When Crow Creek was reclassified as a trout habitat, the wastewater treatment plant for the Frontier Oil Refinery in Cheyenne, Wyoming had a great deal of trouble meeting a new effluent permit limit. The facility, which refines 52,000 barrels per day of crude oil, previously had a mass based limit that required a maximum monthly average effluent concentration of about 20 mg/l NH3-N. The new permit limited the effluent ammonia to 2.18 mg/l as a monthly average and 5.45 mg/l as a daily maximum.

After determining that IFAS was the most suitable cost-effective technology to upgrade their existing bioreactors, Frontier selected BioPortz carrier media for their North and South wastewater plants. During a regularly scheduled refinery turnaround, the Bioreactors were retrofitted in order to convert the existing bioreactors to an IFAS system. Just over a month after slowly adding BioPortz to the first bioreactor, the effects of the additional fixed biomass were already being seen in the plant performance.

Historically, the North plant had always performed worse than the South plant, but after the addition of just half of the designed media, the North Bioreactor was able to nitrify better than the South. Additionally, the IFAS upgrade helped the plant recover more quickly from major process upsets, which are a chronic problem due to the complex nature of the refining process. With the fixed biomass on the media in the North bioreactor, the North plant recovered nitrification much faster than before and continued to perform better than the South Plant. With only a small fill fraction of media, the plant was able to meet the very low effluent ammonia limit and the attached growth biomass helped the plant recover quickly from major refinery process upsets that affected the wastewater plant.

An effective upgrade for especially difficult wastewater streams

“Entex proved to be an excellent and quick solution to the new nitrification challenge faced by the refinery.”

Casey Mueller
Senior Process Engineer

Frontier Refining, Cheyenne, WY

New Regulations, New Technology

A system expansion with never before seen effluent results

Location
Cheyenne, WY
Project
Wastewater Retrofit
Start-up Date
2007
Hydraulic Capacity
0.36 Million GPD
Technology Applied
BioPortz™ moving media
Integrated Fixed-Film/Activated Sludge proved to be an excellent and quick solution to the new nitrification challenge faced by the Frontier refinery. With only a small fill fraction of biocarrier media the plant was able to meet their very low effluent ammonia limit and the attached growth biomass helped the plant recover quickly from major refinery process upsets that affected the wastewater plant. Frontier Oil demonstrated that IFAS is a cost-effective technology for quick upgrade solutions for oil refinery and other industrial wastewater treatment systems. Independently moving BioPortz carriers continually circulate through the aeration basin in a random motion, ensuring excellent oxygen and substrate transfer to the biomass.

**Design Parameters - Local Standards**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Influent (mg/L)</th>
<th>Effluent (mg/L)</th>
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<tbody>
<tr>
<td>COD</td>
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<td>&lt;100</td>
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<tr>
<td>NH3</td>
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</tr>
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**System Process**

**Site Plan**

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