NEW-MINE

EU TRAINING NETWORK FOR RESOURCE RECOVERY THROUGH ENHANCED LANDFILL MINING

ELFMV symposium

06/02/2020

Leuven

WP2

Thermal treatment of Refuse derived fuel from ELFM for syngas and slag production

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Katarzyna Jagodzinska

Ilman Nuran Zaini

This project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721185.

Objective of WP2

- Treat RDF (Residue-derived fuel material) from excavated landfill waste to energy (syngas) and raw solid materials.

- How ?
  - Exploring gasification and pyrolysis to generate hydrogen-rich syngas. (ESR5, ESR 7)
  - Using plasma to get a clean syngas (ESR6)
  - Using Solar Thermal Energy as input to gasification (ESR8)

WP2 at the project flowsheet

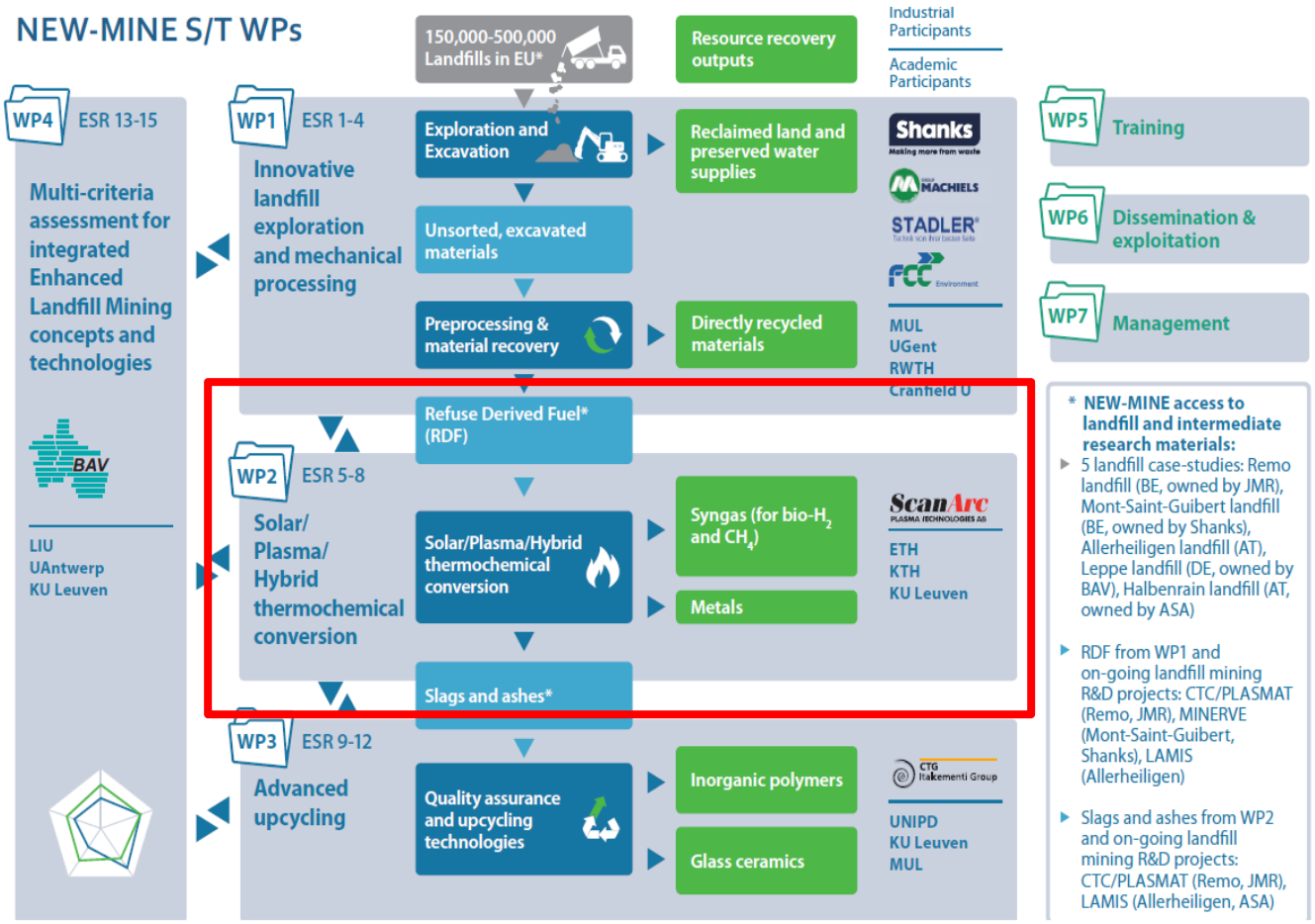

Figure 2. Overview of the NEW-MINE WPs and the value-chain approach

Team of work package 2

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Marco Gigantino (ETH Zürich, Switzerland)

Thermochemical **heat storage** development **for solar-assisted gasification** of RDF.

Ilman Nuran Zaini (KTH, Sweden)

Gasification of RDF from the excavated material in order to obtain **H_2-rich gas.**

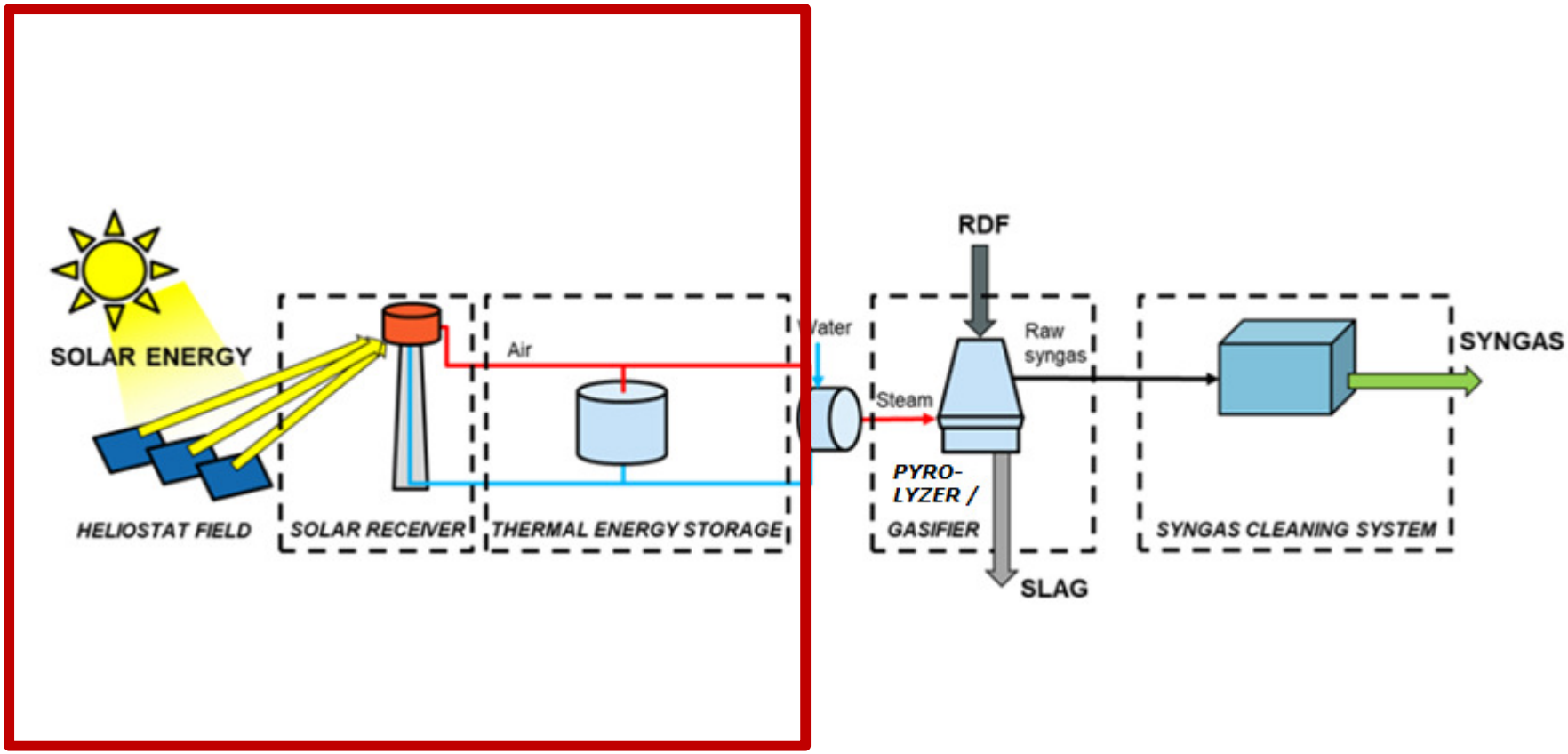
Katarzyna Jagodzinska (KTH, Sweden)

Pyrolysis of RDF from the excavated material in order to obtain **H_2-rich gas.**

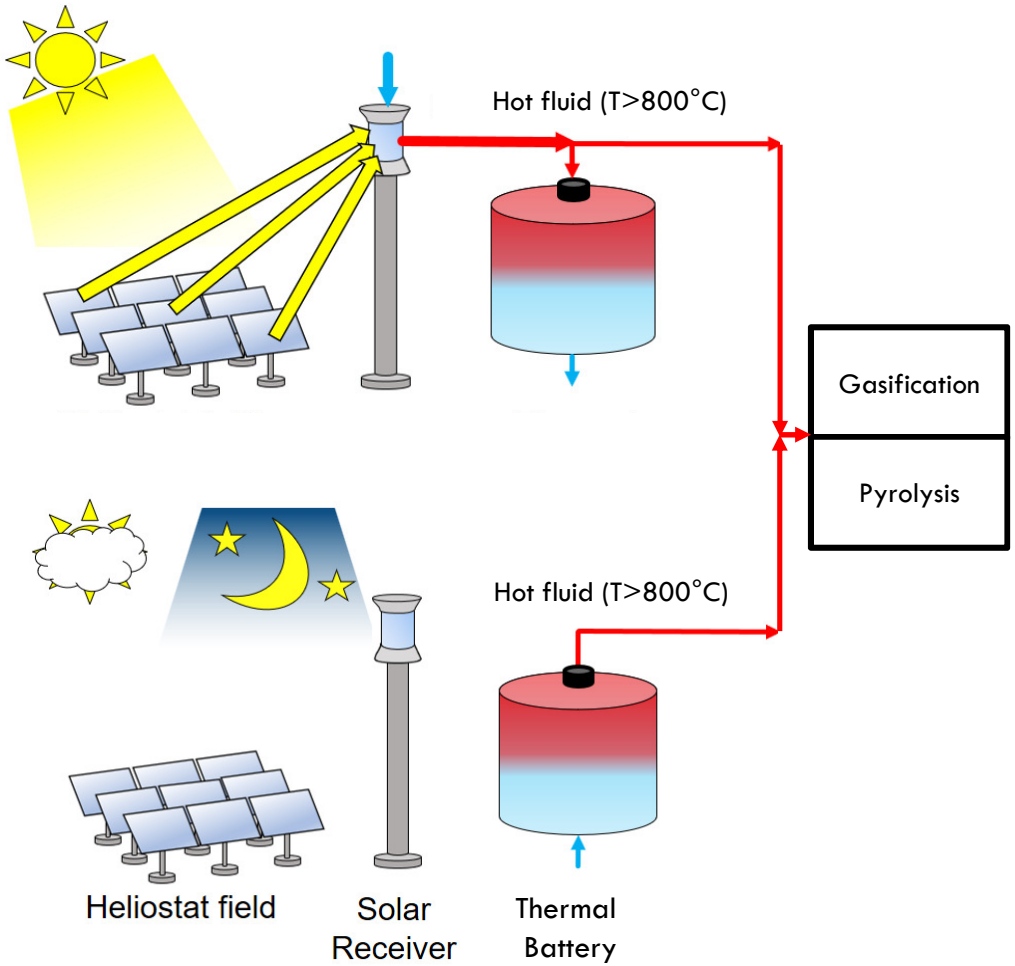
Yamid Gomez Rueda (KU Leuven, Belgium)

Syngas purification by **plasma** tar cracking

Scope of the work



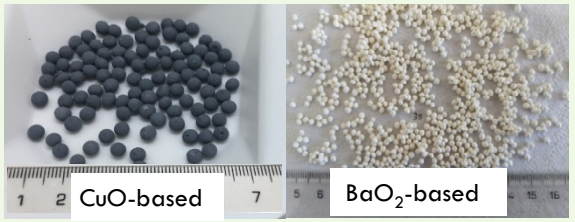
High-T Heat Storage



Thermal battery development:

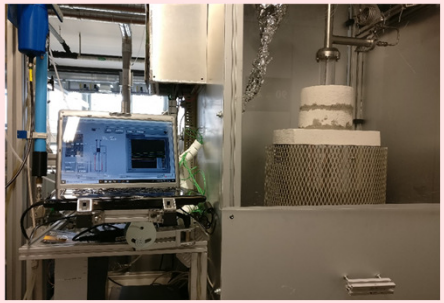
Materials development

- Stability over long term cycling
- High performance



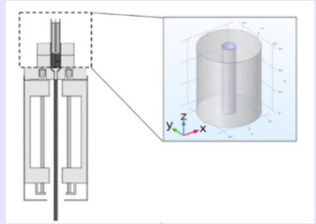
Lab-scale prototyping

- Proof of concept
- Data for model validation



System simulation

- Design optimization
- Scaling-up

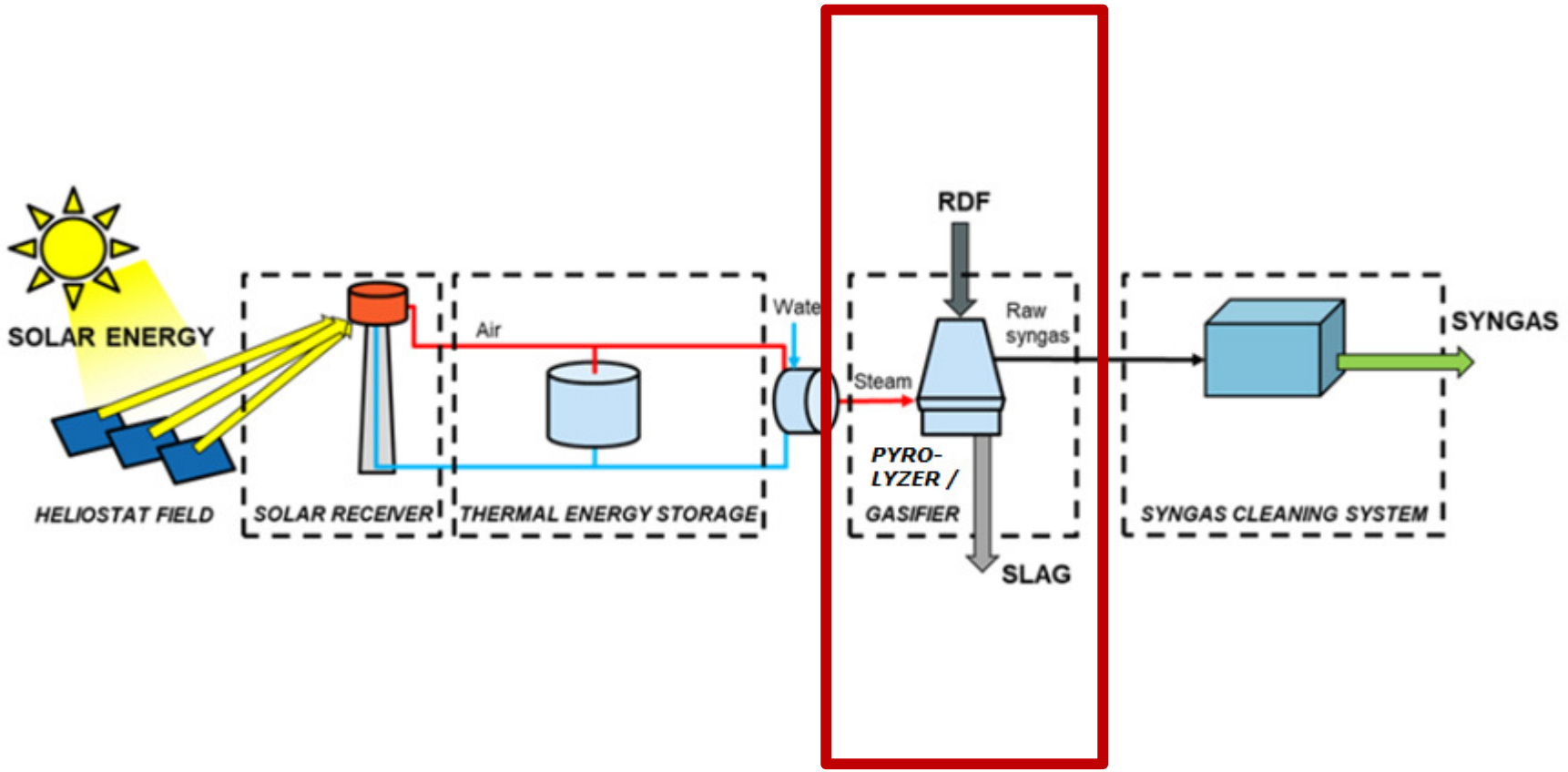


High-T Heat Storage

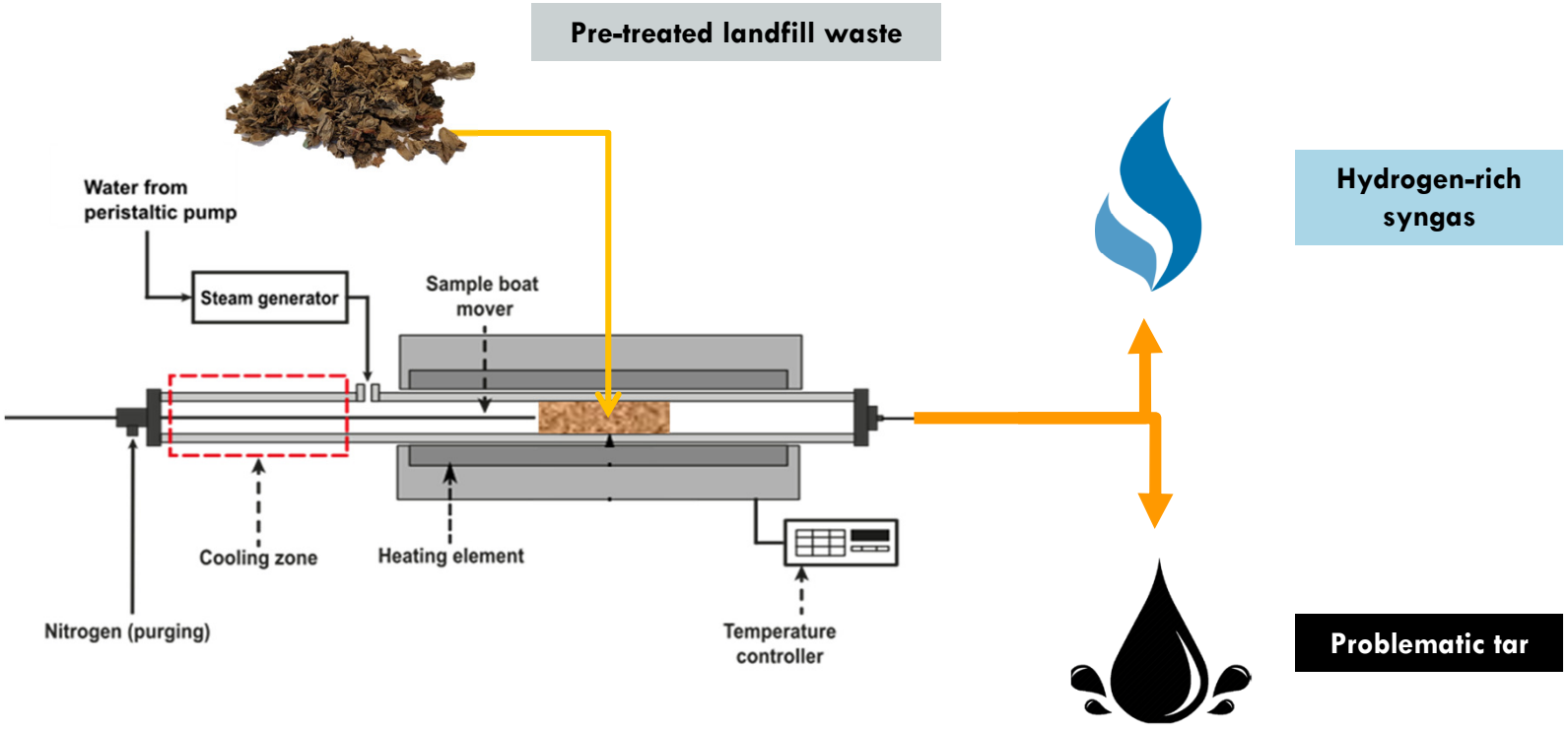
- SrO , CuO, Fe_2O_3, Co_3O_4, BaO_2 based materials for heat storage demonstrated. Some of these materials can be used continuously over 100 cycles (~3 months operation). Journal paper published.

Thermal battery heated under store solar heat up to 1150 °C.

Scope of the work



RDF gasification



Lab-scale gasification

RDF gasification: Scale-up simulation

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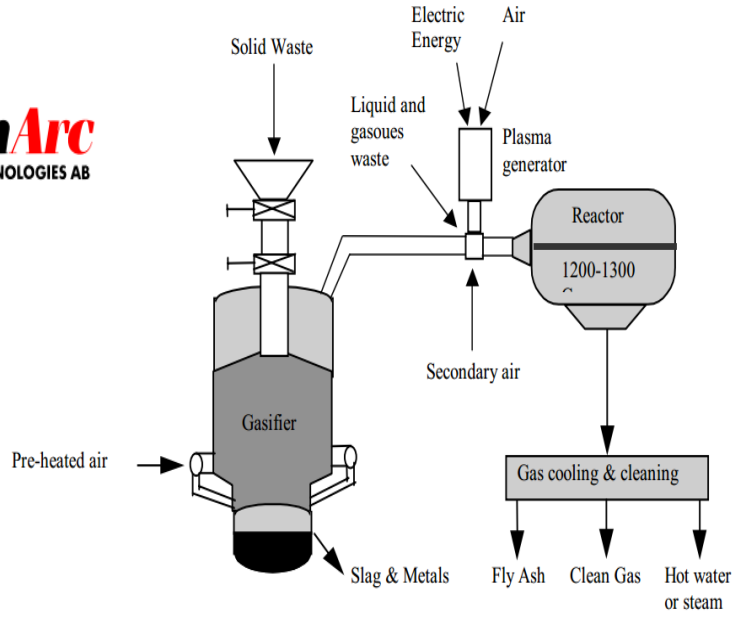
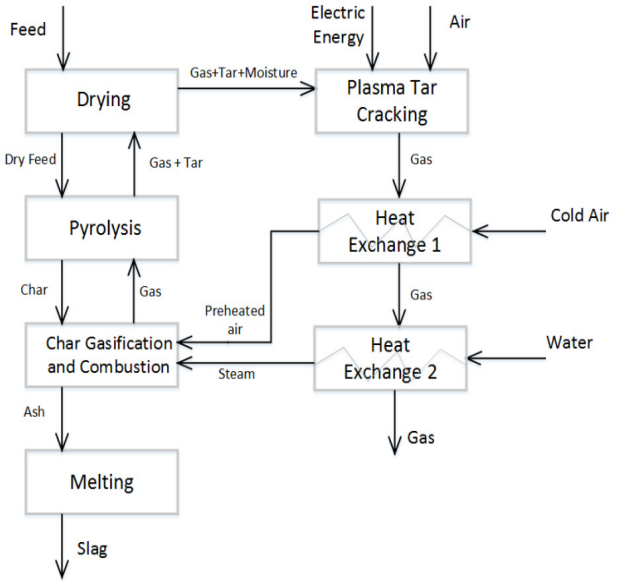


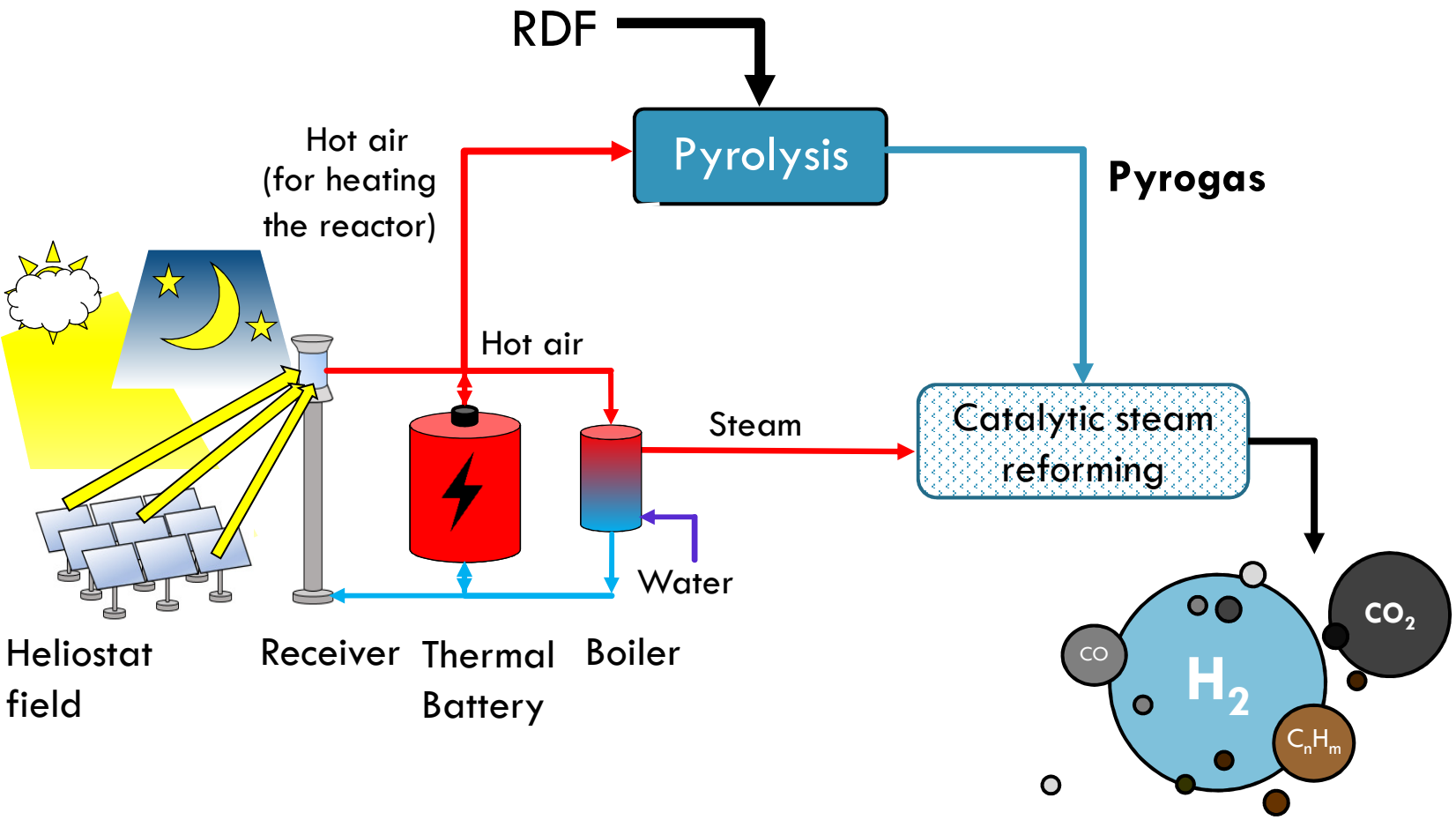
aspentech



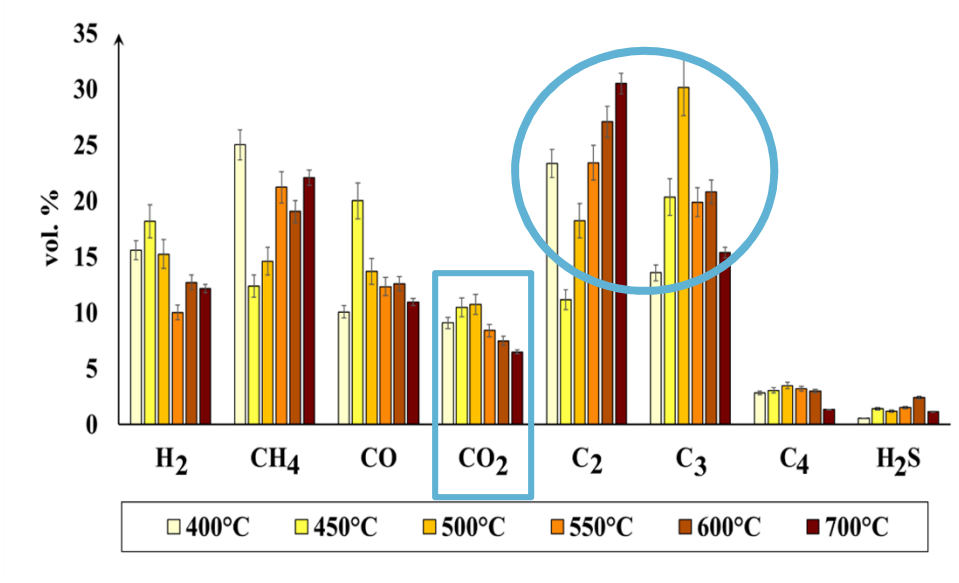
Cold gas efficiency

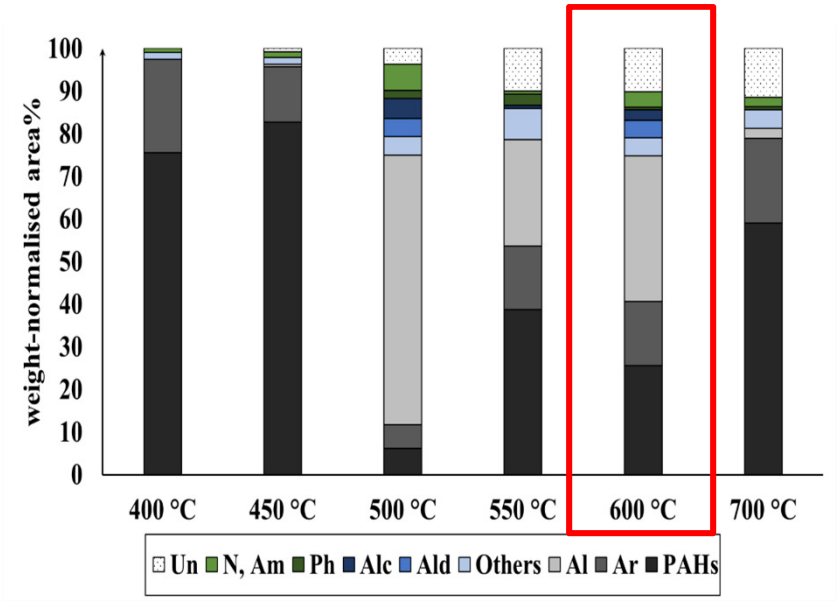
64 – 76 %

RDF pyrolysis for H_2 production

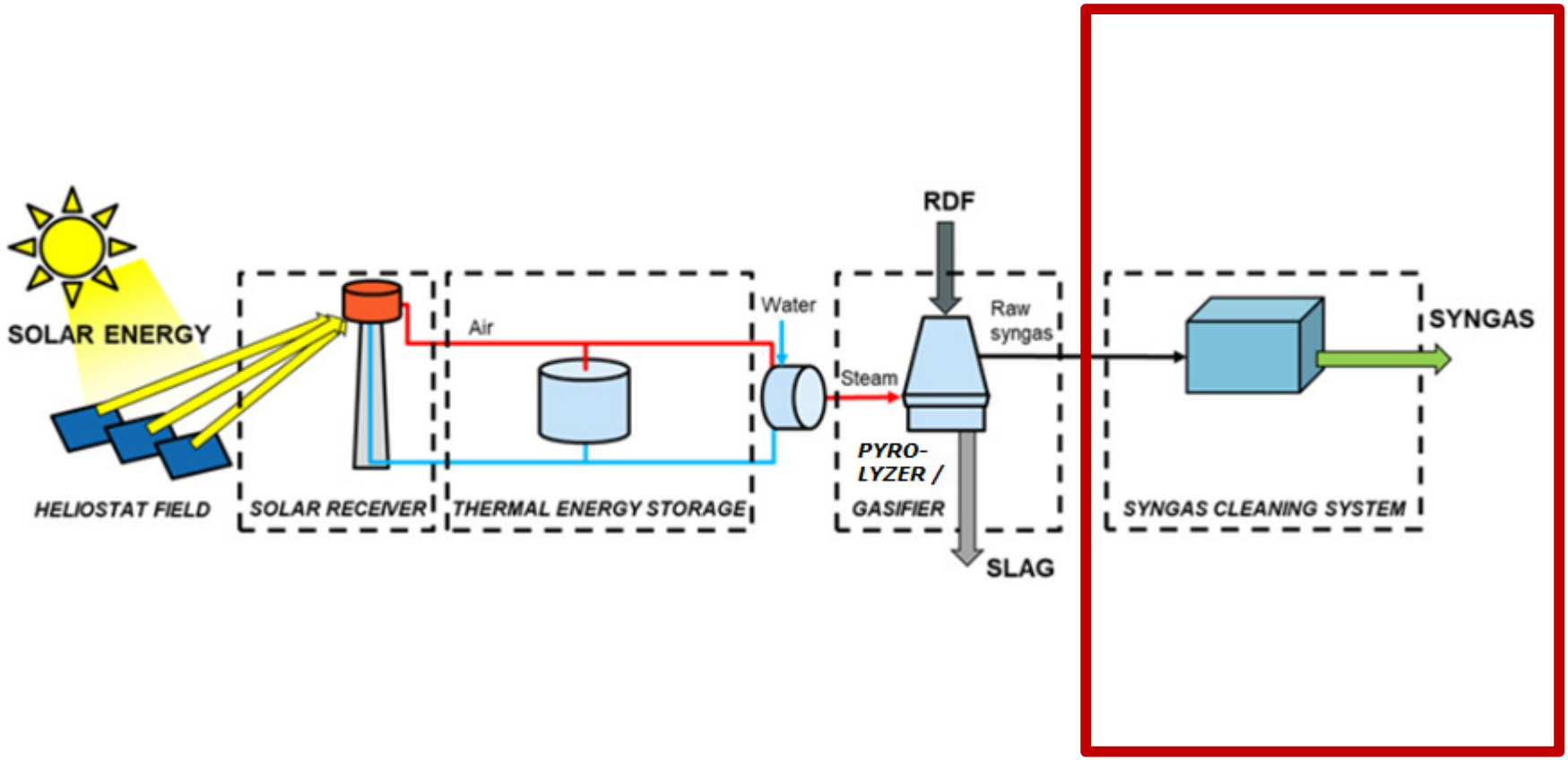


RDF pyrolysis for H_2 production

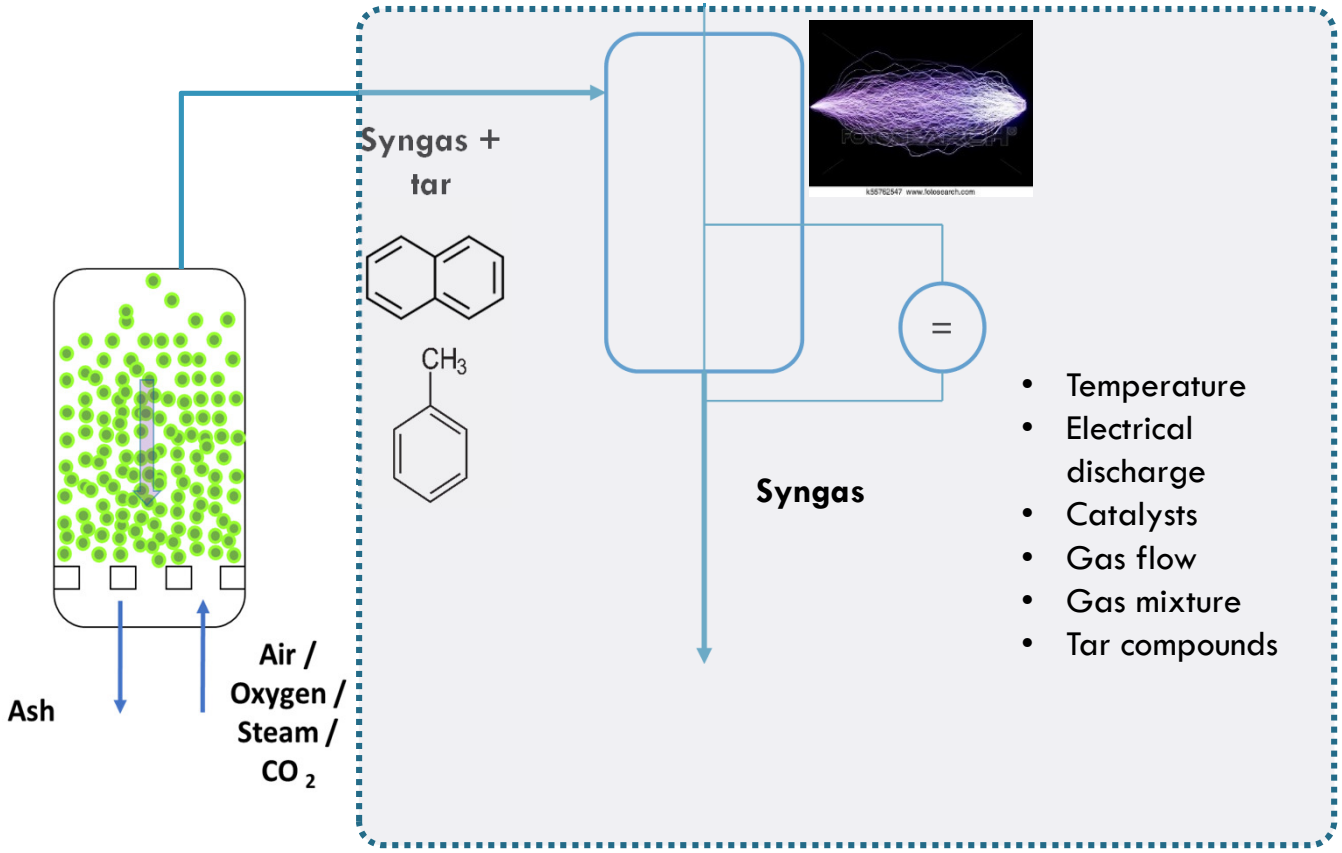




Scope of the work

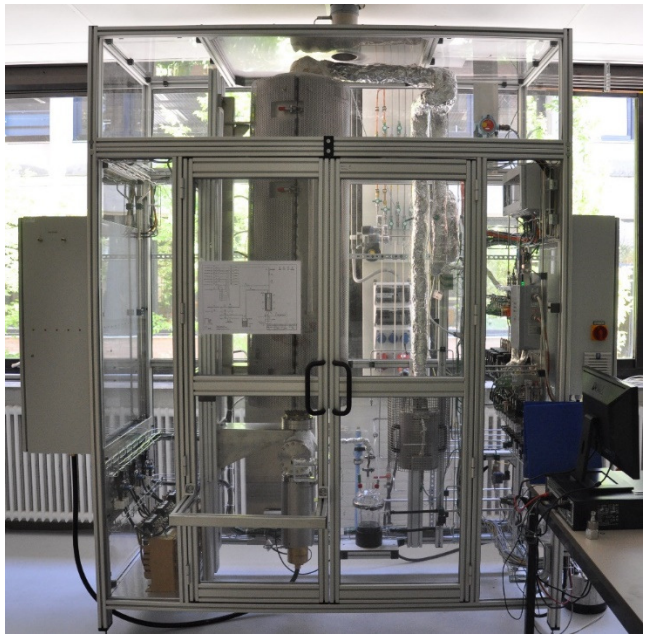


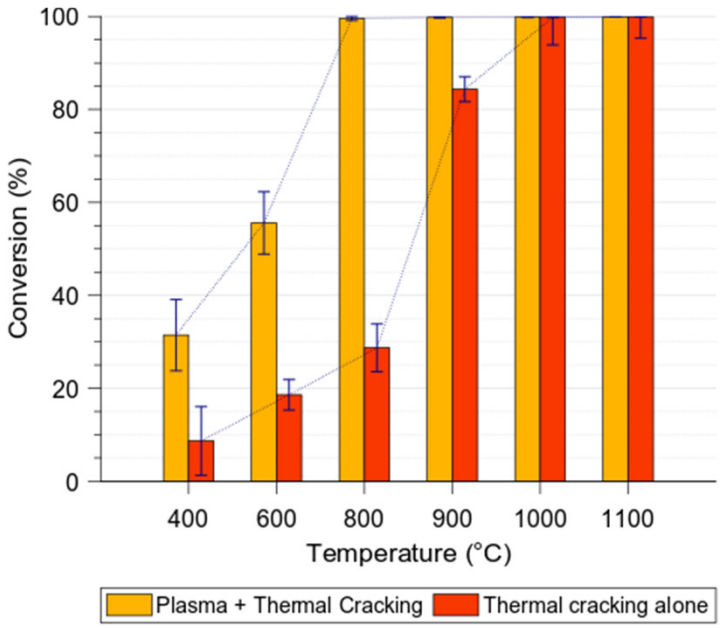
ESR 6. Tar cracking



TRL 2-3

ESR 6. Tar cracking





Conclusions

- The performance of the landfill waste gasification can be improved by adding of biomass / biochar as an auxiliary fuel to produce a higher-quality syngas.
- The pyrolysis-vapours show a potential to be cracked into a high-quality gas.
- SrO and CuO based materials can be used for heat storage/release cycles at high temperatures for up to 3 months with constant performance.
- Plasma can remove tars completely at temperatures lower than expected with thermal cracking.

Thank you for your attention!

If you have further questions, please do not hesitate to contact us:

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The New-Mine project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721185. (https://new-mine.eu/)