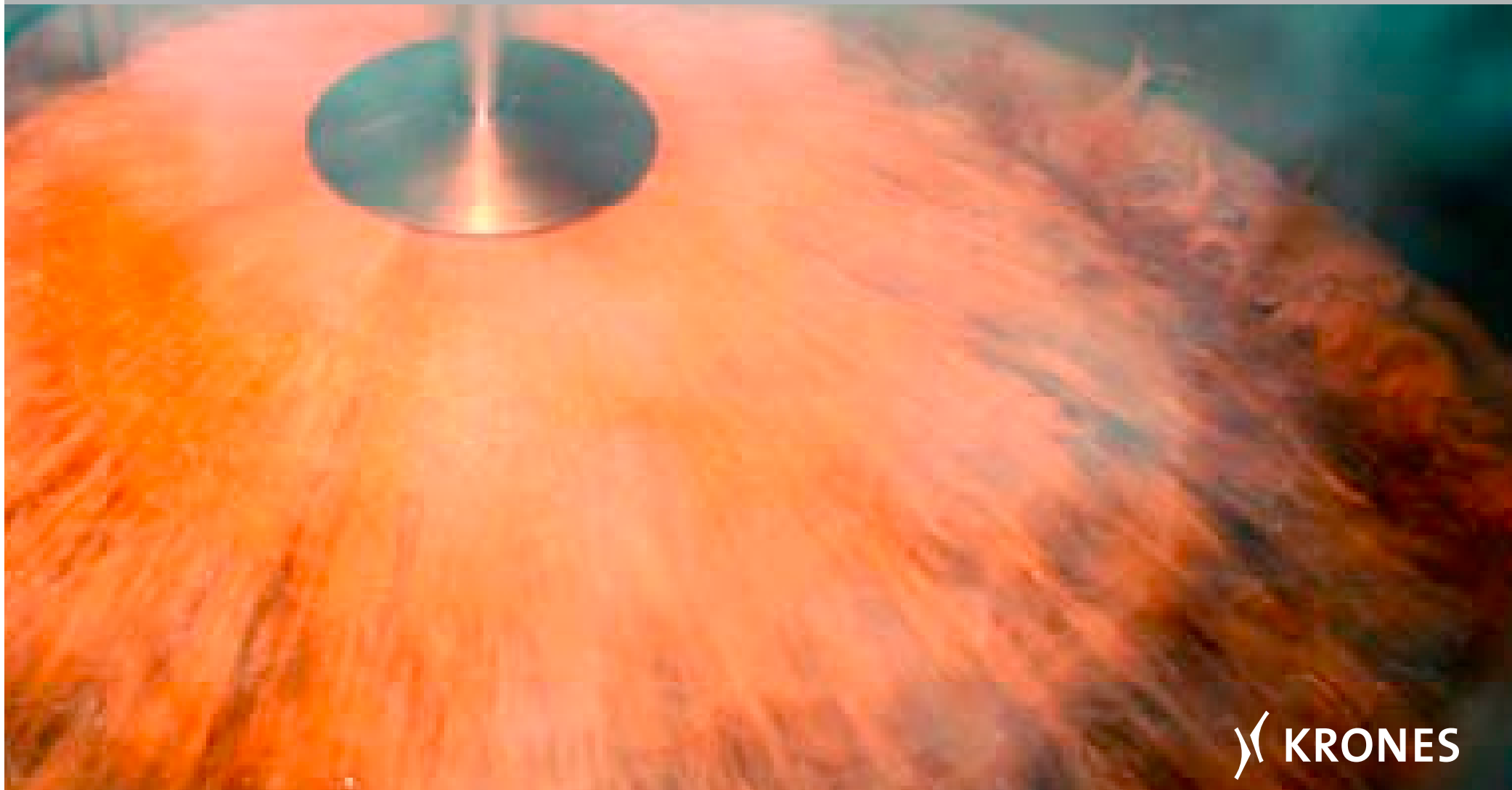


# STEINECKER wort boiling systems

The optimum solution for every requirement



# Perfect wort - gentle on resources included

STEINECKER wort boiling systems

Wort boiling is the fundamental basis for your first-class beers. A stable head on the beer and constancy in the taste are your requirements besides an excellent overall quality. The technical requirements on the processes can be met with precision thanks to the perfect matching of the pre-heating and boiling phases in the STEINECKER wort boiling systems: Low temperatures from the means used for heating prevent any thermal stressing of the wort.

The stripping of unwanted flavourings, the coagulation of albumen as well as non-activation of the enzymes are just a few keywords for the complex reactions of the boiling process. Temperature layers can be prevented by targeted wort swirling and a high wort quality is ensured in this way as well.

**STEINECKER boiling systems provide the perfect technology for every brewery:**

- Internal boiler system Stromboli
- External boiler system Stromboli
- Triton, the combined mash, wort and stripping kettle
- Merlin wort boiling and stripping system



# Wort boiling system for every brewhouse concept

STEINECKER wort boiling systems

## Internal boiler system Stromboli

The internal boiler system consists of a central ascending pipe with associated tube-bundle heat exchanger and wort spreader. A wort cycle supported by the pump through the pipe is set up which is then intensified by the jet pump with venturi effect in the tank. Almost any internal boiler can be converted easily and at low cost to the Stromboli system.

## External boiler system Stromboli

The wort is fed by a frequency-controlled pump over a heat exchanger located outside of the wort kettle. When returning to the kettle, the wort is distributed uniformly over a wort spreader and a large evaporation area is created in this way. The central ascending pipe is integrated together with the jet pump between kettle inlet and wort spreader. This resolves the problem of the dead zones often encountered in the centre of an external kettle and the contents of the kettle are thus guaranteed to be homogeneous. This system is particularly suitable for breweries where the brew sizes can vary.



# Wort boiling system for every brewhouse concept

STEINECKER wort boiling systems

## **Triton, the combined mash, wort and stripping kettle**

A new brewhouse concept is the combined mash, wort and stripping kettle. It is equipped with dimple plates for efficiency in pre-heating both for mashing as well as for wort boiling. Besides an agitator, the kettle also contains the wort spreader already known from the Stromboli systems, and the jet pump as well. This combination of innovative STEINECKER technology makes it possible for both small and medium-sized breweries with a two-vessel brewhouse, to realise the highest mash and wort quality and the energy consumption can be reduced at the same time as well.

Thus, the flexibility is available in the technology, which is particularly beneficial in meeting the highest quality requirements for those breweries where up to three brews, or as many as six brews without the stripping function, are being made each day.

## **Merlin wort boiling and stripping system**

The technology in the Merlin system is based on the principle of thin-film evaporation. The wort is fed over a conical heating area, is thereby heated, boiled and stripped. The wort contents are turned over 5 to 6 times during the boiling process. After resting in the whirlpool, the wort is ideally passed through the Merlin system again and is thereby stripped and then fed to the wort cooler with the defined flavouring parameters now attained.



# Design features

STEINECKER wort boiling systems

- Effective cleaning options for all systems
- Efficient energy recovery for all systems
- Customised brewery installations from standardised components
- Innovative Krones equipment “Made in Germany”
- Options for remote maintenance, thereby focussing on system engineering and the various tasks of specific processes
- Brewery control software, Botec F1, suitable for integration
- Ready for integration in the Krones Lifecycle Service



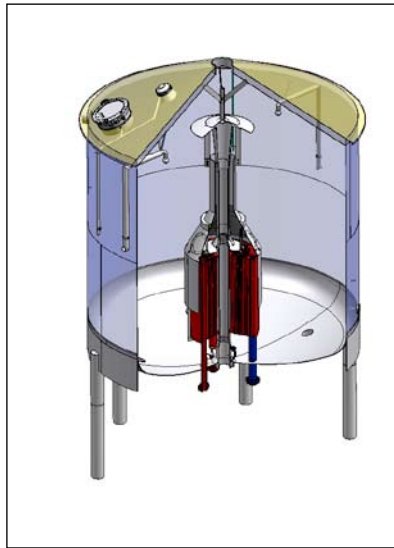
# Internal boiler system Stromboli

## Figures, data, facts

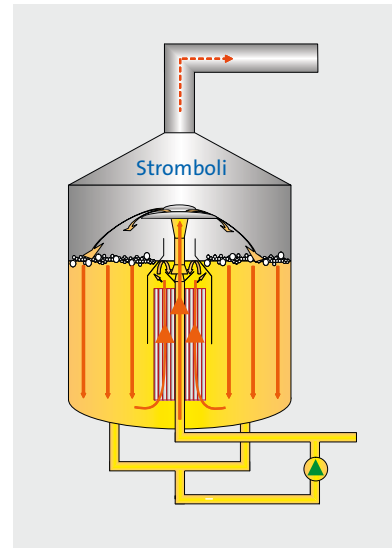
STEINECKER wort boiling systems

### Method of operation for the internal boiler system

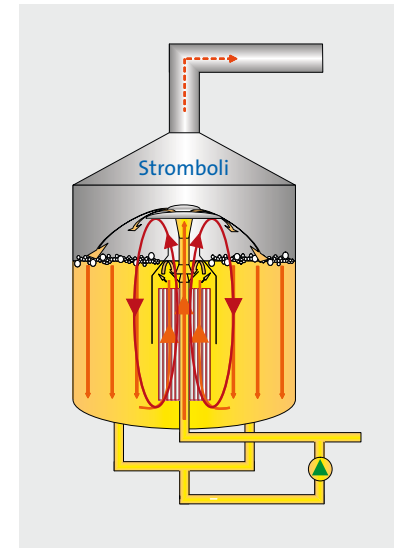
The wort in the wort kettle is uniformly taken off over the lines in the base of the kettle. The frequency-controlled pump feeds the wort through the ascending pipe to the jet pump. The suction effect created in this area causes continuous flowing through the heating pipes of the tube-bundle heat exchanger. Any undesired pulsating, which is one of the main causes of fouling, is thus prevented in every phase.



*Cross-sectional view*



*Pre-heating phase*



*Boiling phase*



*View of the interior*

# External boiler system Stromboli

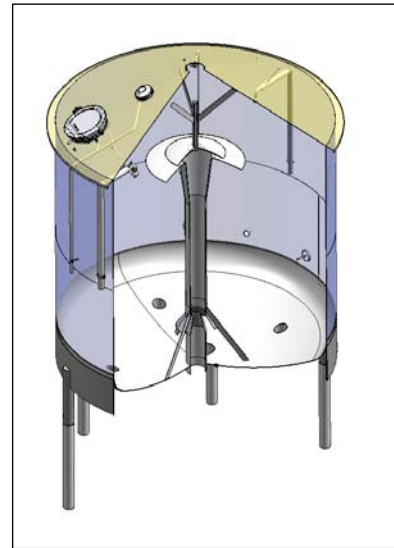
## Figures, data, facts

STEINECKER wort boiling systems

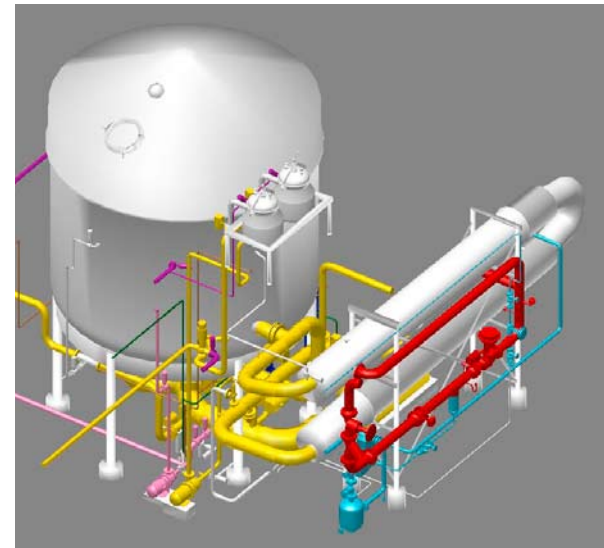
### Method of operation for the external boiler system

The wort cycle between the kettle and the external boiler is supplemented by a jet pump with downstream wort spreader in the wort kettle. Wort-mixing in the kettle is better because of the jet pump, and the wort spreader ensures there is a large area available for the evaporation process. The large heating area of the external boiler means that the difference in temperature between the heat area and the wort is very small, and this in turns means lower temperatures are needed for the heating process.

Besides being able to use the external boiler system for different brew sizes, two wort kettles can be fed from one external boiler.



*Cross-sectional view*



*Example of a pipe system*



*View of the interior*

## Acceptance data for a Stromboli internal boiler system

The average values for acceptance of a Stromboli with three brews give the following picture: The values for the  $\Delta$ TBI of 11.1 units for a boiling time of 65 minutes confirm the gentle nature of the boiling process. Good conventional boiling systems, where only light malt is used and the boiling time is 60 - 70 minutes, lie at around 20 - 21 units when boiling starts, and at a TBI of 30 - 40 in the cast wort. The guiding value in the DIN for this is < 45.

### Kettle full wort (start of boiling)

Parameters	Unit	Average value	Guiding value MEBAK
Original wort	% in wt	12.22	—
Colour	EBC	4.8	—
Coag. N	mg/l	38	—
TBI	—	19.1	—
DMS-free	$\mu$ g/l	134	—

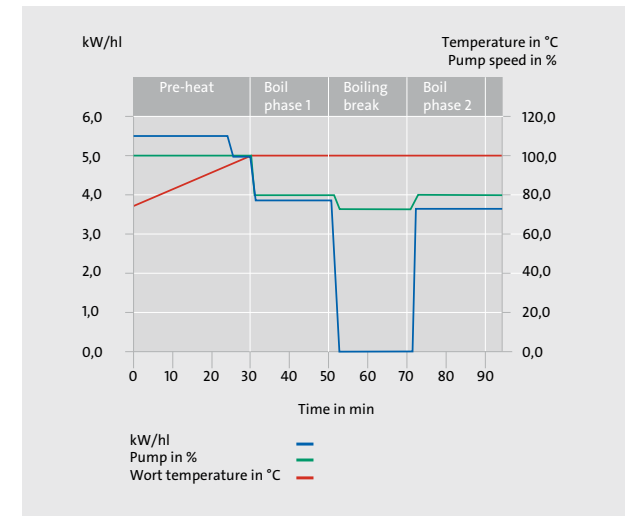
### Cast wort (end of boiling)

Parameters	Unit	Average value	Guiding value MEBAK
Original wort	% in wt	12.68	—
Colour	EBC	5.1	—
Coag. N	mg/l	23	15–25
TBI	—	30.2	< 45
$\Delta$ TBI	—	11.1	—
DMS-free	$\mu$ g/l	13.3	—

### Wort at mid of cooling

Parameters	Unit	Average value	Guiding value MEBAK
Original wort	% in wt	12.56	—
Colour	EBC	7.2	—
TBI	—	36.8	< 60
DMS-free	$\mu$ g/l	65	< 100

Analysis results  
(Average value from three brews)



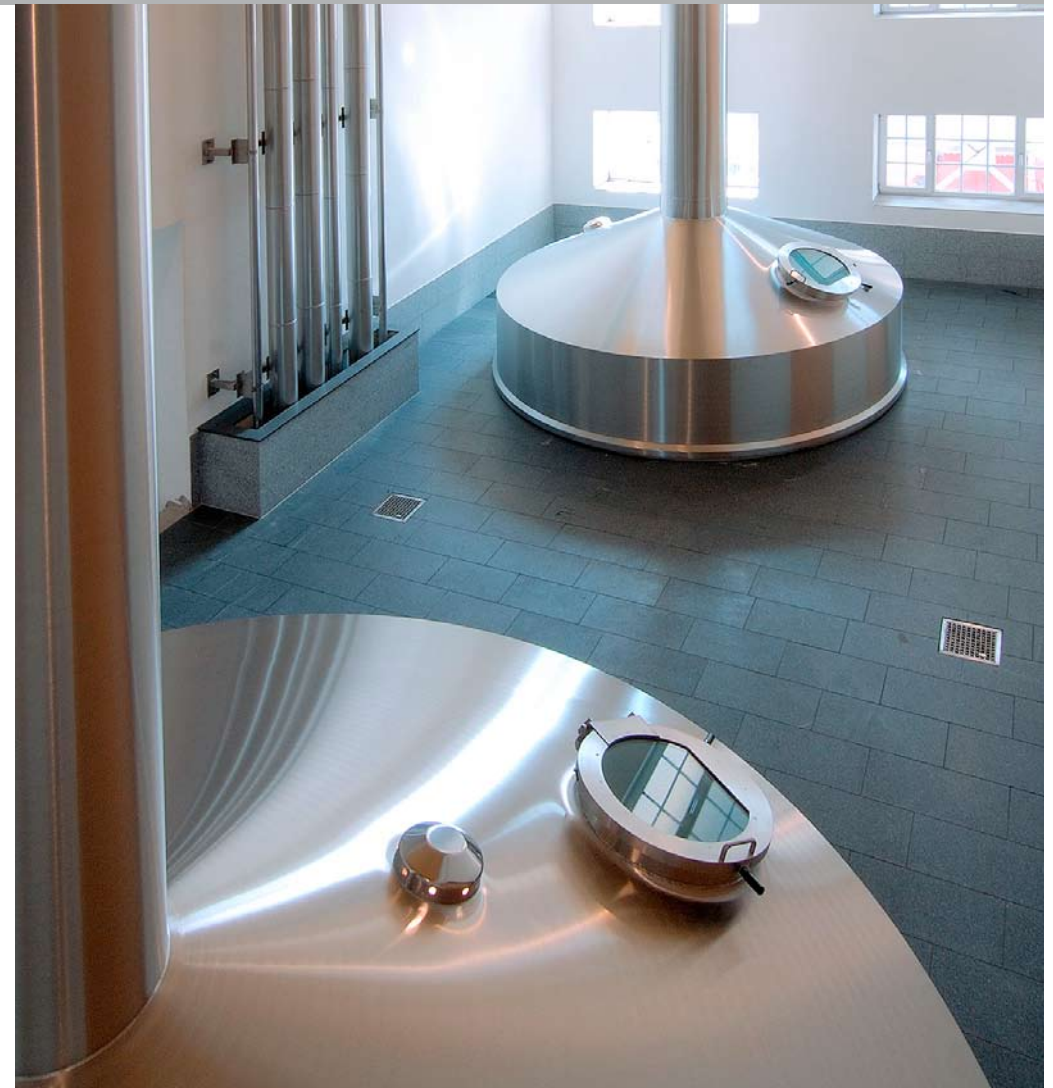
Example of a Stromboli boiling programme

# Stromboli system

## Your benefits

STEINECKER wort boiling systems

- **Gentle pre-heating of the wort**  
Uniformity in pre-heating can be realised by using a frequency controlled wort pump. Any pulsation associated with the internal boiler system is effectively avoided in this way.
- **High wort quality**  
An optimum evaporation area is created thanks to the adjustable width of the slit in the wort spreader. Together with the higher rate for turning over the contents of the kettle by using the circulation pump and the jet pump, a lower overall evaporation is realised here.
- **Longer running times between the cleaning intervals**  
The circulation system prevents any overheating and pulsating of the wort in the internal boiler system, and this reduces fouling.
- **Less energy needed**  
The reduction of 3 – 4 % in evaporation means that less primary energy is consumed. Furthermore, the burden from spent gases, the amounts of fresh and waste water as well as the cleaning agents required are all reduced.
- **Exactly set heat supply**  
Specific control of the heat supplied and the thereby resulting different boiling phases make it possible to control the various flavouring parameters. This is realised with the internal boiler system by integrated energy measurements. With the external boiler system, this can be achieved by regulating the difference between the boiler incoming and outgoing temperatures as well as by making energy measurements.
- **Retrofitting**  
Almost every internal or external boiler can be retrofitted to work according to the Stromboli principle.



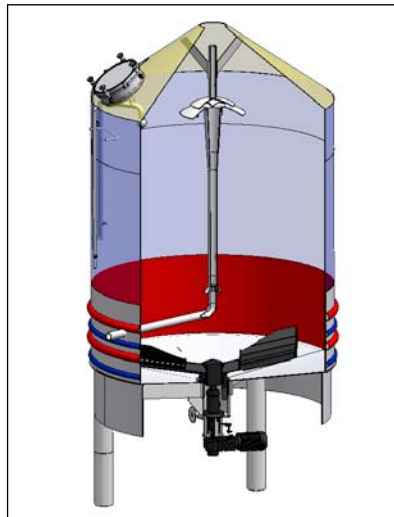
# Triton, the combined mash, wort and stripping kettle

## Figures, data, facts

STEINECKER wort boiling systems

### Method of operation

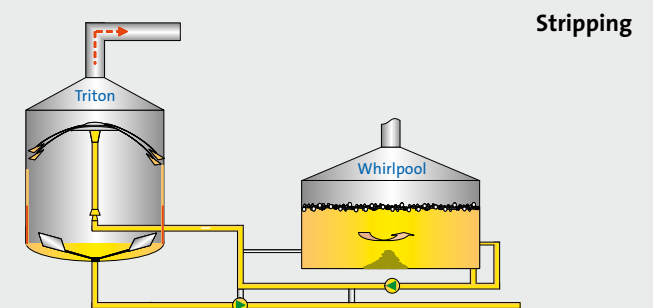
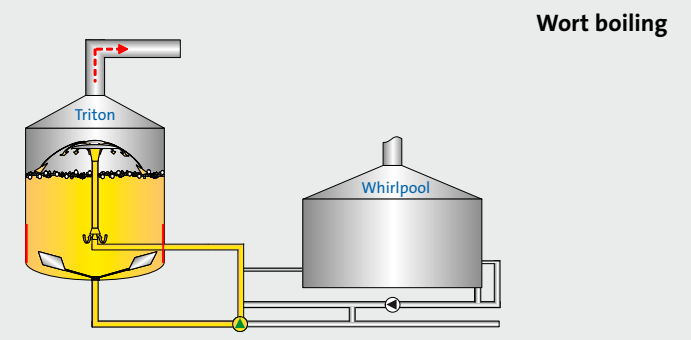
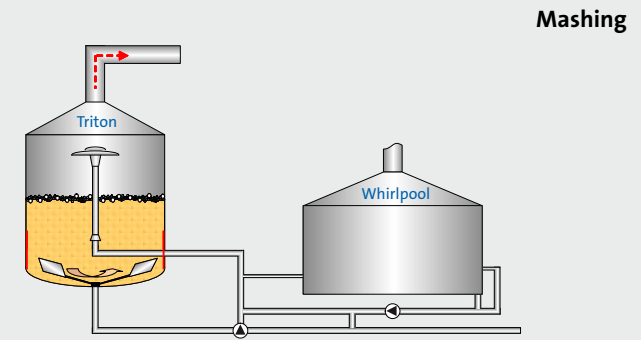
The vessel is fitted with dimple plates, the proven heating areas from the STEINECKER mashing system, ShakesBeer. The mash and the wort are pre-heated and boiled from this heating area. During wort boiling, the wort is being distributed by the pump over the wort spreader whereby the jet pump is supporting homogeneous and thorough mixing for the contents of the kettle and like in the internal boiler system Stromboli, this is realised irrespective of the thermal boost. The wort clarified beforehand from the hot turbid mix is returned by the wort spreader as a thin film over the heating areas in the optimised stripping process and then taken directly from the vessel for wort cooling. In this way the flavouring parameters can be adjusted in a defined manner directly before the cooling process like with the Merlin system.



Cross-sectional view



View of the interior



# Triton system

## Your benefits

STEINECKER wort boiling systems

### ■ Compact system

The combined tank means that the three process parts of mashing, wort boiling and stripping can all be carried out in one vessel.

### ■ Economical brewing process

A two-vessel brewhouse with Triton is the basis for economical production with the highest quality and this right down to the smallest outputs.

### ■ Outstanding wort quality

High pre-heating rates and uniformity in the heat transfer ensure gentle wort handling. Furthermore, homogenous kettle contents are assured. The boiling and stripping processes are controlled exactly, whereby the evaporation of light, volatile and other undesired flavourings is possible by feeding in steam (as in the Merlin method) or without the need for steam (as in the Calypso method).

### ■ Gentle on resources

Less overall evaporation of just 3 – 4% can be realised when a wort spreader is used because a larger area is created. This can be reduced even more by a further 2% by adding a subsequent stripping step. Savings in the total primary energy needed are thus possible in this way.



# Merlin wort boiling and stripping system

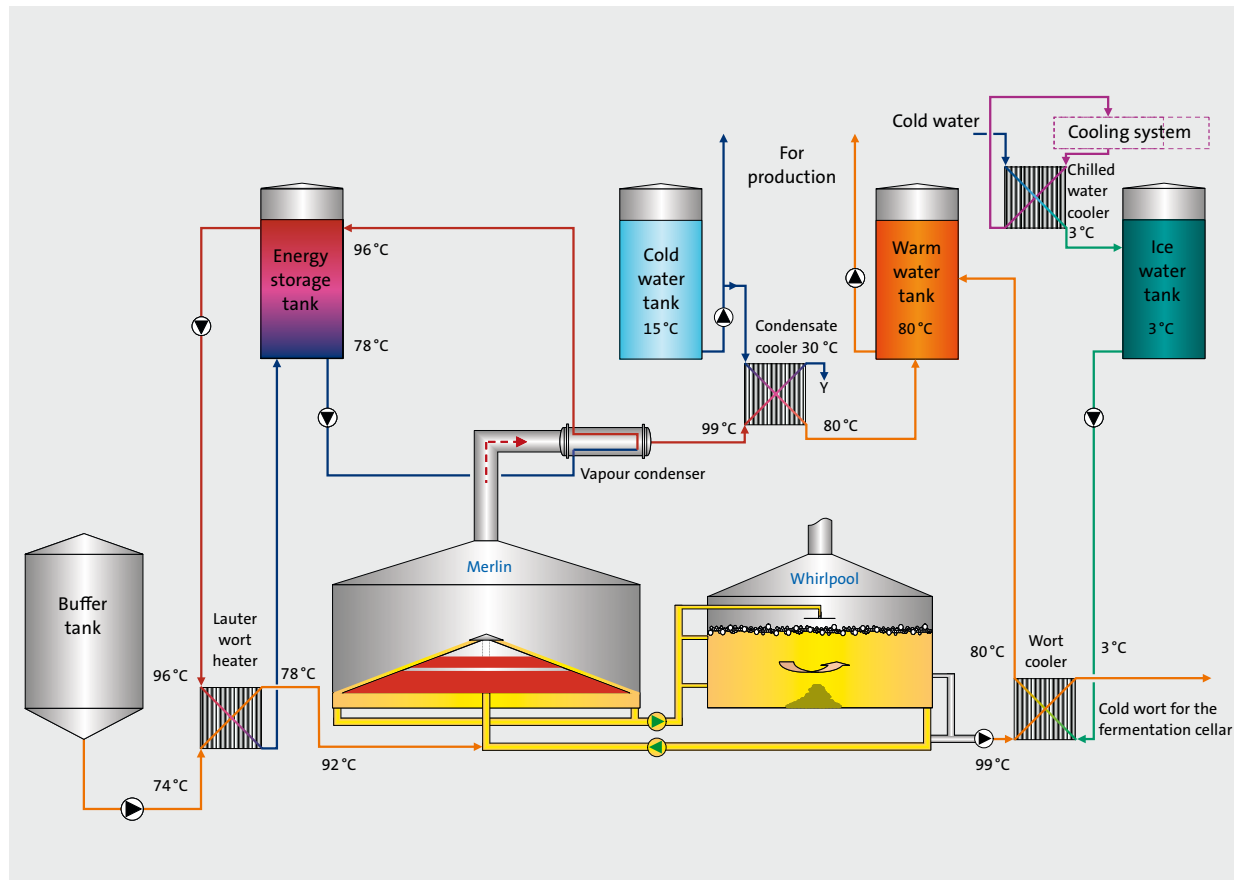
## Figures, data, facts

### Design

A concept completely different from the conventional boiling technique is Merlin. The wort is fed here over a heated cone. The whirlpool serves as a buffer tank. This system therefore offers high flexibility both for the size of the brew and the subsequent stripping process.

### Method of operation

The wort is fed by a frequency-controlled pump to the heating surface of the Merlin system. From here it flows downwards for wort boiling over the conical heating jacket as a thin wort film. The wort is taken again from the whirlpool for stripping and is passed over the powered heating area. In 1999, Merlin was able to demonstrate as the first conventional boiling system that evaporation of the then customary 8% can be reduced to 4%, and that the quality of the wort was improved as well. This development constitutes the basis for making energy savings of up to 50% which have since been possible in the boiling process.



Merlin next to Whirlpool with energy recovery system



Example of the pipe system with Merlin above Whirlpool

# Merlin system

## Your benefits

STEINECKER wort boiling systems

- **Large area for the wort**  
Merlin provides a large area for the thin wort film making the evaporation of undesirable flavouring components very effective.
- **Homogeneous temperature profile**  
Lower vaporising temperatures of between 120 °C and 130 °C are needed to heat the film of wort. The homogeneous temperature profile of the wort is realised by the defined flow and heating of the wort film.
- **Outstanding wort quality**  
Setting the albumen values to an optimum together with minimising the thermal load ensure the quality of the beer and its froth are better.
- **Energy-saving processes**  
The integration of Merlin as the stripping system after the whirlpool stage means that less energy is needed for wort boiling and for retaining the specific wort quality during the stripping process.
- **Designing the individual beer character**  
The system makes it possible to establish a specific beer character in that the different flavouring parameters can be adjusted individually, and each of these independently of the others.
- **High flexibility**  
Different cast wort quantities can be realised by integrating the whirlpool in the boiling process as a buffer tank.



*Merlin wort boiling and stripping system*

## Saving valuable energy throughout the process

Energy recovery is a further module of the STEINECKER wort boiling systems and in these times of increasing energy prices and climate change, this is being focussed on more and more.

Gentle pre-heating phases and a reduction of the overall evaporation contribute to the economic efficiency and to saving resources. The evaporation from the first to the last brew of the production week can be determined exactly by the integrated energy measurements made. It is now meaningful to employ energy storage systems for an overall evaporation of 3 – 4%.

The following systems are recommended as ideal supplements to the STEINECKER wort boiling systems:

### Vapour condenser

The energy from the vapour from wort boiling recovered by the Pfaduko system makes it possible in an additional lautering wort heater, to increase the temperature of the wort in a gentle yet swift manner and almost to the level required for boiling. Thus boiling in the wort kettle is reached quickly and this makes a fur-

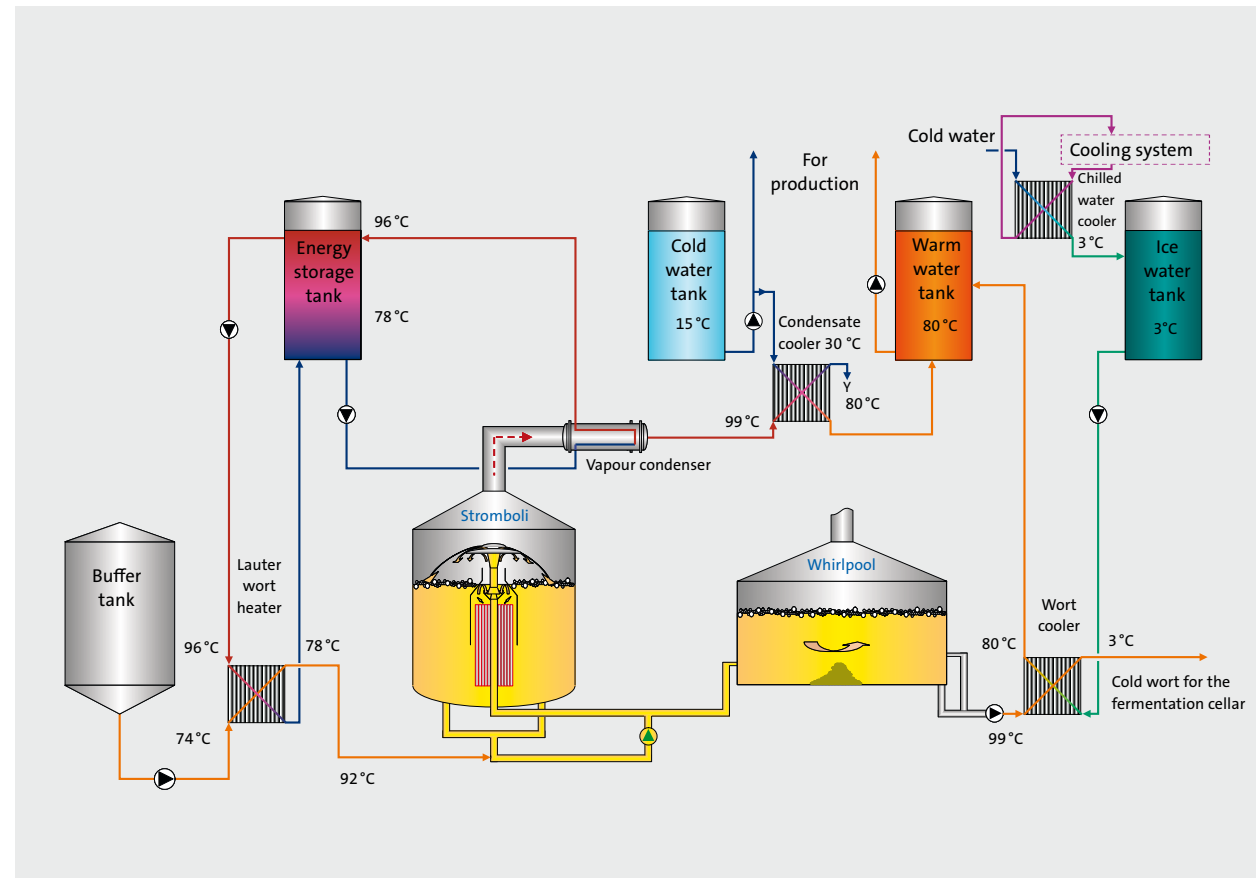
ther contribution to saving resources in the brewing process. The values given above for the overall evaporation mean that a balanced energy and hot-water budget in the brew-house can be realised.

### Thermal vapour compression

Here the vapours are sucked in by a vapour jet compressor, compressed and fed to the boiling system. Live steam at a pressure of more than 8 bar is used here as the propellant.

### Mechanical vapour compression

The vapour can also be compressed by mechanical means using a Roots blower. Prerequisite is that the costs for the electricity needed here are low.



*Stromboli internal boiler system as an example of an energy recovery system*

# Selection criteria for STEINECKER wort boiling systems

STEINECKER wort boiling systems

Selection criterion / Boiling system	Heating medium saturated steam	Heating medium high-pressure hot water	Thermal vapour compressor	Mechanical vapour compressor	High brew sequence	Low brew sequence	Variable amounts of cast wort	Pressure boiling	Explanation of symbols
Internal boiler system <b>Stromboli</b>	++	+	=	=	++	+	=	++	++ strongly recommended
External boiler system <b>Stromboli</b>	++	++	++	++	++	+	++	++	+ recommended
<b>Triton</b> , the combined mash, wort and stripping kettle	++	+	X	X	X	++	++	+	= realisation possible
<b>Merlin</b> boiling system	++	=	=	=	+	+	++	X	X not foreseen
Comments	Saturated steam: 3.0 bar, 144 °C	Admission temperature at the heat exchanger can be regulated 130 - 145 °C	Use when thermal energy costs low and electricity costs high	Economically meaningful as of 1,200 brews a year, high costs for procurement, maintenance and electricity	> 10 brews in 24 hours; usually in combination with a lauter wort heater	> 6 brews in 24 hours; recommended when using a combined mash and wort kettle or a Whirlpool kettle	Fluctuations in the amount of cast wort depending on the type (less than 70% of nominal)	Recommended when atmospheric boiling temperature < 95 °C	GV total evaporation
Selection criterion / Boiling system	Limited space available	Retrofitting in the present system	Long boiler running times	Active control of the wort parameters (e.g. DMS, TBI, coag. N)	Wort stripping	Post-evaporation in the Whirlpool (Calypso system)	Wort pre-cooling	Energy recovery	Hot-water supply from vapour compression
Internal boiler system <b>Stromboli</b>	++	++	+	++	X	++	++	++	++
External boiler system <b>Stromboli</b>	+	++	++	++	X	++	++	++	++
<b>Triton</b> , the combined mash, wort and stripping kettle	++	X	X	++	+	=	+	+	++
<b>Merlin</b> boiling system	=	X	+	++	++	X	X	++	++
Comments	In the present building if the space available is very limited	Enhanced wort quality, reduction of the energy costs, minimum cleaning effort, short period of amortisation	Depending on the AW concentration and the lauter wort boiling, internal boiler & Merlin 20 - 40 brews, external boiler > 40 brews	Control of the border surface temperatures and optimum evaporation, irrespective of the natural circulation	Recommended when DMS-P in the malt > 5 mg/kg	Reduction of the free DMS, without additional thermal energy, without a vacuum	Design: Wort enters the Whirlpool at 90 °C	Goal: Complete energy recovery from wort boiling; < 4 % tot evap.: Energy used again for lauter wort boiling, > 4 % tot evap.: for hot water supply, → possible energy surplus	The hot-water supplied from the brewery shall be in agreement with the total water needed