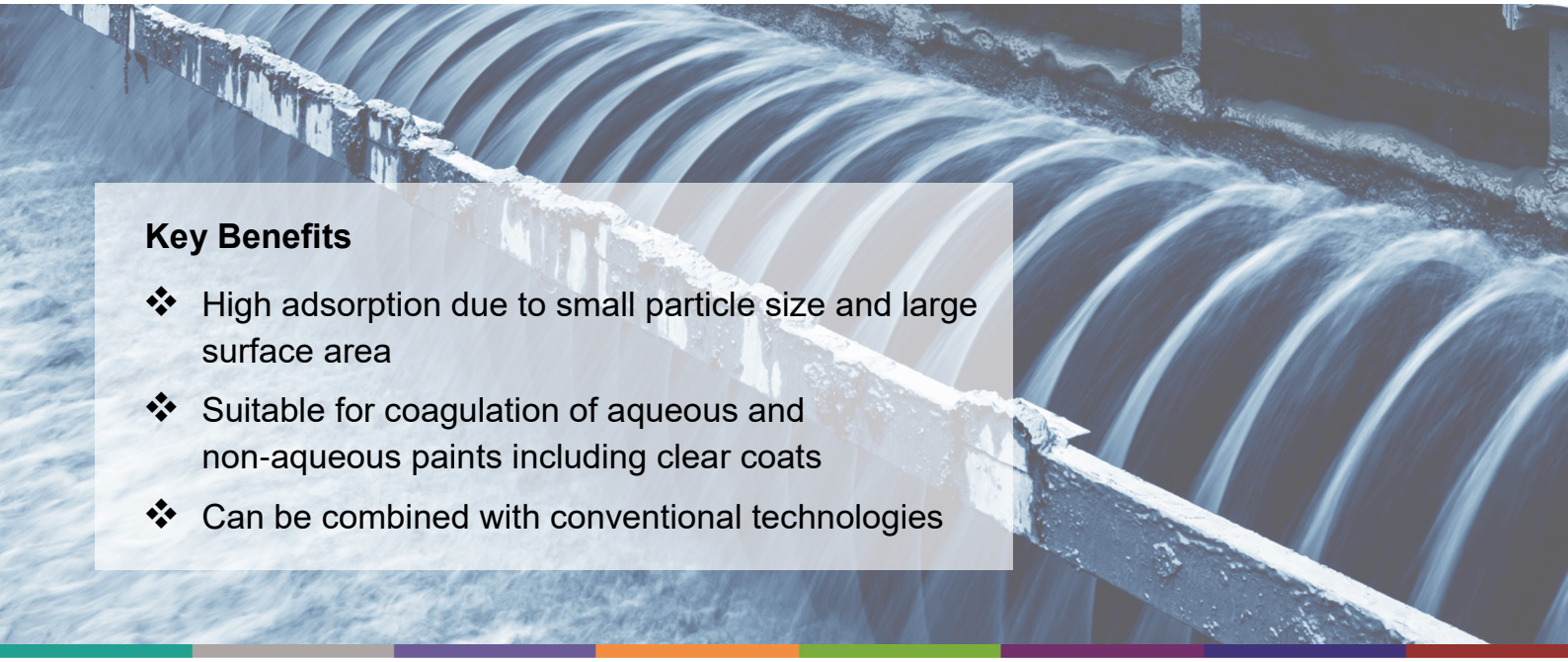
ELEMENTIS

A global specialty chemicals company

Application Leaflet

# Effective use of BENTONE®

## Hydrophilic hectorite clays in water treatment applications



**Key Benefits**

- High adsorption due to small particle size and large surface area
- Suitable for coagulation of aqueous and non-aqueous paints including clear coats
- Can be combined with conventional technologies

## Introduction

Water-sprinkled spray booths are commonly used to apply paints and coatings, both for automotive repair and general industrial applications. The overspray is constantly caught by the water and collected in a bath at the base.

This water is typically recirculated, so the paint droplets from the overspray need to be detackified, flocculated and removed. Smectite clays are first used for the detackification. In a second step, polymers, e.g. polyacrylamides, are added to flocculate the detackified droplets so that they can be easily removed. The cleaned water then goes back into the system.

Smectite clays like bentonites and hectorite can be used in this process. These types of clays have high adsorption powers due to their large surface areas. However, bentonites are problematic in the coagulation of high solid coatings and solventborne paints. Further, hectorite clays are more efficient and can be used for solvent and water based paints including clear coats.

To be effective, the clays need to be dispersed in water before addition to the spray chamber bath. It is generally recommended to prepare slurries as highly concentrated as possible to reduce further water addition. However, these slurries can be very viscous and therefore difficult to pump. For optimum pumping and dispensing, the viscosity of the concentrates should be as low as possible.

For this Elementis offers the hectorite-based products BENTONE® DE and BENTONE® HC which are highly efficient.

BENTONE® DE is a hyperdispersible hectorite grade. Due to its fine particle size and the special beneficiation process, BENTONE® DE can be easily dispersed and activated at very high concentrations of up to 15%. The resulting concentrate is still pourable and can be easily pumped and dispensed.

| Properties | BENTONE® DE | BENTONE® HC | NUOSPERSE® FX 605 |
|---|---|---|---|
| Composition | Highly beneficiated, hyperdispersible smectite clay | Refined hectorite clay | Sodium salt of a polymeric carboxylic acid |
| Color/form | Milky-white, soft powder | Cream colored, free-flowing powder | Clear liquid |
| Density, [g/cm$^3$] | 2.5 | 2.6 | 1.31 |
| Particle size, [$\mu$m] | min. 94% < 75 | 95% < 75 | — |
| Active content, [%] | — | — | 45% |
| pH, 5% in water (ASTM D 1172) | — | — | 8 - 9 |

## Incorporation and levels of use

To prepare hectorite clay concentrates, the calculated amount of purified water should be placed in the mixing vessel. The relevant amount of clay is added while stirring with a toothed bladed dissolver and dispersed for 10 minutes at a tip speed of 16 m/s. In cases of highly concentrated BENTONE® HC gels (up to 15%), NUOSPERSE® FX 605 should be added at the beginning to the water. When dispersed at lower concentrations (10%), NUOSPERSE® FX 605 could also be added later in processing.

Note that after the addition of large amounts of clay, the initial viscosity might be very high so that stirring becomes difficult. Therefore the clay amount added at the beginning must be kept low. After dispersing the initial clay portion, the remaining material can be added in steps until the required final concentration is reached. This is especially important when lower speed dispersers (e.g. propeller mixer) are used.

To achieve full activation of the clay, 10 to 15 minutes of dispersing under the correct conditions is required.

# Products tested

In terms in this leaflet the effective handling of BENTONE® DE and BENTONE® HC for paint detackification in water treatment is illustrated. Both clay products were dispersed at a concentration of 15% in water and the viscosity was compared. With BENTONE® HC, 1% of NUOSPERSE® FX 605 dispersant in total, was added to reduce the final gel viscosity.

## Test system

### Sample preparation

- Put all the water into the dispersing vessel.
- Add the dry clay powder stepwise under stirring with a tooth bladed Cowles disperser.
- Disperse at a tip speed of 16 m/s for 10 to 15 minutes.
- With BENTONE® HC, add 1% of NUOSPERSE® FX 605 prior to the clay into the water.

| Compound | Concentration [%] |
|---|---|
| Water | 85.0 |
| BENTONE® DE<br>BENTONE® HC | 15.0 |
| Total | 100.0 |

## Test method

- Brookfield viscosity was measured with the Brookfield DV-I viscometer using spindle 5 at 50 rpm and a temperature of 25 °C. The viscosity was read-off after 25 seconds.
- Rheograms were measured using the Anton-Paar MCR 300 rheometer, measuring geometry PP 25 (plate/plate, serrated spindle).

## Results

BENTONE® HC at a concentration of 15%, in combination with 1% NUOSPERSE® FX 605, gave a low gel viscosity for easy handling and pumping. The BENTONE® DE concentrate at equal clay content showed even significantly lower viscosity.

**Figure 1: Brookfield viscosity**

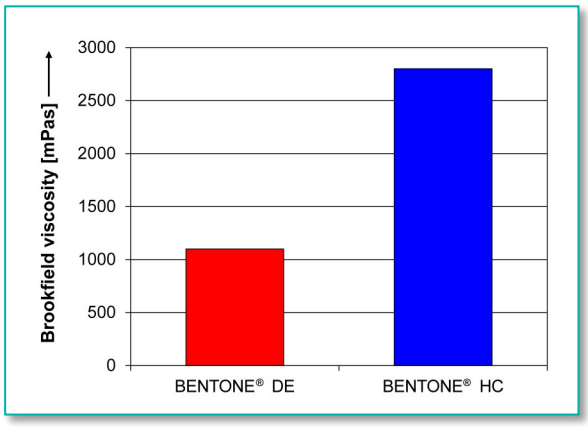
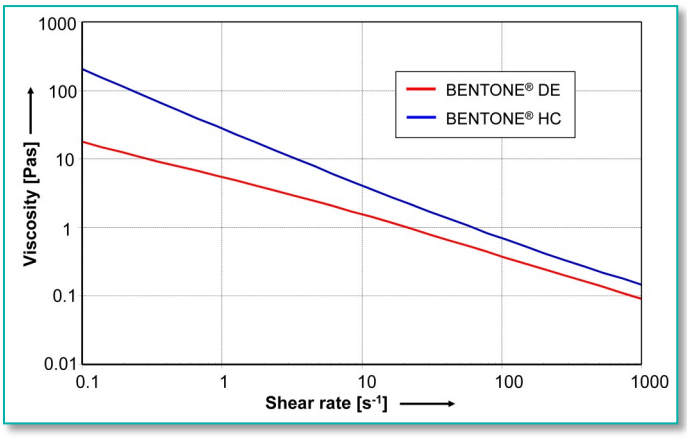



**Figure 2: Rheology curve**




# Conclusion

To produce highly concentrated hectorite clay slurries for effective paint coagulation, the use of BENTONE® HC and BENTONE® DE is highly recommended. BENTONE® DE has easier dispersing properties which results in a very low slurry viscosity at concentrations of up to 15%, so allowing easier handling.

To achieve equally high concentrations with BENTONE® HC, the addition of NUOSPERSE® FX 605 as a dispersant is required. The gel viscosity is somewhat higher than with BENTONE® DE but they are still pumpable and readily dispersed for efficient use.

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