

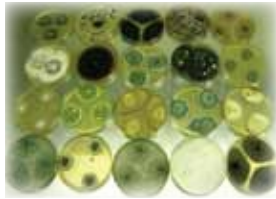
Value Added Services*

For efficient production of fuel ethanol and distilled spirits

Value Added Services tests are part of a comprehensive assessment program designed to help improve fermentation efficiency and ensure that your fermentation and LBDS' products are performing to the highest standards.

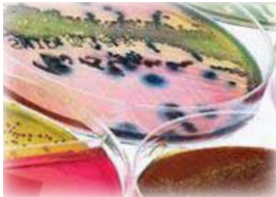
Mash Bacterial Analysis (MBA)

The goal of the MBA program is to resolve bacterial contamination issues in fuel ethanol plants. The MBA identifies, quantifies and pinpoints the source of contamination events within an ethanol plant. Processing these samples will determine the local bacterial populations, the number of isolates, the characteristics of each isolate and an antibiotic screen. Based on this bacterial determination, we recommend a specific antibiotic treatment and cleaning regimentations and cleaning regimen.



Bacterial Identification (BI)

This test identifies the genus and species of any bacterial isolates recovered from MBA testing. This identification is conducted only at the request of the fuel ethanol plant and is conducted in conjunction with MBA testing.

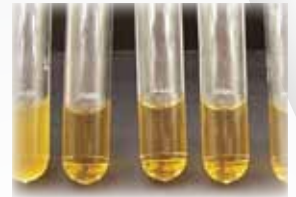


Fermentation Additive Assessment (FAA)

Inclusion of fermentation additives such as yeast nutrients, proteases or acidifying agents can improve fermentation efficiency and maximize benefits. Trailing various fermentation additives at laboratory scale allows for optimizing the process before transferring to a large scale fermentation.

Definitive & Comparative MIC (MIC)

The purpose for this protocol is to pinpoint an actual MIC value for each recovered bacterial isolate from samples submitted from ethanol plants. Based on this MIC value, the degree of susceptibility of an isolate against a particular antibiotic is determined. This MIC testing is usually conducted in conjunction with MBA testing.



Free Alpha Amino Nitrogen (FAN) Only

FAN test detects free alpha-amino nitrogen present in fermentation of fuel ethanol production; thus indicating the amount of usable nitrogen available for fermentation.

Mash Nutrient Analysis & Free Alpha Amino Nitrogen (MNA and FAN)

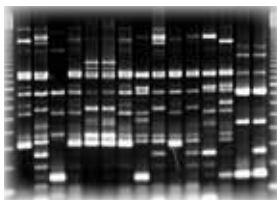
The MNA provides customers with a nutrient profile that helps ensure they have adequate nutrients for yeast and fermentation. The MNA testing determines whether there are any deficiencies in a product fermentation process and whether a fermentation can be improved by the addition of required nutrients.

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Yeast DNA Analysis (YDA)

State of the art molecular methods are used to identify the genetic makeup of yeast strains used in various fermentation processes. Employ this test to ensure consistency of the yeast strain used from year to year in your facility, ensure a batch of yeast has the same genetic makeup as the starter colony, or compare competitive yeasts.



Yeast Analysis (YA)

Yeast analysis is designed to identify problems with a yeast lot or a customer's mash composition. Fermentation comparison testing consists of the customer's yeast lot vs. our quality control standard (QC) yeast or the customer's suspect mash vs. our standard mash composition. The yeast analysis is conducted using numerous instruments, such as our automated yeast counter and submerged fermentation.



Chlorine Dioxide (Chlorite & Chlorate) Test (ClO₂)

This test determines the amount of sodium chlorite and chlorates present in submitted distillers byproduct samples. This test is offered to customers who utilize our Chlorenix® D27 (Stabilized Chlorine Dioxide) product.

Substrate Fermentation Testing (SFT)

Various fermentation substrates can be used in the laboratory for designing a viable fermentation processor for optimizing an existing process. Substrates such as fruit juices, root extracts, grains and different sources of sugar can be evaluated in this manner.



Comparative HPLC Analysis (HPLC)

On occasion, a customer questions the results provided by their in-house HPLC. This may be due to calibration or integration errors. To help correct this problem, samples are submitted for HPLC analysis, along with copies of the customer's latest HPLC results of the submitted samples. Once HPLC samples are tested, a comparison of the results is conducted and reported.



Distillers Byproduct Analysis (DBA)

The purpose of this testing is to provide customers with an accurate account of any residual antibiotics present in their distillers byproducts. Samples submitted are analyzed using a LC/MS/MS method only for the antibiotics specified on the submission request form.



Lallemand Biofuels & Distilled Spirits offers testing by microbiological methods. The producer is ultimately responsible for the suitability and safety of its co-products relevant to their intended use.

All services and recommendations by Lallemand Biofuels & Distilled Spirits representatives or affiliates are intended for use by persons having skill and knowledge of the alcohol production process.

**Value Added Services Available to Contracted Customers Only.*