

Wastewater Solutions

Novozymes Toler-X™ 5100

## Application Sheet

Toler-X 5100 is a blend of beneficial microorganisms for application to municipal wastewater systems with low-temperature conditions. The addition of Toler-X 5100 can help maintain COD removal efficiency at low temperatures. The regular addition of Toler-X 5100 can also help reduce the impact of high influent COD and hydraulic washouts.

### Benefits

Temperature drops impact the biochemical reactions associated with bacterial metabolism and reproduction. Reaction rates typically decrease by a half for each 10 °C (50 °F) drop. This decrease in reaction rate is often first seen as a decrease in oxygen uptake rate (OUR) activity or as a decline in COD removal. It can take months for the microbial community to adapt to low-temperature conditions, causing plant operating problems.

Toler-X 5100 contains beneficial microorganism proven to tolerate cold-temperature wastewater applications. By building microbial communities with Toler-X 5100 just prior to seasonal changes, wastewater operators ensure a safe and fast transition for winter operation. Many wastewater facilities find it difficult to lower their F/M ratio in cold temperatures as many microorganisms tend to spend their energy on stress-induced cellular maintenance instead of reproduction. Augmenting with Toler-X 5100 removes this challenge as the microorganisms' reproduction is not restricted.

## Performance

In biological treatment systems, cold temperatures impact microbial growth by slowing down the transfer of nutrients across the cell membrane. Bacterial cell membranes contain fatty acids, which may be saturated or unsaturated. Saturated fatty acids congeal at higher temperatures than unsaturated fatty acids. The higher the concentration of saturated fatty acids, the more likely the cell membrane will congeal and become rigid at low temperatures, thereby inhibiting the transfer of nutrients across the cell membrane. The psychrophilic (cold-loving) organisms in Toler-X 5100 have much higher concentrations of unsaturated fatty acids in the cell membrane. This allows the membrane to stay more fluid at low temperatures and reduces the impact that low temperatures have on nutrient transport.

Novozymes has formulated Toler-X 5100 with naturally occurring microorganisms that have been carefully isolated from low-temperature environments and screened not only for survivability but also for the highest activities in degrading a range of typical found in municipal wastewater.

With Toler-X 5100, wastewater treatment systems can reduce the period of acclimation and ensure that COD removal rates are not lost so that compliance is not jeopardized.

Table 1 shows data from a food processing wastewater plant that was seeded with Toler-X 5100. Performance was good at the plant except during colder months. As temperatures declined leading into the winter, a maintenance dosage was applied to the aeration basin. The effluent BOD was 88% lower and the effluent TSS 48% lower compared to the year before, when the plant did not use Toler-X 5100.

Effluent/operating conditions	Winter without Toler-X™ 5100	Winter with Toler-X 5100
Average BOD	98 mg/L	12 mg/L
Average TSS	65 mg/L	34 mg/L
Average MLSS temperature	14 °C (57 °F)	11 °C (51 °F)
Lowest MLSS temperature recorded	9 °C (49 °F)	7 °C (45 °F)

**Table 1.** Toler-X™ 5100 led to improved BOD and TSS removal even in colder temperatures.

## **Recommended use**

Toler-X 5100 can be used for multiple applications, including daily dosing to maintain the microbial community's health during the onset of low-temperature conditions, daily dosing to maintain the microbial community's health in year-round cold environments, increased dosing in response to temperature fluctuations, and seeding during cold-weather plant start-ups.

Toler-X 5100 bioaugmentation programs generally start 1 month prior to the onset of cold weather. Dosing begins before ambient temperatures reach 4 °C (39 °F) or before wastewater temperatures reach 13 °C (55 °F). Toler-X 5100 is added daily directly to the aerobic treatment units. The microorganisms in Toler-X 5100 perform within the pH range 6.0–9.0, with an optimum near 7.0.

The dosage rate for Toler-X 5100 is dependent on the volume of the biological reactor and the BOD or COD loading in the system. During the initial seeding period, an increased dosage is used to quickly establish the microorganisms in the system. When the microbial community is properly grown, regular dosing is necessary to maintain an accelerated level of biological activity and to continue to minimize upsets. Waiting until after cold weather arrives will likely necessitate increased dosing due to slower acclimation and will vary with operating sludge age.

## **Product characteristics**

Toler-X 5100 is available as a dry tan powder.

## **Safety, handling, and storage**

Store in a cool, dry place. Avoid inhalation of dusts. Wash hands thoroughly with soap and water after handling. Avoid contact with eyes.

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