

Jonas-Cahn-Str. 9  
D-53115 BonnPhone: +49 22 8 98 33-0  
Fax: +49 22 8 98 33-195eMail: marketing@frings.com  
Internet: www.frings.com

## Essig Infos

### How is Vinegar made?

Alcohol containing raw materials such as wine, fruit wine, malt wine, or diluted alcohol are basic products for vinegar fabrication. The production is effected by tiny organisms: the vinegar bacteria. They convert the alcohol to acetic acid using oxygen from the ambient air.

Ideal living conditions include optimal concentrations of oxygen, alcohol, and nutrients, a constant temperature, and a fully automatic control of the process.

#### Ideal Conditions for Submerged Vinegar Fermentation in the Frings Acetator

The term "submerged vinegar fermentation" shows the similarity to the processes used in the production of antibiotics, yeast etc. Just as in those procedures the term expresses that the organisms, in this case the vinegar bacteria, do their fermenting work in a liquid, in this case in an alcoholic mash. Submerged vinegar fermentation does without any packing material (shavings, birchwood, etc.) as is used in packed generators for holding the vinegar bacteria. The vinegar bacteria are always "submerged" in the fermenting liquid where they multiply and oxidize the alcoholic mash into vinegar. For the oxidation and maintenance of their activity, the bacteria need oxygen. So one of the essential requirements of submerged vinegar fermentation is a uniform and intensive injection of air into the fermenting liquid. This is guaranteed by the FRINGS Aerator, a unit which is patented in many countries of the world. This aerator continuously provides the complete interior of the fermentation tank with finest air bubbles so that the bacteria find an optimal oxygen concentration for their activity anywhere in the tank.

The aeration of fermenting liquids with a higher surface tension than that of water results in foam. The quantity and composition of the foam differs according to the applied raw material. The patented FRINGS Vertical Defoamer, which is automatically switched on and off, condenses the foam by purely mechanical means. Chemical anti-foam agents are not required.

Lack of alcohol leads to an interruption of the fermentation and to a quality deterioration of the finished vinegar. Therefore, the vinegar discharged from the fermentation unit must contain 0,2 to 0,3 vol.% alcohol. A fully automatic fermentation is obtained when the FRINGS Acetomat III with the alcohol probe Alkosens II is employed.

The Acetomat III is a measuring and control system that controls the fermentation process and determines the alcohol concentration fully automatically by means of the Alkosens II. The Alkosens II analyzes the alcohol concentration directly in the fermenting liquid inside the Acetator tank. It can be used for any kind of vinegar production, i.e. spirit vinegar production, wine vinegar production or even the production of speciality vinegars.

#### Vinegar Production in the FRINGS Acetator

The Acetator facilitates the production of vinegar from any alcohol-containing raw material. The conversion of diluted alcohol is as easy as the conversion of wine. Thanks to the equipment of the Acetator with a modern PLC (programmed logical control) system, batch fermentations with acidities from 9 to 15 % as well as continuous fermentations for lower acidities are likewise possible.

During the past few years Frings has developed new fermentation processes, the single- and dual stage high strength fermentation processes. With the single stage high strength fermentation process vinegar with up to 17.5% acidity and with the dual stage high strength fermentation process vinegar with an acidity of up to 20.5% acidity can be produced. These processes are controlled by a modern PLC control system, combined with (optionally) a Frings Fermentation Computer (FFC).

#### High Strength Vinegar from Alcohol

The production of alcohol vinegar with acidities up to 20% requires particular strains of vinegar bacteria which - over many years of hard research work in our own laboratory - have been adapted to the living conditions of the high strength fermentation as well as to the different production processes. There are bacteria strains for the batch process, for the continuous process, and for the single and the dual high strength processes. When new plants are installed, these bacteria will be delivered by FRINGS. The culture can also be stored for inoculation purposes in case of a temporary shutdown of production.

Nowadays, the FRINGS Acetator is doubtlessly the most efficient unit for the production of spirit vinegar. Its high yield and the possibility of producing vinegar of up to 20% acidity make the Acetator a fermentation unit of unequalled economy.

Jonas-Cahn-Str. 9  
D-53115 BonnPhone: +49 22 8 98 33-0  
Fax: +49 22 8 98 33-195eMail: marketing@frings.com  
Internet: www.frings.com

## Vinegar Infos

### How is Vinegar made?

#### FRINGS Nutrients

Our scientific experiments for the adaptation of the vinegar bacteria to the production of highly concentrated spirit vinegar have also led to a better knowledge of how vinegar bacteria are best fed. Special nutrients which guarantee an ideal nutrition and a safe and economical conversion have continuously been developed and optimized:

FRINGS Acetozym DS plus for spirit vinegar  
FRINGS Nutritive Salt for all kinds of wine vinegar

#### Why FRINGS Acetators?

Der FRINGS-Acetator hat sich als das ideale Gärgerät in aller Welt durchgesetzt. Bis Anfang 2000 wurden über 700 Acetatoren in 70 Länder der Welt ausgeliefert. Dies ist ein überzeugender Beweis für die Zuverlässigkeit der FRINGS-Acetatoren und ihre optimalen Eigenschaften:

- Maximum Economy
- High Fermentation Speed by Optimum Aeration
- Excellent Vinegar Quality
- Versatile Adaptation to Production Requirements
- Best Material Quality

#### Maximum Economy

The short residence time of the raw material inside the Acetator and the minimum quantities of consumed air lead to optimum yield figures:

From 100 litres of absolute alcohol between 920 and 960 litres of vinegar with 10 % acidity can be produced. The yield rate largely depends on the use of a condenser and an exhaust air scrubber. When combining these two units developed by Frings the yield can go up to 960 litres of vinegar.

This high yield is not only obtained in the first year of operation but remains constant during the whole life of the fermentation unit.

If the latest measurement and control systems are included in the supply scope, the working hours required

for the supervision of your vinegar production are reduced to an absolute minimum.

#### High Fermentation Speed

The patented Frings aerator guarantees an ideal mixing and conversion of the mash undergoing fermentation. A precision dimensioned aerator motor provides for highest efficiency and yield at extremely low energy values.

#### Excellent Quality of the Produced Vinegar

Thanks to the short residence time of the fermenting liquid in the Acetator and the minimum air quantity, the finished vinegar contains nearly all flavouring substances of the raw material and achieves a mild and aromatic taste and flavour within a relatively short storage time.

#### Versatile Adaptation to Production Requirements

As a versatile fermentation unit, the Acetator is a highly desirable and flexible production unit. It can be started for a short time and shut down again as soon as the required quantity of vinegar has been produced. By the choice of batch, continuous, single- or dual-stage high strength fermentation processes all raw materials can be converted with equal economy independent of their alcohol content. The production of highly concentrated alcohol vinegar leads to a reduction of storage and shipping space.

#### Best Quality of Material

The first-class acid-resistant materials used for the construction of the Acetator are the secret of its long life.