



New insights into the effectiveness of injection products against rising damp

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Chemical injections against rising damp

Large diffusion of chemical injections in NL, B and DE.

Impregnation (with hydrostatic pressure) or injection (with pressure) of chemical products in holes drilled in the wall along an horizontal line → horizontal barrier.

Two main working principles:

- Water repellent
- Pore filling

Different viscosity: liquid or cream

Different solvents: water or organic solvent





Chemical injections against rising damp

Problem:

- Sometimes low effectiveness of injection products in the practice
- Effectiveness in the practice <<< effectiveness in lab test

Research

3y TNO project (2009-2012)

Laboratory and in-situ research

Aims

Define new quick and reliable test

Assess effectiveness of products



Existing laboratory procedures

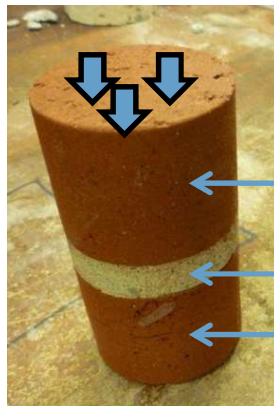
Test	Specimen	Initial saturation degree	Injection pressure	Drying after injection	Duration (from injection)
BBA pillar test	Fired clay brick/mortar (8c)	W, 100-0% bottom to top of wall	Possible	No	90-120d
BBA small scale pillar test	Stone block on brick/mortar base (3c)	W, 100-0% bottom to top of base	?	Yes (2d)	> 14d
TNO 1995	Brick/mortar (8c)	W, 100-0% bottom to top of wall	Possible	No	120-180d
BBRI	CSB, single block	S, 40-60-80% saturation	No	Yes (7d)	> 49d
WTA	Brick/mortar (5c)	W, 60-80-95% saturation	Possible	No	> 120d

Higher simplification → quicker test
Reliability?

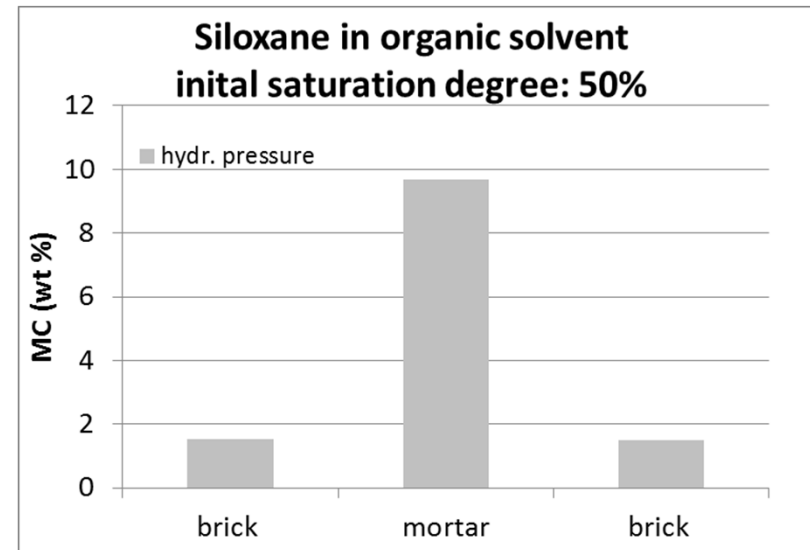


Specimen

Single material or combinations?



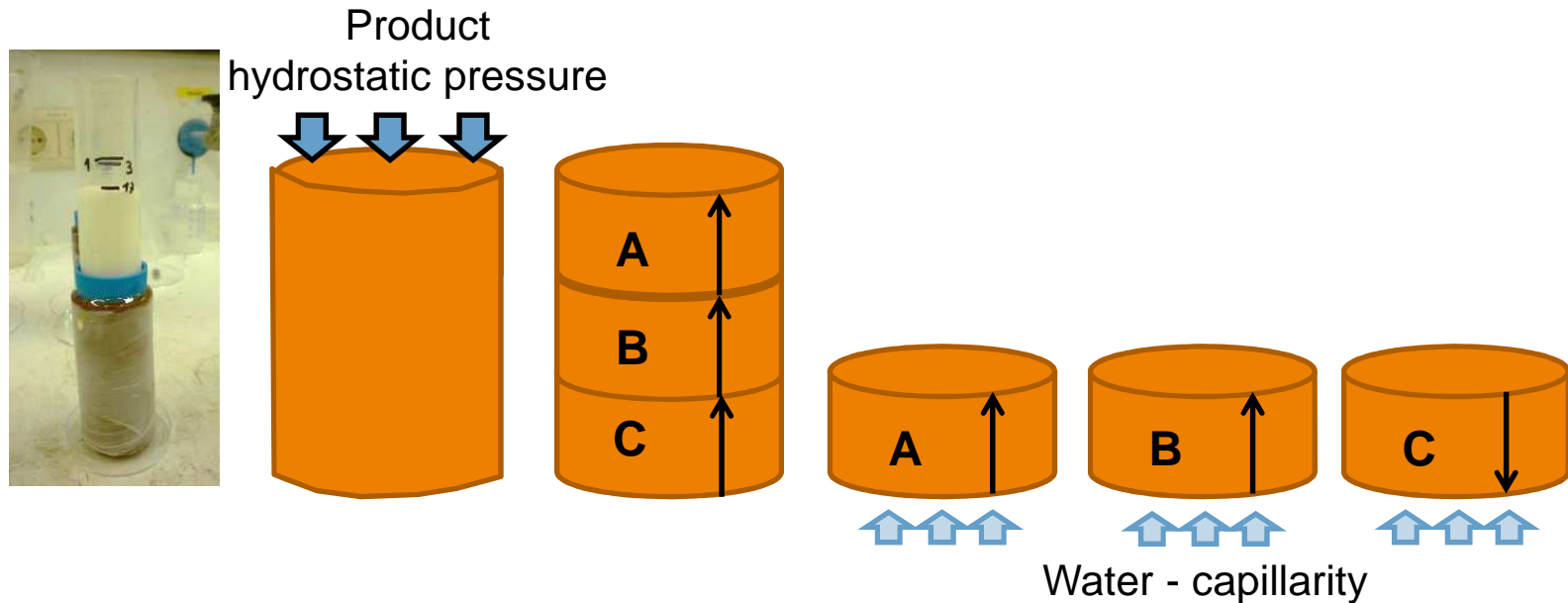
← brick part 1
← mortar joint
← brick part 2



When applying hydrostatic pressure only, some products in organic solvent had problems spreading in the mortar joint
→ test on materials combination necessary
→ Use pressure > hydrostatic pressure?



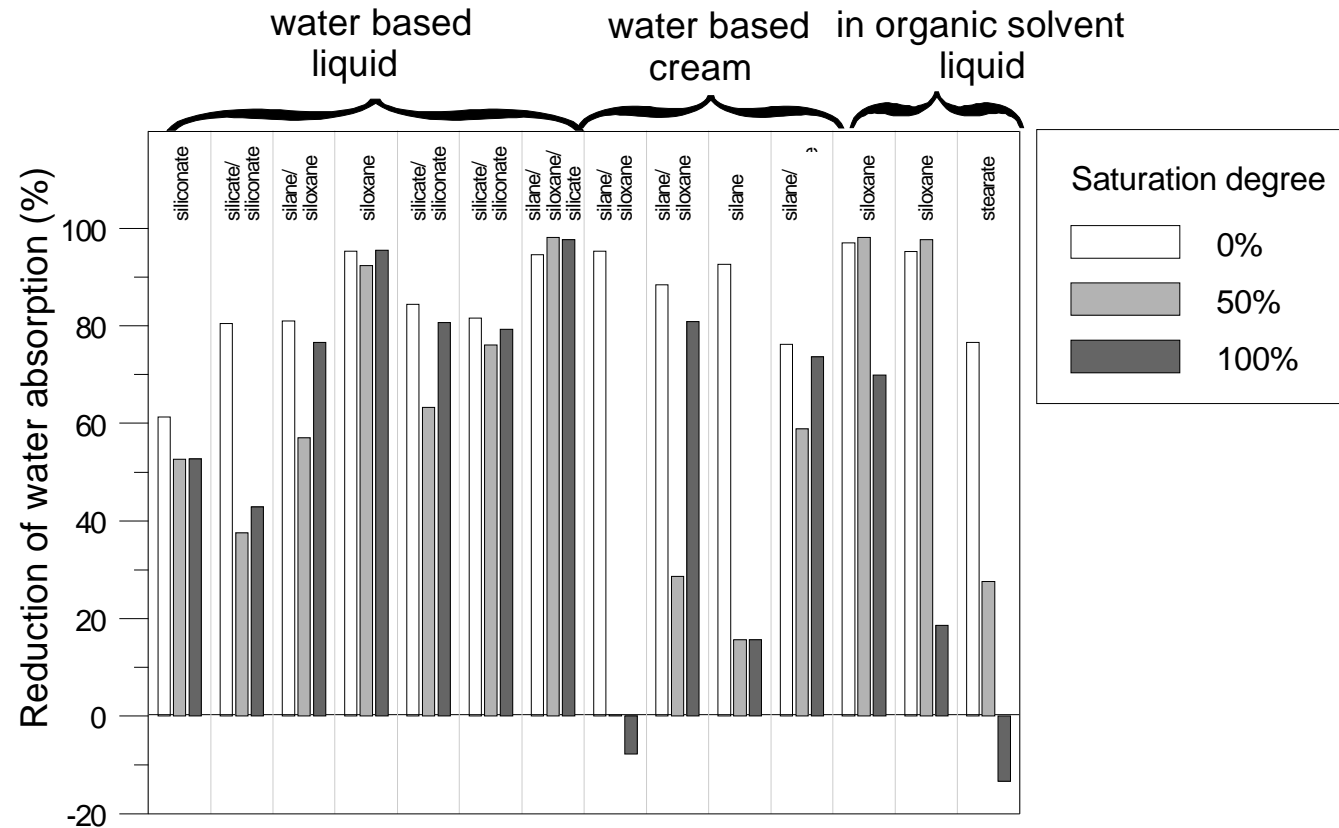
Initial saturation degree



- Single material (brick)
- Initial saturation degree: 0%, 50% and 100%
- Impregnation with hydrostatic pressure only
- Drying after impregnation
- Study of the spreading and (potential) effectiveness



Effect of initial saturation degree

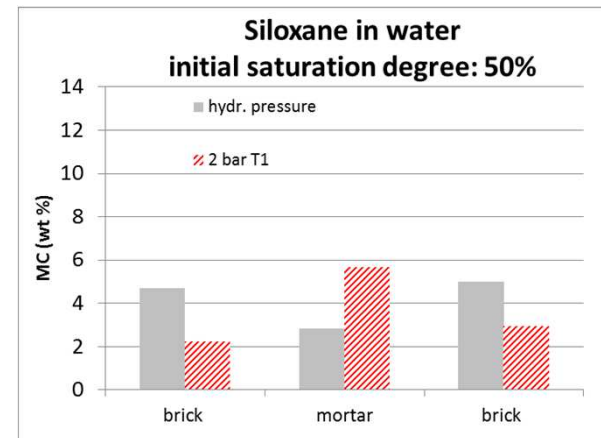
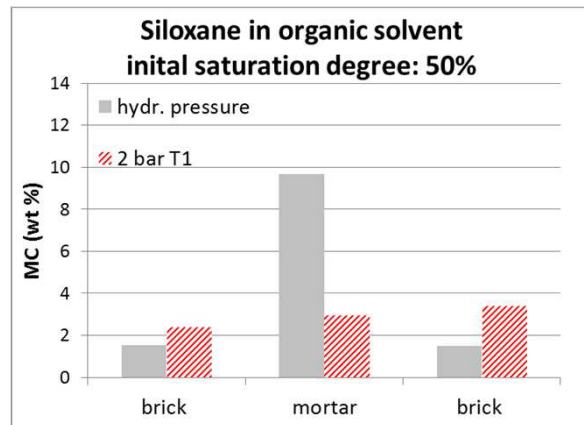


Products in water: saturation degree is not a problem for most of the products → pressure is not needed

Products in organic solvent: a very high saturation degree can be a problem for some products → use pressure?



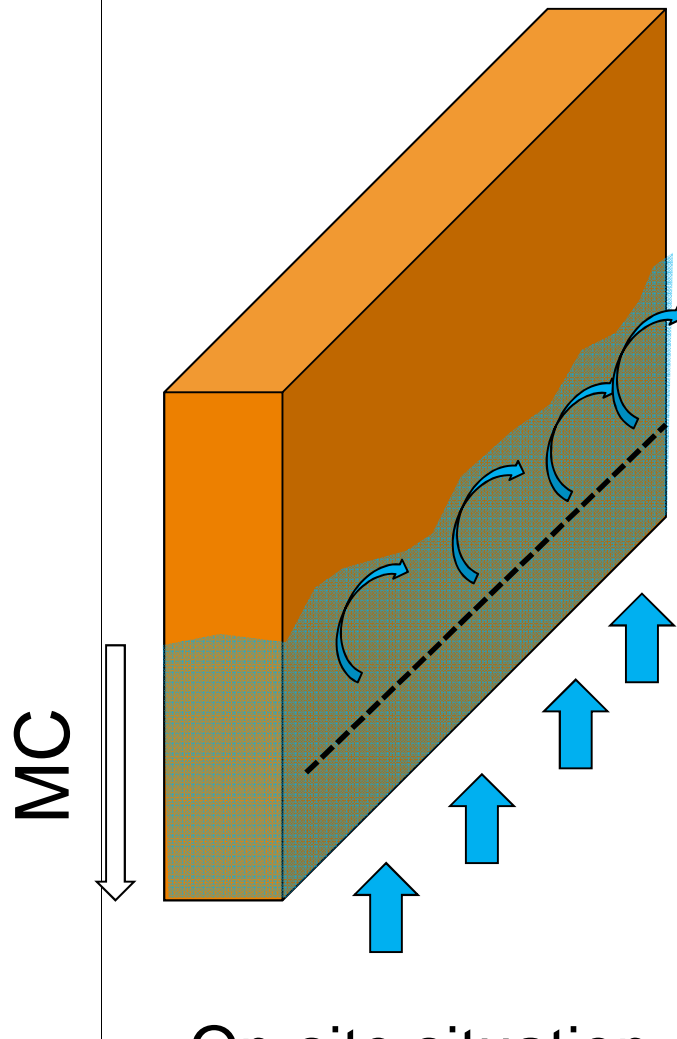
Injection pressure



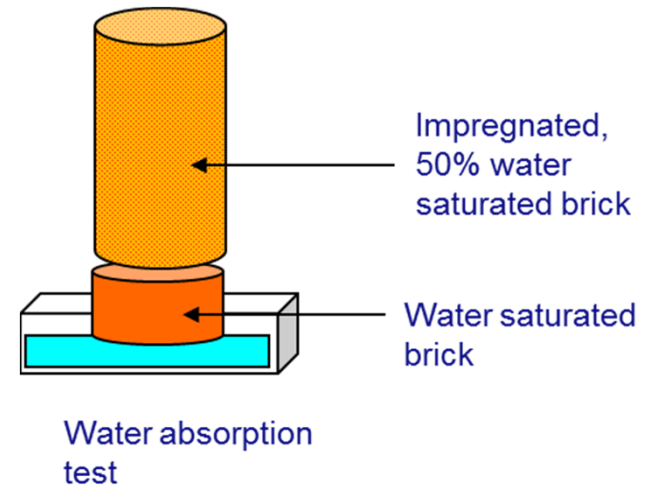
The use of moderate pressure favours the impregnation of the mortar with solvent based products.



Drying after injection?



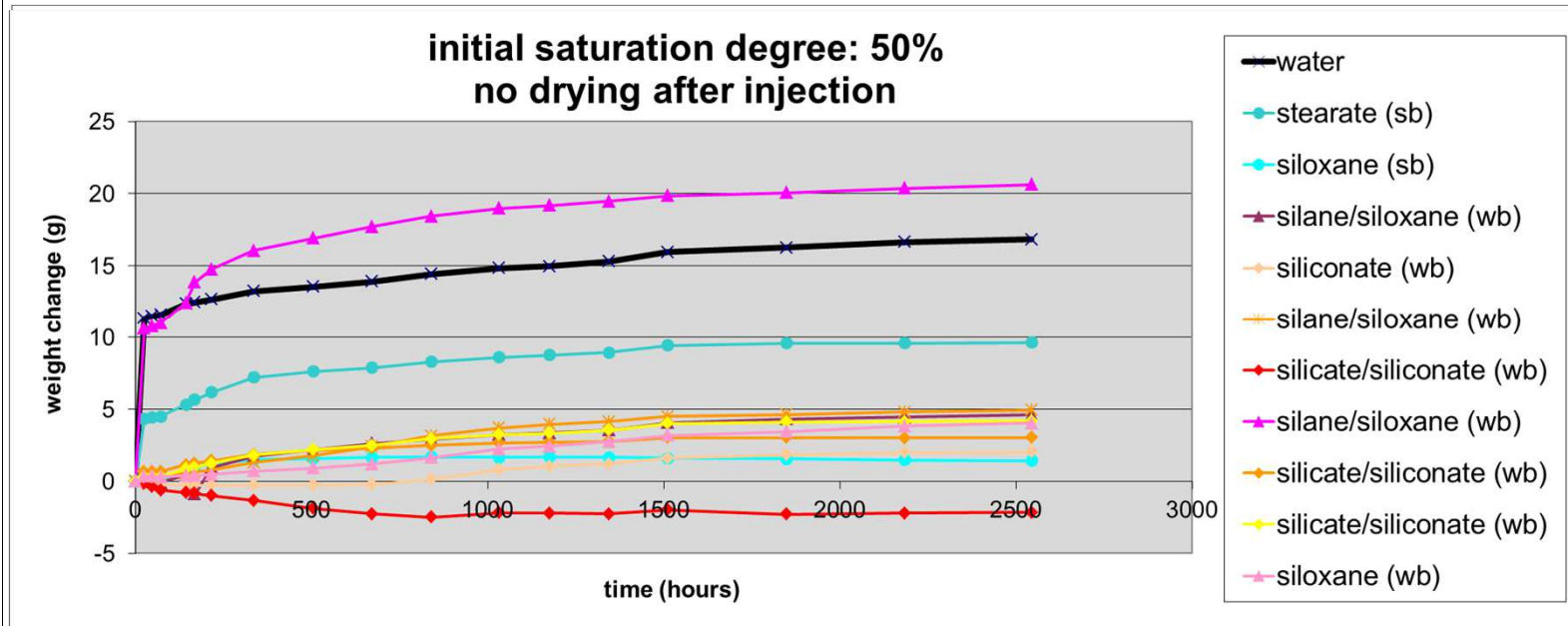
On-site situation



Test set-up



Drying after injection?



An increasing weight indicates an incomplete saturation during impregnation.

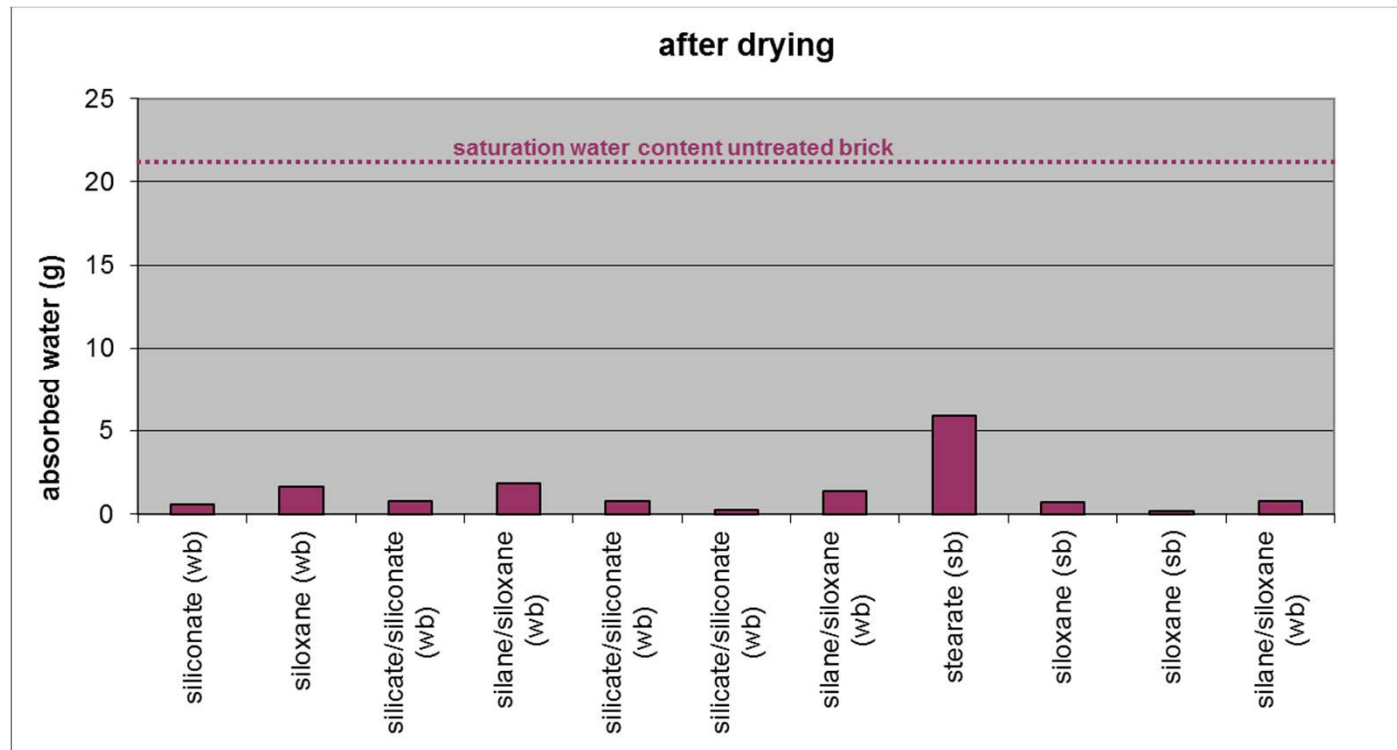
A constant weight indicates a not effective product.

A decreasing weight identifies an effective product.

At these test conditions (no drying after injection) none of the products resulted to be effective.



After drying



At these test conditions (drying after injection) all the products resulted to be effective.



Requirements quick test

- Applicable for:
 - › Different initial saturation degrees
 - › Different substrate materials and materials combinations
 - › Different injection pressures
- Maintain the water supply to the treated zone constant during and after the application.
- Give results within a short term (2-3 months) from the application



New quick lab test



Reservoir for product

Specimen(\varnothing : 65 mm, h: 80 mm)

Silicon sealing

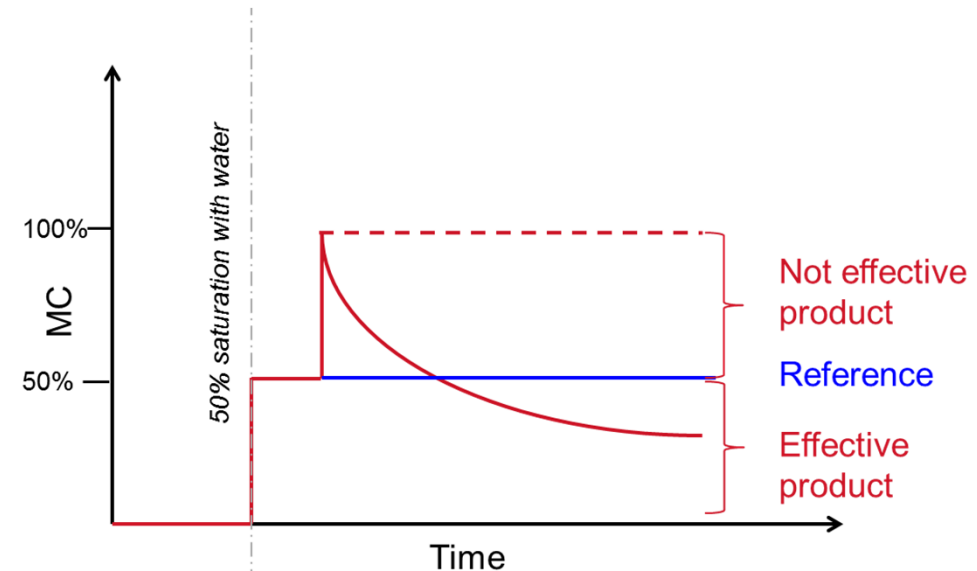
Specimen preparation



Impregnation with or without pressure.



Newly developed fast lab test



Controlled moisture supply → Assessment of actual effectiveness.



DRYING



Capillary absorption of water → Assessment of potential effectiveness.



How fast is the new test?

1. Masonry block preparation and curing



6 weeks

2. Preparation and injection of cores



about 1d

3. Absorption (effectiveness)



4 weeks

(4. Drying)

1 week

(5. Absorption (potential effectiveness))



1 week

about 3 months



Conclusions

Relevant parameters:

- Material combination
- Saturation degree
- Injection pressure
- Drying after impregnation

- The use of a drying phase in lab tests might lead to discrepancies between lab and in-situ results
- A drying phase might be used in-situ after application to improve the effectiveness of interventions.

A new quick lab test has been developed, able to reproduce the practice situation and to assess the potential and actual effectiveness of injection products within 3 months.



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14-1-2015 16:37
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TNO innovation
for life



Thank you
for your attention

