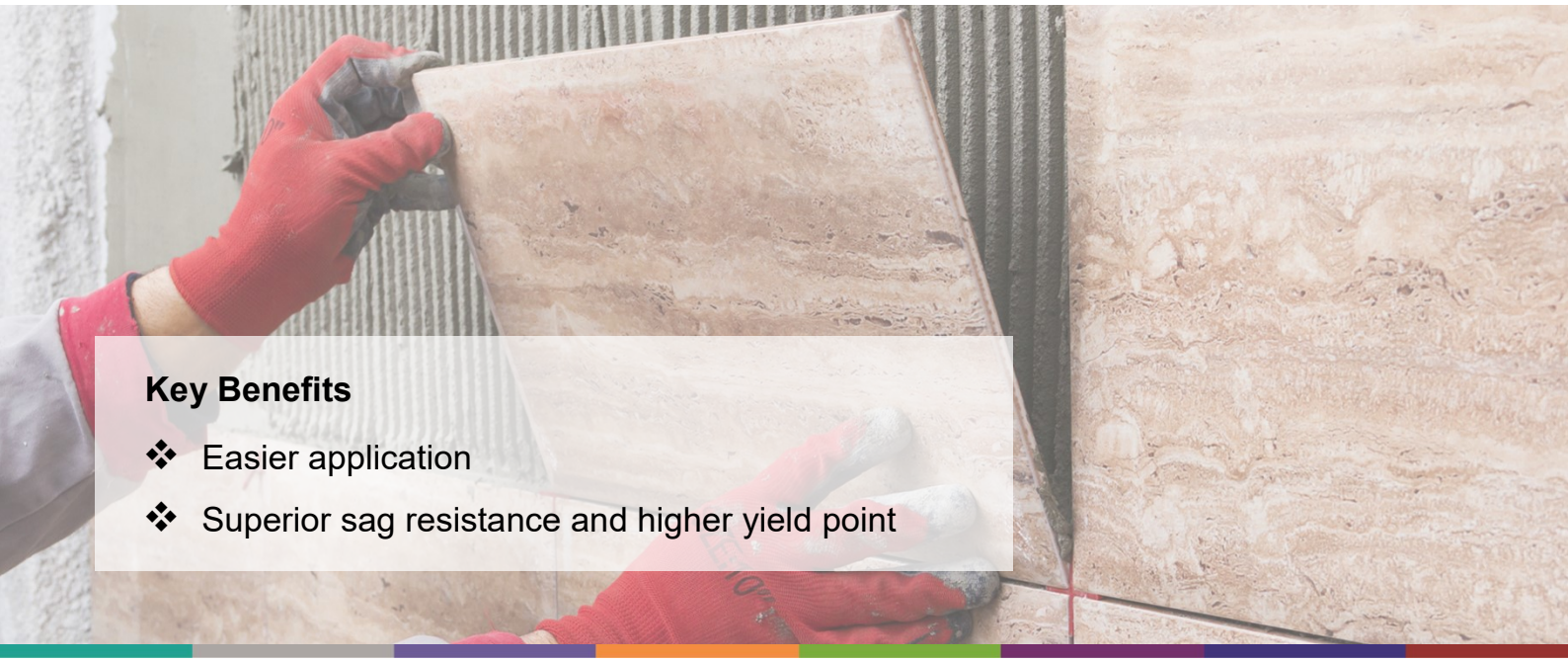
ELEMENTIS

A global specialty chemicals company

Application Leaflet

BENAQUA® 4000 and BENTONE® CT

Clay based rheological additives for cementitious EIFS mortars and reinforcement compounds



Key Benefits

- Easier application
- Superior sag resistance and higher yield point

Introduction

The use of exterior insulation and finishing systems (EIFS) for the thermal insulation of walls is a widespread, modern building technique. These systems consist of expanded styrofoam boards or mineral wool, which are adhered to the substrate, reinforced and coated with a finishing plaster. The material can be applied either as the adhesive for the styrofoam boards or as the reinforcement compound.

Key benefits

BENAQUA® 4000 and BENTONE® CT are rheological additives based on hectorite clay and designed to provide outstanding:

- High viscosity and structure build at low-shear
- Exceptional sag and slump control
- Excellent flow properties for easy application

Properties	BENAQUA® 4000	BENTONE® CT
Composition	Polymer modified hectorite clay	Unrefined natural hectorite clay
Color/form	Off-white, finely divided powder	Free-flowing cream colored powder
Density, [g/cm^3]	1.63	2.6

Incorporation and levels of use

BENAQUA® 4000 and BENTONE® CT are typically added to the dry mix powder blend. The compound can then be mixed with water on site in accordance with the mortar producer`s instructions.

Typical levels of use for BENAQUA® 4000 in EIFS mortars are 0.03% to 0.2% by weight on total formulation. Usual addition levels for BENTONE® CT are between 0.1% and 0.5%. However, in both cases, the levels will depend on the system and which type of cellulose ether is used.

Products tested

The use of BENAQUA® 4000 as a partial replacement for cellulose ether in a cementitious EIFS adhesive is illustrated in this leaflet. Also the use of BENTONE® CT together with the cellulose ether is shown. The control sample is the pure cellulose ether.

Test system

Water concentration

230 ml/kg per dry powder (in all cases constant)

Sample preparation

- Put the defined amount of water into the bowl of the Hobart mixer.
- Add the dry powder over 15 seconds under stirring.
- Stir for 30 seconds.
- Stop the mixer and wait for 30 seconds. Stir for a another minute.

Note: In case of a system based on a standard grey Portland cement, the use of BENTONE® OC as an alternative to BENTONE® CT is recommended.

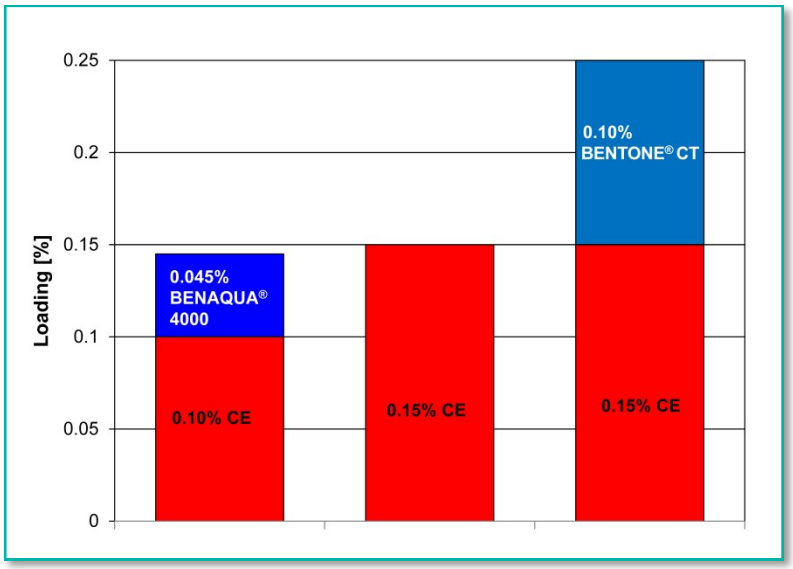
Compound	Concentration [%]
White cement CEM I 42.5 R-DW	28.0
Calcite based extender max 180 µm	19.0
Redispersible latex powder	2.5
Quartz sand 0.1 - 04 mm	50.5 - X
Rheological additive	X
Total	100

X is variable in accordance with individual concentration.

Loading level

The figure 1 shows the additive concentrations required to achieve a flow table value of ca. 15 cm. In all cases, the water amount was kept constant. The abbreviation CE was used for cellulose ether.

Figure 1



BENAQUA® 4000 could substitute approximately 33% of the original cellulose ether loading. Additionally, this resulted in a slight reduction of the total additive consumption. BENTONE® CT on the other hand had to be formulated in addition to the original amount of cellulose ether, not as a partial substitute.

Sag control and yield point

Figure 2

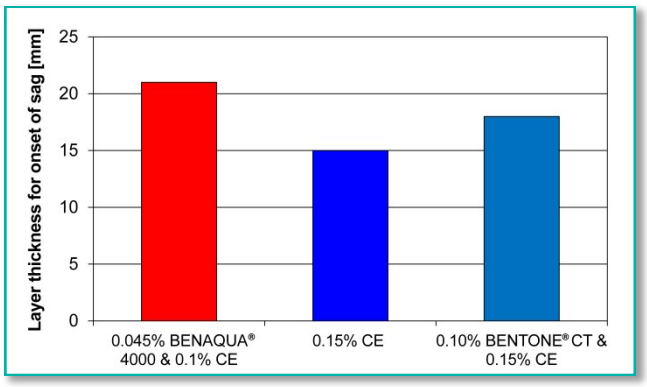
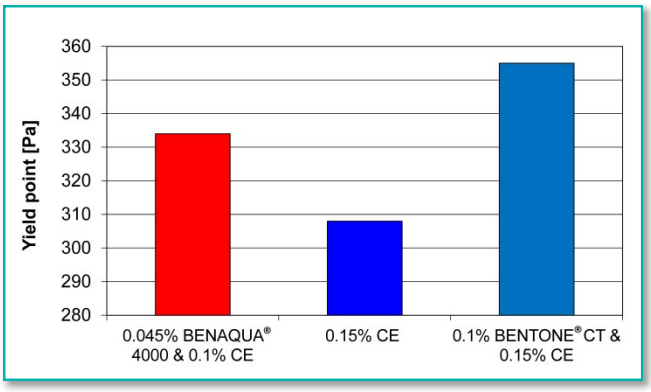


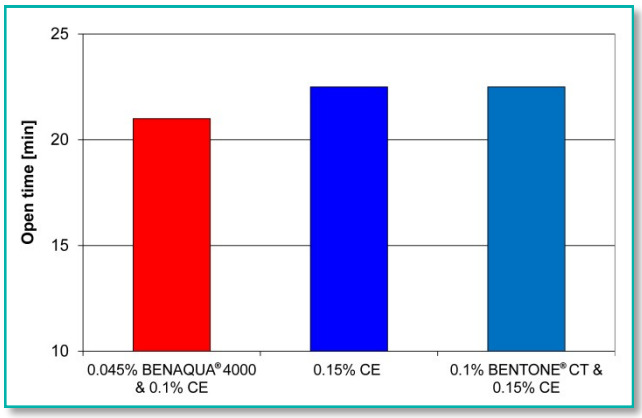
Figure 3



In figure 2 & 3, BENAQUA® 4000 and BENTONE® CT gave a noticeable increase of both sag resistance and yield point compared to the control formulated only with cellulose ether. This means thicker layers could be applied that remain stable on the vertical surface.

Open time

Figure 4

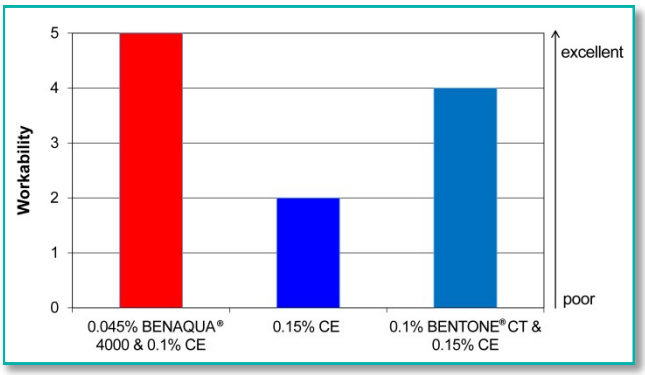


The sample with BENAQUA® 4000 as a partial cellulose ether replacement showed only slightly lower, but still comparable, open time to the control. Adding BENTONE® CT had no influence on the open time.

Application properties/Workability

In figure 5, the application properties are illustrated. The workability is defined as ease of application: reducing the stickiness and resistance to spread out with a trowel. The higher the value the better the performance.

Figure 5



Both BENAQUA® 4000 and BENTONE® CT led to much better workability compared to the original sample. BENAQUA® 4000 as a partial cellulose ether replacement provided the best performance.

Conclusion

In the cementitious EIFS adhesive and reinforment compound both BENAQUA® 4000 and BENTONE® CT gave significantly improved application properties. Samples made with BENAQUA® 4000 and BENTONE® CT also showed higher yield values and sag resistance without significant loss of open time compared to the cellulose ether control. BENAQUA® 4000 showed advantages over BENTONE® CT.

BENAQUA® 4000 could substitute a significant portion of the original cellulose ether quantity. In this case the total additive loading was slightly reduced. BENTONE® CT, however had to be formulated as an additional additive.

Appendix

Test methods

- The flow table value was measured with the Haegermann flow table desk (DIN 18555, Part 2).
- To test the sag resistance the adhesives were applied with a wedge blade (0 - 3 cm height) and stored vertically until cured. The maximum film thickness without sagging was recorded.
- Yield point was determined with a Anton-Paar MCR 3000 rheometer, measuring geometry BM 15 (ball measuring system; ball diameter 15 mm), at a temperature of 23 °C.
- To measure the open time, the EIFS mortar was applied with a serrated trowel (6 x 6 mm) on a polystyrene board (EPS board). After 3 minutes an earthenware tile of 5 x 5 cm was placed with its rough side on the adhesive and weighed down with 1 kg for 30 seconds. Tiles of equal size were applied into the adhesive after 3 minute intervals in the same manner. After 10 minutes all tiles were turned over to assess wetting on the back of each with adhesive. The open time was determined as the time interval when > 50% of the adhesive had stuck to the back.
- Workability or application properties were evaluated by applying the EIFS adhesive with a serrated trowel on a vertically positioned polystyrene board. The stickiness on the tool and the force required during the application were subjectively assessed.

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