Spinning cone column boosts beer quality

Efficient, hygienic production of non-alcoholic and low-alcoholic beer

SCC 10.000-B single column model

Application

The spinning cone column (SCC) is an efficient and extremely versatile steam stripping column. One of its many commercial applications is the removal of alcohol from full-strength beer in order to produce non-alcoholic (NAB) and low-alcoholic beer (LAB).

The SCC provides breweries with a multi-purpose installation capable of producing both NAB and LAB even from unfiltered beer, without compromising CIP procedures.

Compared with other products sometimes used to remove alcohol from beer, the SCC provides breweries with numerous important benefits, such as

- beer quality remains intact due to reduced thermal impact on the product
- opportunities for aroma recovery
- reduction of alcohol levels to as low as 0.05% alcohol by volume (abv) in one single pass without damaging the product
- significantly lower energy consumption due to high mass transfer efficiency
- no need to de-gas the feed beer prior to removing the alcohol
- space-saving design due to the compactness of the skid-mounted installation.

Design

The SCC is designed as an easy-to-install module and is built to comply with relevant engineering and regulatory standards, including hazardous area requirements (complies with ATEX class II 3G).

The column features a self-regulating function for operating pressure and strip rate.

The hygienic design includes the use of stainless steel for all surfaces that the beer comes into contact with, while the elastomers in contact with the product are of food-grade quality. A sanitary steam generator provides the steam needed for the process.

The installation can be cleaned effectively using CIP procedures, with spray devices for the column. A special CIP tank for this purpose is installed on the skid.

Aroma recovery

The SCC has an option for aroma recovery, where the flavours are stripped first and then collected in an alcoholic condensate that can be re-dosed into the final beer. This can be achieved with a two-column set-up.

Operating principles

The SCC consists of a vertical column that features rotating and stationary metal cones placed alternately (Figure 1), with counter-current flows of gas and liquid to bring the two phases into contact. The system works under vacuum at temperatures of 40–45°C (104–113°F).

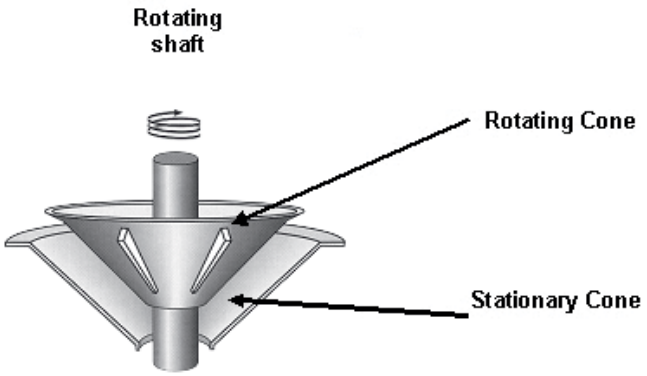


Figure 1. Arrangement of stationary and rotating cones

A thin, turbulent film of liquid flows down the column over the upper surface of each cone. The flow is induced by the alternate effects of centrifugal and gravitational forces.

Gas (vapour) flows up the column in the spaces between the cones (Figure 2). Radial fins on the lower surfaces of the rotating cone ensure maximum turbulence in this phase.

This improves efficiency and has a pumping effect on the vapour phase, which results in a reduced pressure drop across the column. This is important when removing alcohol from beer because it results in consistently lower temperatures in the system, and consequently reduces any thermal impact, which affects the quality of the product – in this case beer.

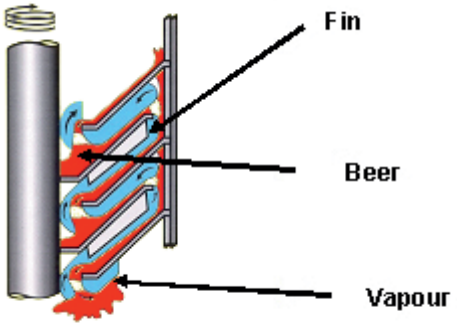


Figure 2. Product and vapour flow in the SCC

Characteristics of the liquid flow

- Thin, turbulent films
- Extended flow path
- Low liquid hold-up volume
- Evenly distributed, rapid passage

Characteristics of the vapour flow

- Highly turbulent (due to the action of the fins)
- Low pressure drop, resulting in operation at lower temperature

In general, this means highly efficient mass transfer, while the beer is only subjected to very limited thermal impact. This ensures effective removal of the alcohol content using only a minimum of energy.

Technical specifications

Energy consumption depends on the particular specifications of the dealcoholization process. The following figures apply to the SCC 10.000-B (single column) model, which has the following specifications

Feed beer:	5.5% abv
Exit beer:	0.05% abv
Capacity:	~ 20 hl/h (17 bbl/h)
Steam	360 kg/h (794 lbs/h)
Chill water product cooling	12 kW (41,000 BTU/h)
Chill water condensing	232 kW (792,300 BTU/h)
Electricity installed/operating	28/18 kW (37.5/24 HP)
Instrument air	1 m^3/h (2,120 cfm)

Models

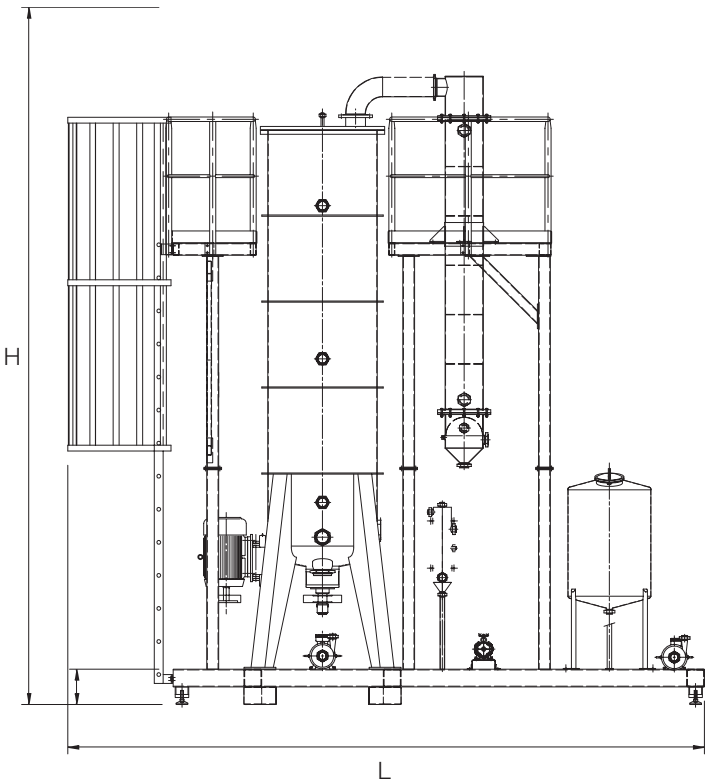
Nominal capacities for alcohol reduction of beer	
SCC 1.000 B	1–2.5 hl/h (1–2 bbl/h)
SCC 10.000 B	15–25 hl/h (13–21 bbl/h)
SCC 10.000 2B	30–50 hl/h (26–43 bbl/h)
SCC 10.000 3B	45–75 hl/h (38–64 bbl/h)

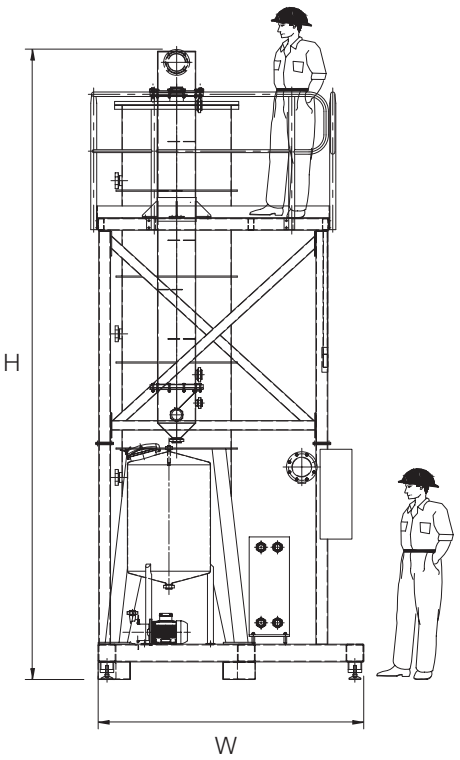
The flow rate depends on the percentage of alcohol by volume in the feed beer and the final beer, respectively, as well as the operating temperature. Throughput can be increased by using a higher operating temperature and/or by adjusting the level of alcohol reduction.

Column speed (rpm)	350
Operating temperature	40–45°C (104–113°F)

Approximate dimensions (WxLxH) in metres. These dimensions do not include the control cabinet, the measurements of which can vary on the basis of the final specifications.

	Width (W)		Length (L)		Height (H)	
Model	mm	inch.	mm	inch.	mm	inch.
SCC 1.000-B	2,050	81	2,250	89	3,850	152
SCC 10.000-B	2,250	89	5,120	202	5,900	232
SCC 10.000-2B	2,250	89	6,620	261	5,900	232
SCC 10.000-3B	2,250	89	8,400	331	5,900	232





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