



Water & Waste Management

**BioRemove™ HC
and BioRemove™
COD SP**

Petrochemical & Refining

Case study: Maximized activated sludge
system production

Rethink Tomorrow

novozymes® 

BioRemove™ HC and BioRemove™ COD SP saved a refinery USD 200,000 per day by improving hydrocarbon removal.

Benefits

- **Lowered operating costs by minimizing the risk of permit violations**
- **Improved plant efficiency, averting the loss of USD 200,000 per day**
- **Simplified operations by reducing the need for various chemical additives**

Background

Some refineries receive crude oil from offshore oil rigs. As a result of bringing the oil upstream, an aeration basin may have problems maintaining an active microbial community, often caused by poor floc formation, low dissolved oxygen (DO), and clarifier performance. The result of such issues is slower production.

A petroleum refinery receives oil from a rig located approximately 3 miles away from the facility. As the crude oil is brought into the plant for refinement, the excess water is sent to an anaerobic filter system prior to entering the conventional activated sludge system. Oil and grease levels in the anaerobic filter are closely monitored. Typical flow through the plant is 1,800 gallons per minute (gpm). However, if the oil and grease levels exceed the permitted limit, the plant will slow down production, resulting in a loss of at least USD 200,000/day. Therefore, the plant has to handle all production flows correctly to achieve the maximum earnings per year.

The petroleum refinery contacted Novozymes looking for a more cost-effective solution. The aeration basin had problems maintaining an active microbial community above 1,800 mg/L MLSS with a volatile fraction of over 70%. This was primarily due to poor floc formation, low DO, and clarifier performance. If the system were to drop below that range, effluent hydrocarbon levels would exceed the permitted limit, and the system would have to slow down production. The refinery was using various chemical additives which did not meet its required specifications.

Application

Novozymes' experts visited the site to evaluate the situation and determine whether a biological solution was feasible. To treat the root cause of the refinery's problem, Novozymes' experts decided not only to treat the hydrocarbon directly with BioRemove™ HC but also to use BioRemove™ COD SP to build floc, keep the microbial community close to 4,000 mg/L, and optimize refinery performance.

While this trial is ongoing, Novozymes regularly visits the refinery to monitor progress and development.

Results

After implementing Novozymes' recommendation, the refinery saw immediate benefits and has been able to operate without slowing down production for the past 4 years.

Typical settled sludge from aeration basins during **sound** operation

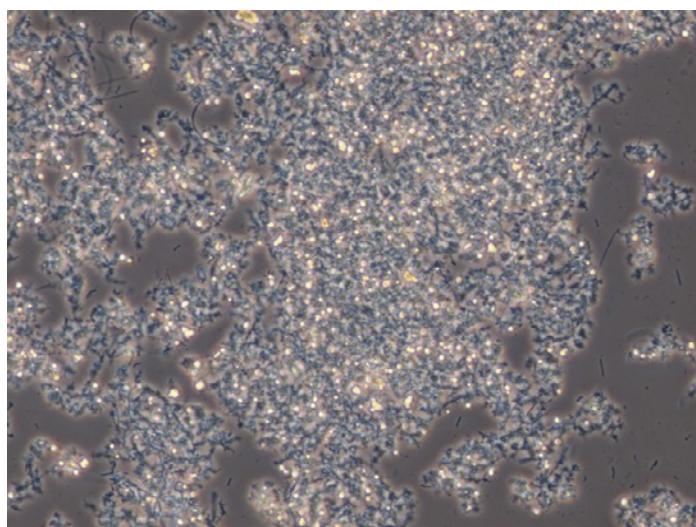


Fig. 1. 400x phase contrast photo of microbial community.

Typical settled sludge from aeration basins during **poor** operation

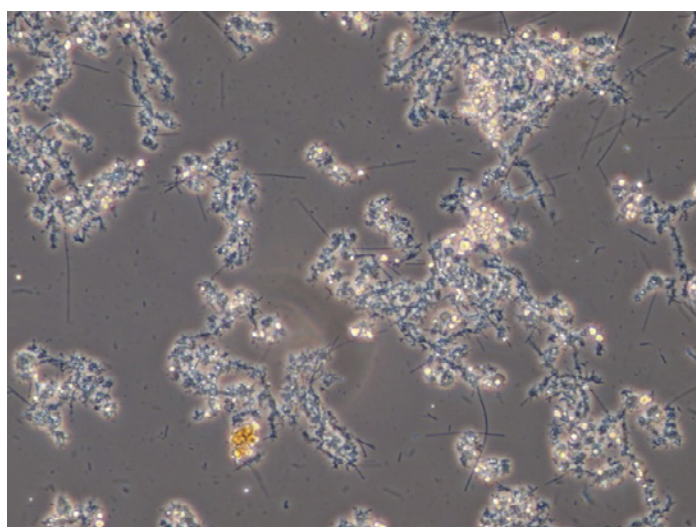
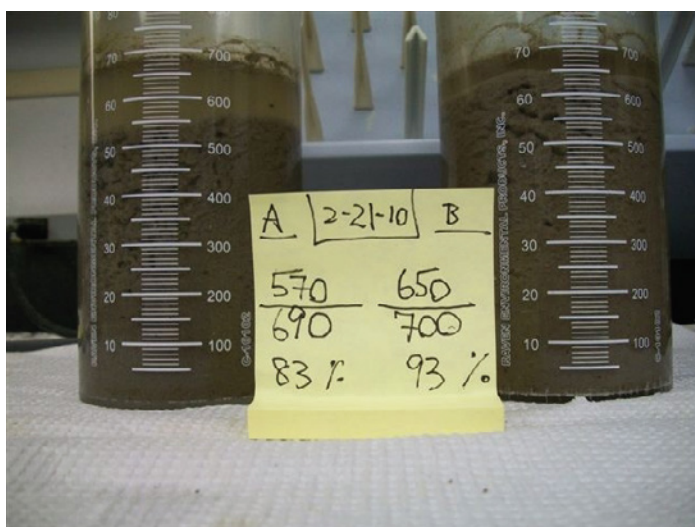


Fig. 2. 400x phase contrast photo of microbial community.

Conclusion

By using advanced beneficial microorganisms, the refinery was able to maximize plant efficiency in order to better handle the microbial community in its aeration basin. This reduced operating costs by minimizing the risk of permit

violations, and simplified operations by avoiding high levels of oil and grease. Novozymes' program resulted in:

- **Lower operating costs**
- **Improved plant efficiency**
- **Simplified operations**



About Novozymes

Novozymes is the world leader in biological solutions. Together with customers, partners and the global community, we improve industrial performance while preserving the planet's resources and helping to build better lives. As the world's largest provider of enzyme and microbial technologies, our bioinnovation enables higher agricultural yields, low-temperature washing, energy-efficient production, renewable fuel and many other benefits that we rely on today and in the future. We call it Rethink Tomorrow.

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