

## Implement High Value-Added Quality Control in Breweries with the GeneDisc® System

### Overview

Bacterial spoilage risk is a major concern for quality-oriented food and beverage industries as it generates high economic losses and negatively impacts brand image. Even though beer is quite restrictive to bacterial growth due to its characteristics (low pH, ethanol concentration, low oxygen content), breweries are no exception to this rule. A few bacterial genera, including *Lactobacillus*, *Pediococcus*, *Pectinatus*, and *Megasphaera*, can cause beer spoilage such as off-flavors, turbidity or acidity.

Furthermore, growing market demands for minimally processed products (e.g. unpasteurized and unfiltered craft style beers) or reduced-alcohol beers, which facilitate growth of spoilage organisms and limit bacterial control measures strengthen the need for highly effective tools for quality control.

As a result, most breweries have implemented bacterial monitoring throughout their process,

using a testing program unique to each brewery. These programs are mostly based on traditional culture methods. These methods have a limited cost- and decision-making effectiveness due to their limitations:

- They are time-consuming and do not allow an early warning on contamination.
- They display weak sensitivity when even one single spoilage bacteria can cause full batch damage.
- They are not specific, while bacteria identification is needed to assess contamination sources and plan for effective countermeasures.

### The Challenge

A craft brewery needed to overcome these traditional method limitations at identified critical sampling points. To efficiently control their process, they required faster and informative results. Among all identified customer's sampling points, testing

Figure 1: The GeneDisc System: GeneDisc Cyclor (left) and GeneDisc Plate (right)





during yeast propagation was extremely critical to avoid bacterial contamination. At this sensitive step, bacterial infection could have impacted multiple fermentations. It would also have generated high economic losses to the brewery due to scrapping product, recall, and/or negative brand image impact.

On the other hand, limited time during yeast propagation (typically 3 days for this customer) made the use of the traditional method inadequate for this brewery as results were obtained only after yeast pitching into the fermenters.

### The Solution

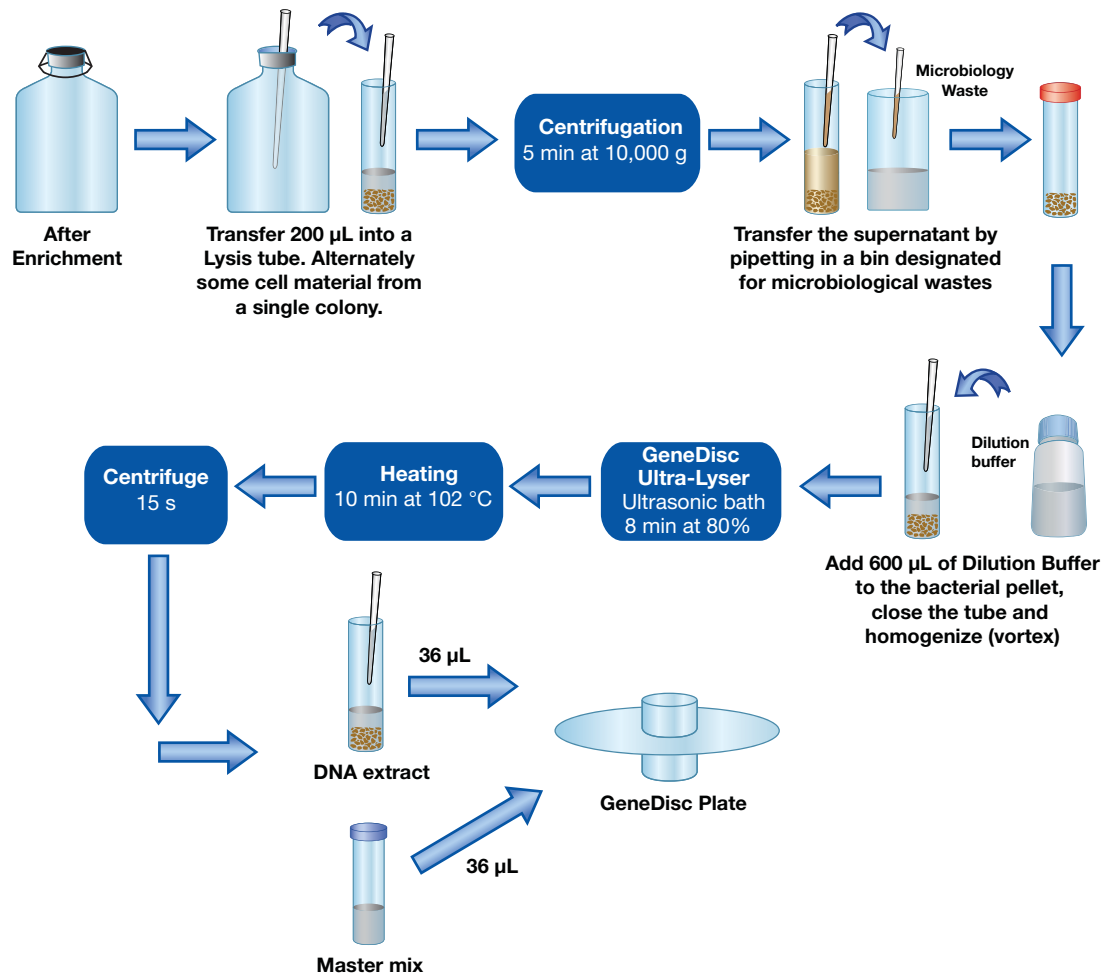
To address the customer's need for a rapid method to monitor and address brewery sources of contamination, Pall offers a polymerase chain reaction (PCR) based method using the GeneDisc system (Figure 1). This system offers sensitive and specific detection of major beer spoilage microorganisms in a matter of hours. This extremely accurate tool can be easily implemented in a routine quality control laboratory. The equipment automation ensures reliability and ease of use for microbiological testing.

With this system, simultaneous detection and identification of the following 21 major beer spoilage microorganisms is performed at once:

- *Lactobacillus brevis*
- *Lactobacillus lindneri*
- *Lactobacillus backii*
- *Lactobacillus collinoides* and *L. paracollinoides*
- *Lactobacillus* group: *L. casei*, *L. paracasei*, *L. coryniformis*, *L. rossiae*, *L. parabuchneri* (= *frigidus*), *L. perolens* and *L. plantarum*
- *Pediococcus* (*P. damnosus*, *P. inopinatus*, *P. claussenii*)
- *Pectinatus* (*P. cerevisiiphilus*, *P. frisingensis*, *P. haikarae*, *P. portalensis*)
- *Megasphaera* spp. (*M. cerevisiae*, *M. elsdenii*)

This highly informative method allows identification of each spoilage microorganism within 2 hours after a single enrichment. It has been validated for use after enrichment with common broths (e.g. MRS or NBB). The GeneDisc PCR assay is adapted for most of the existing sample preparation procedures used in quality control laboratories and Pall also supplies a simplified recommended DNA extraction procedure described in Figure 2.

Figure 2: Workflow of the GeneDisc Beer Spoilage Bacteria Method





The GeneDisc method is designed for use with various sample types including filterable samples (filled product, water) and unfilterable samples (green beer, wort, yeast). The system offers a high value-added quality assurance tool in the brewing process as it fits into currently implemented test programs, hazard analysis plans and contamination troubleshooting.

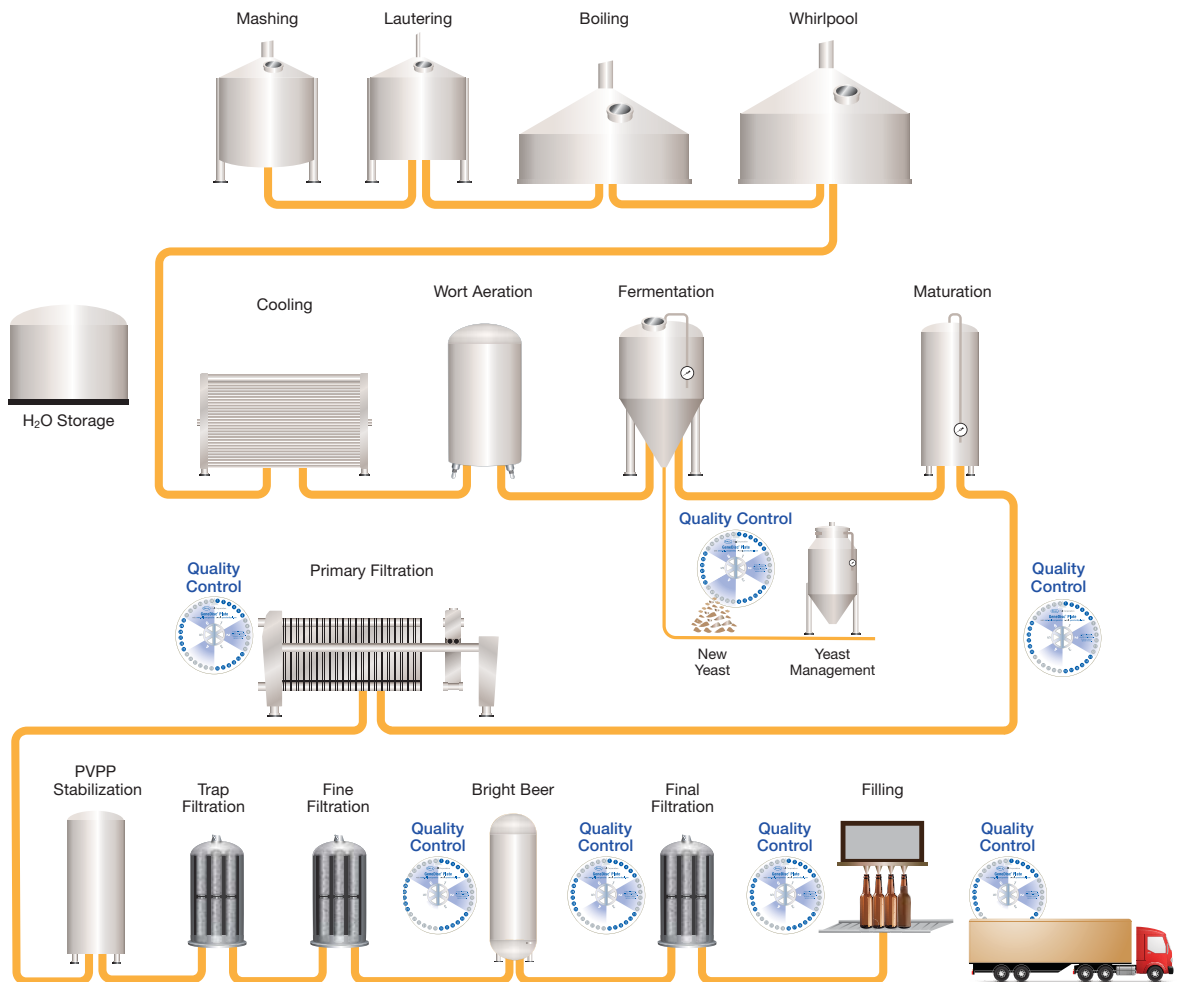
The GeneDisc system indicates presence of contamination and it can also be used as an investigative tool to precisely identify and track specific sources of infection. It facilitates definition of corrective actions in case of contamination and preventive measures to avoid reoccurrence of the issue.

Figure 3 shows a selection of some critical points identified in a brewing process where a GeneDisc test can be implemented for routine controls:

Focusing on the customer's specific concern about yeast propagation bacterial quality, implementation of this control point was made possible because of accelerated time to results with the GeneDisc Cycler. Results are now obtained in less than 3 days and before yeast pitching, while yeast is still in the propagator. This prevents the use of contaminated yeast. Furthermore, periodic control of the yeast brink can also be implemented. The reduced risk of financial losses due to a single or multiple batch spoilage is substantial and justifies a strong rationale for GeneDisc system initial investment.

In addition, breweries can also easily implement internal environmental testing. With the GeneDisc method for *Legionella* quantification in water (e.g. cooling tower water, tap water), *Legionella* monitoring controls can be performed directly at the production facility.

Figure 3: Examples of GeneDisc Control Points in a Brewing Process





## The Benefits

With the GeneDisc solution, breweries can now achieve high value-added quality control to reduce bacterial contamination risk. By implementing Pall's technology, breweries can realize the following benefits:

- Reliable monitoring of all steps of the brewing process
- Accelerated decision-making to reduce risk of product spoilage as GeneDisc technology allows for early preventive controls.
- Fast corrective actions implementation to reduce negative financial impact, due to rapid root cause analysis in case of contamination.
- Easy integration into all brewery types due to proven ease of use. Minimally trained operators can achieve reliable and robust results.

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Pall Corporation is a global filtration, separation and purification leader providing solutions to meet the critical fluid management needs of customers across the broad spectrum of life sciences and industry. We work with our customers to advance health, safety and environmentally responsible technologies.

Pall Food and Beverage provides products and services to ensure product quality and maintain process reliability in beverage and food production. Our solutions also assist in consumer protection, the reduction of operating costs and waste minimization.



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