



## Technical Brief

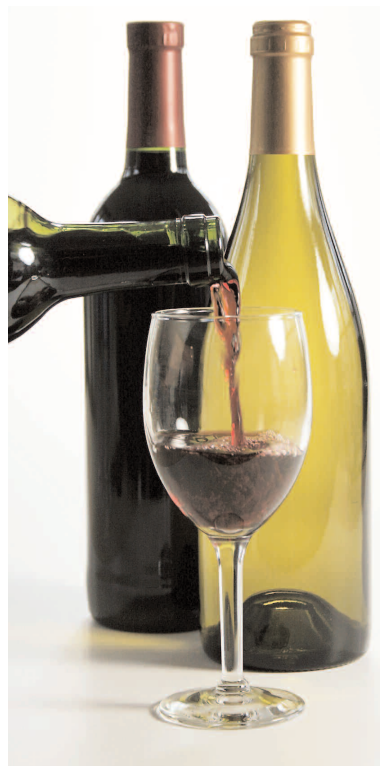
# Graver Cartridge Regeneration Procedures for Wine & Beer Applications

The purpose of this document is to provide suggestions on how to extend the life of Graver filters used in wine, beer and spirits filtration (e.g., ZTEC-B, VTEC, QMC and PMC) by means of regeneration. These procedures are mainly effective for organic and water soluble contaminants.

**Forward Flush Procedure:** this process results in the least amount of stress on your filters.

1. Forward rinse at ambient temperature with pre-filtered water at >5 psid (.34 bar) for 5–10 minutes to remove certain soluble product remnants. This step is critical as it reduces the risk of 'baking' on proteins (e.g., beta-glucans) when introducing hot water.
2. Forward rinse with pre-filtered 125–180°F (50°–80°C) water at 5–30 psid (.34–2.1 bar) for 15–20 minutes. The warmer the water, the better the results, but do not exceed 180°F (80°C).
3. *Optional for heavily plugged filters* – Soak overnight or longer or forward flush with an oxidizing chemical for 30–60 minutes. See below for chemical suggestions.
4. Cold forward rinse with pre-filtered water at >5 psid (.34 bar) just long enough to cool the filter and remove any residual chemicals (if used).
5. Store filter (see below) or progress to sterilization and integrity testing prior to re-use.

**Reverse Flush Procedure:** This process is more effective at regenerating filters. However, reverse flushing is discouraged with sterilizing grade membrane filters (i.e., ZTEC-B) as it stresses the filters considerably more than forward flushing; especially when combined with hot water. There is a much greater risk of compromising the integrity of membrane filters by reverse flushing if pressures and elevated temperatures are not closely regulated within the filter's maximum operating parameters. However, reverse flushing of the VTEC is acceptable and is the preferred procedure.



- ▶ Follow the steps in the Forward Flow Procedure outlined above except flow in the reverse direction. If flushing in the reverse direction, do not exceed 5 psid (.34 bar) for non-membrane products (e.g., PMC and QMC), 2 psid (.14 bar) for the ZTEC-B or 20 psid (1.4 bar) at <125°F (50°C) for the VTEC.

**Chemicals:** The following chemicals will improve the efficacy of the regeneration process. The filters can either be soaked or flushed with these chemicals.

- ▶ Peracetic acid 100–400 ppm
- ▶ Citric acid
- ▶ 1-5% caustic or hot caustic (do not use caustic with VTEC Series)
- ▶ 1-10% hydrogen peroxide
- ▶ Peracetic acid and caustic are more effective than hydrogen peroxide and citric acid.
- ▶ Caustic followed by hydrogen peroxide is also effective.
- ▶ Sodium Hypochlorite (bleach) 200–400ppm, (8ml of 5% household bleach in 1L of water) is very effective, but may leave unwanted residual taste and odor if not rinsed thoroughly.
- ▶ Commercially available chemicals: enzyme-activated detergents such as Tergazyme, require extra time for the enzymes to do their work and be fully effective. Oxidizers effectively breakdown organic species. Chlorinated alkaline is also effective but alkaline chemicals should not be used with VTEC Series.
- ▶ If considering other commercially available chemicals, it is important to select a chemical that will oxidize or breakdown organics. Some detergent containing solutions may actually impede the removal of residuals, so should be avoided.
- ▶ If the filter is plugged mostly with inorganics (i.e. dirt, sand, rust, etc) then little can be done to regenerate. Hence, pre-filtration of process and flush water is important.
- ▶ If using acidic or caustic chemicals, ensure that proper gloves, safety-glasses and other protective clothing is worn. Also, neutralization may be required prior to disposal.



- ▶ Alcohol is the only solvent that should be considered, but it is ineffective at removing organics or for regeneration. Alcohol, however, can prevent microbial growth during wet storage.
- ▶ Under normal circumstances, backflushing VTEC Series filters is sufficient due to its morphology and regeneration chemicals are not needed.

### Storage of Regenerated Graver Filter Cartridges:

- ▶ **Wet storage:** Filters that will be used within a few days or weeks, can be stored by soaking in a sanitizer and/or oxidizer such as citric acid, bleach, alcohol, hydrogen peroxide or other commonly available sanitizing chemicals (Note, many sanitizing chemicals are also good oxidizers).
- ▶ **Dry storage:** If regenerated filters will be stored for more than a few weeks, the filters should be completely dried and placed in clean bags. Blowing air or nitrogen through the filters (exceeding the bubble point pressure) will assist in drying the filters.
- ▶ It is important to either completely dry the filters and re-bag prior to storage, or if storing the filters in a wetted state, to ensure the wetted fluid will not allow microbial growth during storage. The goal is to prevent an environment that is conducive to organism growth.

### Additional Notes:

- ▶ When flushing with water, it is important to pre-filter the water to a micron rating equal or less than the micron rating of the filters being regenerated/flushed. It is also recommended to filter your process water. Otherwise, you may prematurely and irreversibly plug the filter with inorganics commonly found in well or city water. Furthermore, if filters are backflushed with 'dirty' water, these contaminants can potentially enter your process when forward flow is resumed. Graver can offer solutions for pre-filtering rinse and process water.
- ▶ Storing the filters in hot water overnight or flushing with hot water prior to use (i.e. hot water sanitization) will help regeneration efficacy.
- ▶ Finally, it is always recommended to integrity test sterilizing grade membrane filters prior to system sterilization and production.