Group Machiels' Closing the Circle project

Yves Tielemans on behalf of GROUP MACHIELS

CO-ORGANIZED WITH

Agència de Residus de Catalunya

Consell General de Cambres de Catalunya

GROUP MACHIELS

CLOSING THE CIRCLE

www.machiels.com

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October 18, 2017

Group Machiels, an overview

Operational since 1941, Group Machiels is known as a dyniamic and well respected family owned Belgian company in full expansion, pioneering in the areas of sustainable materials, energy and infrastructure.

Activities:

- Group Machiels is always looking for opportunities in terms of CO_2 reducing measures and alternatives for mineral fuels.
- In this respect the company is active in the following domains:
  - Energy & Environment
  - Real Estate
  - Machiels Building Solutions
  - Diversification
- The baseline of Group Machiels is " Closing the Circle" by working on global solutions in order to reduce the ecological footprint to zero.
- Turnover: 128 mio €; EBITDA: 27 mio €; 900 FTE's
- Company website : http://www.machiels.com/

Waste management

Remo milieubeheer

Location

Remo site, Houthalen

Activities of Remo as of today

State-of-the-art Temporary Storage for industrial waste.

Transition towards Closing the Circle

Landfill represents a reserve of materials and energy, afterwards the reclaimed land can be redeveloped

Waste management

Remo milieubeheer

Location

Houthalen

Activities

Purification of leachate, extraction and valorization (CHP) of methane gas

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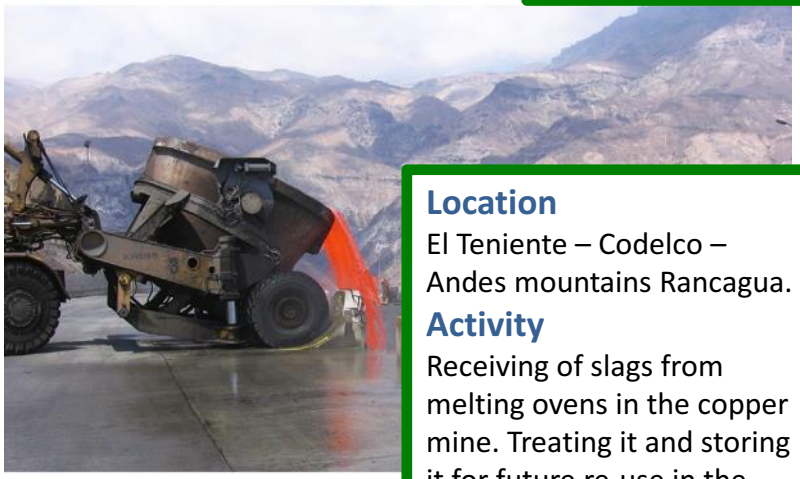
What do we have to offer?

- Today, Group Machiels is able to offer worldwide, together with her industrial partners, based on a wide range of international experience, **sustainable, reliable and integrated waste management solutions** including:
  - The design, implementation and operation of state-of-the-art landfills including water treatment and landfill gas valorisation
  - Classic landfill mining (with our partners)
  - Enhanced landfill Mining, the concept behind our Closing the Circle project
  - Consultancy services including setting up a roadmap to migrate a city or region to a higher waste management maturity level as well as guiding our customers in the implementation of this roadmap

International waste management best practises

Location
Santiago de Chile
Activity
Receiving, processing, recycling and storing industrial waste flows.

Location
Region VIII, Concepción
Activity
Receiving and storing household and industrial waste flows coming from Region VIII.



Location
El Teniente – Codelco – Andes mountains Rancagua.
Activity
Receiving of slags from melting ovens in the copper mine. Treating it and storing it for future re-use in the copper production process.

Location
Salt desert “salar de Atacama” in northern Chile.
Activity
Receiving waste flow containing arsenic from the copper mines in northern Chile. Neutralizing, stabilizing and storing of waste materials.

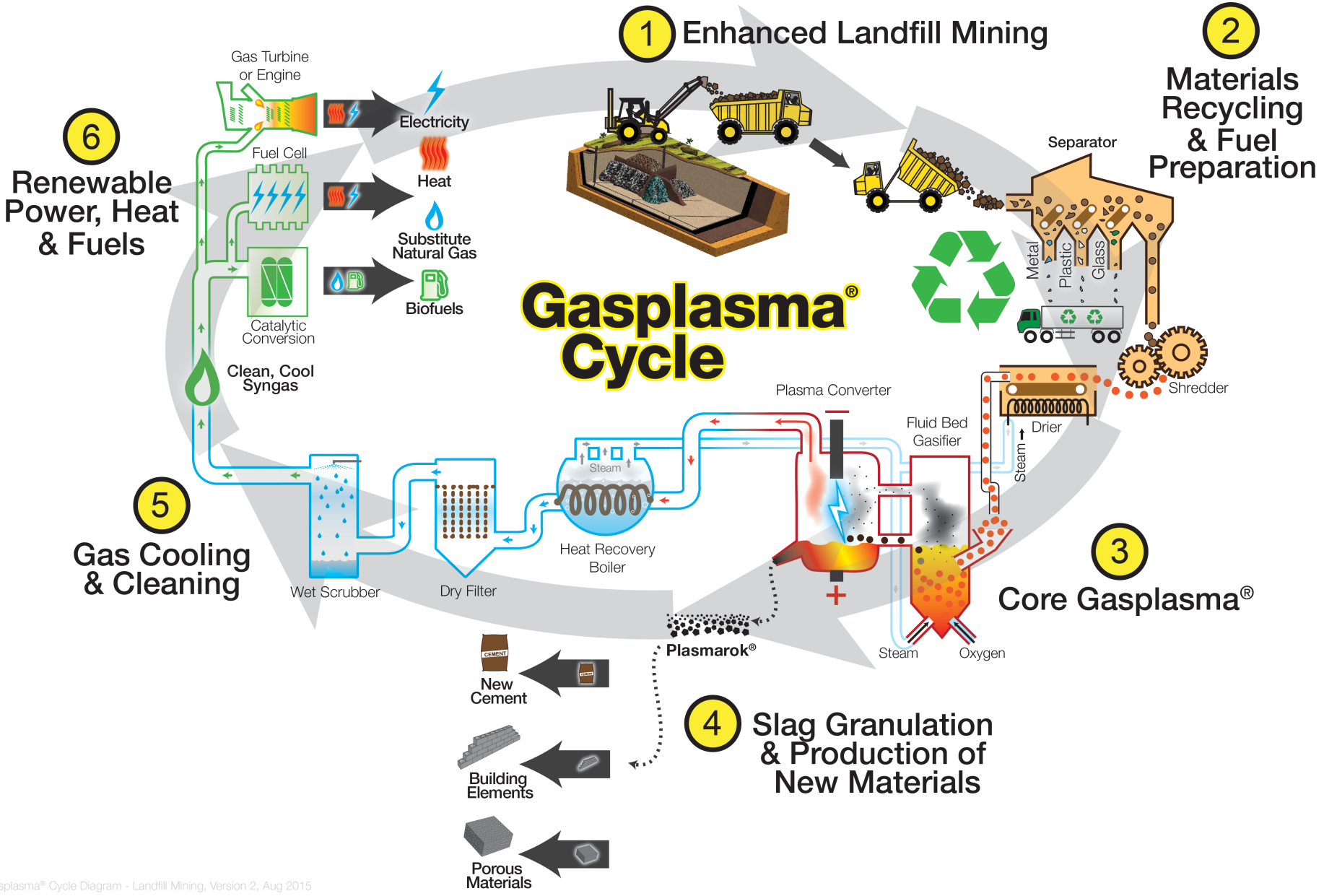
Classic Landfill Mining vs Enhanced Landfill Mining

- Most appropriate landfill mining solution for USW landfills to be tailored based on project driver(s) and objectives

- Option A: **“Classic” Landfill Mining (LFM)**
  - Drive: Resolve environmental problem and/or reclaim land for redevelopment
  - Duration: Few months to 2 years (**FAST** solution)
  - Equipment: Mainly mobile installations
  - Ambition level of resource recuperation: secondary focus

- Option B: **“Enhanced” Landfill Mining (ELFM)**
  - Drive: Maximize potential of materials, energy and land recuperation
  - Duration: 10 to 25 years (**TAILORED** solution)
  - Equipment: Mainly stationary installations
  - Ambition level of resource recuperation: primary focus

Plasma Gasification Technology



Closing the Circle masterplan

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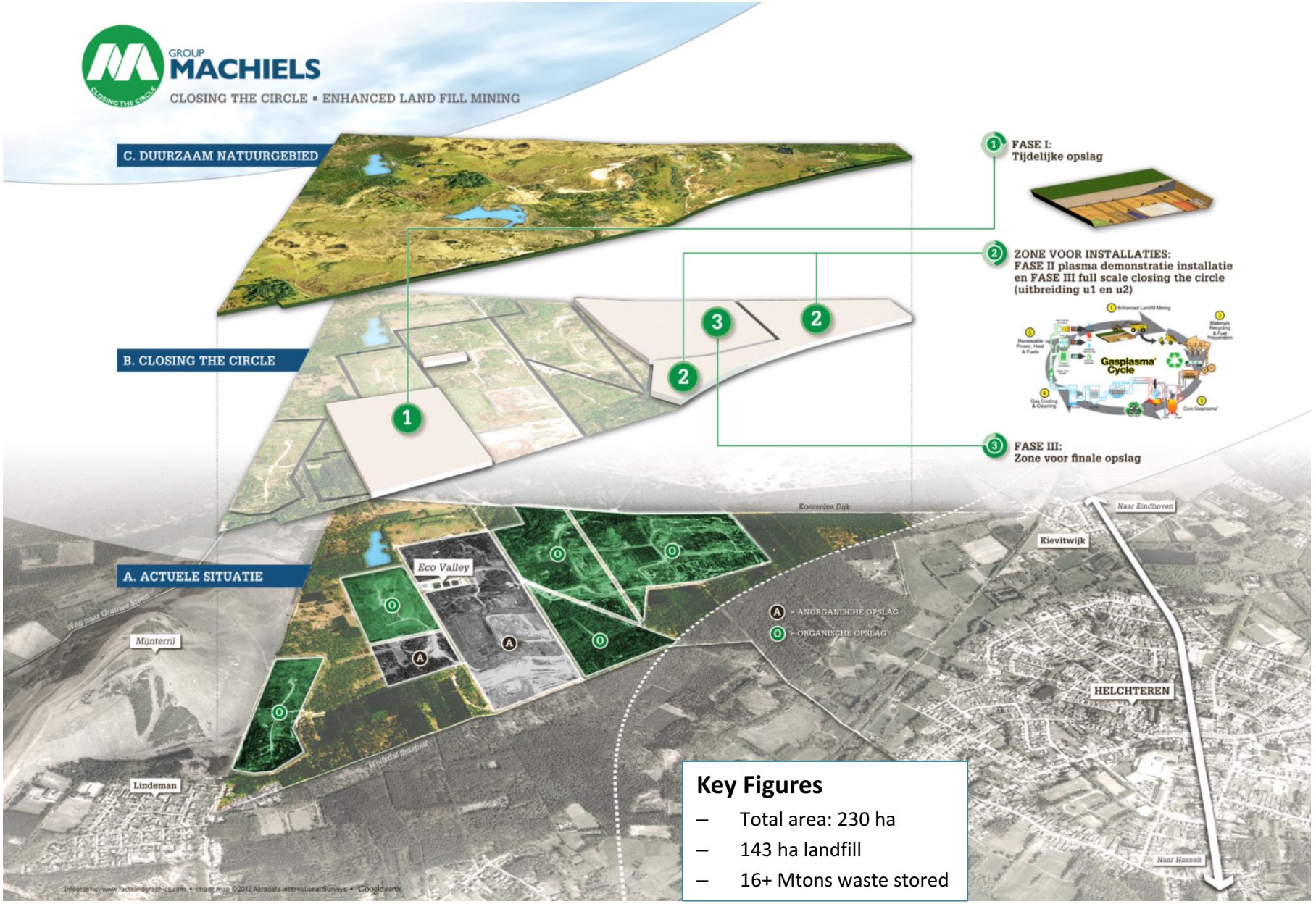
CLOSING THE CIRCLE ▪ ENHANCED LAND FILL MINING



Key Figures

- Total area: 230 ha
- 143 ha landfill
- 16+ Mtons waste stored

Phasing of the CtC project

- Demonstration phase:
  - Operational: 2018; duration 28 years
  - Capacity plasma: 30-100 ktpa
  - Production high purity hydrogen: 0,3 - 1 ton/hr
  - CAPEX: 65 mio €; employment: 100 FTE's, 300 FTE's during construction
- Extension 1:
  - Operational 2022; duration 23 years
  - Additional plasma capacity: 100 ktpa
  - Total hydrogen production: 1,3 - 2 ton/hr
- Extension 2 (full scale capacity):
  - Operational 2025; duration 25 years
  - Additional plasma capacity: 100 ktpa, total 230-300 ktpa
  - Total production hydrogen: 2,3 - 3 ton/hr
  - Total CAPEX: 250 mio €; employment: 250-300 FTE's

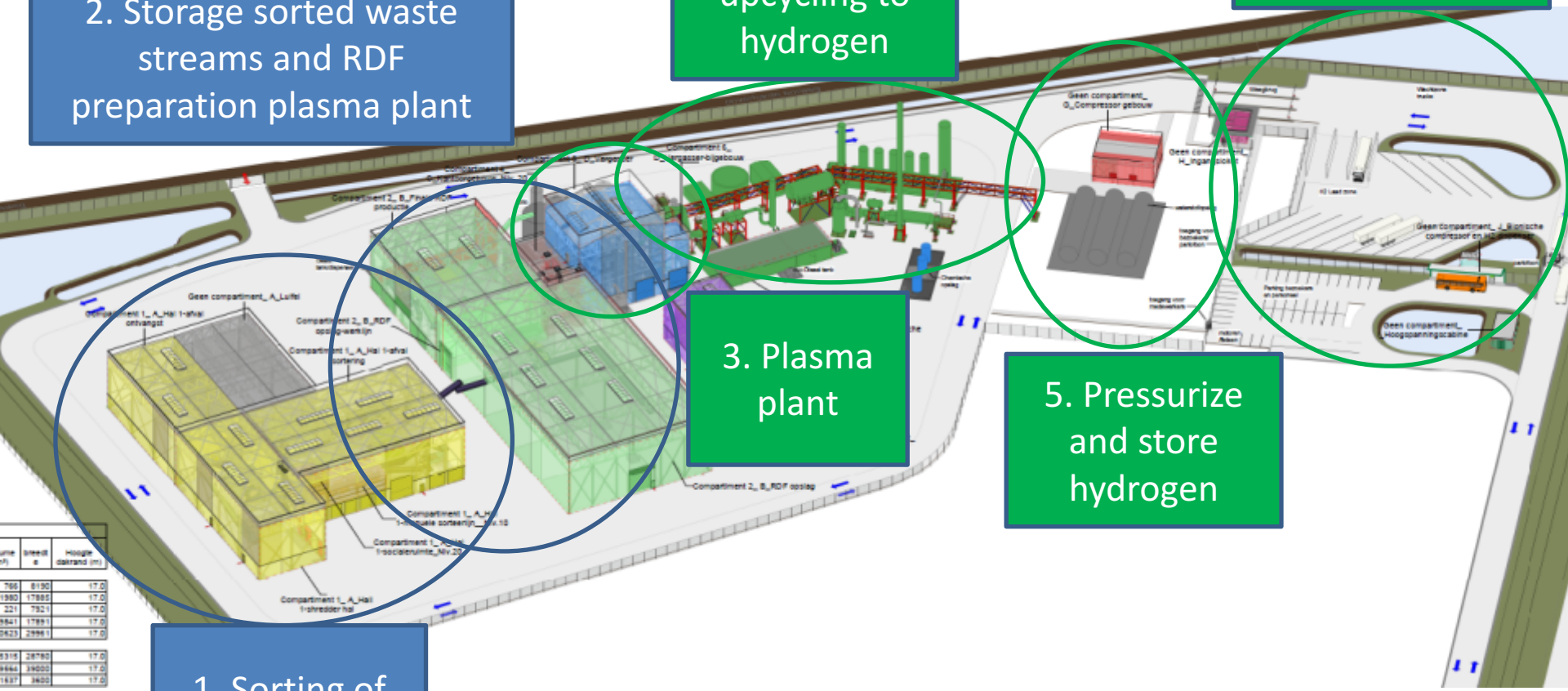
Existing hydrogen applications in Flanders

Scope of demonstration plant

2. Storage sorted waste streams and RDF preparation plasma plant

4. Syngas upcycling to hydrogen

6. Hydrogen distribution and fuelling stations

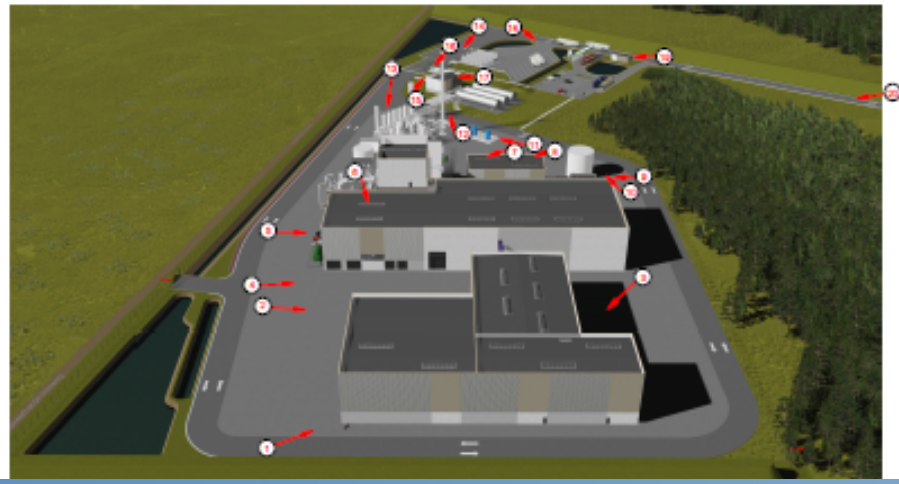


3. Plasma plant

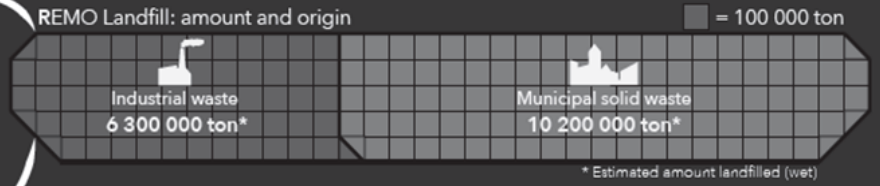
5. Pressurize and store hydrogen

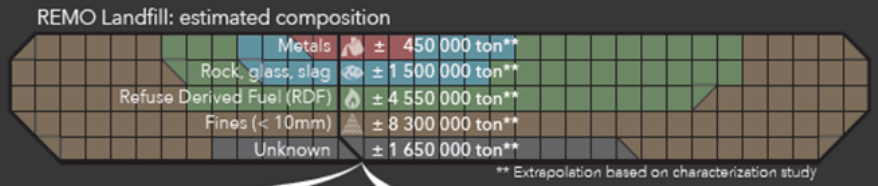
1. Sorting of mined waste

Impressions of demonstration plant



REMO Landfill: Material recovery and upcycling within the REMO case

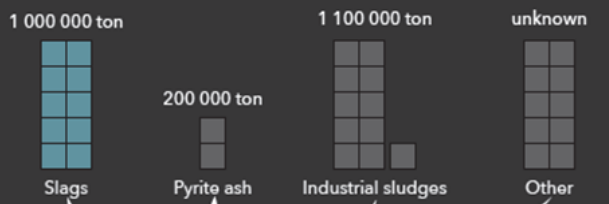




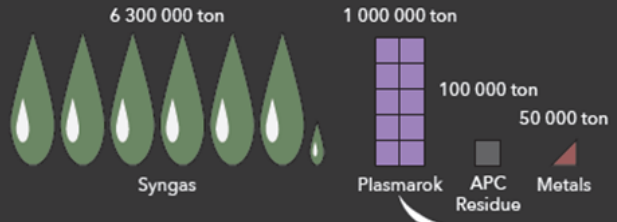
STEP 1 — STEP 2 — STEP 3

Excavation + Separation

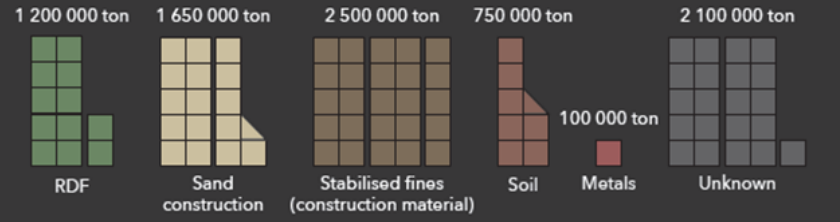
Selective excavation



Gasplasma® treatment



Physico-chemical treatment & upcycling



Upcycling Plasmarok®

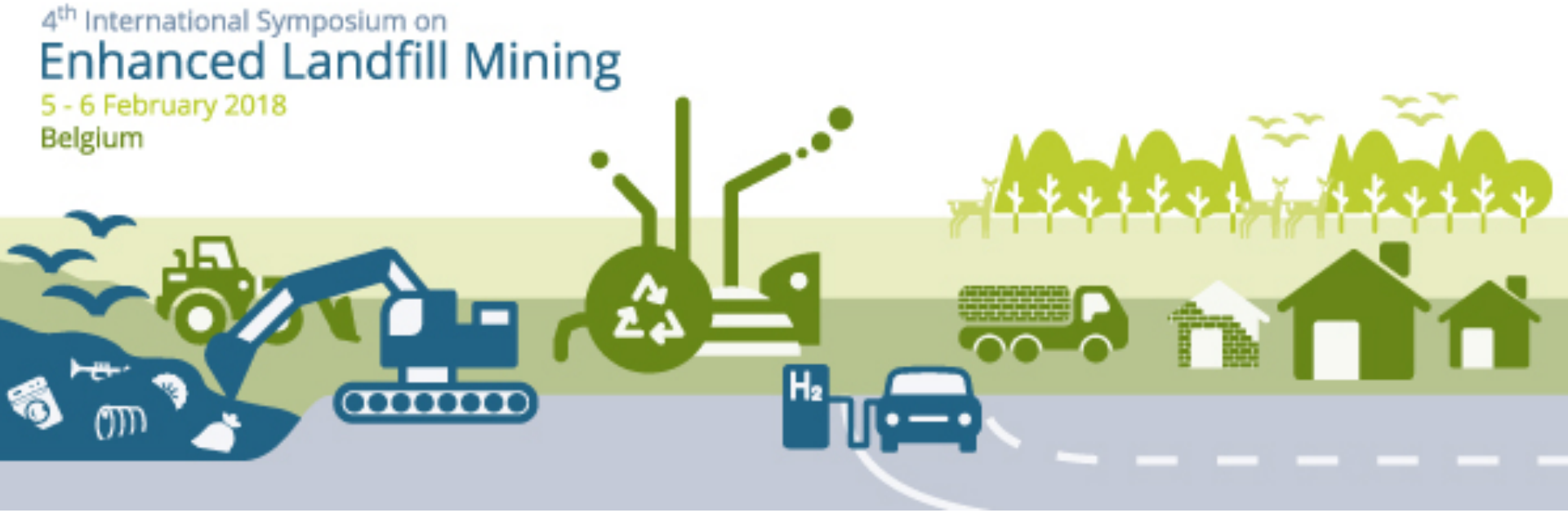
http://www.elfm.eu

Andere partners:
KULeuven, UHasselt, OVAM, HUBrussel, Cleantechpunt, LRM BBL

sources:
Spooren et al. (2013), Material recovery and upcycling within the ELFM concept of the REMO case

Quadruple helix model

- Group Machiels strongly believes in “quadruple helix model” in order to develop projects in a sustainable way with industry, governments, research institutes and civil society actors:
  - Flemish ELFM R&D consortium (established in 2008)
  - European ELFM R&D consortium (established in March 2014, www.eurelco.org)
  - ParticipatiePlatform: platform with local and superlocal actors
  - Locals: platform with surrounding communities to inform and discuss technical and non technical items (active since 2010, 1st Symposium)
  - 3 International ELFM symposia organized (2010, 2013 and 2016 (Lisboa))
  - CtC and Eurelco recognized by European Innovation Partnership (EIP) as Raw Material Commitment (RMC) within framework of Strategic Implementation Plan (SIP)
  - Formation of an Industrial Consortium implement the CtC project and replicate it worldwide

More information

- Animation video on Closing the Circle:
  - https://www.youtube.com/watch?v=GconZYxGo-U
- EURELCO:
  - https://twitter.com/eurelco, https://www.facebook.com/eurelco
  - LinkedIn: https://www.linkedin.com/company/eurelco
  - Simplified movie on ELFM: https://www.youtube.com/watch?v=kXkpaUOGBqk