Natrosol™ hydroxyethylcellulose (HEC) from Ashland Specialty Ingredients is the most widely specified thickener brand for waterborne architectural coatings in the world. For over 50 years, formulators have relied on Natrosol HEC to deliver cost-effective, robust thickening, creamy in-can consistency and user-preferred application properties to both interior and exterior paints.

Natrosol HEC is presently manufactured on three continents, in four state-of-the-art, high-capacity facilities, applying the highest possible level or process and control. This manufacturing network offers our customers redundant supply options and consistent rheology performance. Available in a variety of grades, ranging from highly efficient and economical to the highest-performance hydrophobically-modified types, all Natrosol grades stabilize paints, and provide critical rheology before, during and after application of the paint. In addition, nonionic Natrosol HEC is broadly compatible with the pigments, binders, surfactants and preservatives that are typically used in water-based paint systems. This compatibility results in excellent color acceptance, color development and viscosity retention upon tinting.

**Performance advantages of Natrosol HEC**

- Economical thickening
  - Useful in a wide range of paint types
- Imparts a full-bodied rich feel to the liquid paint
- Viscosity stability
  - Good freeze-thaw and heat stability
- Nonionic
  - Insensitive to pH and electrolytes
- Compatibility
  - Insensitive to surfactants and coalescents
- Colorant compatibility
  - Excellent color acceptance, color development and viscosity retention on tinting
- Water retention
  - Excellent water hold-out and open time
Your formula for success

Natrosol 250 HEC is a nonionic cellulose derivative that is soluble in both hot and cold water. By controlling the molecular weight of the cellulose backbone, Natrosol HEC is produced in a wide range of viscosity types, which correlate to molecular weight. Higher-viscosity grades such as HHR/HHBR are efficient and economical, and are used for in-can stability and leveling. Lower-viscosity grades such as GR are used to increase high-shear (brushing) viscosity, improve sag resistance, and provide a rich, creamy feel to paints.

All grades of Natrosol 250 HEC commonly used in paints are produced as both standard and “B” types, the latter indicating biostability, or more specifically, providing superior resistance to enzyme degradation. All Natrosol grades used in paints and coatings are also surface-treated to provide easy dispersion and lump-free dissolution, and are designated by the letter “R”. Although non R-treated versions are available, they are generally not preferred by paint manufacturers.

Natrosol HEC performs a variety of functions in latex paint formulations.

**During Manufacture**
- Viscosity for effective pigment dispersion

**During Storage**
- Suspension of paint solids
- Prevention of clear liquid separation (syneresis)
- Improves freeze-thaw stability
- Shear stability

**During Paint Application**
- Applicator loading
- Brush drag
- Sag resistance
- Color stability

Choose Natrosol HEC grades with higher molecular weight for:
- higher Stormer [KU] thickening efficiency
- better cost-in-use
- better water resistance
- higher viscosity after water dilution

Choose Natrosol HEC grades with lower molecular weight for:
- higher high-shear [ICI] viscosity
- better spatter resistance
- better sag resistance
- better open time
Natrosol HEC portfolio

**Versatility**
Natrosol HEC can be added to paint at different points in the paint making process and can be added by different methods. Addition of Natrosol HEC to the grind (pigment dispersion) stage will impart viscosity that improves dispersion efficiency by increasing shear stress and reducing turbulent flow and splashing in the mill base. Natrosol HEC can be added to the letdown stage as a slurry in water, glycol, or other liquid paint ingredient. Natrosol HEC can also be added to the letdown as a pre-gel (solution). When Natrosol HEC pre-gels are prepared, they should always be preserved with a suitable biocide.

Often, a portion of the Natrosol HEC is added to the grind stage and the remainder is added to the letdown. In some single-tank processes, all of the Natrosol HEC is added to the grind. In operations using slurry pigments, Natrosol HEC is dissolved in water as a first step in the paint making process or is added later as a slurry or a pre-gel.

**Choosing the right product for your needs**
There are numerous technical and performance considerations that should be made when selecting the Natrosol HEC grade that is right for your paint formulation. Our technical experts can work with you to help select the most effective additives for your specific formulations or applications. In addition to the most common grades noted below, numerous other specialty types are available.

**Viscosity specification of Natrosol (mPa•s) at 25°C (Method N5-5)**

<table>
<thead>
<tr>
<th>B-types</th>
<th>Non-B</th>
<th>Non-R</th>
<th>Viscosity measured at a concentration of</th>
<th>Brookfield LVF setting</th>
<th>Molecular Weight¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHBR</td>
<td>HHR</td>
<td>HH</td>
<td>3.400 - 5.000</td>
<td>4</td>
<td>1.3 x 10⁶</td>
</tr>
<tr>
<td>H4BR</td>
<td>H4R</td>
<td>H4R</td>
<td>2.600 - 3.300</td>
<td>3</td>
<td>1.1 x 10⁶</td>
</tr>
<tr>
<td>HBR</td>
<td>HR</td>
<td>H</td>
<td>1.500 - 2.500</td>
<td>3</td>
<td>1.0 x 10⁶</td>
</tr>
<tr>
<td>MHBR</td>
<td>MHR</td>
<td>MHR</td>
<td>1.000 - 1.500</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MBR</td>
<td>MR</td>
<td>M</td>
<td>4.500 - 6.500</td>
<td>4</td>
<td>7.2 x 10⁶</td>
</tr>
<tr>
<td>KR</td>
<td></td>
<td></td>
<td>1.500 - 2.500</td>
<td>3</td>
<td>1.0 x 10⁶</td>
</tr>
<tr>
<td>GR</td>
<td>G</td>
<td></td>
<td>250 - 450</td>
<td>2</td>
<td>3.0 x 10³</td>
</tr>
<tr>
<td>JR</td>
<td></td>
<td></td>
<td>250 - 400</td>
<td>2</td>
<td>6.0 x 10³</td>
</tr>
<tr>
<td>LR</td>
<td>L</td>
<td></td>
<td>100 - 180</td>
<td>1</td>
<td>9.0 x 10⁴</td>
</tr>
</tbody>
</table>

¹ molecular weight is estimated or calculated from intrinsic viscosity measurements

**Natrosol FPS fluidized polymer suspension**

... liquid Natrosol HEC for easy dispersion and post-batch addition

Many grades of Natrosol HEC and HMHEC are available in an easy to handle aqueous suspension, typically sold in drums or totes at 25% active polymer content. Consult with your Ashland Specialty Ingredients technical sales or service representative for grade and regional availability as well as handling and use guidelines.
Natrosol HEC
R-grades

Water-soluble polymers tend to form lumps when added directly to water. To avoid this problem, Natrosol R grades are surface treated with glyoxal, a pH sensitive material that cross-links hydroxyls on the particle surfaces and temporarily inhibits solubility. This provides a pH and temperature sensitive delay, allowing the Natrosol HEC time to be dispersed as discrete particles before the particles begin to hydrate (swell and become sticky). Once the glyoxal crosslinks hydrolyze, which is typically triggered by raising the pH, Natrosol HEC will begin to hydrate and dissolve without formation of lumps or gels.

Natrosol HEC
B-grades

Cellulose enzymes produced by microorganisms that grow in aqueous environments can degrade cellulose derivatives such as HEC. In paint, this results in viscosity loss. Enzyme-resistant Natrosol HEC B-grades were developed for excellent biostability. Paints thickened with Natrosol HEC B-grades will retain 85 percent or more of their original Stormer KU.

Effect of HEC Concentration on Viscosity of Aqueous Solutions

Enzyme Resistance in Paints Using Natrosol HEC B-grade

Effect of pH and Temperature on the Hydration Time of Natrosol HEC R-grade
Natrosol Plus hydrophobically modified HEC

... superior application performance Plus spatter resistance

Natrosol Plus hydrophobically modified HEC (HMHEC) is an associative cellulosic polymer designed specifically for superior spatter resistance in latex paints. Natrosol Plus products not only retain the benefits of traditional cellulosics, such as compatibility with many latexes, but also offer improved rheology without many of the problems that can be encountered with synthetic associative thickeners.

Natrosol Plus hydrophobically modified HEC thickens the aqueous phase of the paint through conventional hydrogen bonding and chain entanglements as well as via hydrophobic association with itself and other paint components, such as latex. Many of the unique characteristics of Natrosol Plus products can be attributed to its dual thickening mechanism, including enhanced brushing viscosity, as well as thickening efficiency and spatter resistance.

Key benefits of Natrosol Plus HMHEC:

- Best-in-class spatter resistance
- High thickening efficiency (Stormer and Brookfield viscosity)
- Outstanding in-can feel and brushability
- Excellent flow and leveling
- Excellent color acceptance and color development

Natrosol HE 3KB modified HEC

... economical thickening and superior paint application properties

Ashland Specialty Ingredients also offers Natrosol HE 3KB, a high-performance, enzyme-resistant modified HEC that provides an excellent balance of thickening efficiency and superior application properties.
The right solutions
… for a sustainable future

Natrosol HEC is manufactured using renewable natural resources (high-purity cotton or wood pulp). Additionally, Ashland Specialty Ingredients offers a portfolio of complete rheology solutions that set the industry standard for consistent, superior performance at very low use levels – typically less than one percent in waterborne coating formulations.

Ashland believes delivering sustainable chemistry and offering environmentally responsible alternatives is important to customers. As a Responsible Care® company, Ashland is committed to pursuing advancements toward creating sustainable chemistries, which are essential to meeting environmental standards when developing new products.

We have developed specific products that allow paint manufacturers to design and produce the next generation of paints and coatings complying with the latest environmental directives and standards without sacrificing performance.

- Free of alkylphenolethoxylates (APEOs)
- Free of heavy metals
- Positive eco-labeling
- Easy liquid handling in a production environment
- Ease of incorporation resulting in energy savings

**Did you know?**

The Ashland Specialty Ingredients family of performance additives for paint and coatings includes Aquaflow™ nonionic synthetic associative thickeners, Natrosol™ hydroxyethylcellulose (HEC), Natrosol Plus modified HEC, Culminal™ and Combizell™ methylcellulose derivatives, Dextrol™ and Strodex™ specialty surfactants, and pHLEX™ neutralizing agents.
Ashland Specialty Ingredients
coatingsadditives@ashland.com

North America
1313 North Market Street
Wilmington, DE 19894-0001
U.S.A.
Tel.: +1 800 345 0447
Fax: +1 302 992 7287

Asia Pacific
200 Pandan Loop
#07-01 Pantech 21
Singapore 128388
Tel.: +65 6775 5366
Fax: +65 6775 5690

China
18th Floor, Xuhuiyuan Building
1089 Zhongshan No.2 Rd.S.
Shanghai 200030, P.R.China
Tel: +86 21 2402 4888
Fax: +86 21 2402 4850

Europe
Euro Haus
Rheinweg 11
8200 Schaffhausen
Switzerland
Tel: +41 52 560 55 00
Fax: +41 52 560 55 99

Latin America
Saltillo 19, Piso 10
Col. Hipodromo Condesa
Del. Cuauhtémoc
06100 Mexico, D.F.
Mexico
Tel: +52 52 11 0111
Fax: +52 52 12 0883

Middle East and Africa
Dubai Airport Free Zone
Building 6 EB, Office 139
Dubai, U.A.E.
Tel.: +971 47 017 131
Fax: +971 47 017 132

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Reliable supply, service and support

As the global leader in rheology- and performance-enhancing coatings additives, Ashland Specialty Ingredients has offices, laboratories and application specialists across North America, Europe and Asia Pacific dedicated to supporting new product development, technical assistance and customer service. With four major production facilities on three continents, including our newest HEC production facility in Nanjing, China, we’re well positioned to deliver the products when and where you need them.