

Wastewater Solutions

Novozymes BioSpikes® 1000

## Application Sheet

BioSpikes 1000 are used in pulp and paper mill wastewater lagoons to reduce sludge volume and lower dredging costs. BioSpikes contain a combination of beneficial microorganisms, fast-acting enzymes, and essential nutrients.

### Benefits

Lagoons offer an economical way to treat the high cost of wastewater flows generated from pulp and paper mills. Despite effective treatment, solids accumulate at the bottom of the lagoons, resulting in short-circuiting, reduced hydraulic retention time, and ultimately poor treatment. The most common way to alleviate this problem is through costly dredging.

BioSpikes offer a biological alternative to dredging. The combination of beneficial microorganisms, enzymes, and essential nutrients stimulates biological activity in the sludge and provides a cost-effective way of reducing sludge volume and improving treatment. The dense BioSpikes are applied at the water surface and sink directly into the settled sludge layer. They are easily applied over a broad area and to target hot spots where sludge has accumulated.

The microorganisms and nutrients in BioSpikes 1000 stimulate biological activity in the sludge layer, allowing floc particles to become larger and more dense. Denser floc particles contain less water and lead to greater compaction. The enzymes in BioSpikes 1000 help to degrade substances that hold decaying biomass together at the lagoon bottom. Beneficial microorganisms further complete the degradation of decaying biomass and result in a lower and more compact sludge layer.

## Performance

BioSpikes have proven effective at reducing the sludge volume in pulp and paper mill wastewater lagoons. Individual results vary according to the sludge makeup and the initial volume.

Figure 1 shows results from three treatment areas in a pulp and paper application. After 60 days, sludge levels in the treated areas dropped 0.56 m (1.8 ft) lower than untreated control areas. This increased treatment capacity by 81% in the treated areas. If these results were extrapolated over the entire 58-acre lagoon, BioSpikes would provide an additional 34 million gallons of treatment capacity and over 31 hours of hydraulic retention time.

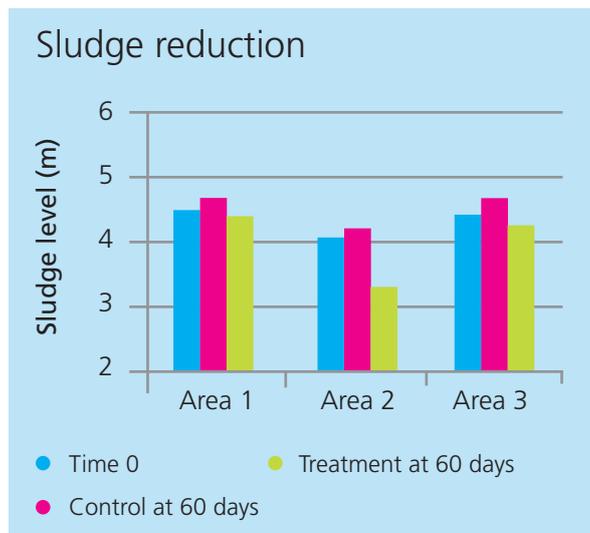
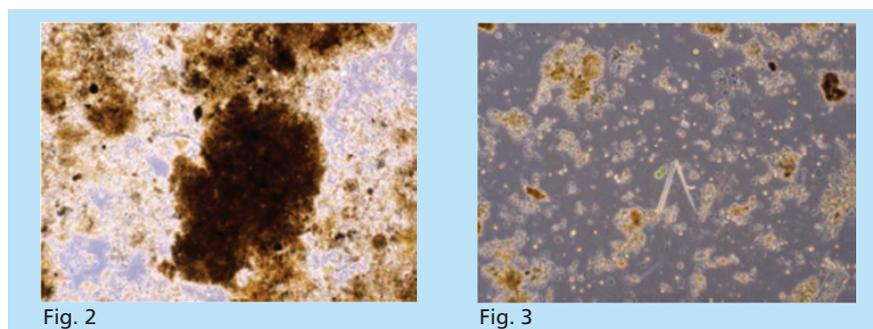


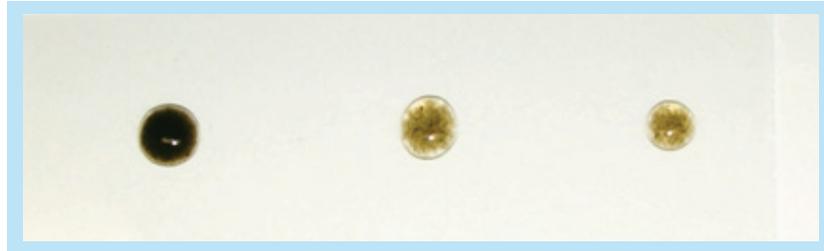
Fig. 1. The application of Novozymes BioSpikes® 1000 reduces the sludge level by an average of 0.56 m (1.8 ft) compared to controls.

Figures 2 and 3 show difference in floc size and density in sludge samples taken from treated and untreated areas. Floc particles appear larger and denser, which suggests that the sludge compacts more readily. These changes occurred in parallel with a reduction in the sludge layer depth.



Figures 2 & 3. Floc particles from treated areas (Fig. 2) are much larger and denser than floc particles from untreated areas (Fig. 3).

Figure 4 shows the difference in color between treated and untreated sludge samples. Increased biological activity results in a further oxidized and darker sludge.



**Fig. 4.** Treated settled sludge samples from the bottom of a lagoon appear darker than untreated settled sludge and mixed liquor suspended solids (MLSS). The dark color of the treated settled sludge sample (left) shows that it is further oxidized, which is an indication of increased biological activity compared to untreated areas (center). A drop of the MLSS (right) is shown for comparison purposes.

### **Recommended use**

BioSpikes applied over a broad area reduce the overall sludge layer in a lagoon. BioSpikes applied at a higher dosage in problem areas or hot spots yield greater sludge reduction. The dense BioSpikes sink to the bottom of the lagoon and are easily applied at the lagoon surface from a boat. PVC piping can be used to position BioSpikes in hot spot areas where accuracy is critical.

Sludge quality varies with system design, sludge age, amount and type of inert material, and compaction. This affects the degree to which the sludge depth can be impacted, dosing, and dosing frequency.

For applications over broad areas, an initial dosage is recommended to reduce the existing sludge volume. Follow-up applications at reduced dosages are recommended every 30–90 days, depending on the sludge accumulation rate and compactability. Hot spot dosing is recommended for areas where sludge has a tendency to accumulate at an accelerated rate and lagoon efficiency is impacted. In pulp and paper mill lagoons, results may vary depending on the concentration of inert solids found in the sludge.

### **Product characteristics**

Each BioSpike is 13.5 cm long and 4 cm in diameter (5.3 in x 1.6 in) and weighs approximately 150 g (5 oz).

## Safety and handling

Store in a cool, dry place at 10–35 °C (50–95 °F). Avoid inhalation of dust. Wash hands thoroughly with soap and water after handling. Avoid contact with eyes.

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