

# Sustainable water distillation

## Energy-efficient distillation through vapor compression

### Graduate



Noah Lüchinger



Robin Müller

**Initial Situation:** Sustainable water treatment has long been in great demand in a wide variety of areas. From development aid to modern space stations, new and sustainable water treatment methods are being sought. Roland Lehmann has been working for some time to provide a practicable solution to these needs.

**Approach:** The aim of this thesis was therefore to develop methods for water treatment using 'vapour compression technology', i.e. water treatment by distillation with an open heat pump circuit. The fact that this technology works has already been shown in an earlier bachelor thesis, but there are still some open points, in particular the required power of over 200W of the system is too high compared to the amount of water treated. The main objective of this bachelor's thesis was to find a compressor that delivers 50 litres per day at an output of less than 200W. For this purpose, various centrifugal and axial compressors, mainly from the low-cost range, were tested with air. These compressors came from battery-powered hoovers or from the modelling sector. They were tested using an existing test rig of OST in Buchs. This rig was adapted for this purpose. However, the results were very disappointing. None of the compressors tested achieved the desired values. The desired pressure differences of a factor of 1.2 could not be achieved, but the volume flow was often greater than the required 5 to 15 m<sup>3</sup>/h. Even throttling the supply air was hardly successful. Nevertheless, some tests were repeated with an improvised steam generator. However, the required amount of vapour could not be achieved. After various clarifications, including discussions with compressor manufacturers, the search for a suitable compressor proved to be too ambitious. Nevertheless, the creation of a vapour test bench for compressors was defined as a new objective of the bachelor thesis. This rig should also facilitate the search and testing of suitable compressors in the future.

**Result:** This test rig was created as part of this work and continuously improved through various tests. In addition to several other compressors, a Wankel compressor prototype from Fautech was successfully tested. This compressor met many expectations and, with a few adjustments, could be a possible solution in the future.

The conclusion was that the Hoover compressors are not suitable for the desired application. However, Florian Ausserer's prototype did provide a possible compressor and the test bench makes it easy to carry out further tests in the future.

### Advisor

Prof. Stefan Bertsch

### Co-Examiner

Dr. Leon Brendel,  
Buchs, SG

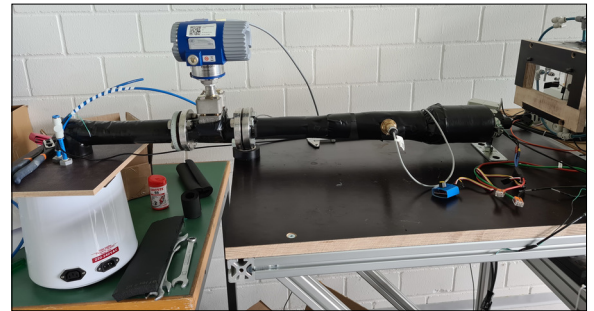
### Subject Area

Mechanical  
Engineering

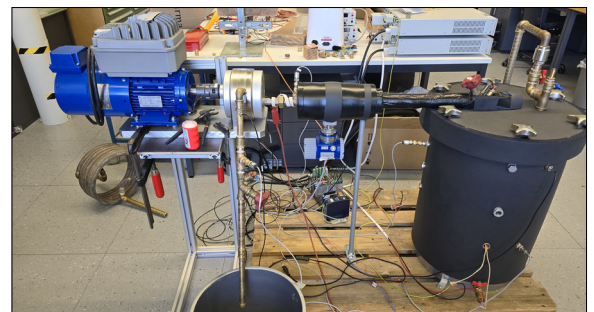
### Project Partner

Lehmann Raindrop,  
Gossau, SG

**Improvised vaporiser set up**  
Own presentation



**Final set up**  
Own presentation



**Fautech compressor**  
Own presentation

