Recent developments of new sealing clays

for water wells and geothermal drillings at SSKG

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Content

- Overview: SSKG products
- Compactonit®
- Motivation for new products
  - 10/80 M
  - Spheres
  - ThermoClay
  - ThermoGrout
- Conclusion

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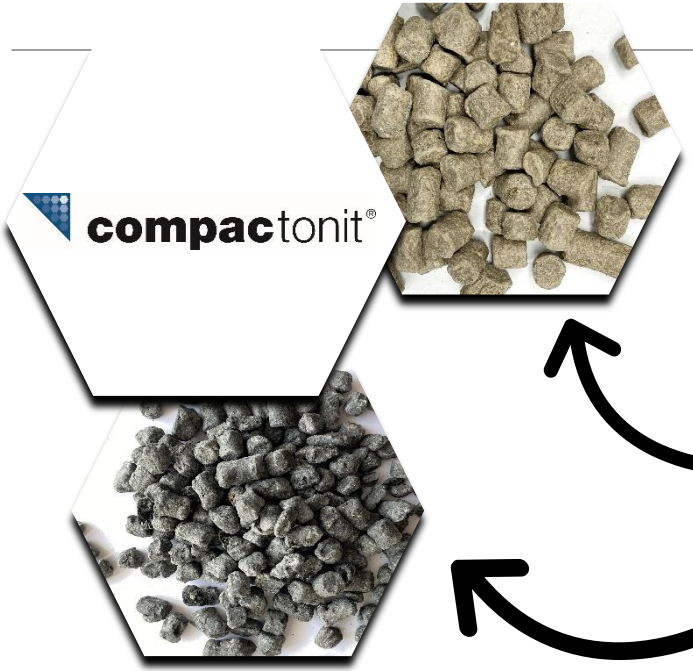
Sealing clay according to DIN 4904

Quality features of Compactonit®

- ✓ Vacuum-extruded clay pellets according to **DIN 4904** and **KIWA BRL K265**
- ✓ Well retarded swelling onset
- ✓ High bulk and dry densities
- ✓ High swelling tension
- ✓ Proven ground water suitability (GGU, Kiwa)
- ✓ Doped special products for improved sinking and/or detectability
- ✓ New bagging plant allowing private labels for distributors

GGU
Gesellschaft für Grundbau und Umwelttechnik mbH

kiwa approved kQ KIWA QUALITY



The current product group

Various swelling pressures, densities and structural stabilities

Material	Quality
Compactonit® 10/200	+++
Compactonit® 10/80	++
Quellon® HD (with heavy mineral)	++++
Quellon® WP (gamma activ)	++++
Compactonit® Typ S	+

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..identified as necessary based on feedback from customers & partners

New Product variations for special applications:

1. **Magnetically detectable and cheaper product** variation compared to Quellon HD
2. **Clay spheres** with small diameter and improved pourability for narrow and complicate annular spaces and boreholes
3. **Thermally improved** products for sealings in association with near-surface geothermal drillings (also in fissured subsoil)

secursol®
concresol®

compactonit®

1.

Magnetically detectable and cheaper product variation compared to Quellon HD

Compactonit® 10/80 M

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Currently sold as "Hydropipe mittel magnetic aktiv"

Parameter	Measured value	Parameter	Measured value
Dimensions	Ø 10 mm, length 6-15 mm	**Oversize/undersize particles**	< 1 % / 0 %
Settling velocity	18 m/min	**Bulk density**	1.25 g/cm³
Structural stability 1) mass loss (sinking) 2a) mass loss (installed) 2b) penetration resistance	 1) < 2 % 2a) 6 % 2b) 0.06 N/mm²	**Magnetic Susceptibility**	*Detectable via Magnetic-Log* *
		Y-radiation activity	*50 API* *
Swelling pressure after 35d	0.020 N/mm²	**Start of swelling**	~ 30 min *
Hydraulic conductivity	5×10^{-11} m/s	**Moisture** **Content of carbonate**	< 18 % < 5 %

* Value not measured according to DIN method

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2.

Clay spheres with small diameter and improved pourability for narrow and complicate annular spaces and boreholes

Compactonit® Spheres-3

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Modified Compactonit® 10/80

Especially for extremely narrow gaps and installation depths of up to ~ 100 m.

Parameter	Measured value	Parameter	Measured value
Dimensions	Ø 2.5 – 4.5 mm	**Oversize/undersize particles**	< 10 % / 3 %
Settling velocity	~ 14 m/min *	**Bulk density**	1.10 g/cm³
Structural stability **		**Magnetic Susceptibility**	*Not detectable via Magnetic-Log* *
1) mass loss (sinking)	1) < 2 %		
2a) mass loss (installed)	2a) 6 %		
2b) penetration resistance	2b) 0.06 N/mm²	**Y-radiation activity**	*50 API* *
Swelling pressure after 35d	0.020 N/mm² **	**Start of swelling**	~ 10 min *
Hydraulic conductivity	5×10^{-11} m/s **	**Moisture**	< 18 %
		Content of carbonate	< 5 %

* Value not measured according to DIN method
** Data derived on the basis of measured values

Compactonit® Spheres-6

Modified Compactonit® 10/80

Especially for deeper drillings

Parameter	Measured value	Parameter	Measured value
Dimensions	Ø 6 – 9 mm	**Oversize/undersize particles**	< 10 % / 3 %
Settling velocity	~ 20 m/min *	**Bulk density**	1.20 g/cm³
Structural stability **		**Magnetic Susceptibility**	*Not detectable via Magnetic-Log* *
1) mass loss (sinking)	1) < 2 %		
2a) mass loss (installed)	2a) 6 %		
2b) penetration resistance	2b) 0.06 N/mm²	**Y-radiation activity**	*50 API* *
Swelling pressure after 35d	0.020 N/mm² **	**Start of swelling**	~ 20 min *
Hydraulic conductivity	5×10^{-11} m/s **	**Moisture**	< 18 %
		Content of carbonate	< 5 %

* Value not measured according to DIN method
** Data derived on the basis of measured values

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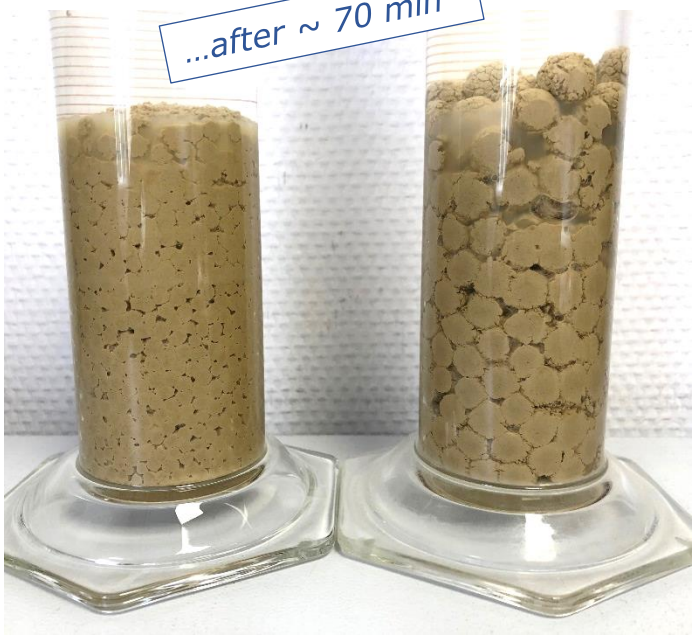
Compactonit® Spheres



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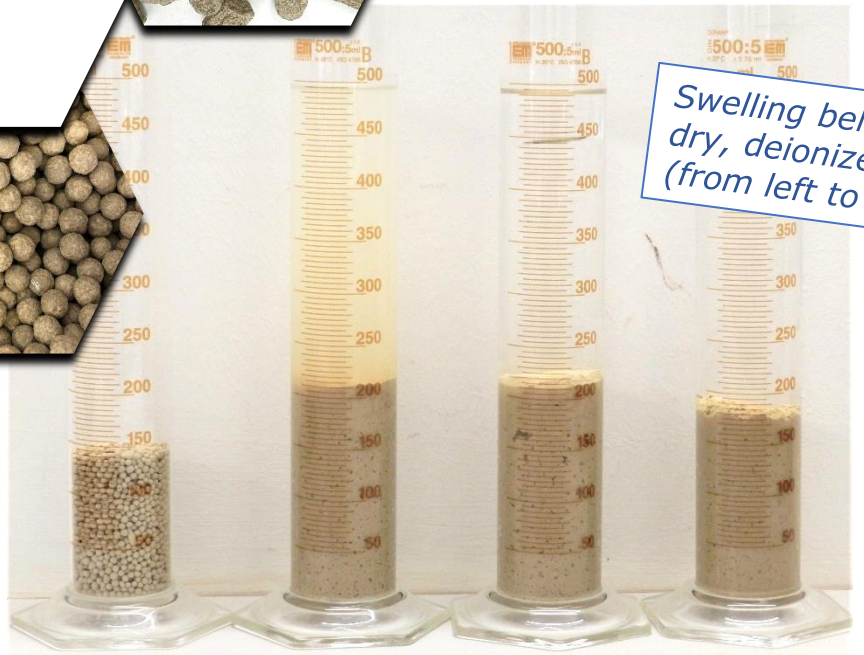
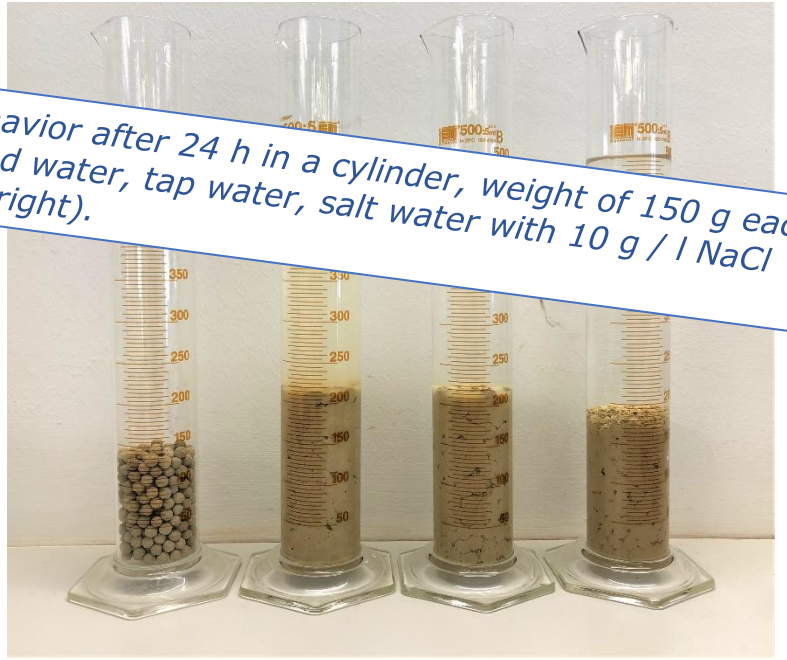
Compactonit® Spheres

Our interest: Application tests



Swelling behavior after 24 h in a cylinder, weight of 150 g each: dry, deionized water, tap water, salt water with 10 g / l NaCl (from left to right).



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3.

Thermally improved products for sealings in association with near-surface geothermal drillings (also in fissured subsoil)

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Geothermal drillings

Normally, the annular space in geothermal drillings is backfilled with cementous grout.

VDI 4640-2 (2015): Thermal use of the underground - Ground source heat pump systems

7.2.4.2.8 Special cases

"When backfilling geothermal probe boreholes in **fissured subsoil**, the location of the crevices and the crevice zones and their appearance (...) are essential for the decision to continue drilling and to ensure safe well installation and professional filling.
Depending on the depth of the crevice or crevice zone and according to hydrogeological aspects, **the annulus is to be filled with sand/ gravel or with clay pellets** in coordination with the responsible authority."

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Geothermal drillings

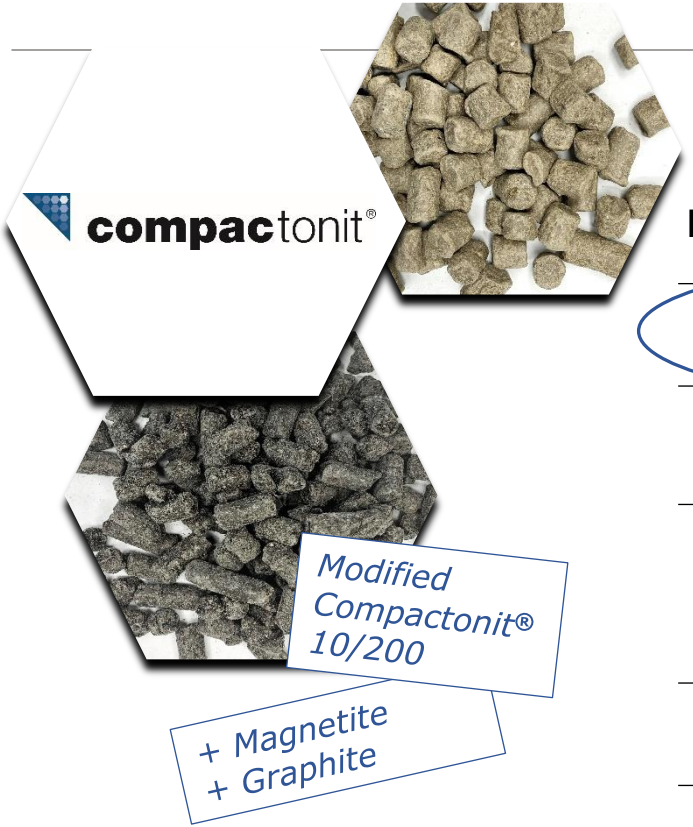
❖ *Problematic subsoil* *fissured, extremely narrow*

Compactonit® Spheres-3
Compactonit® Spheres-6
Compactonit® ThermoClay

❖ *Unproblematic subsoil*

Securesol® ThermoGrout

Thermally improved



Compactonit® ThermoClay

Parameter	Measured value		Parameter	Measured value
Dimensions	Ø 6 mm, length 6-15 mm		**Oversize/undersize particles**	< 1 % / 0 %
Settling velocity	~ 18 m/min		**Bulk density**	1.00 g/cm³
Start of swelling	~ 45 min	**		
Structural stability		**	**Magnetic Susceptibility**	*Detectable via Magnetic-Log* *
1) mass loss (sinking)	1) < 2 %			
2a) mass loss (installed)	2a) 6 %			
2b) penetration resistance	2b) 0.31 N/mm²		**Y-radiation activity**	*50 API* *
Swelling pressure after 35d	0.040 N/mm²	**	**Thermal conductivity**	1.8 W/mK
Hydraulic conductivity	1×10^{-11} m/s	**	**Moisture**	< 18 %
			Content of carbonate	< 5 %

* Value not measured according to DIN method
** Data derived on the basis of measured values

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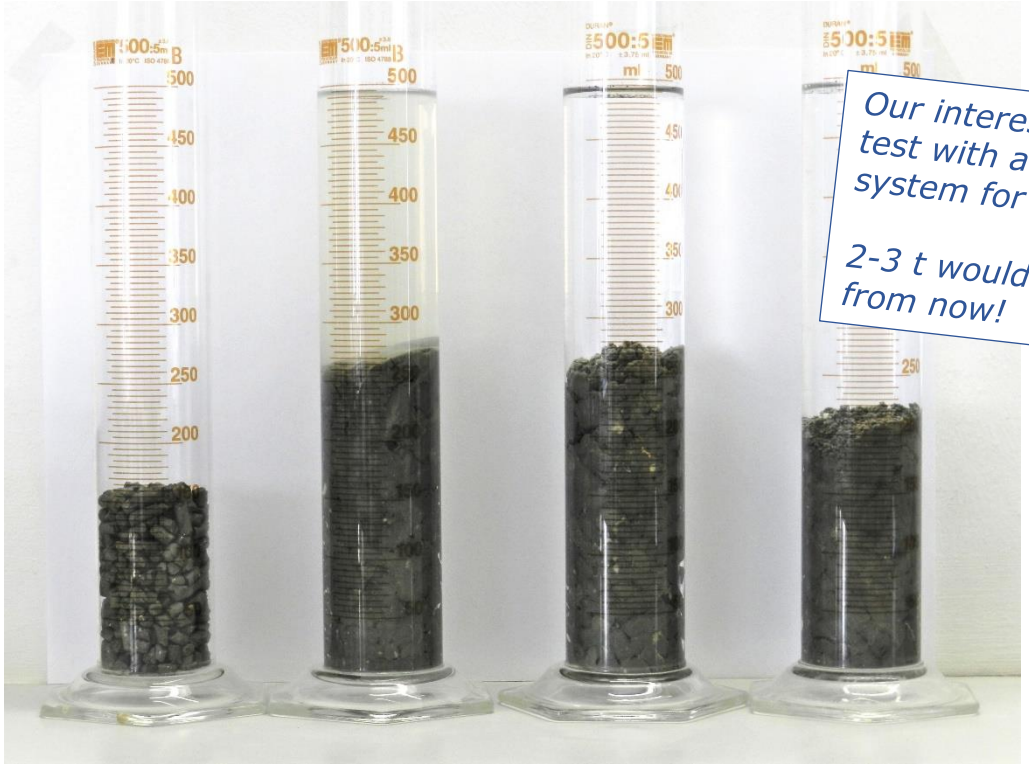
Compactonit® ThermoClay



Our interest:Application test with a pumping system for pellets.

2-3 t would be available from now!

concresol®

Systems of concrete, mortar & cement

securesol®

special civil engineering and environmental technology

Securesol® ThermoGrout *experimental stage*

Water-Solid value = **0.6**
Tap water
Fine sand
Cement CEM III/A
Concresol® 105 A

Parameter	Measured value
Marsh efflue time	42 sec
Settlement 100 ml cylinder, 1h	0.5 %
Ball harp	8
Volume weight 500 ml glass flask	1675 g/l
Compressive strength 7t	3.5 – 3.8 MPa
Compressive strength 28t	6.4 – 7.9 MPa
Thermal conductivity	*still to be measured*

Higher thermal conductivity compared to standard filling suspensions, as well as improved fluidity!

Concresol® replacing bentonite: + 5 % thermal conductivity!

Customer requests are welcome!

Mixing plant in Heijen

Conclusions

- New, market-driven products for drilling technology in constant dialogue with its customers
- Clay spheres for secure sealing in narrow and geometrically complex annular spaces
- Thermally improved clay pellets offer the highest level of safety and thermal efficiency in geothermal wells - in complicate subsoil
- Secursol® ThermoGrout as suspension for backfilling geothermal wells - especially for the Dutch market


Thank you!
Glückauf !
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