INTRODUCTION

The role of filtration in the brewing industry is vital to the production of bright, haze free, stable beers and lagers.

Carlson Filtration have been supplying the brewing industry with filtration for over 8 decades and are highly regarded for their expertise in the filtration processes. Whilst technologies have expanded, the main objectives of stable, fresh, bright beer have remained the same.

Carlson have continued to develop their product range to offer a full filtration service to the brewery including all liquid filtration areas.

The Process (Typical)

Filtration areas:

Whilst there are a number of different alternatives in filtration, to reach the final product quality, the typical filtration stages are as follows:

1. Main Kieselguhr or Diatomaceous Earth filtration
2. Trap Filtration
3. Depth / Polishing sheet filtration
4. Sterile Filtration
5. PVPP (stabilising) treatment
6. Liquor/water filtration/treatment
Main Kieselguhr (KG) or Diatomaceous Earth (DE) Filtration

The filtration of fully fermented beer, following a period in cold storage (maturation) is the most common and widely practised single filtration stage.

This filtration stage serves to remove all remaining yeast and visible turbid matter as well as reduce the bacteria loading.

The basis of KG filtration is to use the filter powder to trap and hold the solids to be removed. To do this a mechanical, porous, support surface is required on which a thin layer of KG or perlite powder is deposited. This is called the pre-coat. It is normal to use 2 pre-coats to form an effective support structure (typically 0.5 to 1.2kg per m2 of filter area). The beer to be filtered is then passed through this surface and the correct degree of filtration is achieved. Due to the nature of the solids being removed if nothing else was done during this filtration stage the filtration surface would soon blind. Therefore further KG needs to be continuously added to the beer just prior to the filter surface. This is known as body feed and can typically vary between 35 to 200 grammes per hectolitre, dependant on beer type and quality. The typical beer flow rate through the filter would be between 3.5 to 5 hectolitres per square meter of filter surface per hour.

This filtration cycle is best carried out by a modern filter press. The filter press utilises the New Carlson ‘W’ range support sheets as the mechanical filter surface. Turbid frames up-stream of the W2 support sheet hold the pre-coat, added body feed powder and retained solids. At the end of each filtration cycle the filter press is opened and the residue cake washed off. The press is then closed, sanitised and ready for its next filtration cycle. The Carlson ‘W’ range can be used for multiple filtration cycles (up to 30 cycles) before changing out.

Specially designed for this type of application, ‘W’ range sheets offer a number of benefits to the brewer:

- Manufactured from natural fibres incorporating carefully chosen food grade wet strength resins within the cellulose matrix, providing high wet strength and durability.
- Even control of pore size distribution of the sheet to ensure even build up of the filter cake on the sheet. This ensures that filter capacity is maximised and that there is minimum risk of bleed through of even the finest of fines, whilst minimising the pressure drop through the filter.
- Very tolerant of pressure transients during the filtration cycle because the formulation used in their manufacture, coupled with the manufacturing process, produces an extremely durable yet flexible sheet.

W1 Support Sheet:
This new support sheet has been designed for the large filter press, 100cm and larger, especially where a slot in the crease is required. It offers extra strength and durability.

W2 Support Sheet:
Re-engineered to provide extra durability for standard support sheet applications. Available in all single and double sizes to fit filter presses from lab scale 20cm, through 40cm, 60cm, 80cm, 100cm and larger.

Carlson’s highly developed ‘W’ range normally come in double form. They are suspended over the outlet collection plate, and the sizes available suit all filter presses. Typical sizes are double 140cm, double 120cm, double 100cm, double 80cm, double 60cm and double 40cm.
2 Trap filtration

As an additional security, or if other types of mechanical KG support surfaces are used, a trap filter is commonly used to avoid the carry over of KG powder that might bleed through the mechanical support surface. To achieve this a 5 to 10um trap cartridge system is incorporated, sized to suit the up-stream KG filter capacity.

Due to the different KG filtration set-ups and further down stream processes Carlson’s trap filter system is designed around each individual application to offer the most effective and economical solution.

3 Depth / Polishing Sheet Filtration

In the depth or polishing filtration step, there is a need to remove any remaining chill and oxidation hazes as well as micro-organisms, thereby enabling the required degree of biological stability to be achieved.

This is done with either filter sheets within a filter press or lenticular* modules in a housing. This filter press can be a physical part of the KG filter, so one filter press offers both KG filtration followed by the 2nd stage polishing, or as a separate stand alone filter press. For beers which are filtered and then pasteurised, typically Carlson’s XE200H is used, which has been developed to provide an excellent degree of polish whilst achieving high flow rates and long life.

For beers which undergo aseptic or sterile filling, high levels of biological stability are required. For this duty, typically Carlson’s XE675H is ideal due to its carefully controlled pore size distribution.

Typical flowrates for this stage can vary between 2 and 5hl/m2/hr.

*For lenticular module information see separate Carlson CARLENT lenticular brochure.

4 Sterile Beer Filtration

More and more demand has been put on the requirement of cold sterile filtration. Whilst sterile filtration with the correct grade of sterile filter sheet is still the most effective and economic sterile filtration, there is a need for a final, pre-packing, stage which should be carried out with either a 0.65um or, more commonly, 0.45um membrane cartridge. Carlson’s range of membrane cartridges are designed specifically to target the removal of beer spoilage organisms. This in turn offers secure, sterile beer being presented to the packaging line. It is important to carry out pre-sterile sheet filtration prior to the membranes, as the membranes are not designed to take a high loading, but as a final sterile guard.

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<thead>
<tr>
<th>KG</th>
<th>POL</th>
<th>PVPP</th>
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<tbody>
<tr>
<td>Lager</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Ale</td>
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<td>Dark Beer</td>
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Beer Stabilisation by means of PVPP

The demand for improved stabilisation of beers/lagers is now more common place because of the requirement for extended shelf life of product. Soluble polyphenols and proteins in the beer are the main cause of stability problems in sterile beer. To extend the stable life of beer either one or both should be reduced.

Polyvinylpolyprrolidone - or PVPP as it is more commonly known - has adsorptive capacity for Polyphenols.

Carlson’s **Prop4** process sheet is made-up as per a standard filter sheet, but with the incorporation of PVPP powder. Bright, pre-filtered, beer is then presented to this treatment sheet and the contact with the sheet allows the entrained PVPP to absorb polyphenols. The big advantage of this treatment sheet over sacrificial dosing of PVPP powder into the beer (pre-KG filter) is that the sheets can be regenerated with caustic after each batch and re-used up to 30 times. The **Prop4** treatment sheet is also available to suit all common filter press sizes.

Liquor / Process Water Filtration

Brewing liquor and process water used around the brewery also requires filtration and treatment. Carlson offers a range of solutions for chlorine treatment, particulate removal and sterilisation dependant on the requirements and the water source/condition.
Complementary Filtration

Cartridges, Bags and Housings

Carlson can also offer a comprehensive range of cartridges from wound, pleated, and thermal bonded through to PES membranes as well as bags in felt, nylon monofilament, polypropylene and polyester. They are available for either new application or to retrofit current installations. A full range of housings are also available to complement this range.

Filter spares

Another important element of Carlson’s support service is to supply spare parts for their filter range. These are categorised into:

Consumable spares

which include eyelet seals, in a host of materials including Nitrile, Silicon, Natural Rubber, EPDM, Butyl and Viton

Servicing spares

including pump spares, sight glasses, valve diaphragms and pressure gauges etc. Service kits for hydraulic filter press closing systems are also available.

Filtration Equipment and Spares

New filter equipment

Carlson offers a comprehensive range of new filtration equipment, incorporating a full range of filter presses and plate and frame filters varying from lab scale 20cm units through to large 120cm automatic closing units. Also available are the fully enclosed lenticular format housings that utilise lenticular modules. Standard and sanitary design cartridge housings, in a range of sizes and configurations, are also available.

Reconditioned filter equipment

Carlson also offers reconditioned sheet and plate and frame filter presses. We have developed a wide ranging network of contacts in the filter press user community as well as amongst dealers in used factory equipment. On arrival back at Carlson’s factory all filters are rebuilt to exacting standards and the customers specification to achieve an “as good as new” quality. All reconditioned units come with a six month warranty, a full pressure test before delivery and full Carlson site back up where required.

Purity through quality™ since 1923