



#### Supplement of

## Pilot plant tests to demonstrate the functionality of sealing elements made of salt cut bricks

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# Pilot plant tests to demonstrate the functionality of sealing elements made of salt cut bricks

1. Motivation: initial porosity of chrushed salt is given by some 35 - 40%

initial porosity of salt cut bricks is given by some 1 - 5%depending on joint thickness and brick size





<u>idea</u> a sealing element made of salt-cut bricks offers the potential for an early loadbearing and sealing effect



2. Preliminary investigations into the sealing behaviour of salt cut surfaces



3. Construction of a pilot plant to analyze in detail the performance of a sealing element made of salt cut bricks





sample size:1,5 m x 0,75 m

4. Production of salt cut bricks – avoidance of axially continuous joints



3 brick types x 3 brick sizes 3 layers with different brick typ and size are followed by 3 layers, each rotated by 15°





- 12 t basic raw material  $\rightarrow$  0,66 m<sup>3</sup> / 1,5 t sealing element ≈ 6 t crushed salt
- ≈ 4,5 t offcuts
- ≈ 7 salt bricks per week  $\rightarrow$  ≈ 1a per sample

 $\rightarrow$  375 bricks per sample



5. Triaxial THM test control and evaluation





 $\frac{2p_A \cdot \dot{Q}_A \cdot \mu_A \cdot L}{A(p_A^2 - p_B^2)}$ 



 $\downarrow p_A$ 

## Measurement results:

a sealing element made of salt-cut bricks with moistened cut surfaces achieves a high sealing effect under typical in situ loading conditions within a few months





### e.g. stage-I-2: $\sigma_r$ / $\sigma_z$ = 12.5 / 13 MPa, $p_{gas\_primary}$ / $p_{gas\_secondary}$ = 0.2 / 10 MPa







					$K_A = \frac{2p_A \cdot Q_A}{2p_A \cdot Q_A}$
	<b>p</b> gas_primary	p <sub>gas_secondary</sub>	σr <b>-p</b> gas_secondary	К	$A(p_A^2 - 2p_B \cdot \dot{O}_B)$
	MPa	MPa	MPa	m <sup>2</sup>	$K_B = \frac{2p_B q_B}{A(p_A^2)}$
	σ	<mark>շ, = 12.5 MPa, σ</mark> z =	13 MPa		<b>VA</b>
stage-I-1	0.2	12	0.5	4.0E-19	
stage-I-2	0.2	10	2.5	2.1E-20	
stage-I-3	0.2	8	4.5	5.2E-22	
stage-I-4	0.2	9	3.5	9.9E-22	
stage-I-5	0.2	10	2.5	7.2E-21	
stage-I-6	0.2	9	3.5	1.5E-21	
stage-I-7	0.2	8	4.5	2.3E-22	
stage-I-8	0.2	11	1.5	3.1E-20	
stage-I-9	0.2	12	0.5	2.1E-19	
stage-I-10	0.2	11	1.5	3.3E-20	
		σ <mark>r = 8.5 MPa, σ</mark> z =	9 MPa		
stage-II-1	0.2	4	4.5		
stage-II-2	0.2	5	3.5	1.6E-21	
stage-II-3	0.2	6	2.5	5.9E-21	
stage-II-4	0.2	7	1.5	2.7E-20	
stage-II-5	0.2	8	0.5	2.1E-19	
stage-II-6	0.2	6	2.5	1.3E-20	