GDNOX™ 1 Additive - Grace Davison’s Next Generation NOx Reduction Additive

Eric Griesinger
Marketing Manager, Grace Davison Refining Technologies, Columbia, MD

GDNOX™ 1 additive is the next generation NOx reduction additive for the FCC regenerator unit. Unlike traditional NOx reduction additives, GDNOX™ 1 additive utilizes a new technology platform that builds on the success of DENOX®, while allowing refiners the ability to achieve greater NOx reduction. And, unlike earlier generation NOx reduction additives, GDNOX™ 1 additive greatly mitigates H₂ and/or dry gas penalties. GDNOX™ 1 additive is formulated to reduce exposure from inflation in rare earth pricing.

As extensive pilot plant testing shows in Figure 1, refiners have the ability to incrementally improve NOx reduction, by upwards to 80%, with increased GDNOX™ 1 additive dosing rates. To achieve targeted NOx reduction, the recommended dosing rate for GDNOX™ 1 additive typically ranges between 2.5 wt.% and 7.5 wt.% of catalyst inventory.

GDNOX™ 1 additive allows refiners to:

• Meet local/federal NOx regulations,
• Meet EPA constraints without the cost of capital,
• Process feeds high in nitrogen with greater economic flexibility,
• Balance refinery wide NOx emissions, and
• Maintain FCC throughput

As your Grace sales representative for more information.

<table>
<thead>
<tr>
<th>GDNOX™ 1 Additive Addition Rate% of Inventory</th>
<th>Base Line NOx (ppm)</th>
<th>NOx After GDNOX™ 1 Additive Addition (ppm)</th>
<th>Percentage NOx Reduction/%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5% GDNOX 1</td>
<td>292</td>
<td>139</td>
<td>50</td>
</tr>
<tr>
<td>5.0% GDNOX 1</td>
<td>287</td>
<td>110</td>
<td>60</td>
</tr>
<tr>
<td>10.0% GDNOX 1</td>
<td>287</td>
<td>62</td>
<td>80</td>
</tr>
</tbody>
</table>