



# DISTILLASE® SSF+

## Saccharifying System For Dry Grind Ethanol Production

### DESCRIPTION

DISTILLASE® SSF+ is a system of enzymes designed to produce glucose from liquefied corn or milo mash during simultaneous saccharification and fermentation (SSF+) to ethanol. It contains: amylase (1,4- $\alpha$ -D-glucan glucanohydrolase - EC 3.2.1.1), glucoamylase (1,4- $\alpha$ -D-glucan hydrolyase E.C. 3.2.1.3), Aspergillopepsin 1 (EC 3.4.23.18) and phytase (EC 3.1.3.26).

The enzymes contained in DISTILLASE® SSF+ are produced by genetically modified strains of *Trichoderma reesei*.

### TYPICAL CHARACTERISTICS

**Activity:** 380 GAU/g (minimum)

**Appearance:** Brown liquid

**pH:** 4.0 - 4.5

**Specific gravity:** 1.10 - 1.14 g/ml

### 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

The DISTILLASE® SSF+ systems' unique composition improves fermentation yield and consistency. It does so by minimizing the fraction of starch that remains unfermented and enhancing yeast nutrition.

The glucoamylase in DISTILLASE® SSF+ system rapidly converts the dextrans to glucose across a broad range of starting pH (4.0 to 5.8). This results in 5 - 10% faster initial ethanol production.

The acid stable saccharifying amylase in the DISTILLASE® SSF+ effectively hydrolyzes starch that would not otherwise be converted to glucose during fermentation.

The protease in the DISTILLASE® SSF+ system hydrolyzes protein matrices in the corn kernel that bind the various fractions enabling the hydrolysis of "hard" to hydrolyze starch. It also increases the levels of essential yeast nutrients in the form of amino acids, peptides and free amino nitrogen.

The phytase in DISTILLASE® SSF+ generates inositol an important yeast nutrient and increases the available phosphorous in DDGS.

### APPLICATION RECOMMENDATIONS

DISTILLASE® SSF+ is used to saccharify liquefied mashes of whole ground corn and milo. The resultant glucose is fermented by yeast to produce ethanol. All of the enzymes in DISTILLASE® SSF+ perform well within the temperature and pH ranges typical in whole ground corn and milo batch fermentations: 28 to 35°C (82 to 95°F) and 4.0 to 5.5 respectively. In high gravity (>34% solids) and/or milo fermentations performance can be further enhanced by the addition of FERMGEN® acid fungal protease.

### DOSAGE RECOMMENDATIONS

DISTILLASE® SSF+ should be dosed at 0.06 to 0.08% weight enzyme / weight as is corn. The actual dose required will depend upon the conditions of your fermentation: time, initial pH and the level of solids.

### REGULATORY STATUS

DISTILLASE® SSF+ is GRAS (Generally Recognized As Safe) in the United States for use in alcohol production with the resultant distillers grains being used in animal feed.

The ingredients in DISTILLASE® SSF+ are in compliance with the Toxic Substances Control Act in the United States and Domestic Substances List in Canada.

## PACKAGING

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

## STORAGE

DISTILLASE® SSF+ will meet the declared activity upon arrival at your plant. DISTILLASE® SSF+ can be safely stored in sealed containers. Enzymes 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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