MEURASTREAM

Conventional brewhouses, even those equipped with vapour condensation on the wort kettle, still have significant steam consumption and over-production of hot water. Over-production of hot water has become a problem for many brewers, as the industry is trying to reduce the water consumption in the overall process. The extra hot water produced in the brewhouse cannot (or only partially) be used. Consequently in many brewhouses the hot water tank is often overflowing, which represents important water and energy losses.

With this reduced steam use and hot water excess in mind, Meura has developed and patented a new concept, called the **"MEURASTREAM"**. The principle of the **MEURASTREAM** can be implemented in a batch brewhouse or a Meurabrew (Meura's continuous brewhouse).

The **MEURASTREAM** reduces by about 50% the thermal energy compared to a brewhouse without energy recovery and 35% for a brewhouse with vapour condensation! Exess of hot water is reduced by 30%! These figures make the **MEURASTREAM** most probably the most energy efficient brewhouse concept available on the market. The **MEURASTREAM** concept can be easily implemented in any existing brewhouse.

MEURASTREAM

The MEURASTREAM is a combination of 2 major technologies:

De-intensified boiling and the Ecostripper technology

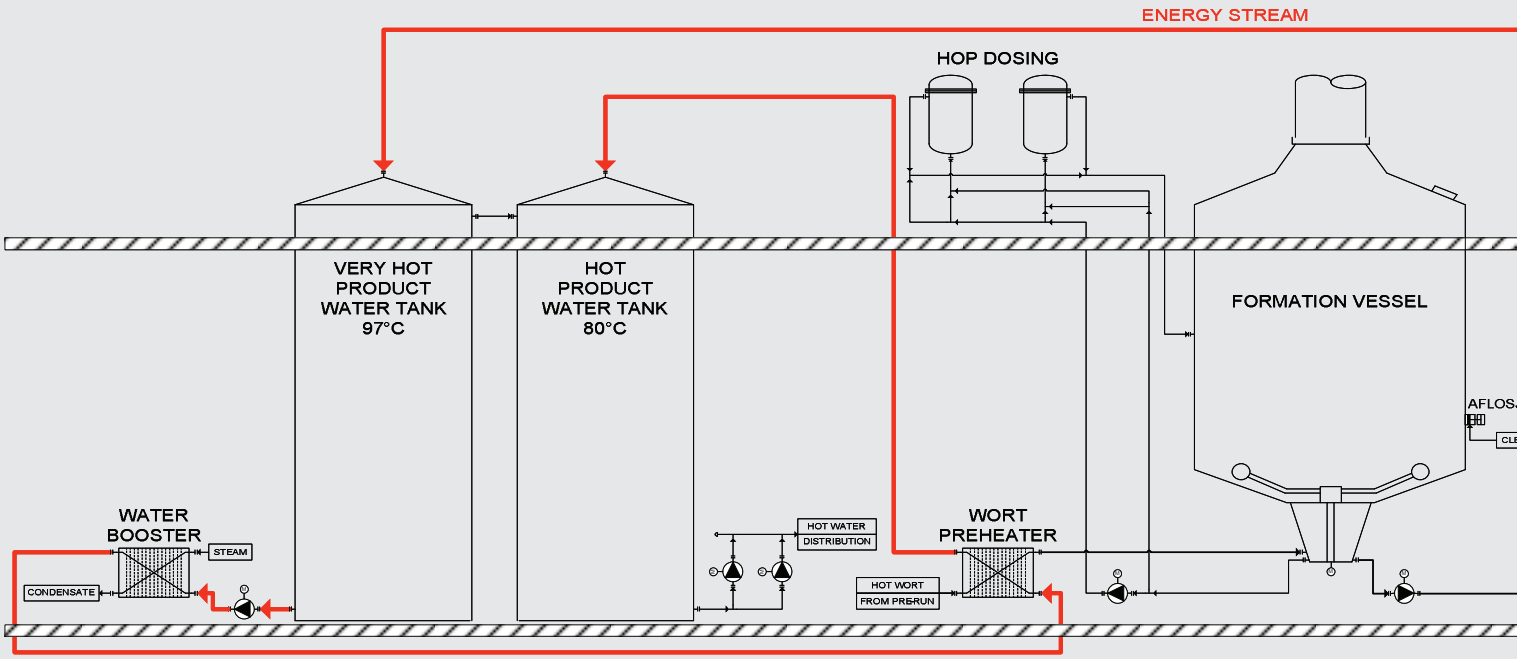
With the de-intensified boiling, the heat treatment of the wort and elimination of volatiles is separated into two steps (in a classic brewhouse the wort kettle performs these processes at the same time). In a first vessel, called the formation vessel, the wort is kept at 100°C with almost no evaporation (less than 1%). In this step all processes that involve heat treatment are performed (formation of DMS, sterilization, enzyme deactivation, hop isomerisation etc.). After this formation step the trub is eliminated by a whirlpool or Clarisaver (wort settling tank). The final step, in-line with the wort cooling, is the **ECOSTRIPPER**, a wort stripping technology. Wort is pumped on top of the stripper and in counter-flow 0.5% steam is injected to eliminate the unwanted volatiles. The overall evaporation rate is thus less than 1.5%!

Very hot brew water production with energy re-use

The energy to heat up the wort after mash filtration from 78°C to boiling temperature will primarily come from the wort cooling.

The table shows that the **MEURASTREAM** reduces the thermal energy by 50% compared to a brewhouse without energy recovery and by 35% compared to a brewhouse with pfaduko! Excess hot water is reduced by 30% thanks to the **MEURASTREAM**!

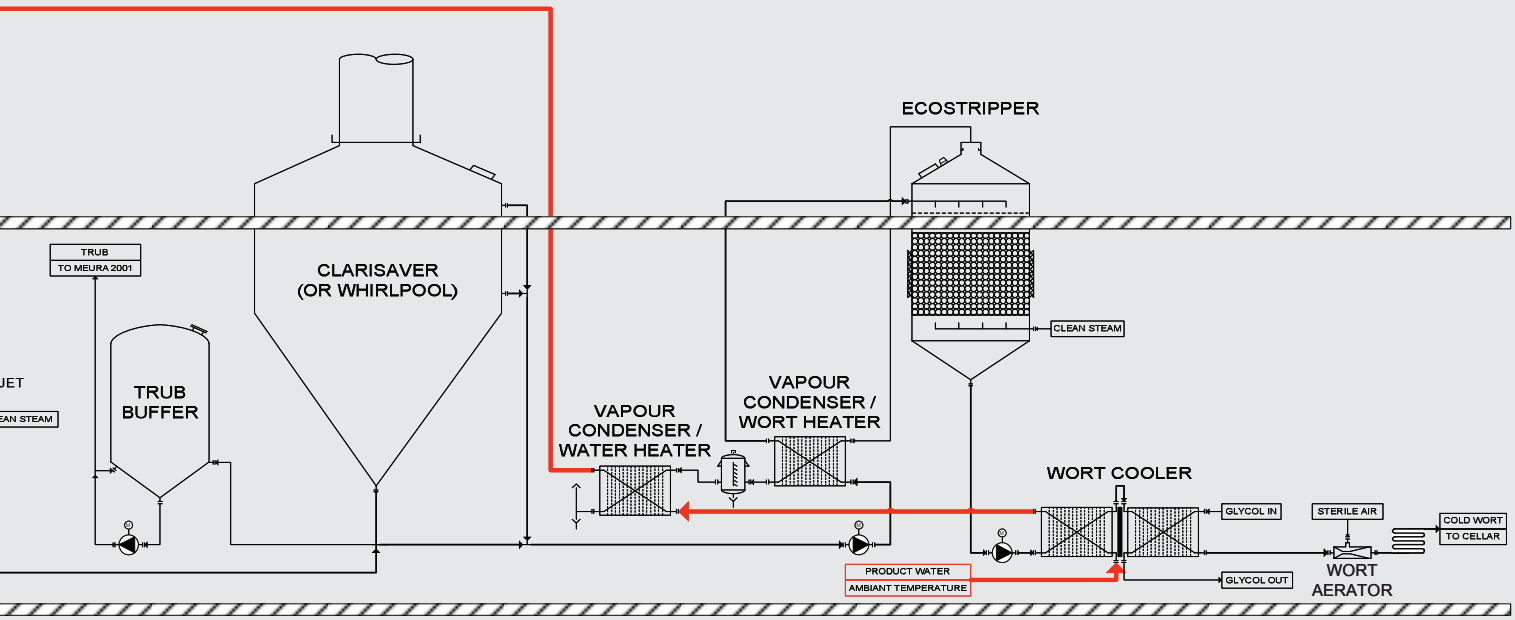
These figures make the meurastream the most energy efficient brewhouse concept available in the market. The meurastream concept can be easily implemented in any existing brewhouse.



Instead of heating the brew water in the wort cooler to the traditional 80-85°C, the water will leave the heat exchanger at about 96°C. This means that the volume of hot water will be smaller than at the usual lower temperature. The energy from the steam injected into the Ecostripper is partially recovered and heats this water to 97°C. The hot water is then temporarily stored in a very hot water vessel. For the next brew, that 97°C water is heated to 103°C with an in-line steam booster and is used to pre-heat the wort to 99°C, when pumped to the wort kettle (or formation vessel). The brew water will leave the heat exchanger at 82°C, and is then used for mashing-in and sparging. In short, part of the energy from the wort cooling is used for the wort pre-heating. It also means that most of the steam consumed in a Meurastream brewhouse is for mash heating only!

The following table compares the **MEURASTREAM** with a brew-house without energy recovery and one with the conventional vapour condensation technology. The calculations are made under the same conditions and recalculated to 15°P cold wort.

	CLASSIC BREWHOUSE	VAPOUR CONDENSATION	MEURASTREAM
Thermal energy	26.0 MJ/hl	19.4 MJ/hl	12.6 MJ/hl
Excess in hot water	37.8 l/hl	37.8 l/hl	15.6 l/hl



MEURASTREAM VS VAPOUR CONDENSATION

The MEURASTREAM is by far exceeding the performances of the conventional vapour condensation.

With the conventional vapour condensation, the vapours from wort boiling (generally between 4% and 8% evaporation) are condensed to prepare water up to 96°C. This water is stored in a so-called stratification tank since at a certain stage water at 96°C will float to the upper part in the vessel while colder water at 76-80°C will be at the bottom. The wort of the next brew will be heated with this energy to about 92°C (and potentially further heated to 99°C with a water booster).

Although the evaporation energy is partly recovered, the vapour condensation system has some major disadvantages compared to the Meurastream:

a) The need to evaporate at least 4%

To have sufficient energy to heat up the wort, at least 4% evaporation (theoretically 3.6 to 3.8%, in reality 4%) is needed. With 100% malt brews, and thus quite a high concentration of DMS formed during boiling, this evaporation of 4% may be required. But in the case of brewing with unmalted adjuncts a lower evaporation rate is common. Thus, in many cases, a 4% evaporation is necessary not for wort quality reasons, but for the operation of the heat recovery system!

b) No solution for excess hot water

In a conventional brewhouse, with wort cooling generating water at 80-85°C, the brewhouse is making more water than it needs for its own operation. Today more and more breweries do not have other consumers for this excess hot water. Consequently, brewhouses with vapour condensation are producing too much hot water.

c) Complexity of the system – maintenance costs

In general, a vapour condensation assembly consists of 4 heat exchangers (a large vapour condensator, an other large pre-heater, a water booster and condensate cooler). In addition there are a few valves in the circuit, as well as a fan to evacuate the non-condensed vapours. To summarize: the system has a certain complexity and will require substantial investment costs (Capex), but also maintenance costs (Opex).

d) Space requirement

The heat exchanger to condense the vapours from the wort kettle is very large, certainly when a tubular exchanger is used. Also, large-diameter piping is needed to connect the chimney to the heat exchanger. Furthermore, there is the significant height of the stratification tank. In conclusion, vapour condensation technology requires more space for its implementation.

e) Energy losses

If the brewhouse is shut down over the weekend, the water at 76-80°C and 96°C is stored in the stratification tank. Over the weekend, this water will mix and the temperature will go down, which makes the system for the first 2 brews inefficient.

CASE STUDY

VBL Da Nang

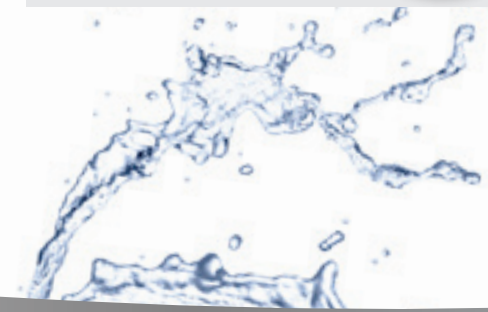
In 2014 a Meurastream was comissionned for the VBL brewery in Da Nang (Vietnam – partly owned by Heineken).

The table below shows the results before and after the installation of the MEURASTREAM.

	THERMAL ENERGY CONSUMPTION (MJ/HL. AT 15° P)	PROCESS WATER CONSUMPTION (HL/HL. AT 15° P)
Brewhouse before revamping	23.00 MJ/hl	1.50 hl/hl
Brewhouse after integration of the MeuraStream concept	11.52 MJ/hl	1.26 hl/hl

The thermal energy was reduced by 11.48 MJ/hl! With the current steam cost of 70$/T (= 0.03$/MJ), this represents a saving of 0.34$/hl. For a 2.4 million hl wort production a year, **it means 816,000 $ of annual savings in thermal energy**!

In addition, Da Nang achieved water savings of 0.24 hl/hl! Note that in case of excess production of hot water, not only is the water wasted, but also the energy it contains.



Edition 2015

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