W2L Final conference

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WOOL2LOOP

TREE GRUPA

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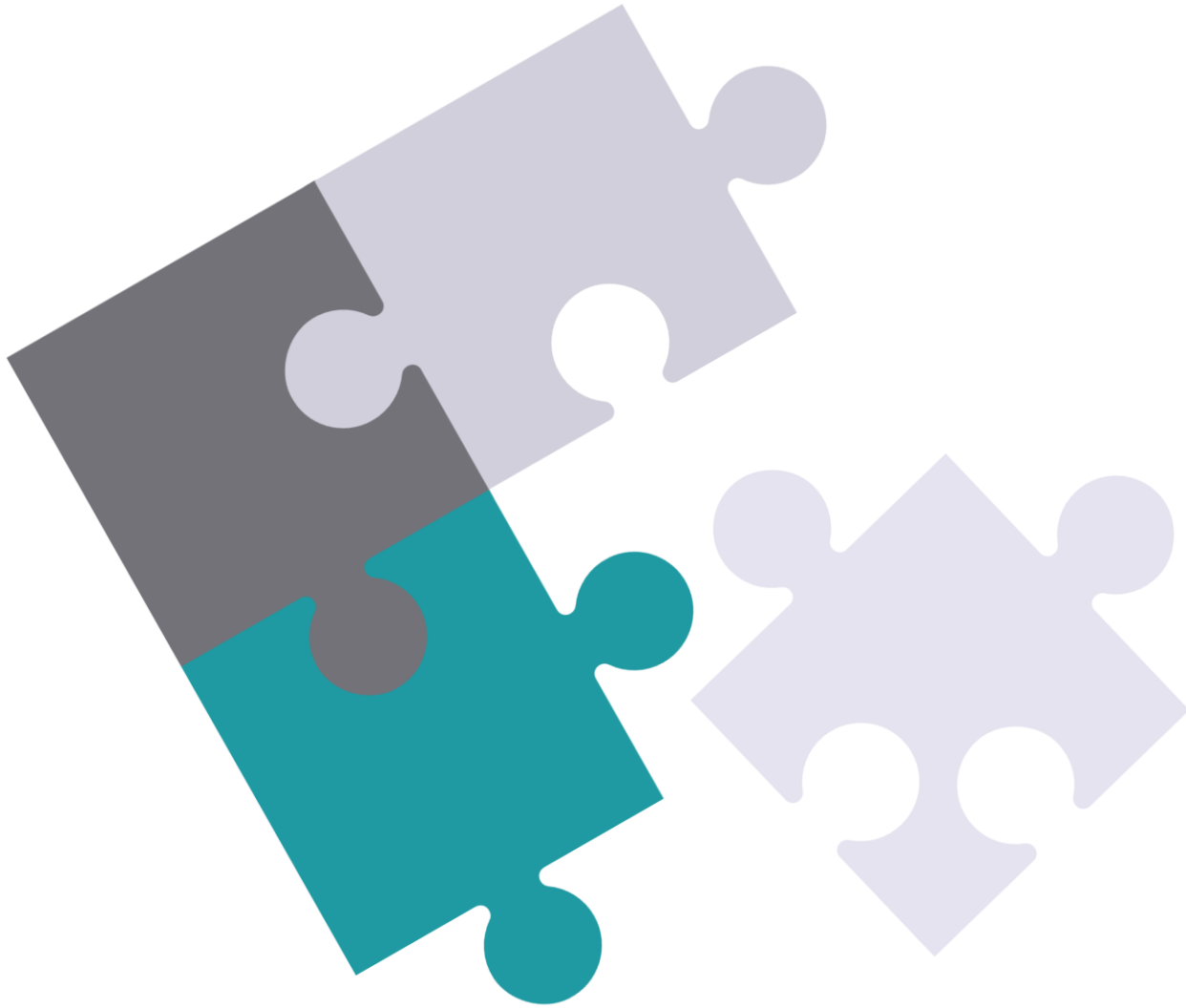
Agenda

1. Purpose of the project
2. Obtaining mineral wool
3. Mineral wool as a substrate
4. Pavement slabs - production
5. Pavement slabs – challenges
6. Conclusions and next steps



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Non-reinforced structures
Pavement slabs – purpose

- One of TREE's task was to implement pilot production of pavement slabs.
- The main purpose was to find an alternative solution for landfilling of the wool and to use waste as a substrate in production.

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Non-reinforced structures
Pavement slabs – obtaining mineral wool

- TREE collected few types of mineral wool from demolition site. Mineral wool differed in type (glass wool, stone wool and mix of glass and stone wool) and age.
- Mineral wool was shredded and then milled in a ball mill filled with stones. Milled wool had a consistency of flour.

Collecting → Shredding → Milling

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Non-reinforced structures
Pavement slabs – mineral wool as a substrate

- Milled mineral wool was a substrate in pavement slabs production. After obtaining milled wool, work on an optimal formula started.

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Non-reinforced structures
Pavement slabs – production

- All the raw materials were mixed in a planetary mixer
- After mixing the ingredients a mortar of soil consistency was received. This mortar was putted into vibropress where it was pressed and vibrated. Ready slab had to be cured for 28 days in a room temperature and 50% humidity.

Planetary mixer

Vibropress

Ready slabs

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Non-reinforced structures
Pavement slabs - challenges

1) It was difficult to find a formula that would work on a vibropress and fulfill standards' requirements (EN 1338:2005; EN 1339:2005) which are:

- Dimensions
- Bending strenght/splitting tensile strenght,
- Abrasion resistance
- Freeze-thaw resistance
- Freezing in the presence of de-icing salts,
- Resistance to acids,
- Leaching parameters

A very important parameter was also a setting time.

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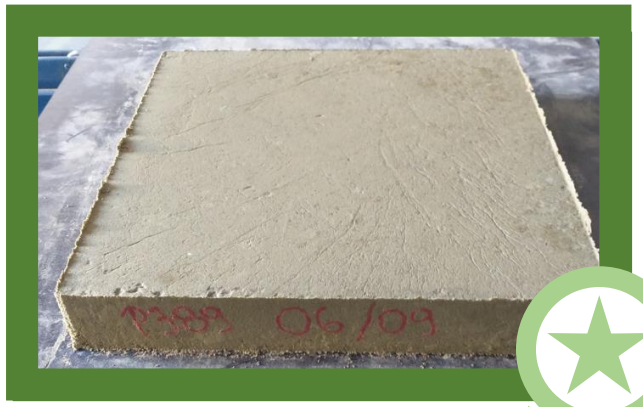
Non-reinforced structures
Pavement slabs - challenges

- TREE tried 134 formulas that differ in:
- raw materials' ratio
- type of chemical activator (betol, water glass, mix of NaOH and water glass, geosil),
- origin of substrates



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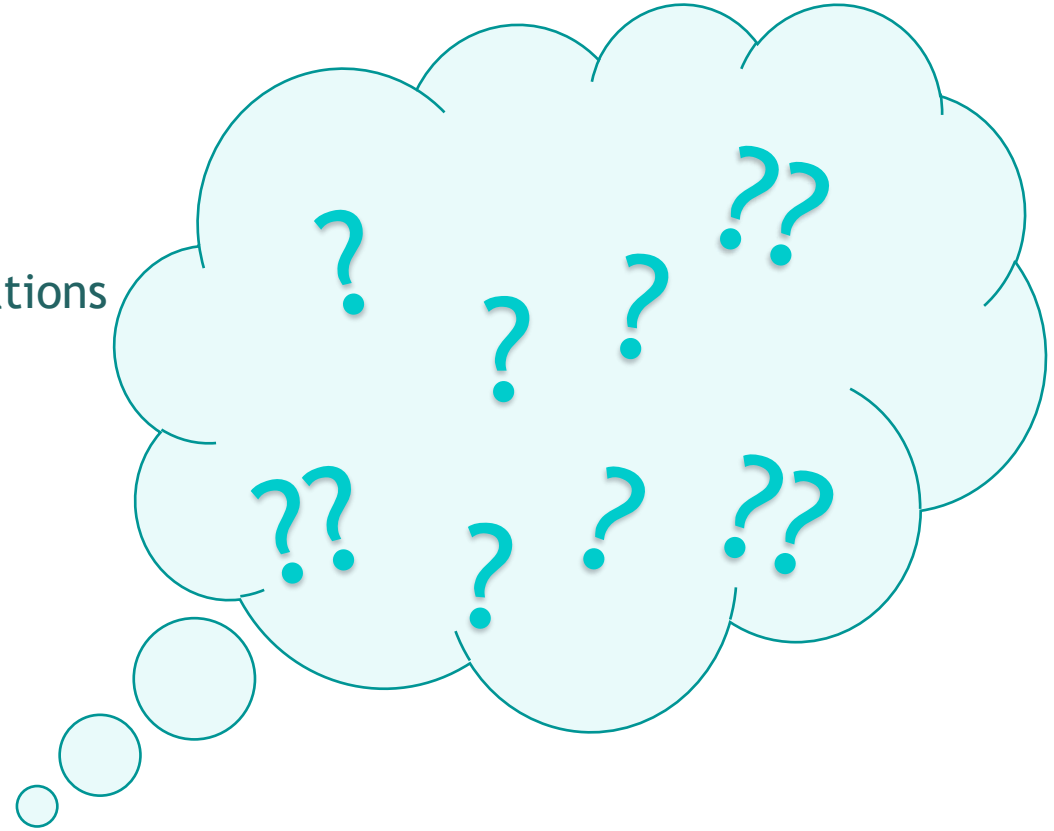
Non-reinforced structures
Pavement slabs - challenges

2) Variable composition of mineral wool
3) Variable results of milling
4) Mineral wool used in production should not contain contaminations
5) Special conditions must be kept during production
6) Type of mixing
7) Pressing force in vibropress
8) Curing conditions



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Non-reinforced structures
Pavement slabs' test results

- 24 pavement slabs were send to ZAG for durability tests. TREE managed to determine the most promising formula which has the biggest bending force and that last through 150 cycles of freeze-thaw test.

Before testing

After 100 cycles

After 150 cycles

Sample no.	Sample batch	Length [mm]	Thickness [mm]	Force at fracture [N]	Bending strength [MPa]	Average Bending strength [MPa]	Bending force [N]
P245 08/06	1	349.6	46.9	7500	4.7		6865.0
P249 08/06	1	349.9	55.8	5498	2.4	3.55	5028.2

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Non-reinforced structures
Pavement

- TREE made a pavement from ready slabs to observe how the slabs last through time.

Ready slabs

Pavement

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Non-reinforced structures
Pavement slabs – conclusions and next steps

- Pavement slabs made from mineral wool are durable (they can last through 150 cycles of freeze-thaw test). We are now during leaching tests and mechanical properties tests in a certified laboratory.
- It is hard to obtain similar properties of mineral wool from demolition site. Every time it differs in chemical composition, humidity, type and age. This causes that slabs will be different every time that type of wool changes (for e.g. color of slabs will be different, type of leached substances will differ).
- Production of pavement slabs with mineral wool is challenging, because many factors impact the results. It is crucial to maintain constant temperature (20°C) and humidity at 50% level. Any deviations from those numbers can influence the production. Other factors that influence the production are: type of chemical activator, concentration of chemical activator, type of substrates, type of mixer, pressing force in vibropress, quality of wool milling and temperature of curing.
- The profitability of the process is questionable due to high cost of substrates and complex process of mineral wool preparation

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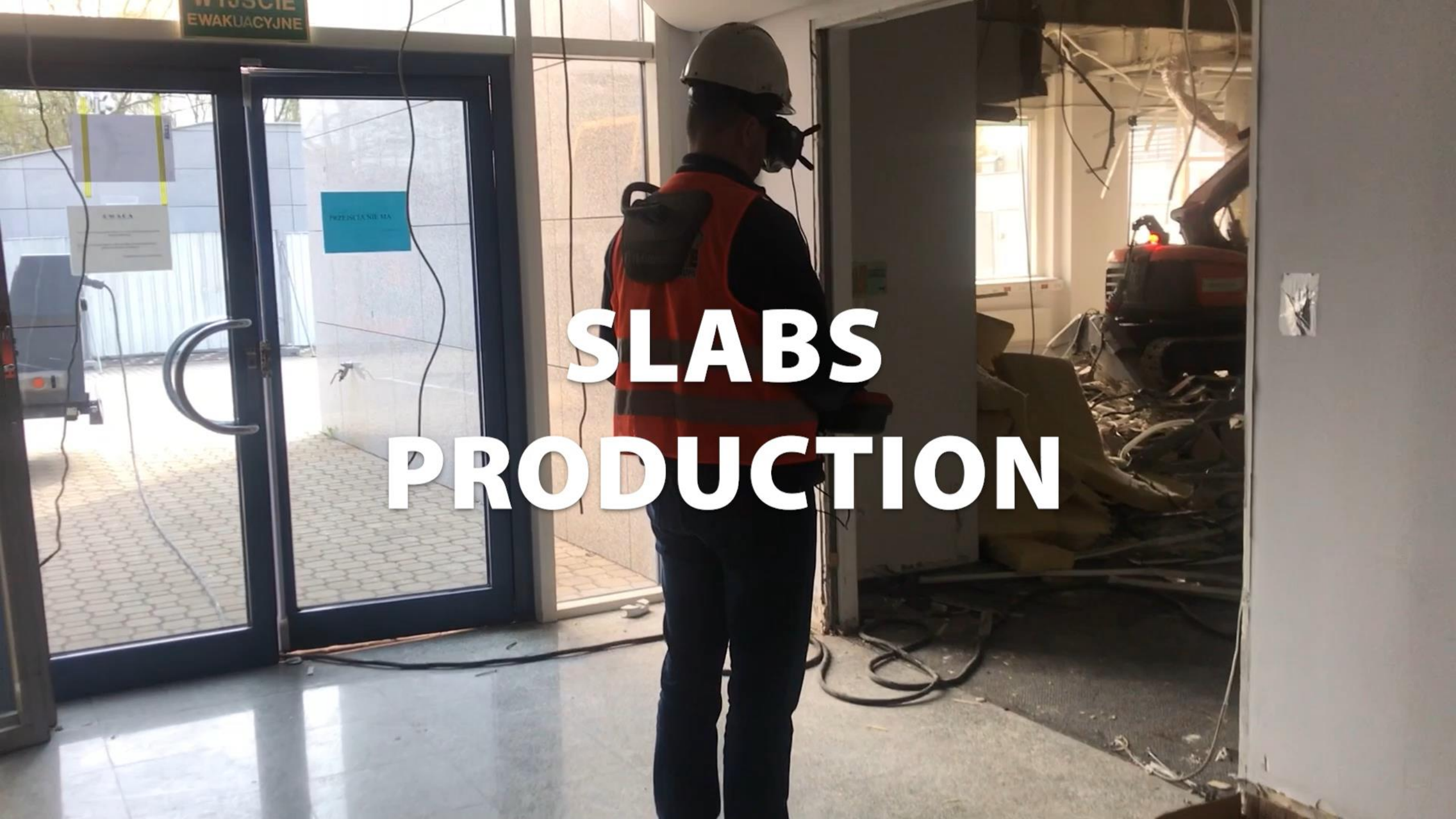

SLABS PRODUCTION

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