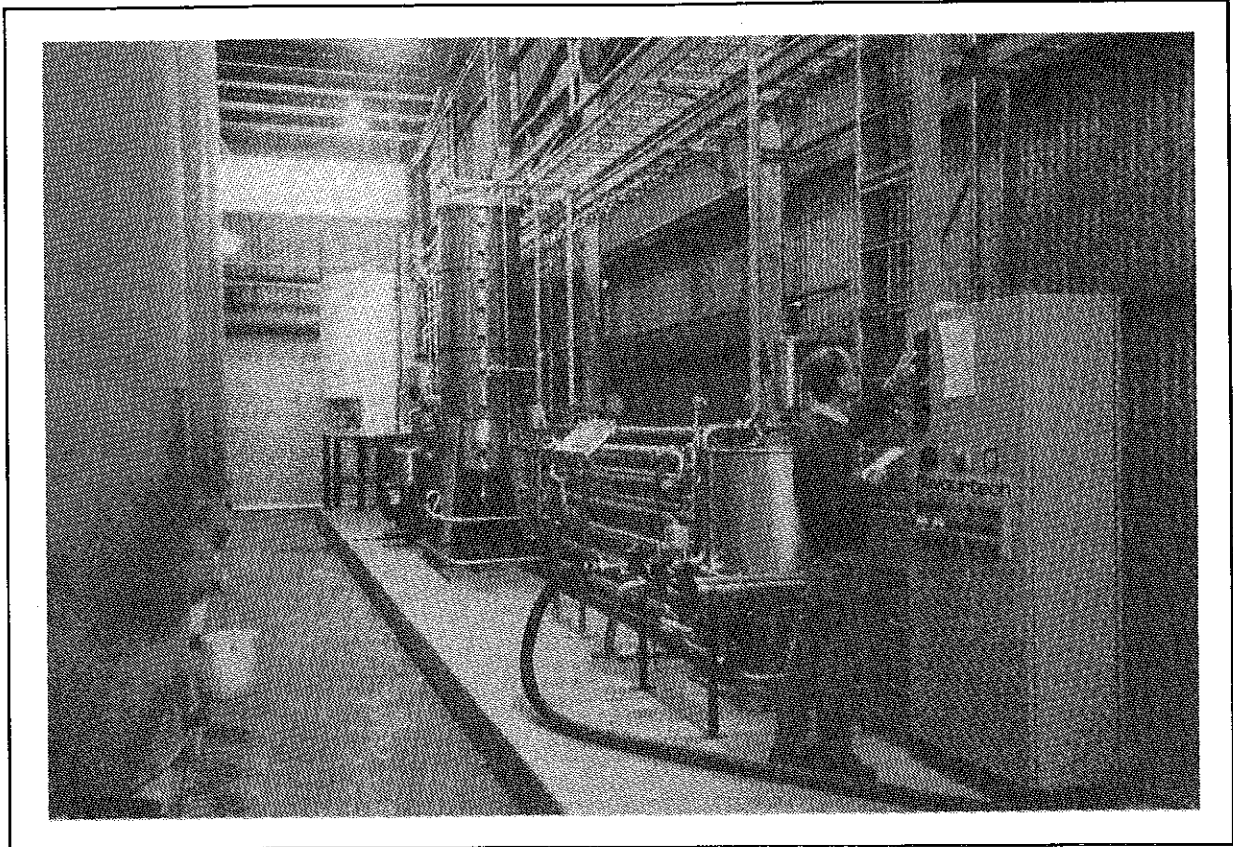




flavourtech
PTY LTD.



Spinning Cone Column

Flavourtech is a high tech Australian company supplying equipment and process technology to the Food and Beverage processing industry. Strong links with the CSIRO Division of Food Processing has led to Flavourtech commercialising the Spinning Cone Column (SCC) and associated technology first conceived at the Sydney laboratories of the CSIRO.

The SCC is a unique and extremely efficient gas-liquid contacting device. This patented unit and its associated technology offers significant improvement over traditional methods of volatile recovery/removal from liquid process streams.

BENEFITS

The benefits of the Spinning Cone Column and its associated technology to the user are

- *production of high quality flavours with very little thermal damage*
- *production of concentrated flavours/volatiles without any need for further rectification*
- *compact unit means less floor space and lower head room required*
- *substantial energy savings*
- *minimal product losses compared with conventional aroma recovery systems*
- *minimal thermal damage to the stripped product*

The Spinning Cone Column (SCC) is a multi-stage mass transfer device consisting of a series of alternating stationary and rotary truncated cones as shown in Figs. 1 & 2. During operation product is fed at the top of the column and then flows down the upper surface of the stationary cones under the influence of gravity and moves across the upper surface of the rotating cones in a thin film due to the applied centrifugal force. The stripping gas enters the bottom of the column and flows counter current to the liquid phase in the spaces between the fixed and rotating cones.

DESIGN FEATURES

Spinning truncated cones

- Highly turbulent thin liquid film giving high mass transfer rate in liquid phase and a low liquid hold up
- Each cone redistributes the flow so no channelling occurs and liquid closely approximates plug flow.
- Long liquid and gas path lengths due to spiral path induced by the rotation, giving high column efficiency
- The gravitational and centrifugal film flows allow the column to pass high viscosity liquid or slurries containing high percentages of suspended solids.

Fins

Specially designed fins on the underside of rotating cones give

- highly turbulent gas phase, giving high mass transfer rates in this phase
- each cone set (i.e. fixed and stationary cones) acts as a radial flow gas pump. The gas is actually pumped up the column with the rate of rotation of the discs determining the pumping action and hence the pressure drop. This means the pressure drop is very low and in fact can be negative, enabling the column to be operated under high vacuum and at low temperature
- gas flow behaves as if in a cyclone, hence liquid droplets are constantly centrifuged back into the liquid, giving low entrainment of liquid in the gas.

Multi-Stage Design

The multistage design allows

- greater concentration of volatiles
- more efficient use of stripping medium
- higher flow rates for a specific duty
- much lower strip rates to remove required amount of volatiles

Heat Reinjection

Part of the stripped product is heated and then returned to the bottom of the column. This is used to overcome the evaporative or radiation losses instead of overheating the feed.

Inert Gas Stripping

In some applications inert gas can be used as a stripping medium instead of steam which means

- low molecular weight gases can be used which improves separation efficiency
- gas can be recycled hence cost is independent of the flow rate
- lower load on the vacuum system
- no cooling of product during stripping
- evaporation without boiling is possible

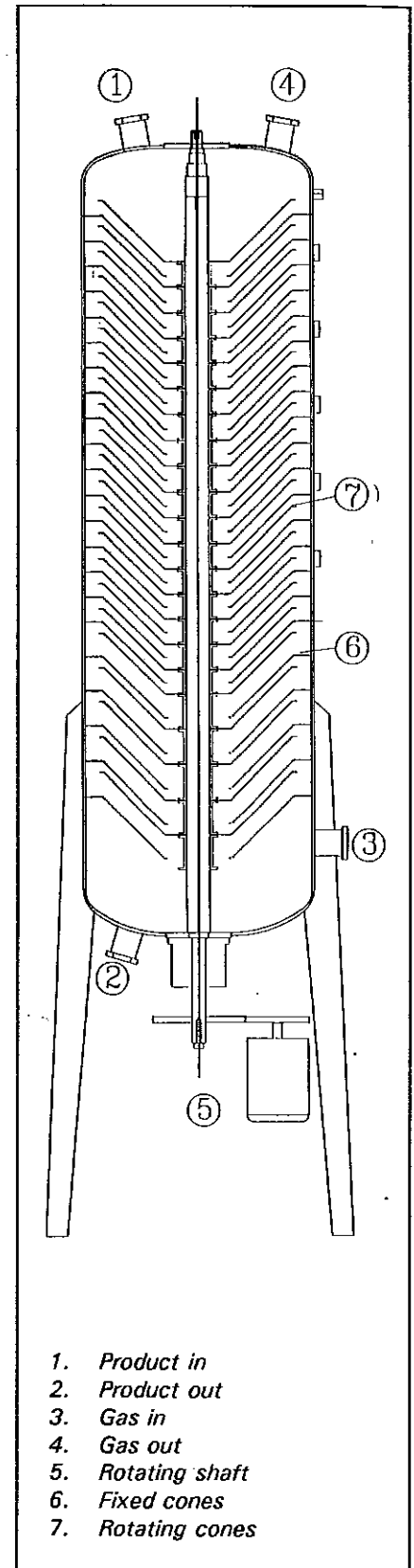


Fig 1 Mechanical Layout of Spinning Cone Column

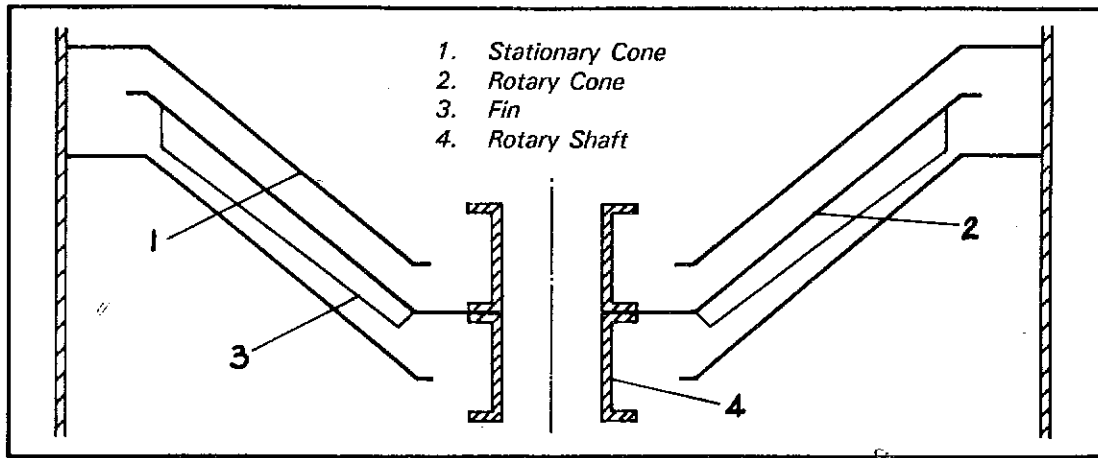


Fig 2 Cross Section of Cone Set

APPLICATIONS

Flavourtech currently offers process technology in the following areas.

Wine Processing

- Recovery of grape juice flavours
- Recovery of wine flavours
- Alcohol removal from wine
 - Low alcohol wine base
 - High quality spirit production
- Removal of high levels of sulphur dioxide
- Recovery of marc volatiles
- Removal of unwanted flavours/volatiles

Citrus Processing

- Recovery of oil soluble flavours from juice and peel
- Recovery of water soluble flavours
- Folding of citrus oil
- Deoiling of citrus juice
- Deaeration of citrus juice
- Removal of sulphur based flavours
- Recovery of oil from peel

Fruit and Vegetable Juice Processing

- Grape juice
- Pomme Fruits - apple, pear
- Citrus juices - orange, grapefruit, mandarin, lemon
- Tropical juices - mango, pineapple, passionfruit
- Tomato juice
- Berry fruits - strawberry
- Onion, garlic, celery, carrot

Beer & Cider Processing

- Recovery of malt/wort/apple juice flavours
- Recovery of beer/cider flavours
- Alcohol removal for low alcohol beer/cider
- Removal of undesirable flavours/volatiles

Instant Coffee

- Recovery of flavours from various process streams

Vegetable/Animal Oils and Fats

- Removal of undesirable odours/flavours

Essential Oils

- Recovery of essential oils from
 - Tea tree
 - Peppermint

Associated Technology Available

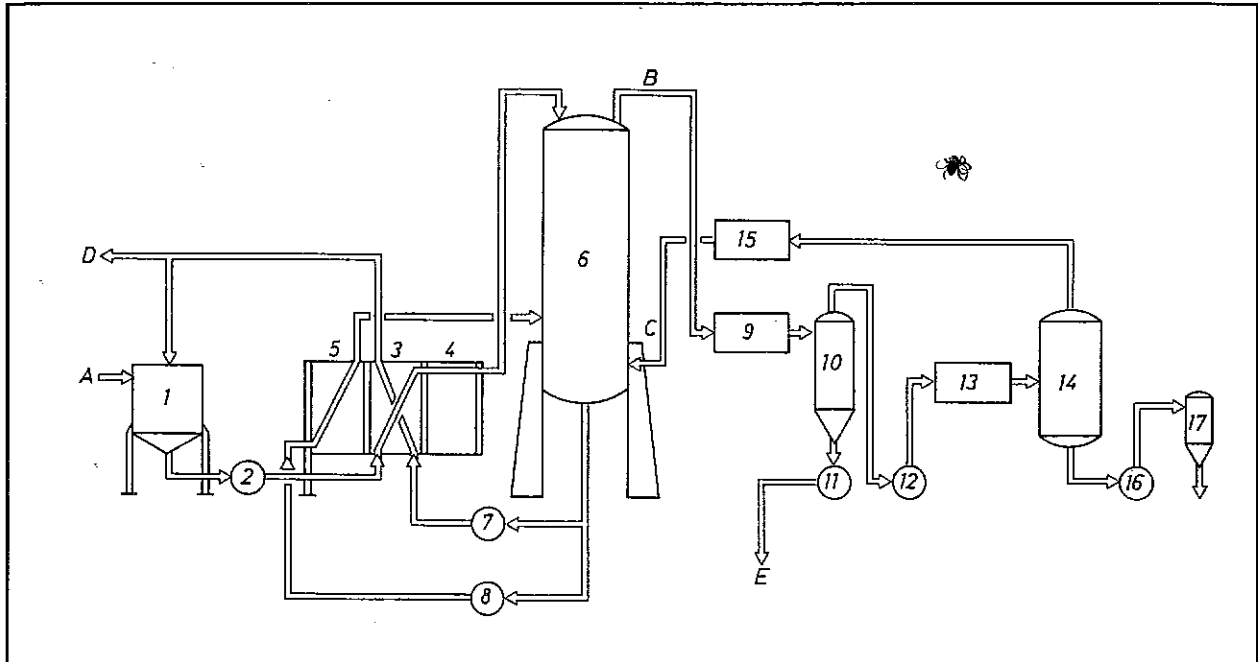
- Ambient temperature storage of single strength and concentrated juices
- Preservative free concentrate
- Low alcohol beverage formulation
- Fruit juice and puree processing

ADVANTAGES

The Spinning Cone Column offers many advantages over conventional gas-liquid mass transfer devices

- *Highly turbulent gas and liquid phase*
- *High differential velocity between gas and liquid phases*
- *A large path length for gas and liquid phases*
- *Very high plate efficiencies (sometimes higher than 100%)*
- *Low height per theoretical plate (approx. 1/4 to 1/3 of traditional packed columns)*
- *Low entrainment of liquid droplets in the gas stream*
- *Low liquid hold up volume*
- *Low retention time (minutes in SCC compared with hours in conventional systems)*
- *Ability to handle highly viscous liquids and slurries*
- *Low operating temperatures*
- *Low pressure drop*
- *Percentage evaporated (strip rate) can be varied without varying the temperature*
- *Low percentage evaporated to achieve complete removal of a particular compound*

Schematic Layout of Flavourtech Essence Recovery Plant



- | | | | | | |
|----------|-------------------------------|----------|------------------------------------|-----------|--------------------------------|
| <i>A</i> | <i>Product Feed</i> | <i>1</i> | <i>Product Feed Tank</i> | <i>10</i> | <i>Condensate Cyclone</i> |
| <i>B</i> | <i>Stripping Gas/Flavours</i> | <i>2</i> | <i>Product Feed Pump</i> | <i>11</i> | <i>Condensate Pump</i> |
| <i>C</i> | <i>Stripping Gas</i> | <i>3</i> | <i>Regeneration Heat Exchanger</i> | <i>12</i> | <i>Gas Compressor</i> |
| <i>D</i> | <i>Product Out</i> | <i>4</i> | <i>Product Heater</i> | <i>13</i> | <i>Operating Liquid Cooler</i> |
| <i>E</i> | <i>Flavour Extract</i> | <i>5</i> | <i>Reinjection Heater</i> | <i>14</i> | <i>Condensate Cyclone</i> |
| | | <i>6</i> | <i>Spinning Cone Column</i> | <i>15</i> | <i>Gas Heater</i> |
| | | <i>7</i> | <i>Product Discharge Pump</i> | <i>16</i> | <i>System Vacuum Pump</i> |
| | | <i>8</i> | <i>Reinjection Pump</i> | <i>17</i> | <i>Vacuum Pump Cyclone</i> |
| | | <i>9</i> | <i>Gas Cooler</i> | | |



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