**DISTILLASE® CS WB**

Saccharifying Enzyme For Ethanol Production

**DESCRIPTION**

DISTILLASE® CS WB enzyme is an optimized blend of enzymes that produces glucose from liquefied starch. DISTILLASE® CS WB enzyme contains fungal 1,4- α-D—glucan glucohydrolase (E.C. 3.2.1.3) commonly referred to as glucoamylase or amyloglucosidase and fungal alpha-amylase (E.C.3.2.1.1). The glucoamylase in DISTILLASE® CS WB catalyzes the release of successive glucose units from the non-reducing ends of soluble dextrins and oligosaccharides, while the alpha-amylase at the same time can generate those oligosaccharides and dextrins. The enzymes contained in the DISTILLASE® CS WB system are produced by genetically modified strains of *Trichoderma reesei*.

**TYPICAL CHARACTERISTICS**

- **Activity**: 400 GAU/g (minimum)
- **Appearance**: Opaque brown liquid
- **pH**: 4.0 - 4.5
- **Specific gravity**: 1.05 - 1.15 g/ml
- **Formulation**: Food-grade

**UNIT DEFINITION**

One Glucoamylase Unit (GAU) is the amount of enzyme that will liberate one gram of reducing sugars calculated as glucose per hour from soluble starch substrate under the conditions of the assay. A detailed assay method is available upon request.

**PERFORMANCE BENEFITS**

DISTILLASE® CS WB enzyme provides the following benefits to ethanol producers:

- Increased ethanol yield by complete saccharification of liquefied starch
- Less unfermentated starch in stillage and DDGS
- Improved performance in pre-saccharification processes.
- Increased fermentation rates and shorter fermentation times

**APPLICATION RECOMMENDATIONS**

DISTILLASE® CS WB enzyme is used to saccharify liquefied starch from various sources including wheat, corn, sorghum, barley, rye, rice and cassava. The resultant glucose product is fermented by yeast to yield ethanol.

**RECOMMENDED OPERATIONAL CONDITIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum pH range</td>
<td>4.0 - 5.0</td>
</tr>
<tr>
<td>Effective pH range</td>
<td>3.2 - 5.8</td>
</tr>
<tr>
<td>Effective temperature</td>
<td>28 to 65°C (82 to 149°F)</td>
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<tr>
<td>Pre-saccharification</td>
<td>1 to 16 hours at 60 to 65°C (140 to 149°F)</td>
</tr>
<tr>
<td>DISTILLASE® CS WB Dosage</td>
<td>Please contact your DuPont representative for recommendations specific to your fermentation process</td>
</tr>
</tbody>
</table>

**DOSAGE RECOMMENDATIONS**

DISTILLASE® CS WB enzyme is generally added at a level of 0.080 to 0.11 % w/w (starch, dry solid basis). This corresponds to a level of 0.54 to 0.725 kg DISTILLASE® CS WB / MT grain ‘as is’. The actual enzyme requirement is dependant on the temperature, reaction time and pH of the individual plant saccharification/fermentation process, and its desired results. Fermentation performance may be enhanced by the addition of acid fungal protease like FERMGEN™.

**COMPLETE SACCHARIFICATION OF STARCH**

DISTILLASE® CS WB enzyme converts more starch to fermentable sugars compared to other comparable products.
**REGULATORY STATUS**

The enzymes and ingredients in DISTILLASE® CS WB are in compliance with TSCA and meet the standards for fuel ethanol production in the United States. In addition, the enzymes in the product have been demined to be GRAS for distillers dried grains produced as a by-product in alcohol production. For other countries, please contact customer service.

**PACKAGING**

DISTILLASE® CS WB is available in various package sizes and bulk tankers. Please consult your DuPont representative for detailed information.

**STORAGE**

To ensure maximum retention of activity, store DISTILLASE® CS WB enzyme under refrigerated conditions with the container closed. Prolonged storage at elevated temperature should be avoided.

**SAFETY & ENZYME HANDLING**

Inhalation of enzyme dust and mists should be avoided. In case of contact with the skin or eyes, promptly rinse with water for at least 15 minutes.

For detailed handling information, please refer to the appropriate Material Safety Data Sheet, the Enzyme Technical Association (ETA) handbook *Working Safely With Enzymes*, and the Association of Manufacturers and Formulators of Enzyme Products (AMFEP) handbook *Guide to the Safe Handling of Microbial Enzyme Preparations*. All are available from DuPont.

**TECHNICAL SERVICE**

Information covering specific applications of this product is available. DuPont will work with customers to enhance processes and solve problems. Let us know what you need and we will assist you.

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