



# SPEZYME® CL

## Conventional Liquefaction Blend

### DESCRIPTION

SPEZYME® CL contains a thermostable starch hydrolyzing  $\alpha$ -amylase that is produced by a genetically modified strain of *Bacillus licheniformis*. The endoamylase in SPEZYME® CL hydrolyzes  $\alpha$ -1,4-glycosidic bonds to rapidly reduce the viscosity of gelatinized starch, producing soluble dextrans and oligosaccharides under a variety of process conditions.

### TYPICAL CHARACTERISTICS

**Activity:** 15,225 AAU/g (target)

**Appearance:** Brown liquid

**pH:** 5.5 to 6.5

**Specific gravity:** 1.17

The activity of SPEZYME® CL 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  $\alpha$ -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

The SPEZYME® CL system offers the following benefits to ethanol plant operators:

- Quick viscosity reduction allowing for higher solids
- Process flexibility
- Improved performance at low slurry temperature

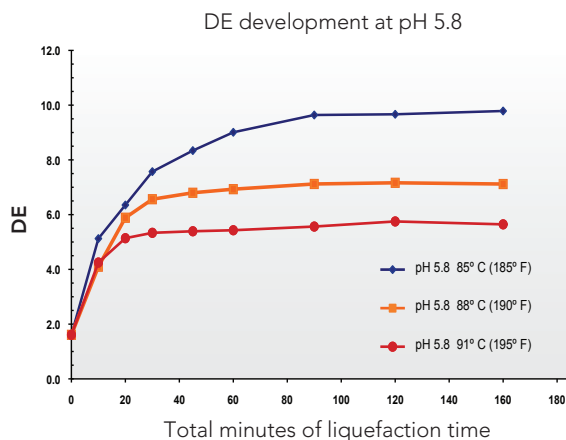
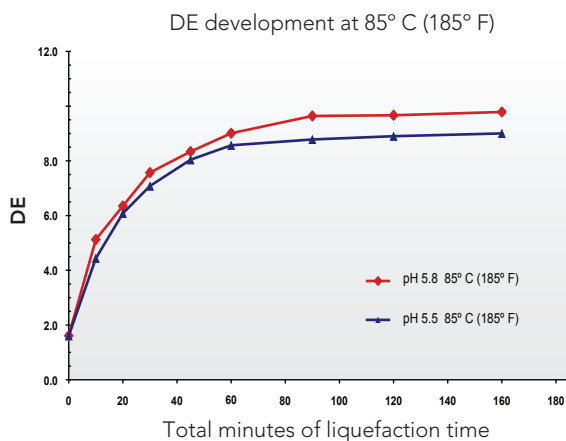
### APPLICATION RECOMMENDATIONS

SPEZYME® CL enzyme is suitable for use in a variety of liquefaction process designs.

### RECOMMENDED OPERATIONAL CONDITIONS

Solids	30 to 36% weight/weight
Optimal pH	5.6 to 6.0
pH Range	5.4 to 6.0
Optimum Temperature	83 to 85° C (182 to 185° F)
Temperature Range	77 to 86° C (170 to 187° F)
Time	90 to 240 minutes

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



## DOSAGE RECOMMENDATIONS

SPEZYME® CL should be dosed at 0.020 to 0.024% weight enzyme / weight as is grain. The ratio of slurry to liquefaction dose in split dose systems will vary with plant conditions, a 40 / 60 split is the recommended starting point.

## REGULATORY STATUS

The enzymes and ingredients in SPEZYME® CL 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 determined to be GRAS for distillers dried grains produced as a by-product in alcohol production. For other countries, please contact customer service.

## PACKAGING

SPEZYME® CL is available in various package sizes and bulk tankers. Please consult your DuPont representative for detailed information.

## STORAGE

SPEZYME® CL will meet the declared activity upon arrival at your plant. SPEZYME® CL can be safely stored in sealed containers. Enzyme should be stored below 25°C (77°F) and sheltered from direct sunlight for maximum stability.

## 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

DuPont is committed to working with ethanol producers to achieve their goals. More detailed information about the application of this product is available upon request. If you have any questions, please call us and let us know how we can be of assistance.

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