



# PLATE AND FRAME FILTRATION

## WORKING PRINCIPLE

In precoat (plate & frame) filtration, the filtration process is carried out by the filter aids - usually diatomaceous earths. The W2N grade of filter sheet acts as a support sheet for the filter aid. The filtration process itself is preceded by the application of the precoat onto the support sheets until a filtering layer of adequate thickness has been formed. During the subsequent filtration process it will be necessary to add continuously the same quantity of filter aids as there are solids to be extracted from the product.

## SELECTION OF FILTER AID

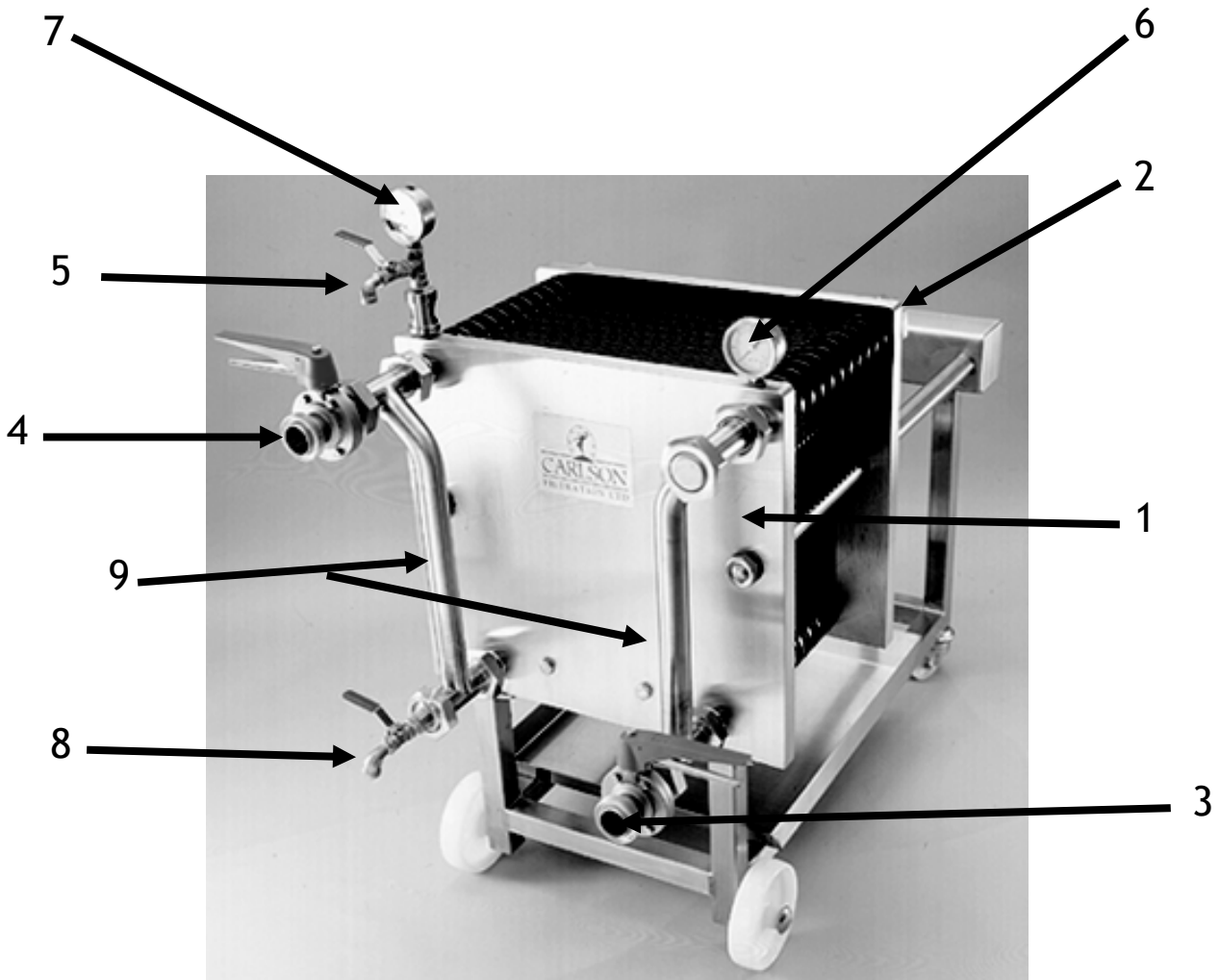
Selection of the most suitable type (grade) of diatomaceous earth will depend on the degree of filtration required and on the properties of the product to be filtered. If in doubt, contact **CARLSON** or your filter aid supplier to obtain advice on the selection of the appropriate type of kieselguhr. If a specific type of kieselguhr fails to produce sufficient clarity, sharper filtration with a finer grade of filter aid will be necessary. If the filtration effect (clarity) is satisfactory, whereas the filtration throughput is too slow, a slightly coarser grade of filter aid should be used. It should be realised, however, that clarity and throughput are inter-dependent factors; i.e. one can only be improved at the detriment of the other. A better filtration effect will therefore reduce the filtration throughput and vice-versa.

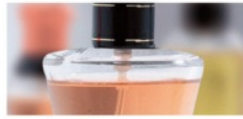
## FILTER OPERATION

Before starting to operate the filter, its inlet/outlet valves, head/end cells (end plates), elements (intermediate plates), draff frames, fittings and eyelet gaskets should all be washed with warm water. Avoid the use of aggressive chemicals. After cleaning, the filter should be examined with respect to correct assembly.



- 1 Head Plate (Fixed End)
- 2 End Plate (Moving End)
- 3 Product Inlet/Inlet valve
- 4 Product Outlet/Outlet Valve
- 5 Air Vent/Sampling Valve
- 6 Inlet Pressure Gauge
- 7 Outlet Pressure Gauge
- 8 Drain Valve
- 9 External Standpipes (where fitted)





## FITTING THE SUPPORT SHEETS

Optimum function and maximum sheet-life can only be achieved if the support sheets are handled and fitted correctly. Hand the double sheets over the elements ensuring that the sheets are folded in the same way as when unpacked, i.e. with the rough side turned outwards against the draft frames and the smooth side (bearing the brand) turned inwards against the filter elements.

Please remember that the filter unit should be sterilised with hot water (80° to 85° C) after each dressing of new filter sheets.

## FILLING THE FILTER WITH WATER

- Examine the as-yet uncompressed filter pack to ensure that the filter sheets and eyelet gaskets have been fitted correctly
- Open the air-vent valve (item 5)
- Ensure sheets are completely wetted out.
- Close the filter pack by turning the tightening spindle in a clockwise direction using the heavy-duty ratchet handle provided
- Open the outlet valve (item 4) slightly
- Open the inlet valve (item 3)
- Close the drain valve (item 8)
- Allow the water to enter the filter slowly (to prevent air-locks) until the water begins to emerge from the outlet valve and air-vent (items 4 and 5)

## VENTING OF AIR

Close the outlet valve sufficient to allow the filter sheets to be completely soaked with water to their edges. During this process a counter-pressure of 0.5 Bar (7.5 psi) maximum should arise. This operation will result in the complete venting of air from the filter.

## COMPRESSING THE FILTER PACK

- Open the outlet valve (item 4) to such an extent that the pressure drops to 0.1 Bar (1.5 psi). The filter pack can now be compressed at a negligible internal pressure which is still sufficient to prevent the introduction of air.
- Turn the tightening spindle (again using the ratchet handle) vigorously; though **without** the use of any form of lever extension (tommy bar etc.).
- Close the air vent valve (item 5).
- Allow the water to flow for some minutes to enable the filter sheets to be thoroughly soaked. Filtration can then be started.



## PRECOATING

- Adjust the flowrate to approx. 4 HL/H/m<sup>2</sup> and a counter-pressure of approx. 1 Bar (15 psi) via the outlet valve (item 4).
- Use a kieselguhr dosage rate of approx. 600 to 800 g/m<sup>2</sup> of filter area.
- Vent any air from the feed-pipe.
- Once the filter has been vented, water-flow must not be interrupted until later filtration cycles are started.

Do not try to economise with the amount of filter aid used as such action will only lead to an increased consumption of support sheets. For precoating, we recommend a coarse grade kieselguhr containing as few fine particles as possible. NB More than one precoat can be used.

During each diatomite filtration process, fine filter aid particles will enter the support sheets, thus reducing their permeability. The use of a fine-grade kieselguhr will result in the support sheets blinding noticeably sooner than a coarser grade.

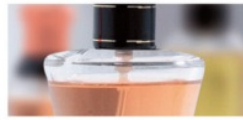
## FILTRATION

- Charge the slurry-feeder with filter aid.
- Set the body-feed.
- Turn off the water and introduce the product simultaneously.

Pressure shocks should be avoided during the entire filtration process. This can be achieved by good venting of the feed-pipe and by careful operation during any process changes, e.g. when changing from one product to another.

## END OF FILTRATION (WITHOUT RINSING)

- The product remaining within the filter is evacuated by means of water pressure
- Open the air-vent valve (item 5)
- Close the inlet valve (item 3) and cut the water supply
- Open the drain valve (item 8)
- Uncompress the filter pack



## CLEANING THE FILTER

After opening the filter pack, scour the draff frames and the inlet side of the support pads with a large jet of water to remove diatomites and filtration sludges. The filter cake can also be removed by the use of compressed air.

## RINSING THE SUPPORT SHEETS

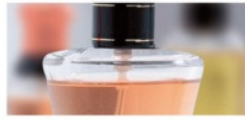
After the removal of the filter cake and the thorough washing down of the filter unit, the filter pack is re-compressed and the filter is filled with fresh water. Air is then vented and the filter unit is flushed in the direction of filtration; firstly with cold water and subsequently using warm water (40° to 50°C max.) each time until absolute water clarity is achieved. This will ensure that all the solids will be scoured off the support sheets and prevent premature blinding.

Highly acidic or caustic detergents and disinfectants (e.g. sodium hypochlorite etc.) will accelerate dissolution of sheet impregnation. Steam or water at too high a temperature (over 90°C) may bring about the same detrimental effect. Such means should therefore be avoided when rinsing the support sheets.

## RINSING

- Sheet life can be substantially increased by thorough rinsing. This operation will ensure that a large proportion of any solids intercepted by the filter sheets during the filtration cycle are washed out of the sheets. When the rinsing is done using warm water, compression of the filter pack must be loosened to compensate for thermal expansion.
- Rinsing should be first performed using cold water for approximately 20 minutes; followed by warm water (40° to 50°C) for a further 10 minutes. This process should be carried out at a flowrate of 2 to 3 HL/H/m<sup>2</sup>. Do not recycle the water. Allow the water to flow until it has completed its cycle through the filter. All solids will be rinsed out of the filter sheets during this operation.
  - Open the inlet valve (item 3)
  - Open the air-vent valve (item 5)
  - Close the drain valve (item 8)
  - Open the outlet valve (item 4) sufficient that water still emerges from the air-vent valve (item 5)

The filter can be sterilised either directly after rinsing or prior to the next filtration run.



## RINSING (CONTD)

- If it is intended to sterilise only prior to the next filtration run, the filtration cycle can be considered complete after flushing with cold water.
- If the filter has been flushed using warm water and sterilisation is to take place when the next filtration run is undertaken, it is advisable to cool the filter using cold water. This will help to prevent the activity of harmful micro-organisms.
- If the filter was rinsed using warm water, it would be most economical to proceed with sterilisation immediately afterwards although, in our experience, the cooling-down of the filter overnight will not incur any disadvantage.

## STERILISATION USING HOT WATER

- Always sterilise the filter in the same direction as the filtration flow using hot water in preference to steam.
- As explained earlier, the filter pack must not be compressed too tightly.
- Due to increasing temperatures within the filter, the filter elements and draff frames will begin to expand which can lead to high pressures and subsequent damage. This risk can be eliminated by gradually uncompressing the filter pack (via the tightening spindle and ratchet handle) as the temperature begins to increase. This precaution will also prolong the service life of the eyelet gaskets.
- We recommend an ideal sterilising temperature of 85 °C and the sterilisation procedure can be regarded as being complete once the water has been flowing from the filter's outlet at a minimum temperature of 80 °C for a period of 20 minutes.

**NB : 'Novotrox' (Noryl plastic) elements will expand more than Stainless Steel**

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