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BIOTERRA NV

Transformation of polluted soils/mineral waste into high-quality secondary materials by means of wet separation

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Environmental Division, Group De Cloedt

INTERSOIL
Brussels, 3rd of March 2020

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BIOTERRA NV

- Founded in 1996 as a soil cleaning facility
- 49 FTE
- 100% part of **Group De Cloedt (1875)** → Dredging, Aggregates, Environment
- Main office = Genk, Belgium

- Belgium : approx. 1 million tons of polluted soils and mineral waste per year

- **Site Genk** = European epicenter of treatment of Group De Cloedt, BIOTERRA
  - 9 →13,5 ha
  - Waterbound (3500 tons waterway)
  - State-of-art wet separation plant, in-house developed
  - 500.000 tons yearly processed

- Soil cleaning facility → mineral waste recycling facility → producer of recycled aggregates…

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Site Genk (B)

9 ha (13,5ha)

Innovative washing plant ; 100t/h

3.500 ton waterway

Main treatment site Europe

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2019

Sand and Sustainability: Finding new solutions for environmental governance of global sand resources

UN environment

United Nations Environment Programme

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Scarcity of primary aggregates – awareness on political level – sustainable society

+

Potential for recyclable mineral waste that is landfilled or disappear in the gray zone of legislation

+

20 years of experience in physico-chemical treatment of contaminated soils, combined with 4 years of research on treatment of mineral waste

=

Design&Build of *state-of-art* wet processing plant

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ON SITE WORKS


'IN SITU' SOIL &
GROUNDWATER


BIOREMEDIATION


WASTE TO
NEW RESOURCES


TEMPORARY STORAGE

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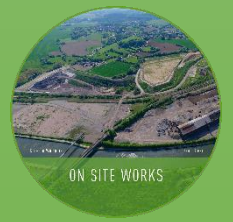

ON SITE WORKS

'IN SITU' SOIL & GROUNDWATER

BIOREMEDIATION

WASTE TO NEW RESOURCES

TEMPORARY STORAGE

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Facts & figures

Wet processing plant Genk (B)

- Capacity : 100 TPH (250kT/yr)

- Built-in separation techniques based on:
  - Grain size distribution
  - Density
  - Magnetic affinity
  - Shape
  - Optical properties

Chemical
&
Physical
contamination

- 15 outputs of which the most important are :
  - filtercakes (fraction < 0,063 mm)
  - Light density materials
  - Ferrous
  - Non-ferrous
  - Washed sand 0-2mm
  - Washed coarser aggregates 2-8mm, 8-32mm en > 32mm
  - Glass
  - …

- Closed circuit of processwater, 500 m³/h, alimented with processed wastewater from own activities

BIOTERRA TENDS TOWARDS A ZERO DISCHARGE OF WASTE WATER

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Nitrification - Denitrification
Membrane Bio-Reactor (MBR)
12m³/h
4000 m³ storage of water

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Fines (< 20mm) of Construction & Demolition Waste

60% recovery of mineral fraction

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From Waste to New Resources = Production of secondary aggregates

Washed sand 0/2mm
< 2% organic matter
Re-usable in building materials such as drainage layers, sand bed for conducts, stabilised sands and concrete structures.

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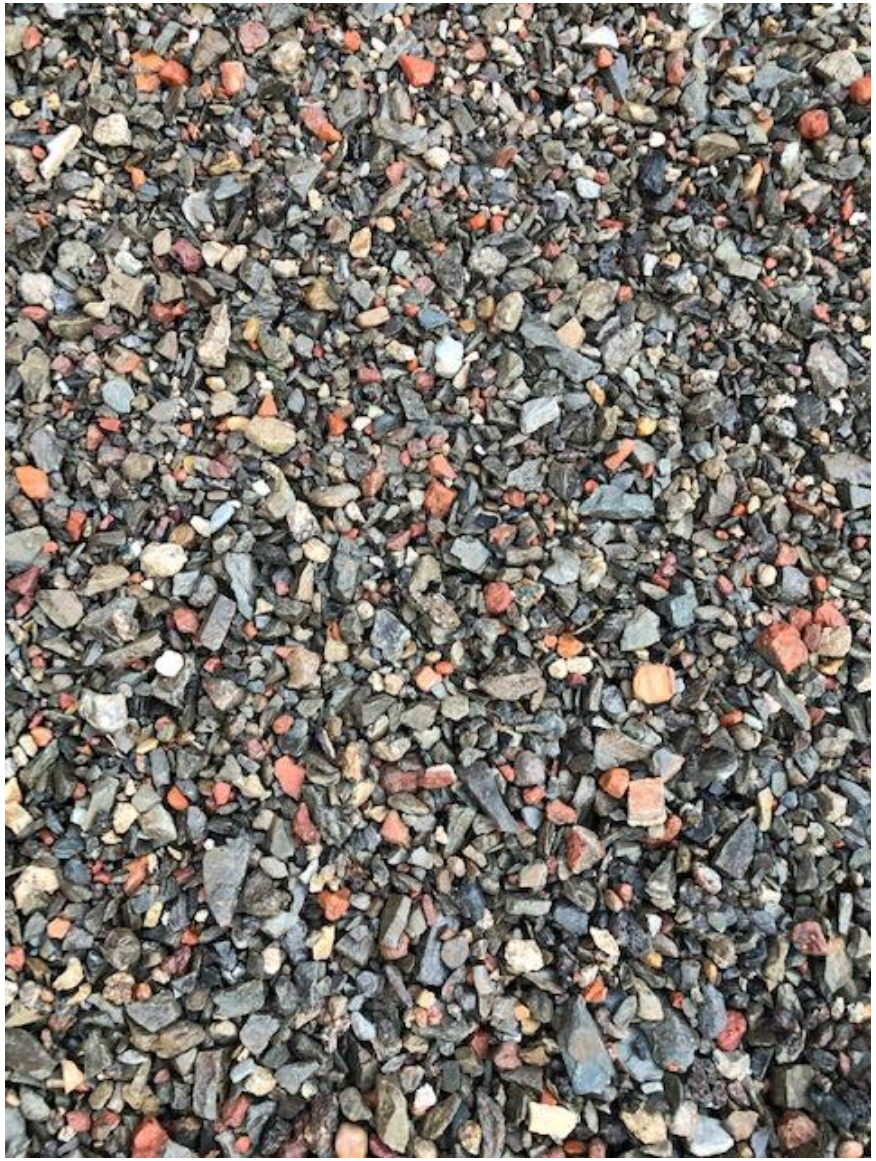
From Waste to New Resources = Production of secondary aggregates

2/8 mm



8/20 mm

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RECYCLING

(POLITICAL) TOOLS

Minimal % of recycled content

- **Concrete (depending on strength)**
- **Asphalt**
- **Concrete based products**
- **(sub)Foundations**
- **…**

DEFINING A FRAMEWORK WHEREBY <u>PRODUCTS</u> ARE DEFINED REGARDING THE <u>% OF SECONDARY/TERTIARY MATERIALS</u> TO BE PRESENT INCL. THEIR <u>QUALITY</u> NEEDS

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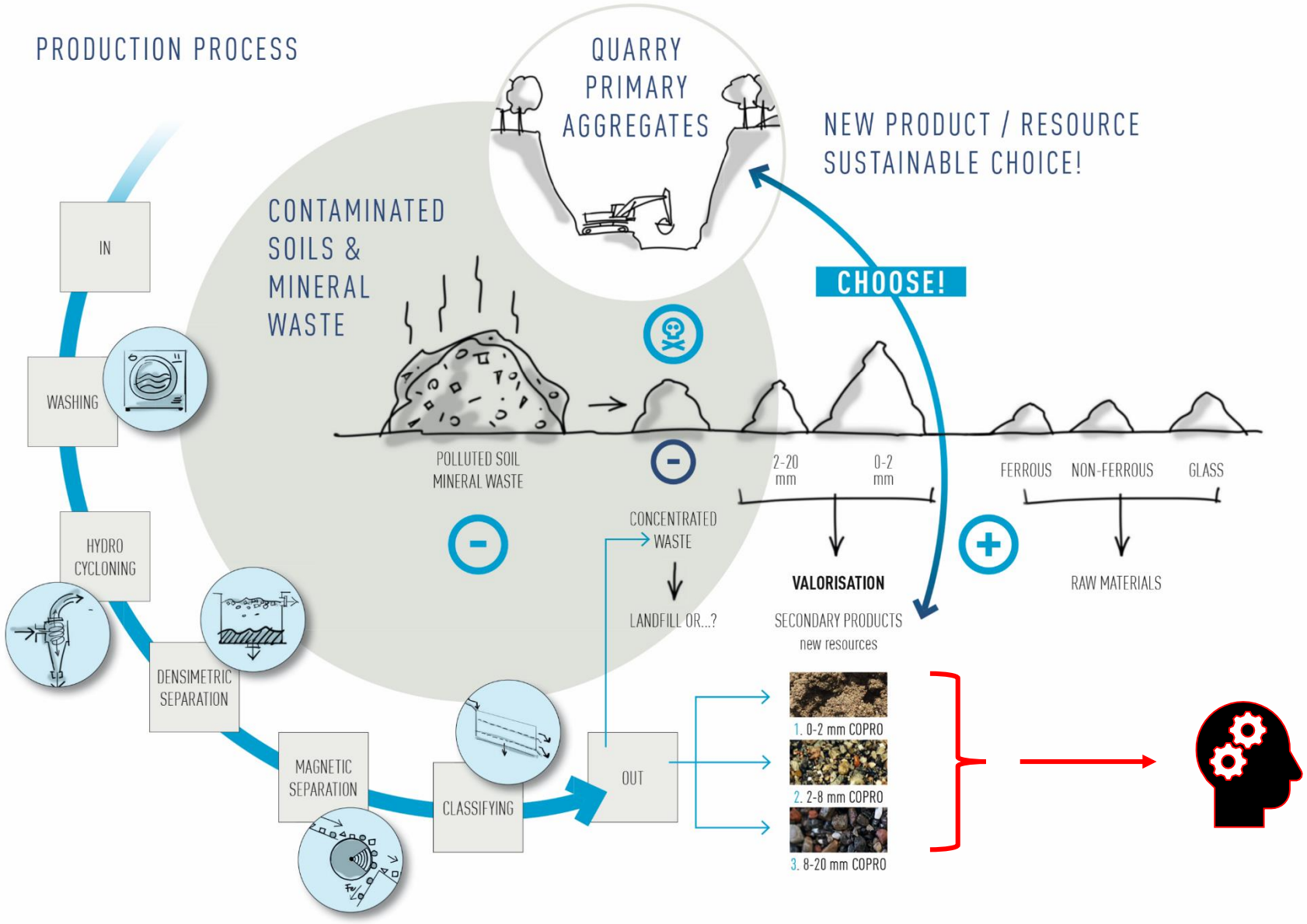

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Legislative framework and processing potential is there. Now let's look at the question:

"Which products do we make with which raw materials?"

PRECAST CONCRETE – LOWER STRENGTH APPLICATIONS

MINIMAL %
RECYCLED AGGREGATES

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PRECAST CONCRETE – LOWER STRENGTH APPLICATIONS

Test case – Precast concrete L-element

- Sand mixture 60% recycled
- 400 kg cement CEM I 52.5 R
- Crushed limestone 2/6 and 6/14
- Superplast (!)

Result :

- Pressure strength : 84,2 Mpa!!!
- Result > only primary aggregates and smoother surface
- Second life OK!

- Status : testing precast fabrication large scale

Research funded by :

GIST

Interreg
EUROPESE UNIE
Vlaanderen-Nederland
Europees Fonds voor Regionale Ontwikkeling

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HIGHER STRENGTH CONCRETE – MORE RISKY APPLICATIONS REGARDING USE OF RECYCLED AGGREGATES

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TEST CASE / DEMO PROJECT - EXTENSION OF OWN RECYCLING CENTER

- Application of road pavement concrete (C40/45)
- 40.000 m² for own use
- Demonstration project in “Circular Concrete (C²)”
- Followed up by BBRI, Belgian Building Research Institute

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CIRCULAR CONCRETE

bbri.be
Researches • Develops • Informs

installation of 2 test fields with pump truck

Onsite sampling by BBRI

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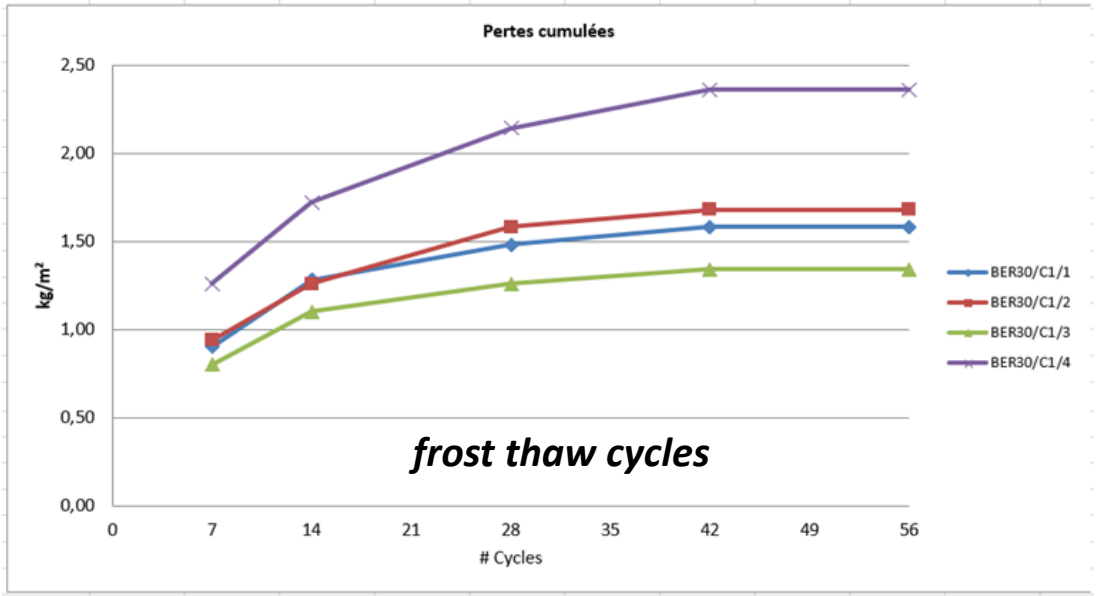
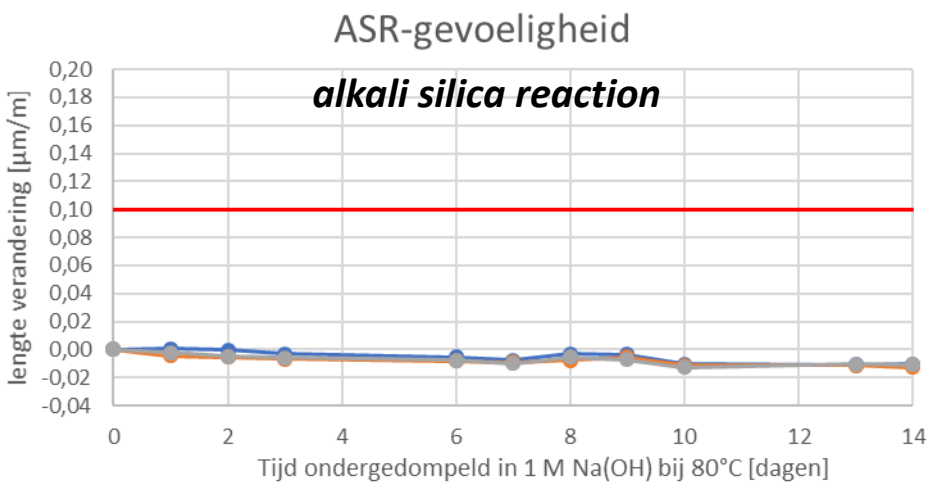
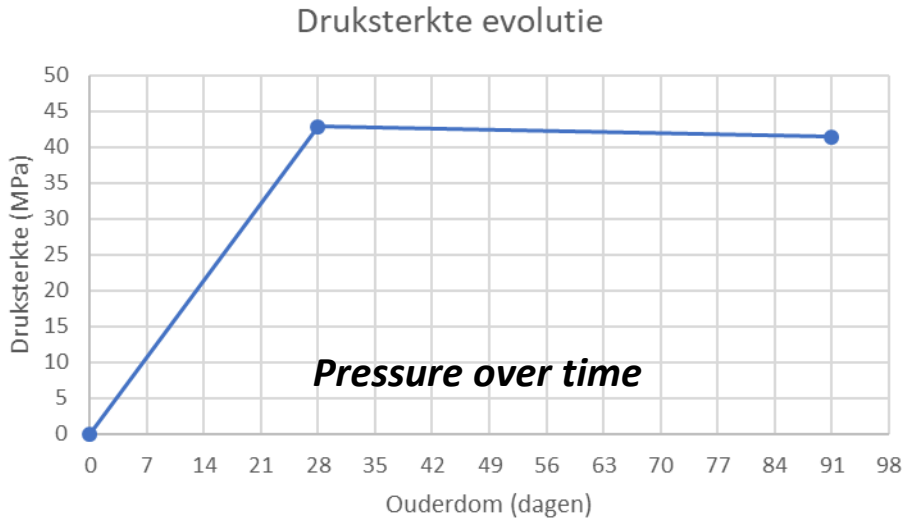
TEST CASE / DEMO PROJECT - EXTENSION OF OWN RECYCLING CENTER

RESULTS (by BBRI)

- Sand mixture 60% recycled aggregates
- 380 Kg cement CEM IIIA 42.5
- Crushed limestone 2/8 and 8/20
- Superplast
- Easy pumpable (see previous slide)
- 45 Mpa pressure strength (> 37 Mpa)
- Fresh concrete :
  - 2,7% air content
  - 2,35 Ton/m³
  - Slump S4 (180-190)
- Water Absorption Index : 6,9%







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RECYCLED AGGREGATES → NEW LIFE IN BUILDING APPLICATIONS

BUT :

Application defines strength and thus quality of composants of new product(s)

- Recycled aggregates are a fraction compared to primary aggregates, so…
- Give them their right place for the right application and …
- Define its quality needs to fit the application/product, both chemical and physical
- Second life must be assured by tests

IT'S WRONG TO SAY THAT "RECYCLED" IS ALWAYS EQUAL TO LOWER QUALITY.

WE JUST NEED TO APPLY THE RECYCLED AGGREGATES ACCORDING TO THEIR QUALITY

AND DEFINE THE LOWER LIMIT FOR USE DEPENDING ON THE TARGETED APPLICATION

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SO…..LET'S CHOOSE!

Why put primary aggregates in lower strength applications whereas they can be replaced by recycled aggregates?

THANK YOU

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