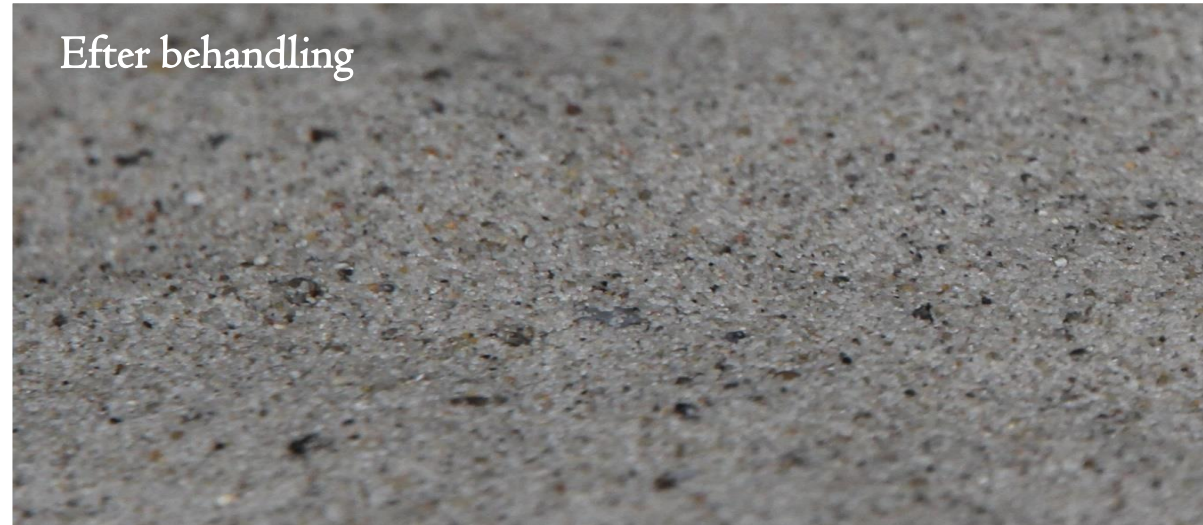


Visuelt resultat af MOPS-rensproces

Før behandling



Efter behandling

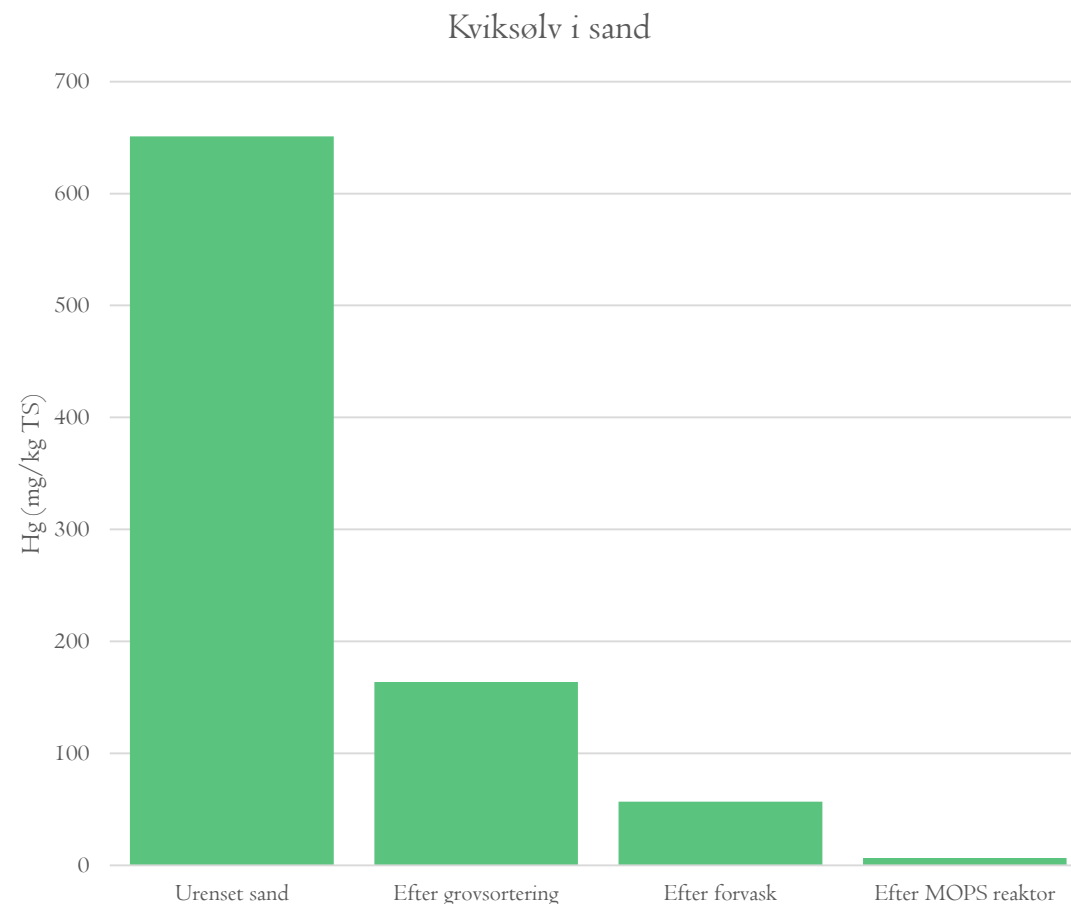


Før behandling



Resultat - Kviksølv

- Figur viser resultater af MOPS-forsøg ved I vaskecyklus
 - Resultater viser kviksølv under 3 mg/kg TS
 - Falder under lovmæssig kategori ”lettere forurennet jord” iht. Miljøstyrelsens jordkvalitetskriterier
 - Muliggør nyttiggørelse uden for følsomme områder
 - >99,5% af kviksølvforureningen fjernes
- ”Efterpolering” af det rensede sand vil betyde:
 - 80% af sandet: kviksølvkoncentration kan bringes under 1 mg/kg TS, hvilket betyder ingen begrænsninger i brugen af det rensede sand
 - 20% af sandet: kviksølvkoncentration kan bringes under 3 mg/kg TS, hvilket betyder nyttiggørelse uden for følsomme områder



Resultat - Pesticider

Pesticid-analyser gennemført for følgende pesticider: Ethyl-parathion, methyl-parathion, malathion og E-sulfotep

- Resultater fra MOPS processen ved I vaskecyklus, reducerer summen af de fire pesticider med >95%
 - Sub ppm level
- ”Efterpolering” af det rensede sand vil betyde:
 - 80% af sandet: pesticider under detektionsgrænsen
 - 20% af sandet: pesticider på ”sub ppm level”



Resultat – Spildevand og slam

- Forsøg med vandbehandling
 - Separation af kviksølv og pesticider fra vandfase
 - Muliggør genanvendelse af vandet til processen
- Delstrøm af spildevand skal slutbehandles
 - Mængde af delstrøm afhængig af ønsket renhed af sand
- Vandet forrenses grundigt inden udledning til rensningsanlæg:
 - Hver pesticidtype $< 0,05 \mu\text{g}/\text{l}$ (under detektionsgrænse)
 - $\text{Hg} < 1 \mu\text{g}/\text{l}$
- Slamfase fra vandbehandling slutbehandles hos Fortum i Nyborg



Viden – Beskæftigelse – Eksportpotentiale

Hvilken viden mangler

- Hvor rent skal sandet være ?
 - Kviksølv
 - Pesticider
- Hvor skal anlægget placeres ?
- Hvorledes skal entreprenørarbejdet organiseres ?
- Midlertidig oplag ?
- Hvad skal der ske med det rensede sand ?

Beskæftigelse

- Entreprenørarbejde: 5 FTA
- Konstruktion af anlæg: 10 FTA (6 – 9 måneder)
- Drift af MOPS anlægget: 5 FTA
- Transport af sand og slam: 5 FTA
- Dokumentation, analyser, kvalitet, sikkerhed, etc.: 5 FTA

Eksportpotentiale

- Komplekse jordforureningsopgaver
- Spildevandsslam
- Flyveaske



Pilotanlægget i fuld skala drift

- Kumla, Sverige
- Oprenses forurenede jord med kviksølv og halogener



Tak for jeres tid

FORTUM RECYCLING & WASTE TURNS
WASTE INTO VALUE
FOR A CLEANER WORLD

Join the
change

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