

Jetstar - a novel internal boiler for wort preparation

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Jetstar

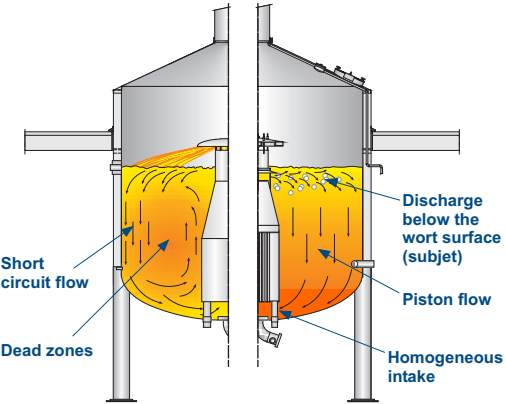
Introduction

Huppmann AG has developed a new boiler generation. With the new design, the wort boiling process can be divided into a thermal conversion phase and an evaporation phase. It is the first system that allows this process splitting in internal boilers with natural circulation. The new procedure makes wort boiling more flexible and allows the specific setting of important wort parameters such as total evaporation, concentration of unwanted flavour volatiles or coagulable nitrogen content. Thermal stress is considerably reduced as pulsation (also called geysering) of the wort during heating is completely eliminated. Due to efficient volatile stripping, total evaporation can be minimized to levels well below 4 %. Thus the system saves primary energy without reducing wort quality.

Wort heating conventional vs. Jetstar

Conventional boiler during heating

Jetstar during heating



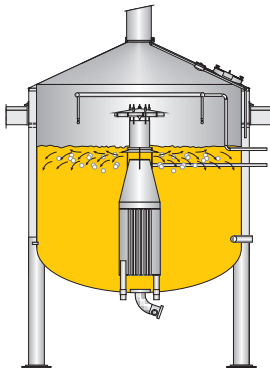
Homogenous wort treatment

A basic requirement for a consistent, high wort quality is a boiling process in which the contents is homogeneously distributed. Inhomogeneity in wort kettles can be caused by inadequate recirculation patterns as they are often observed in conventional boilers. Short-circuit flows can largely be prevented by discharging the wort below the wort level with the so-called "subjet", because the wort is distributed evenly. The new boiling system from Huppmann operates with this principle. The results of the new internal boiler system "Jetstar" are presented below.

The two-phase boiling concept

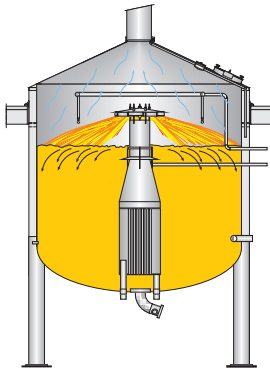
Phase 1

Heating-up and thermal conversion with homogeneous circulation, depending on the coagulable nitrogen and DMS conditions and the requested final values. This phase is independent of the evaporation.



Phase 2

Gentle evaporation of undesired flavour volatiles over the large evaporation surface of the two-level wort spreader. Concentration of the wort to the requested original gravity.



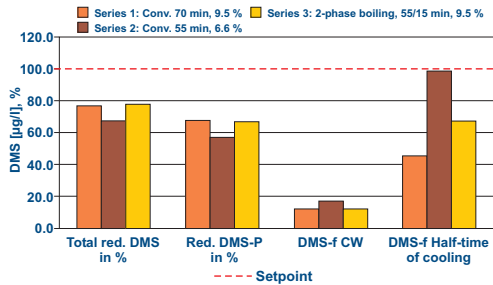
Industrial trial conditions

- Wort volume (kettle full): 620 to 770 hl
- After lautering, the wort is collected in the pre-run tank. Wort preheating to approx. 90-91 °C during transfer to the wort kettle with water from the energy storage tank through a plate heat exchanger.
- As soon as the heating surface of the Jetstar is covered, wort heating is started.
- Phase 1: Thermal conversion with homogeneous circulation
- Phase 2: Intensive evaporation
- Trials were carried out at Löwenbräu Brewery in Munich, part of InBev Germany

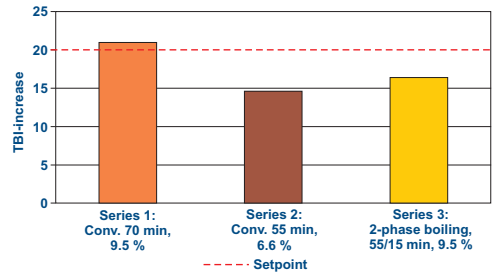
Results

- Three methods are compared:
- Conventional boiling 70 minutes: 8.5 – 9.5 % total evaporation
 - Modified conventional boiling 55 minutes: 6.5 % total evaporation
 - Two-phase boiling with Jetstar Phase 1: 55 minutes / Phase 2: 15 minutes: < 4 % total evaporation
- Standard beer type: light beer

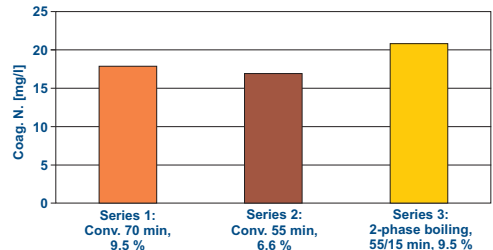
DMS conditions



TBI-increase



Coagulable nitrogen



Heating-up rates

- Wort heating with the Jetstar is faster.
- In the temperature range from 93 °C to the start of the boiling process the heating-up rates were measured for 22 brews.
- With the Jetstar heating-up rates of 1.38 K/min were achieved. The heating-up rate of the old internal boiler was 0.88 K/min.



Conclusion

The "Jetstar" enables two-phase boiling with an internal boiler with natural circulation for the first time. This means the separation of thermal conversion processes and necessary vaporization (evaporation) in an atmospheric wort kettle. Thanks to the thermosiphoning principle, the wort is subjected to a very gentle and homogenous treatment. Technological advantages are achieved through the minimized heat load during pulsation-free heating. Greatly reduced steam temperatures are also used during thermal conversion. The desired analytical parameters can be set deliberately and separately from one another. The homogeneous temperature distribution in the kettle guarantees high conversion rates. Evaporation is carried out effectively via the large surface of the two-level wort spreader. In view of system design, the "Jetstar" can be easily retrofitted without much installation effort and without additional consumption of electric energy. The hygienic design ensures excellent cleaning properties. Thanks to the small thermal load, daily intermediate cleaning is not necessary. Thus, the costs for water and cleaning agents can be minimized.