

## Distillery 4.0

### Introduction

Fruit brandy production can be seen as a complex manufacturing process with the objective to separate **pleasant** aroma volatiles from **unpleasant** aroma volatiles. Up to now, scientific publications mainly focused on the reduction of unpleasant aroma volatiles in the product. There is a missing link that investigates **how pleasant aroma volatiles can be enriched** in the product. Due to the complexity of the manufacturing process it is required to **gain excessive information from the distillation process** to understand cause-effect relations. We hypothesize that with additional knowledge on distillation process parameters and fractionation behavior of pleasant aroma volatiles, it is possible to adjust the distillation process in a way that increases fruit brandy quality.

### Digitized distillation equipment

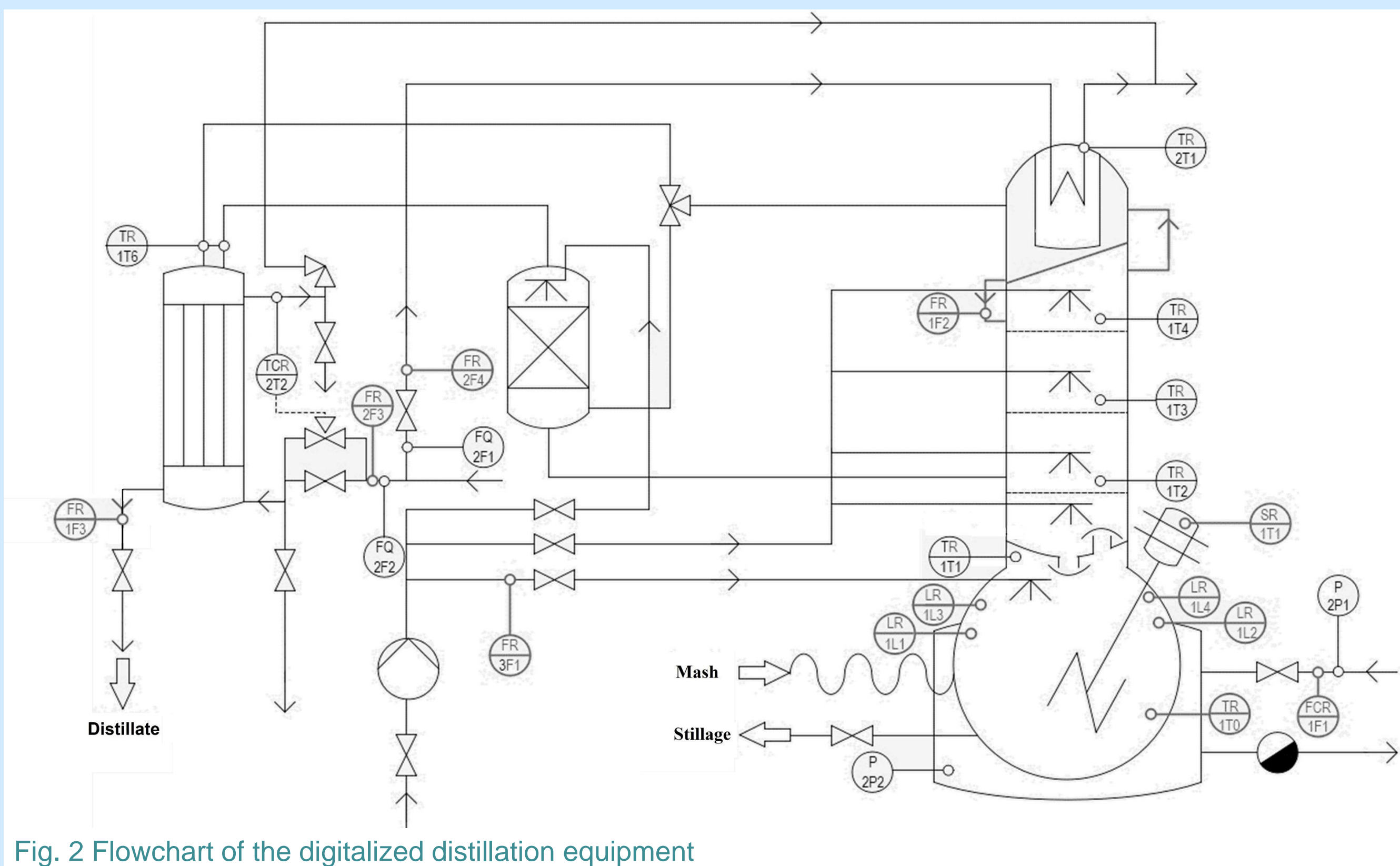


Fig. 2 Flowchart of the digitalized distillation equipment

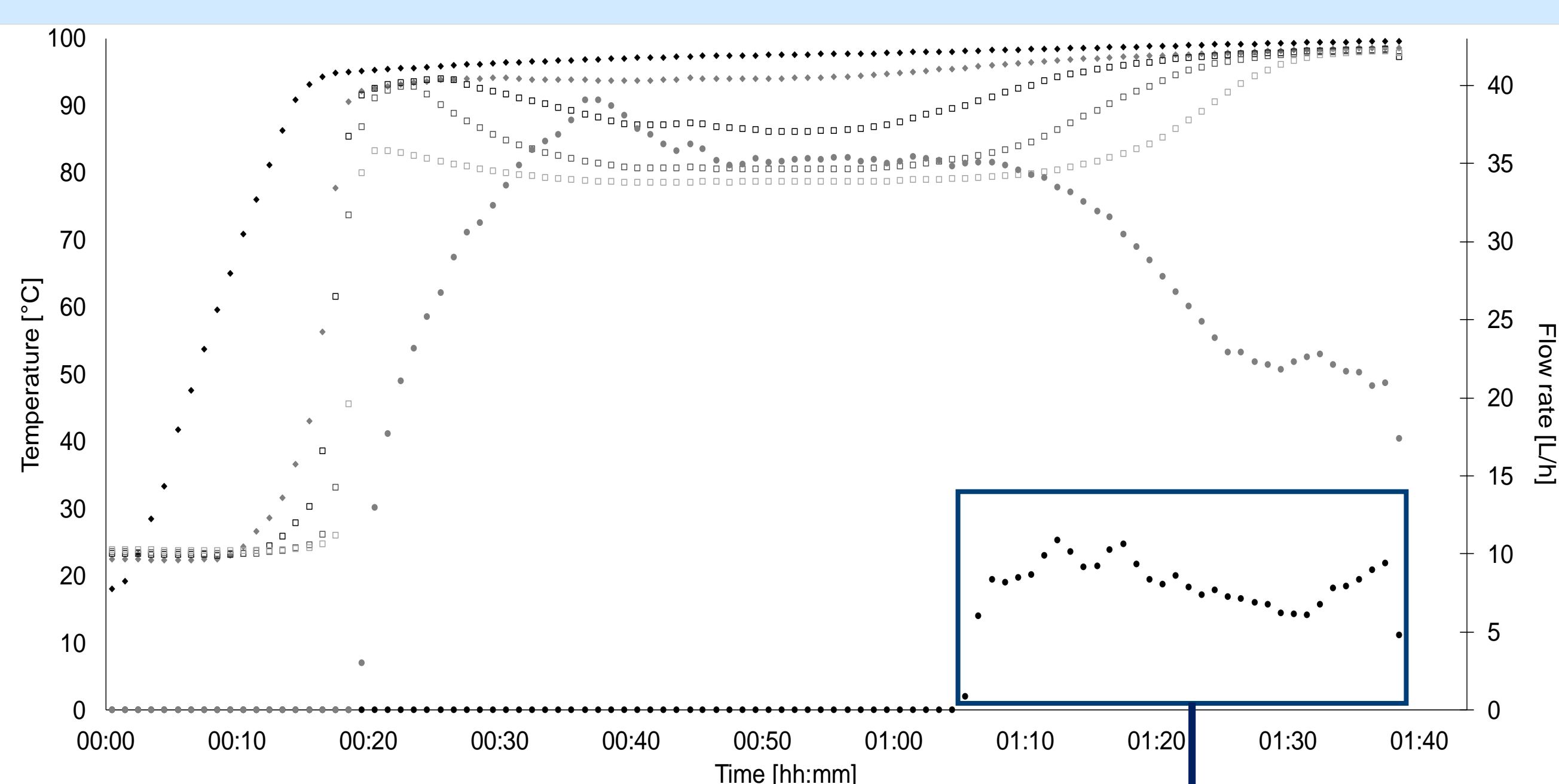
#### Technical sensors

- 1 x Thermal energy input
- 8 x Temperature
- 5 x Volumetric flow rate
- 4 x Foam level detectors

#### Adaptation parameters

- thermal energy input
- active trays
- internal reflux

### Distillation profile

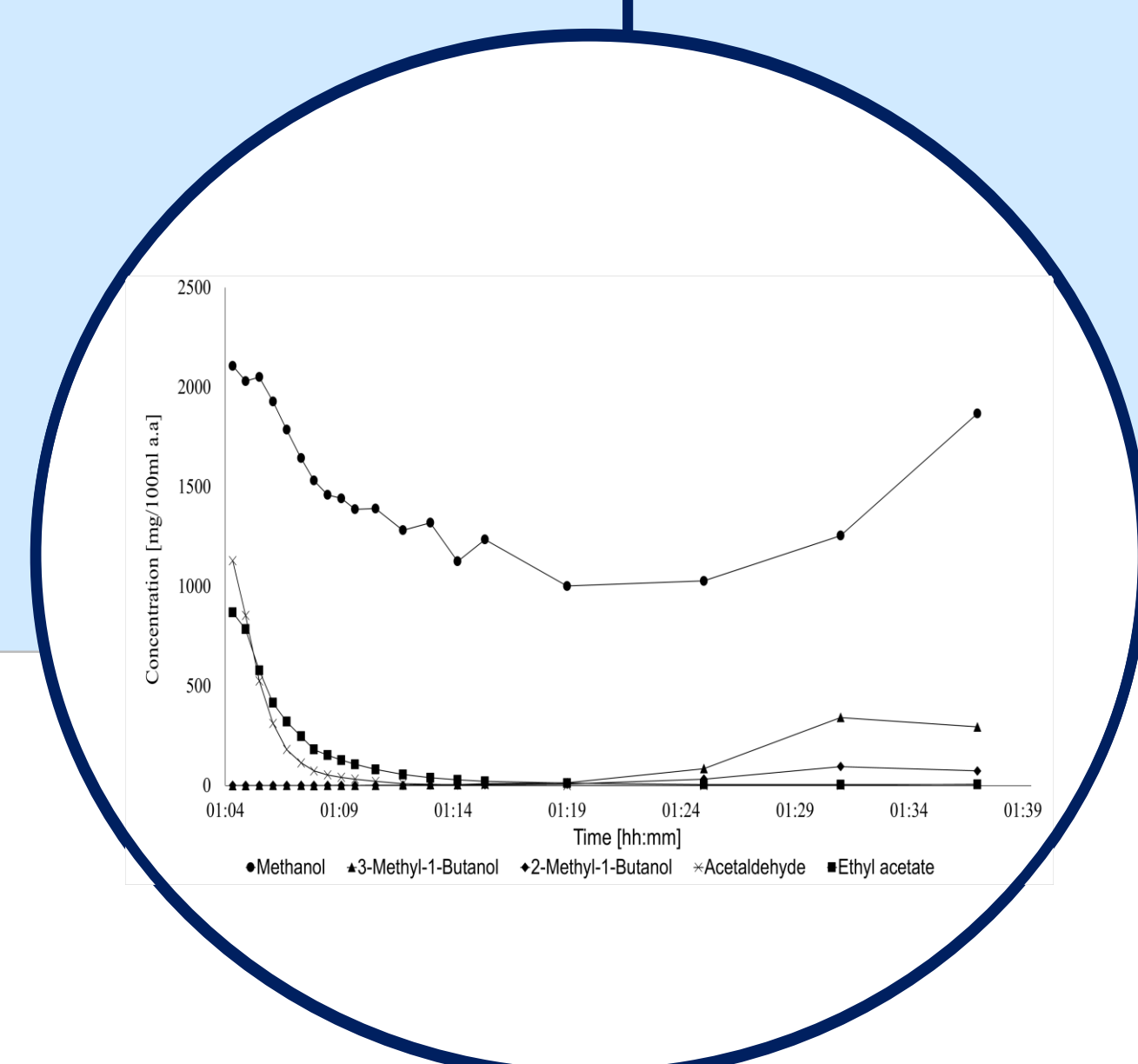


- T Mash [°C]
- T Headspace [°C]
- T Tray 1 [°C]
- T Tray 2 [°C]
- T Tray 3 [°C]
- Q Destillate [L/h]
- Q Column [L/h]

Fig. 3 Distillation profile of digitized distillation system

#### Objective

- Understand how to establish defined distillation profiles
- Yield highest amount of pleasant flavors



### Fractionation behavior of aroma volatiles

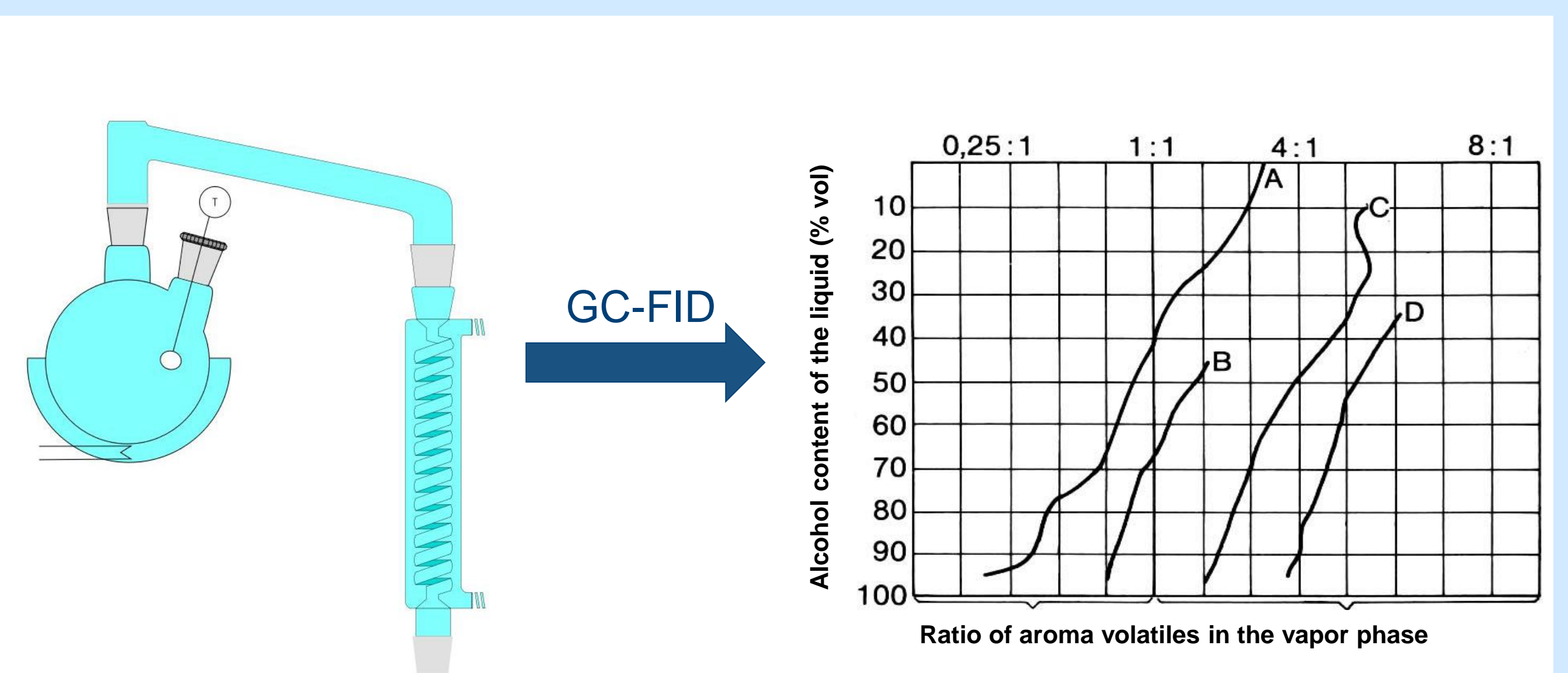


Fig. 1 Determination of rectification coefficients of aroma volatiles

#### Objective

Identification of ideal fractionation behavior of key aroma compounds

**No studies have been conducted to improve aroma volatiles in brandies based on rectification coefficients**

### Adapted distillation process with online interface



Fig. 4 Process interface for online adaptation of the process

#### Aims of project

- optimize distillation process control with online interface
- perform adapted distillation profile distillations based on rectification coefficients
- improve product quality by focusing on key aroma compounds