PRAESTOL® Anionic and Nonionic Polymers
Municipal and Industrial Wastewater Treatment

Description
PRAESTOL anionic and nonionic polymers are high molecular weight, water-soluble flocculating agents made by the copolymerization of acrylamide with itself or various anionic (negatively charged) monomers. These polymers are available in both liquid emulsion and granular dry solid grades and cover the full spectrum of charges from 0 to 100 percent. These products have found wide applicability in municipal, industrial, pulp and paper and mining liquid-solids separation systems.

Applications
- Influent water clarification, including potable water (TR grade)
- Filtration
- Mineral processing
  - Base metal sulfide concentrate thickening
  - Iron ore tailings clarification
  - Coal refuse thickening and dewatering
  - Bauxite/red mud
  - Phosphoric acid filtration
  - Copper tailings clarification
  - Brine clarification
  - Sand and gravel washing
- Effluent treatment
  - General coagulant aid for wastewater
  - Primary and secondary clarifiers, alone or in combination with organic cationic coagulants
  - Primary and secondary clarifiers, in combination with aluminum, iron salts or lime
  - Phosphorous removal in conjunction with inorganic coagulants
  - Conditioning of metal hydroxide sludges prior to dewatering of pulp and paper mill effluent
- Textile mill wastewater
- Food processing wastewater
- Petrochemical wastewater
- Other
  - Lime/soda softening
  - Sugar juice clarification

Dry Polymer Solution Preparation
PRAESTOL dry polymers cannot be fed into an application without pre-diluting in water. The recommended concentration range is 0.1-0.5 percent with 0.25 percent being optimum. Although these products are completely water soluble, certain precautions should be followed to obtain total dissolution with minimum loss of activity. Complete wetting of the individual polymer particles is the single most important factor in the preparation of dry polymer solutions. One method to achieve good wetting is to use an aspirator-type disperser that draws solid particles into a water stream using vacuum created by water pressure. A water pressure of 30 psi or greater is necessary to implement this method. The wetted polymer from the aspirator should be discharged into a vessel equipped with a high torque mixer capable of stirring the entire tank at 250-400 rpm. If the entire tank is not stirred at 400 rpm, try a lower concentration of polymer. If mixing is still inadequate, add larger impellers (or more impellers) to the mixing shaft and increase the horsepower of the mixer, if necessary. Do not increase the mixing speed beyond 400 rpm or shearing of the polymer could occur. Best practice is to mix the polymer solution at 400 rpm for 45-60 minutes or until dissolution is complete.

There are a number of commercially available automatic feed systems that use an auger to sift dry polymer into the dilution water stream. The recommended units of this type feature two separate tanks, one for mixing and one for use as a day tank for finished polymer solution. The size of the day tank should be such that the dilute polymer is consumed within 48 hours. Many applications require a concentration much lower than 0.25 percent polymer. In that case, it is best to add secondary dilution water through a tee and a static mixer on the way to the application.

For laboratory preparation, carefully sift 1.0 gram of dry polymer into the vortex of 400 mls of water being stirred with a Continued on page 2.
Emulsion Polymer Solution Preparation

In most applications, PRAESTOL® emulsion polymers should be pre-diluted in water before use. The manual method for dilution is to slowly pour the neat polymer into the vortex of a stirred tank at ratios of 0.25-1.0 percent (0.5 percent is optimum). Make sure the mixer is large enough and has enough torque to stir the entire tank at speeds between 250-400 rpm. If the dilute polymer solution does not appear to be stirring due to high viscosity, try a lower concentration of polymer, but in no case should the concentration be reduced to below 0.25 percent or poor dissolution may result. If mixing is still inadequate, add larger impellers (or more impellers) to the mixing shaft and increase the horsepower of the mixer, if necessary. Do not increase the mixing speed beyond 400 rpm or shearing of the polymer could occur. Best practice is to mix the polymer solution at 400 rpm for 10-20 minutes, shut the mixer off and allow the polymer to age for an additional 10-20 minutes. If the solution has too much undissolved emulsion, try adding the material to the vortex at a slower rate.

There are a number of commercially available automatic feed systems that provide in-line mechanical mixing. The recommended units of this type feature initial high energy mixing (>1000 rpm) for a short time (<15 sec) to achieve good dispersion of the product into water. This is followed by lower energy mixing (<400 rpm) for a longer time (10-20 min) and aging for an additional 10-20 minutes to achieve complete polymer dissolution. Best practice is to use these in-line dilution systems followed by a mixing/aging tank fitted with high/low level probes to refill the tank. The optimum concentration in the mixing/aging tank is 0.5 percent, and in no case should the initial concentration of the polymer be less than 0.25 percent for best results.

In both the manual and automatic systems, the size of the mixing/aging tank should be such that the dilute polymer is consumed within 48 hours. Many applications require a concentration much lower than 0.5 percent polymer. In that case, it is best to add secondary dilution water through a tee and a static mixer on the way to the application.

For laboratory preparation, inject 2.0 mls of emulsion polymer into the vortex of 400 mls of water being stirred with a mechanical mixer to prepare a 0.50 percent solution. Continue to mix at 250-400 rpm for 10-20 minutes. For best results, allow solutions to age for an additional 10-20 minutes before testing.

Properties

See property tables of PRAESTOL emulsion and dry polyacrylamides.
# Table of Properties - PRAESTOL® Anionic/Nonionic Polymers

## I. Anionic/Nonionic PRAESTOL emulsion polymers (milky disperse liquid)

<table>
<thead>
<tr>
<th>PRAESTOL POLYMER GRADE</th>
<th>ANIONIC CHARGE</th>
<th>ACTIVE CONTENT (%)</th>
<th>DENSITY (GR/ML)</th>
<th>PRODUCT VISCOSITY (CP)</th>
<th>SOLUTION VISCOSITY 0.5% IN DIST. WATER (CP)</th>
<th>SOLUTION VISCOSITY 0.5% in 10% NaCl-Brine (CP)</th>
<th>FREEZING POINT (°C)</th>
<th>EFFECTIVE pH RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N3100LTR Nonionic</td>
<td>27%</td>
<td>1.03</td>
<td>&lt;3000</td>
<td>&gt;300</td>
<td>&gt;300</td>
<td>-15</td>
<td>0-13</td>
<td></td>
</tr>
<tr>
<td>A3010LTR Low</td>
<td>30%</td>
<td>1.04</td>
<td>&lt;1700</td>
<td>&gt;6500</td>
<td>&gt;400</td>
<td>-15</td>
<td>0-13</td>
<td></td>
</tr>
<tr>
<td>A3025L Medium</td>
<td>32%</td>
<td>1.07</td>
<td>&lt;4500</td>
<td>&gt;5000</td>
<td>&gt;175</td>
<td>-15</td>
<td>5-13</td>
<td></td>
</tr>
<tr>
<td>A3030L Medium</td>
<td>36%</td>
<td>1.09</td>
<td>&lt;4000</td>
<td>&gt;4000</td>
<td>&gt;160</td>
<td>-15</td>
<td>5-13</td>
<td></td>
</tr>
<tr>
<td>A3040L Medium</td>
<td>31%</td>
<td>1.07</td>
<td>&lt;3100</td>
<td>&gt;8000</td>
<td>&gt;400</td>
<td>-15</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>A3040LTR Medium</td>
<td>31%</td>
<td>1.07</td>
<td>&lt;3100</td>
<td>&gt;7300</td>
<td>&gt;400</td>
<td>-15</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>A4040L Medium</td>
<td>40%</td>
<td>1.10</td>
<td>&lt;3800</td>
<td>&gt;6000</td>
<td>&gt;175</td>
<td>-15</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>A3050L High</td>
<td>40%</td>
<td>1.12</td>
<td>&lt;4000</td>
<td>&gt;10000</td>
<td>&gt;400</td>
<td>-15</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>A3095L High</td>
<td>33%</td>
<td>1.10</td>
<td>&lt;2000</td>
<td>&gt;5000</td>
<td>&gt;40</td>
<td>-15</td>
<td>7-14</td>
<td></td>
</tr>
</tbody>
</table>

(1) Brookfield RVT, No. 2 or 3 @ 5 RPM, referred to active substance
(2) Brookfield RVT, No. 1 or 2 @ 10 RPM, referred to active substance

### Operational Hints

1. Avoid use of aluminum and galvanized equipment for polymer solutions.
2. Use clean water, as free as possible from dissolved salts and solid impurities, and as close to neutral pH as can be supplied, for solution preparation.
3. Use metering pumps of the positive displacement or gear type for feeding polymer solutions. Avoid centrifugal pumps.
4. Avoid the use of natural or buna-n rubber in contact with neat emulsion polymer.
5. Avoid high speed mixing for the neat product and solution. Propeller mixers should run less than 600 RPM and turbine mixers less than 60 RPM.

## II. Anionic/Nonionic PRAESTOL granular polymers (solid grades)

<table>
<thead>
<tr>
<th>PRAESTOL POLYMER GRADE</th>
<th>ANIONIC CHARGE</th>
<th>BULK DENSITY (LBS/FT³)</th>
<th>SOLUTION VISCOSITY % IN DIST. WATER (CP)</th>
<th>SOLUTION VISCOSITY 1% IN 10% NaCl-Brine (CP)</th>
<th>EFFECTIVE pH RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500/2500TR Nonionic</td>
<td>41</td>
<td>&gt;200</td>
<td>&gt;140/&gt;60 (TR)</td>
<td>0-13</td>
<td></td>
</tr>
<tr>
<td>2510 Low</td>
<td>43</td>
<td>&gt;300</td>
<td>&gt;140</td>
<td>5-13</td>
<td></td>
</tr>
<tr>
<td>2515/2515TR Low</td>
<td>42</td>
<td>&gt;2000</td>
<td>&gt;180</td>
<td>5-12</td>
<td></td>
</tr>
<tr>
<td>2520 Low Medium</td>
<td>43</td>
<td>&gt;3500</td>
<td>&gt;180</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>2525 Low Medium</td>
<td>43</td>
<td>3000</td>
<td>200</td>
<td>5-13</td>
<td></td>
</tr>
<tr>
<td>2530/2530TR Medium</td>
<td>43</td>
<td>&gt;5000</td>
<td>&gt;200</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>2540/2540TR Medium</td>
<td>44</td>
<td>&gt;4500</td>
<td>&gt;200</td>
<td>6-13</td>
<td></td>
</tr>
<tr>
<td>2640 Medium</td>
<td>43</td>
<td>&gt;4000</td>
<td>&gt;200</td>
<td>6-13</td>
<td></td>
</tr>
</tbody>
</table>

Packaging-All solid grade polymers are supplied in poly-lined multi-walled bags net weight 50 lbs. (23 kg.) or polypropylene big bags net weight 1379 lbs. (625 kg.). Pallets are 25 bags (1250 lbs. net). All emulsion grade polymers are supplied in 55-gallon steel drums net weight 450 lbs. or 275-gallon semi-bulk containers net weight 2290 lbs. TR grades are NSF-approved products for use in potable water applications.