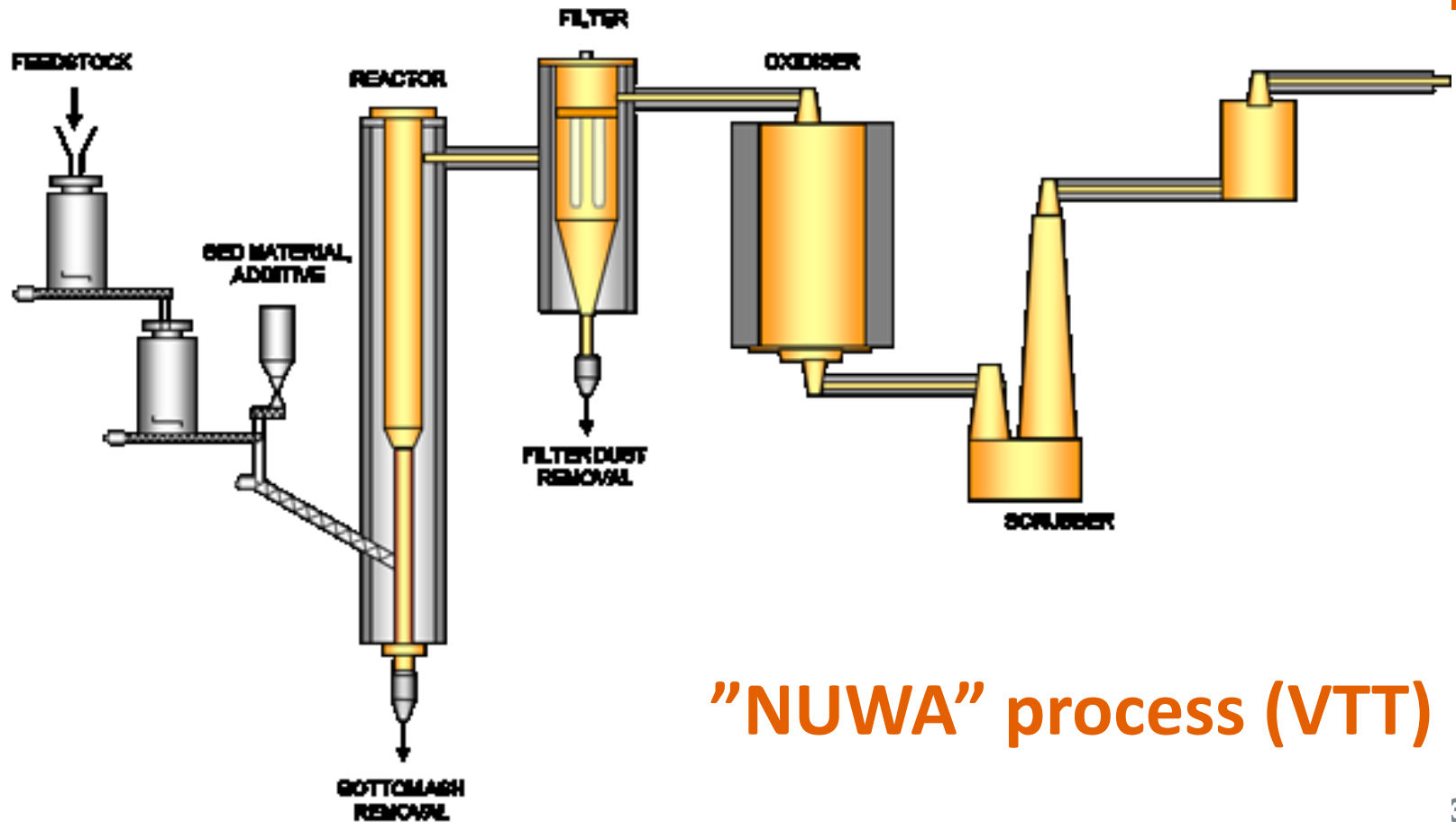


A large, vertical geometric pattern occupies the left side of the slide. It features a repeating motif of interlocking shapes in shades of yellow, orange, and pink, creating a 3D effect of stacked cubes or a complex tessellation.

# Development of Gasification based Thermal Treatment of Low and Intermediate Level Waste

**Matti Nieminen and Markus Olin**  
VTT Technical Research centre of Finland Ltd

- Removal of organic matter by thermal gasification => suitable for treatment of organic matter containing waste (organic ion exchange resins, operational waste, etc.)
- The first project plans in the end of 80's after Chernobyl disaster
- Technology based on previous R&D&D on IGCC (Integrated Gasification Combined Cycle ) technology (started in the beginning of 80's and continued until mid of 90's)
- R&D&D of conventional waste gasification and gas cleaning started mid of 90's (2 commercial scale plants constructed (50 MW/Varkaus and 160 MW/Lahti Energia)
- Development of technology in Tekes funded project 2013-2016
- THERAMIN Euratom project 2017- (2020)
- Until now experimental development made using stable isotopes
  
- Until now patent granted in Finland and Russia (under examination in USA, China, EPO, etc.)



## “NUWA” process (VTT)

# Process description

- Removal of organic matter by Thermal gasification
  - Well controlled reaction temperature lower than in incineration
    - ⇒ Minimised vapour pressure of cesium and other radionuclides
    - ⇒ Enables efficient gas cleaning prior release to atmosphere
- Reducing conditions in the reactor favourable for relatively simple gas cleaning with high efficiency
- Cleaned gas is oxidised in a high temperature oxidiser
- Flue gases cleaned in two steps: wet scrubbing followed by HEPA filter

# Status of development today

- Performance of the developed process verified using simulated feeds (non-radioactive waste; ion exchange resins doped by stable isotopes)
- Partners for commercialization are sought
- Next step demonstration using hot samples
  - Licensing for operation with hot feeds required

This project has received funding from the European Union's Horizon 2020 Euratom research and innovation programme under grant agreement No 755480

**VTT**

The European project **THERAMIN** –  
**Thermal treatment for radioactive waste  
minimization and hazard reduction**

Matti Nieminen, VTT Technical Research Centre of Finland Ltd

# What?

Low- and intermediate-level waste (LILW) is one of the least radioactive waste, but the tonnages involved are by far the greatest (together with the very low level waste).

# LILW (Low and Intermediate Waste)

- The LILW of interest for the THERAMIN project were selected by partners of the project (not representing all LILW but selected waste fractions could potentially be processed by thermal treatment )
- In many cases rich in organic matter contaminated by some radioactive components
- Volume is large but radioactivity relatively low
- May contain poisonous or hazardous components
- Disposal of LILW causes significant cost



# Thermal processing could offer an attractive alternative

- Thermal processing/treatment could be an alternative way to process LILW before disposal
- Thermal processing will
  - Enhance safety
  - Reduce volume
  - Reduce toxicity
  - In many cases enable best possible immobilisation of radioactive components
- Thermal processing is not free of charge and risk but it might save money and improve safety in longer term

# The THERAMIN project

- The main objectives of the THERAMIN project are to

- Promote thermal treatment of LILW by piloting/demonstrating several thermal treatment technologies
- Improve the overall understanding and knowhow on thermal treatment
- Make thermal treatment technologies more well-known technologies

# Who will do this?

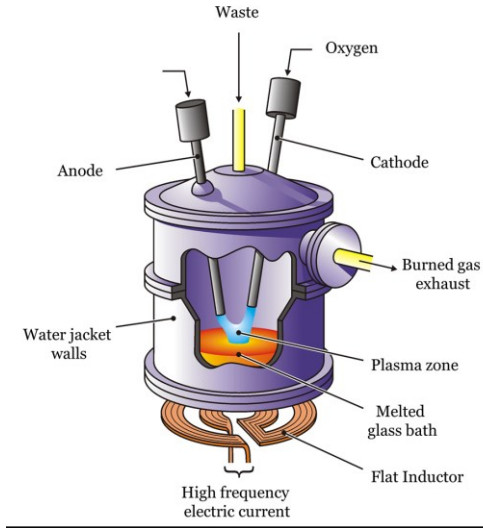
- Twelve key players in Europa
- In addition, 9 end-users



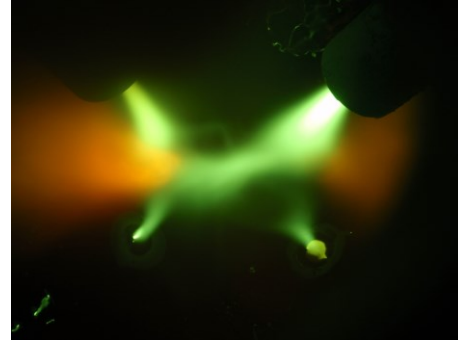
# The most essential part of the project

- Demonstration of several different technologies to treat thermally low and intermediate radioactive waste
- Technologies demonstrated included direct Joule heating, plasma melting, thermal gasification, etc.
- Products of these processes have been characterised
- The impact in terms of disposability of thermally treated waste products evaluated

# Some examples



SHIVA by CEA



# Some examples

Geomelt by NNL



# Some examples

HIP by NNL



# Some examples

Thermal gasification  
by VTT





## Further information

- The THERAMIN project has a web site

<http://www.theramin-h2020.eu/index.htm>

or contact coordinator

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