



SPEZYME[®] ALPHA PF

Alpha-Amylase for Dry Grind Ethanol Production

DESCRIPTION

SPEZYME[®] ALPHA PF enzyme contains a thermostable starch hydrolyzing α -amylase that is produced by a genetically modified strain of *Bacillus licheniformis*. The endo-amylase in SPEZYME[®] ALPHA PF enzyme hydrolyzes α -1,4-glucosidic bonds to quickly reduce the viscosity of gelatinized starch, producing soluble dextrans and oligosaccharides under a variety of process conditions.

TYPICAL CHARACTERISTICS

Activity: 13,775 AAU/g (minimum)

Appearance: Clear brown liquid

pH: 6.0

Specific gravity: 1.15 - 1.19

UNIT DEFINITION

The activity of SPEZYME[®] ALPHA PF is expressed in Alpha Amylase Units (AAU). Enzyme activity is determined by the rate of starch hydrolysis as reflected in the rate of decrease in iodine-staining capacity. One AAU of bacterial α -amylase activity is the amount of enzyme required to hydrolyze 10 mg of starch per minute under specified conditions. A detailed assay method is available upon request.

PERFORMANCE BENEFITS

SPEZYME[®] ALPHA PF enzyme provides the following benefits to ethanol producers:

- Quick viscosity reduction allowing for higher solids
- Liquefaction pH's as low as 5.2
- Process flexibility
- Improved performance at low slurry temperatures

APPLICATION RECOMMENDATIONS

SPEZYME[®] ALPHA PF enzyme is suitable for use in a variety of liquefaction process designs.

RECOMMENDED OPERATIONAL CONDITIONS

Solids	30 to 36%
Optimal pH	5.7 to 5.8
pH Range	5.2 to 5.9
Optimal Temperature	83 to 85°C (182 to 185°F)
Temperature Range	77 to 88°C (170 to 190°F)
Liquefaction Time	90 to 140 minutes

DuPont's technical sales professionals can provide specific process recommendations based on your objectives and plant characteristics.

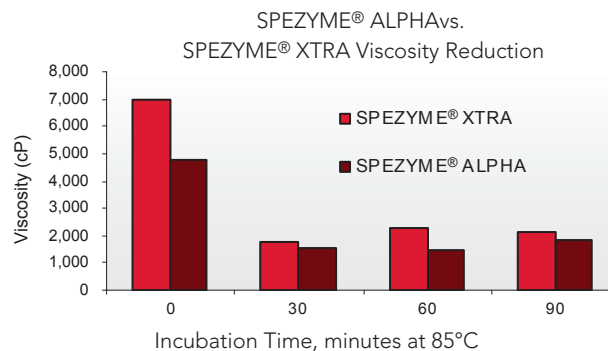


Figure 1 - raw material: corn

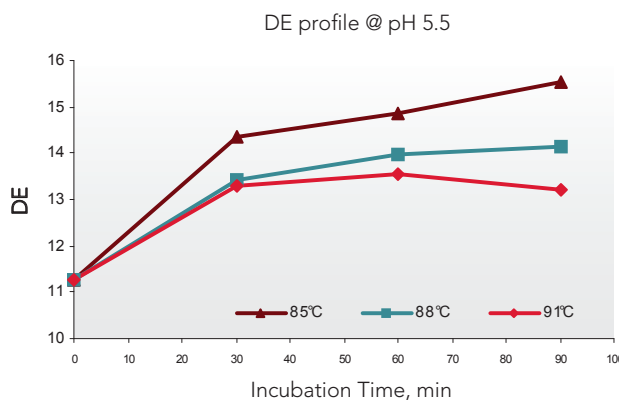


Figure 2 - raw material: corn

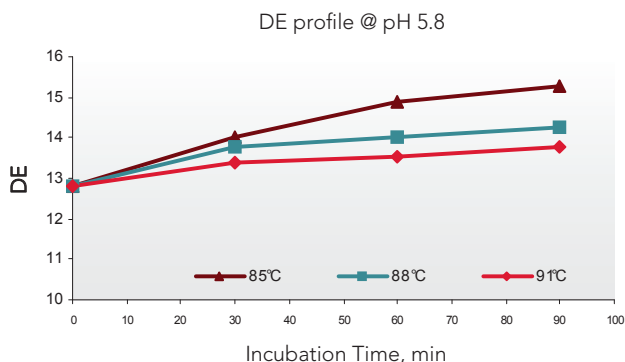


Figure 3 - raw material: corn

DOSAGE RECOMMENDATIONS

The optimal dose for SPEZYME® ALPHA PF enzyme in slurry and liquefaction depends upon processing parameters such as the type of raw material, viscosity, processing time, pH temperature and DS (Dry Substance). A recommended minimum starting dose for whole ground corn is 0.20 to 0.24 kg per metric ton DS (0.020 to 0.024% w/w). The optimal dose and split between slurry and liquefaction tanks are best determined in actual practice.

REGULATORY STATUS

SPEZYME® ALPHA PF enzyme complies with current FAO/WHO and FCC recommended specifications for food-grade enzymes and is GRAS (Generally Recognized As Safe) in the United States for use in production of potable alcohol. The enzyme ingredients in SPEZYME® ALPHA PF are in compliance with the Toxic Substances Control Act in the United States and Domestic Substances List in Canada.

PACKAGING

SPEZYME® ALPHA PF enzyme is available in various package sizes. Please consult your DuPont representative for detailed information.

STORAGE

To ensure maximum activity, store SPEZYME® ALPHA PF enzyme in a cool place. 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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