EPA Tier 4 Emissions and DEF/Urea Supply Chain

**Urea Source**
- Global Nitrogen Producers
- 32.5%, 40%
- Barge, Tanker, Bulk, Drum availability

**Terminal Network**
- Quality gate – in and out
- Solutionizing or Dilution
- Packaging – Totes
- Warehouse
- Bulk Inventory
- Coastal and Inland network

**MARINE MARKET**
- Marine market is a small % of urea tons
- NA producers have capacity
- Has been in highway and off-highway use for years

**INFRASTRUCTURE INVESTMENTS**
- Infrastructure investments for “on highway” DEF can be used for 40%.
- New locations will crop up as underserved areas demand increases.
- 40% marine preferred as more efficient for volume stored

**DISTRIBUTORS**
- Distributors exist who can deliver DEF to the inland marine vessels.
- Experience in delivering to this market is key to ensure customers receive **high quality product** and reliable service.
IMO 2020 Impact on Domestic Marine Fuel

EIA projections of U.S. distillate, residual fuel oil prices

USGC products vs Mars spreads

Indexed gasoil and heavy sulfur fuel oil prices* 2017-2025 (NWE CIF)
What is AUS 40
ISO 18611 Marine Nox reduction agent

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>Limits</th>
<th>Test methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>min.</td>
<td>max.</td>
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<tr>
<td>Urea content(^a)</td>
<td>% (m/m)(^d)</td>
<td>39</td>
<td>41</td>
</tr>
<tr>
<td>Density at 20 °C(^b)</td>
<td>kg/m(^3)</td>
<td>1 105</td>
<td>1 177</td>
</tr>
<tr>
<td>Refractive index at 20 °C(^c)</td>
<td></td>
<td>1,394 7</td>
<td>1,398 2</td>
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<tr>
<td>Alkalinity as NH(_3)</td>
<td>% (m/m)(^d)</td>
<td>—</td>
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<tr>
<td>Biuret</td>
<td>% (m/m)(^a)</td>
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<td>0,8</td>
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<tr>
<td>Aldehydes</td>
<td>mg/kg</td>
<td>—</td>
<td>100</td>
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<tr>
<td>Insoluble matter</td>
<td>mg/kg</td>
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<tr>
<td>Phosphate (PO(_4))</td>
<td>mg/kg</td>
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<tr>
<td>Calcium</td>
<td>mg/kg</td>
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<tr>
<td>Iron</td>
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<tr>
<td>Magnesium</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Potassium</td>
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<tr>
<td>Identity</td>
<td>—</td>
<td>identical to reference</td>
<td>ISO 18611-2, Annex J</td>
</tr>
</tbody>
</table>

- 40% high purity urea / 60% high purity water
- Weight per gallons 9.28 lbs
- Crystallizes at 35 deg F (-11 deg C)
- Do not store below 35 deg F
- Non-Hazardous
- Color – clear
- Smell – slight ammonia smell
- Corrosive – stainless steel and poly should be used or a lined steel tank
- Shelf life – dependent on temperature. 1 year is typical.
- If spilled clean with soap and water
- Avoid contact with skin and eyes (refer to suppliers SDS)
Availability