Cold sterilisation by dimethyl dicarbonate

Identification

Key words: dimethyl dicarbonate, Velcorin®, beverages, microbial inactivation, sensory properties

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How does it work?

Primary objective: Dimethyl dicarbonate (Velcorin®) provides effective protection against spoilage microorganisms for non-alcoholic beverages and wine without affecting the sensory properties of the drink.

Working principle: Dimethyl dicarbonate (DMDC) is used for extremely effective removal of typical beverage-spoilage microorganisms such as yeasts, a wide range of bacteria and molds and is simple to use.

Dimethyl dicarbonate penetrates the cell and deactivates enzymes, leading to the destruction of the microorganisms. After addition to the beverage, dimethyl dicarbonate rapidly breaks down into negligible amounts of methanol and carbon dioxide, naturally occurring compounds in many beverages such as fruit and vegetable juices and wines. It has no effects on the taste, smell or colour of the beverage. Dimethyl dicarbonate is suitable for carbonated or non-carbonated juice beverages, isotonic sports beverages, iced teas and flavored water and wines. It is added immediately before filling the beverage [1, 2, 4, 5, 6].

Images

Additional effects: Application of dimethyl dicarbonate reduces sulfur content in young wines, replaces membrane filtration as a means of stabilizing unfiltered wines, eliminates spoilage yeast such as Brettanomyces, and prevents secondary fermentation of the wine. The use of dimethyl dicarbonate helps to keep the wine stable during the period from filling to consumption.

Dimethyl dicarbonate can help the sector reduce production costs, since switching from hot fill to cold fill technology in the manufacture of fruit-juice-based beverages saves energy. In addition, thinner PET bottles can be used in cold filling.

Important process parameters: Dimethyl dicarbonate concentration, break-down time before distribution, careful manipulation with substance (poisoning agent), dosing equipment, filling line protection (consume of freshly filled drinks by workers is strictly prohibited). Acceptable for use as a cold sterilization agent for beverages when used in accordance with Good Manufacturing Practice up to a maximum of 25 mg/l (Dr M. Younes Max von Pettenkofer Institute of the Federal Health Office, Berlin, Germany)

Important product parameters: Dimethyl dicarbonate concentration
What can it be used for?

**Products**
Carbonated or non-carbonated juice beverages, isotonics sports beverages, iced teas and flavored water and wines, perishable beverage

**Operations**
Filling of beverages, preservation, sterilization

**Solutions for shortcomings**
This cold-fill technology could replace pasteurisation or hot-fill technology

What can it NOT be used for?

**Products**
Highly viscous products that slow down the decomposition reaction.

**Operations**
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**Other limitations**
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**Risks or hazards**
Dimethyl dicarbonate in its pure form is moderately toxic by ingestion, highly toxic by inhalation, irritating to the skin and eyes and combustible if exposed to an open flame. Due to these hazards, people are required to wear safety gear when handling Dimethyl dicarbonate and are given regular safety training.

Implementation

**Maturity**
This technology is generally used by beverage companies.

**Modularity/Implementation**
Only minimal modifications are needed to convert an existing hot fill line to the dimethyl dicarbonate technology. Technical requirements are the installation of an optimized energy recovery system (cross-flow heat exchanger) and a dimethyl dicarbonate metering unit. Energy consumption by the filling process can be optimized by applying the pinch point method. In such a “design process”, the ingoing and outgoing energy at different temperature levels can be optimized until the difference reaches the desired minimum value at the pinch point.

**Consumer aspects**
Consumers do not know about its use because in many EU states (including CR) it has not to be declared on label as preservation additive.

**Legal aspects**
The EU Scientific Committee on food, the FDA (Food and Drug Administration) in the United States of America and the JECFA of the WHO have confirmed the safe use in beverages. The use of dimethyl dicarbonate technology as a new enological procedure for stabilizing wine during filling was approved for Europe - according to Regulation (EC) No 643/2006.

**Environmental aspects**
Low energy consumption

Facilities that might be interesting for you

Further Information

**Institutes**
University Bordeaux 2 - Oenology

**Companies**
LANXESS AG
References


Source: