

Having defined the function of filtration and decided on the filter type required to fulfill that function the next step is to:

Design the *most economical system* which will fulfill the function

The most economical filtration system usually combines depth filters and screen filters. The graphs shown below illustrate the effects of various combinations in a typical process.

Fig. 22 shows what happens when the 0.45 μm screen filter is protected by a relatively coarse depth filter. (Pressure drop as a function of volume is shown for each filter by the broken line.) Here, because there is little pressure build-up across the depth filter, it evidently is not providing enough retention efficiency to protect the final filter. As a result, the final filter plugs quite rapidly, and maximum pressure is exceeded, with most of the batch still to be processed.

In Fig. 23 a much tighter depth filter has been used. The depth filter has more than adequate retention efficiency, but insufficient

dirt-holding capacity. This time, it is the depth filter that clogs prematurely.

Fig. 24 shows what happens when the depth filter has just the right retention efficiency and dirt-holding capacity. The properties of the two filters are perfectly matched, and overall pressure drop has just reached the pressure limits of the system as the last of the batch has been processed. Note that at the end of the run, both filters have exhausted almost all their dirt-holding capacity.

For contrast, Fig. 25 shows what would have happened if the final filter had been used alone, with no depth filter.

In some cases, the most economical combination might be a final filter protected by a highly efficient depth filter which is in turn protected by another depth filter which is low in efficiency, but high in dirt-holding capacity.

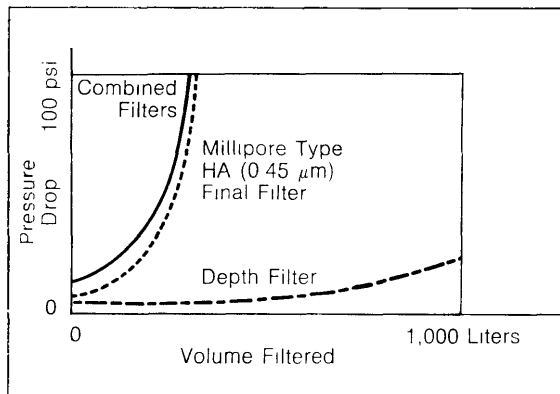


Fig. 22 Screen filter protected by relatively coarse depth filter. Inadequate prefiltration has resulted in premature clogging of screen filter.

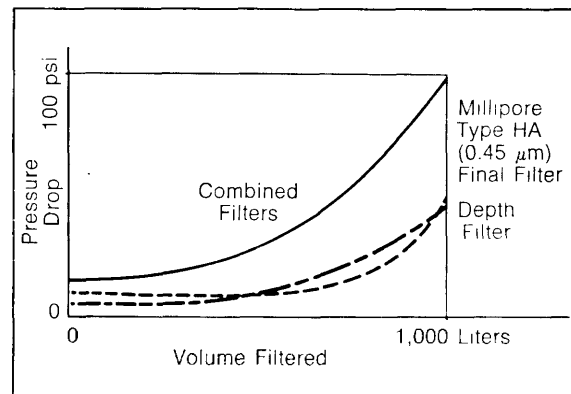


Fig. 24 Properly matched depth filter and screen filter, resulting in full use of both filter capacities and complete filtration of batch.

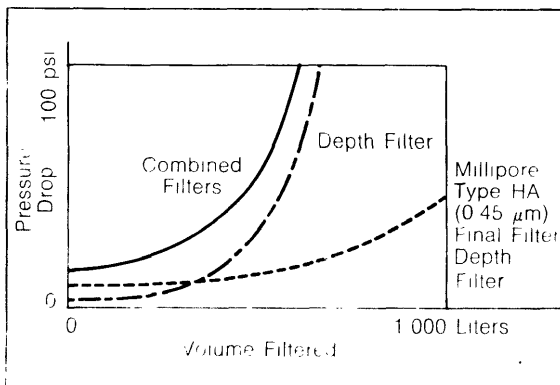


Fig. 23 Screen filter protected by depth filter with too little dirt-holding capacity. Result: premature clogging of depth filter.

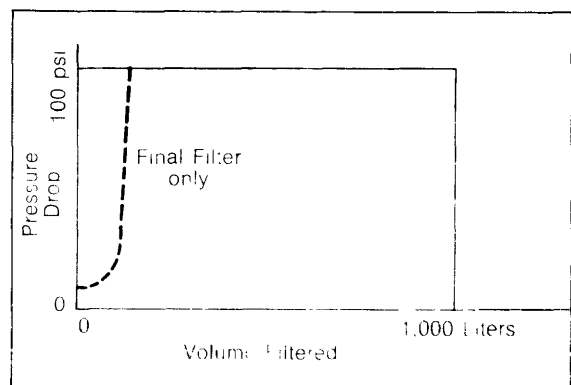


Fig. 25 Without prefiltration, the screen filter quickly clogs, resulting in a small throughput.