

## CONTROLLED FERMENTATION BY CO<sub>2</sub> MEASUREMENT



**In wine making, the fermentation process is a catalyst function, which converts grape juice into an alcoholic beverage. During fermentation, the yeast interacts with sugar to produce ethanol, generally known as ethyl alcohol, and carbon dioxide as a side product.**

During the fermentation process there are several factors which the vintner must take into account. The most important is the internal temperature of the mash. A typical white wine ferments at 18-20°C, while red wine is usually fermented at a higher temperature (up to 29°C). Of course, there are exceptions to this. Some vintners let their red wines ferment at lower temperatures in order to obtain more fruity aroma. A further factor for the vintner is the residual sugar level, which determines the sweetness of the wine. Nowadays, fermentation is mainly carried out in stainless steel tanks.

### Uncontrolled fermentation has the following disadvantages

- High mash temperatures of up to 30 °C
- Loss of aroma due to the high temperature
- Loss of aroma due to high CO<sub>2</sub> emissions over a short period
- Intensive foaming
- Stress on the yeast due to high temperatures results in inactivity and therefore fermentation problems.
- An uncontrolled fermentation only lasts for 3-5 days, which restricts the development of aromas.
- Possible development of chemical residues such as histamine (a hormone which is produced by bacteria during fermentation).

### Standard processes:

The vintner usually counteracts the disadvantages of uncontrolled fermentation by:

- controlling the temperature of the mash through the use of various types of cooling devices, e.g. fermentation tanks with integrated cooling coils.
- measurement of the residual sugar level at regular intervals in order to select the ideal temperature for the individual phase of fermentation and to halt fermentation once the desired level has been achieved

Optimum results are achieved by linking the form of the temperature control curve to the reduction of residual sugar.

Fermentation usually starts at 18-20°C. During the main phase of

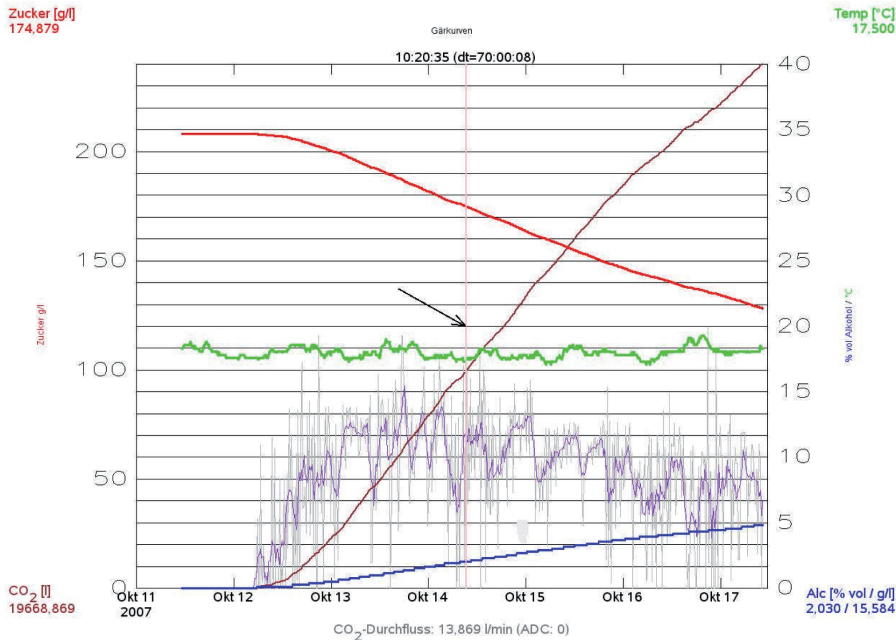


Optimum wine fermentation in stainless steel tanks

fermentation the temperature should be between 16-18°C. At the end of fermentation the temperature should be higher in order to compensate for the harsh environment of the "tired" yeast. The change in temperature should always be less than 4°C per hour.

**Innovative process:  
Controlled fermentation by measurement of the quantity of CO<sub>2</sub> produced**

By measuring the quantity of CO<sub>2</sub> which is produced during fermentation in combination with the temperature of the mash, the vintner obtains



Progress of controlled fermentation

the important information about the performance of the yeast and the quantity of sugar which has been transformed into ethanol. Before starting the process, the vintner must determine the sugar content and the volume of the mash as the starting parameters.

After this, he obtains information about the quantity of residual sugar during every phase of fermentation.

He can use this information in order to achieve a constant increase in the level of ethanol by controlling the temperature of the mash and therefore the activity of the yeast in the form of a closed feedback loop.

all

## • Application conditions

Measurement range: 0.25 - 10m/s  
 Temperature range: 10 - 35°C, typically 15 - 20 C  
 Output: Analog, 1 - 5V  
 Conditions of use: Approximately 100% CO<sub>2</sub> at ambient pressure; contamination with foam possible

## • E+E Product



**EE575**  
 Miniature flow sensor

Flow sensor in compact stick design.  
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