

# Beer - NAB & LAB Production

Spinning Cone Column Application Bulletin 4-01-1402



The Spinning Cone Column (SCC) is an efficient and versatile steam stripping column. One of the many commercial applications for this unique technology is alcohol removal from full strength beer for the production of Non Alcoholic Beer (NAB) and Low Alcohol Beer (LAB).

Traditional techniques for producing NAB or LAB have a number of undesirable aspects, including:

- Production of an inferior quality product due to high thermal impact.
- High utility consumption requirements or large effluent streams.
- Can, in some cases, unnecessarily complicate the production process by requiring degassing and possibly an additional filtration stage.

In contrast, the key benefits of the Spinning Cone Column technology for producing NAB are:

- **Reduction of alcohol content** in full strength beers to 0.05% abv continuously in a single pass and with no product damage.
- **Significantly lower utility consumption** when compared to alternative de-alcoholisation systems.
- **No external reflux** thus limiting residence time and avoiding unnecessary exposure of the product to elevated temperatures.
- **No concentration of the beer stream** during dealcoholisation (hence no make-up water required and a better quality).
- **Ability to process unfiltered beer** thus increasing productivity by removal of a filtration step.
- **No need to de-gas the feed beer** prior to de-alcoholisation.
- **Option to recover beer aroma** from alcoholic condensate using unique process.
- **Multipurpose plant** that can produce both NAB and LAB products.
- **Stripping steam is produced** by means of a pure steam generator.
- **High strength and high quality spirit** is produced during alcohol removal.
- **Hygienic design** with full Clean-In-Place (CIP) capabilities.
- **No effluent problems.**

The SCC is now installed in several breweries for the production of premium quality NAB and LAB products.



Flavourtech Spinning Cone Column model SCC 10,000-B

## The Spinning Cone Column

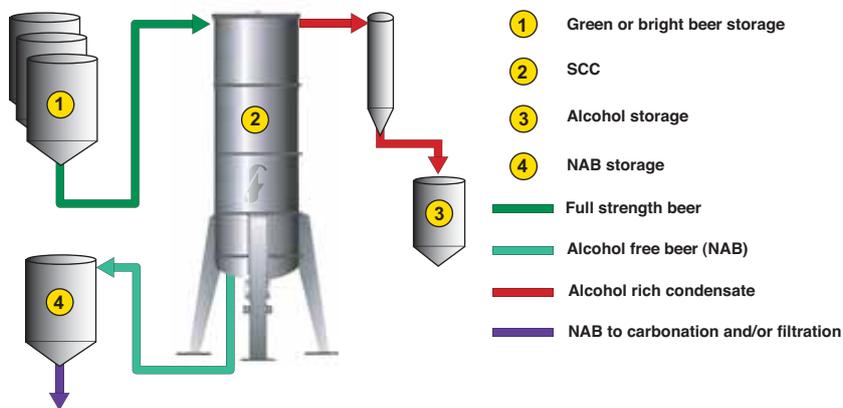
The SCC is a uniquely efficient counter-current liquid-gas contacting device, a distillation or stripping column that belongs to the same family of mass transfer devices as packed, plate and bubble-cap columns. The SCC is unique in its use of gentle mechanical forces to enhance inter-phase contact. This allows the rapid, efficient and cost-effective separation of volatile compounds such as aroma and alcohol from a thin-film liquid system. The SCC can process thick viscous slurries containing high levels of suspended solids, just as readily as it can process clear liquids, without damaging the recovered flavour or the treated product.

Further details regarding the operating principle of the SCC may be found at [www.flavourtech.com](http://www.flavourtech.com)

## No damage to the product

The beers made by the SCC are generally considered superior to NAB and LAB products made by other techniques. A major reason for this is that the thermal impact experienced by the beer whilst in the SCC is minimal. Several factors contribute to minimising the thermal impact:

- **Short residence time.** The time for the product to travel through the column is around 12 - 15 seconds.
- **Low operating temperature.** Typically in the range 40°C to 45°C. Moreover, there is very low pressure drop across the column meaning low temperatures are maintained throughout. These low operating temperatures reduce thermal damage to the beer.
- **No external reflux** thus avoiding product recycling and extended



Basic process schematic for NAB production

residence time. In addition, the absence of external reflux and the high mass transfer efficiency of the SCC means that equilibrium is reached virtually instantaneously.

### Low Energy Costs

Due to the unique system design, the SCC system has very low energy usage. Aspects contributing to the low energy requirements include:

- High mass transfer efficiency (low steam consumption).
- No reflux (reduces steam and coolant consumption).
- No product recycle (reduces steam and coolant consumption).
- Use of heat recovery where possible (reduces steam consumption).
- Simpler system (lower electricity usage).

### Simultaneous de-gassing and alcohol removal

The SCC is capable of simultaneous de-gassing and alcohol removal. The feed beer to the SCC may have up to 5 g/L CO<sub>2</sub>. This facet of the SCC system design avoids the need to de-gas the beer prior to de-alcoholisation and subsequently simplifies the process.

### Processing unfiltered beer

A major advantage of the SCC, when compared to alternative devices used for alcohol reduction, is its ability to process unfiltered beer. Specifically, the SCC can readily process “young” or “unfiltered” beer, as well as beer directly from the maturation tanks, thus avoiding an additional filtration stage.

Due to the unique design of the SCC, the residues and suspended particles present in unfiltered beer pass through the device without blocking and causing CIP problems. Alternate distillation devices (such as packed or plate columns) require

the feed beer to be filtered as they cannot process beer containing solids. The reason is that in these devices, suspended solids tend to build up on product contact surfaces and gradually reduce the performance of the system, ultimately leading to major cleanability issues.

### Generation of stripping steam

The Flavourtech SCC system uses a flow of high quality stripping steam to remove the alcohol. If food grade steam is unavailable on site, a Steam Generator can be included in the system supply. This consists of a heat exchanger, controlled by the SCC automation system, to convert a supply of treated water (typically de-ionised water with <3ppm TDS) into stripping steam using normal factory steam as the heating medium.

### Wine industry experience

The SCC has been widely used by winemakers in America, Europe, Australia and Chile for the production of alcohol adjusted wines. In most cases, this means reducing the alcohol levels of a wine from above 15% abv to an optimum level within the range of 12 – 14% abv. As one example of technologies success, some 600 of California's 800 wineries use the Spinning Cone Column for alcohol adjustment.

### Worldwide marketing by Alfa Laval

In 2004, Flavourtech appointed Alfa Laval as a global distributor for its Spinning Cone Column technology for the dealcoholisation of beer. This appointment was made on the basis of Alfa Laval's specialist brewery industry knowledge and its commitment to delivery of efficient process solutions based on high-quality products and



comprehensive process know-how.

Since the appointment, several SCC systems have been installed for NAB/LAB products.

### Low alcohol beer production

For production of Low Alcohol Beer, a two stage process is used whereby the volatile beer flavour is first removed from the beer using the SCC. This flavour is stored separately while the de-flavoured beer is passed again through the SCC to remove the alcohol. The de-alcoholised beer is then blended with the flavour and full strength beer (if required) to produce the finished product at the required desired alcohol level.

### Non alcoholic beer production

For production of Non Alcoholic Beer (<0.05% abv) it is not possible to add back the concentrated alcoholic aroma condensate generated in the two stage approach used above due to the requirement to produce a final product at <0.05% abv. Flavourtech has therefore developed a 'technology module' that can be added to the SCC allowing some of the beer aroma compounds to be completely separated from the alcoholic condensate generated during the dealcoholisation process. As a result more flavoursome Non Alcoholic Beer can be produced than previously possible.

### Models

Two Spinning Cone Column models are available; SCC1,000-B and SCC10,000-B. Nominal capacities for alcohol reduction of beer are given in the table below. Maximum throughput can be increased using a higher operating temperature and/or reduced level of alcohol reduction.

If the processing capacity is greater than that achievable on the largest single column plant (SCC10,000-B), then a system is constructed with parallel columns. Such multiple column systems (SCC10,000-2B and SCC10,000-3B) share feed, discharge, condensing and control systems.

Model	Capacity* hl/hr
SCC1,000-B	1-2.5
SCC10,000-B	15-25
SCC10,000-2B	30-50
SCC10,000-3B	45-75
* Flowrate depends on % abv of feed beer, % abv of final beer and the operating temperature.	



Contact details are continually updated on our website. Please visit: [www.flavourtech.com](http://www.flavourtech.com)

Flavourtech is an Australian based company specialising in innovative process technology, particularly thin film distillation and concentration systems. Technologies include:

- Centritherm® evaporator
- Spinning Cone Column
- Integrated Extraction System
- Rotating Disc Column

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