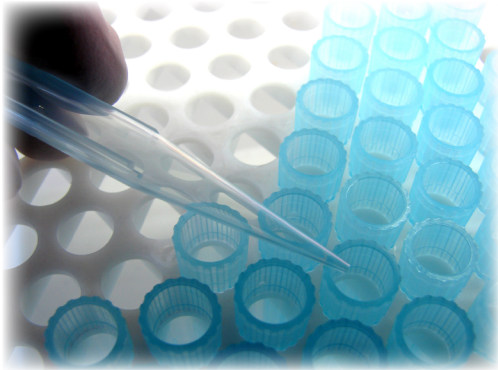


Success – Solving a Mystery and Preventing Random Filter Clogging



Description of the Filtration Challenge

A solid dose pharmaceuticals manufacturer was using a process that required elevated temperatures. The process also used solvents that attacked most membranes, except PTFE membrane.

The filters in the process:

- were PTFE membrane filters in a single housing on a transfer line between an elevated temperature reaction vessel and downstream processes
- were replaced after each batch
- would become completely fouled at the beginning of new production shifts at infrequent, random intervals.

The customer's process engineers, production and quality staff were unable to find any specific process changes that might cause the PTFE membrane filters to become fouled. Process parameters seemed to be within specifications at all times. The customer staff believed that inconsistencies in filter construction and performance were the likely cause of the fouling.

The Technical Support Team was called to investigate the inconsistent performance of the filters. To start that process, the team looked at our internal records documenting the quality of the filters during production.

They found:

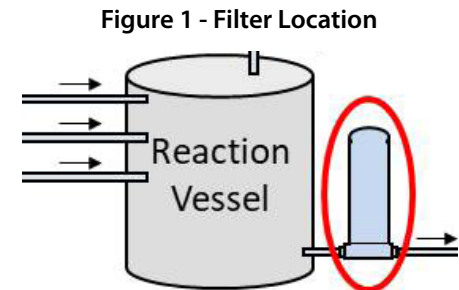
- All filters sold to the customer were "Pharmaceutical" grade filters with specific performance requirements
- The membrane used in all production batches sold to the customer were within the strict specifications for Pharmaceutical grade PTFE membrane filters
- The flow rates for all membrane used in production were within the specifications for the PTFE filters
- Integrity tests performed as part of filter production were all within specifications for the Pharmaceutical grade PTFE membrane products

The conclusion of the Technical Services Team was that the filters were consistent in their construction and should be just as consistent in their performance. The filters were fouling because some other factor had changed and was not being seen by the customer's staff or our Technical Services Team.

Process Review

The Technical Services Team met with customer production and quality personnel to do a step-by-step review of the events leading up to each fouled filter event. As with all process reviews conducted by the team, a series of questions was asked to determine what factors will most affect the process and filter performance. The questions and answers found during the meeting were:

- Timing of the replacement of filters
 - Between batches, as normally done
- Filtration goals
 - Particle reduction after the reaction vessel to capture undissolved particles
- Chemical composition of the process fluid
 - The same in all batches - no effect on PTFE membrane
- Known or suspected contaminants to be removed
 - Customer provided analysis showed the usual low level of contaminants in all batches
- Process conditions
 - Flow rate, pressure, temperature - AS MEASURED - were within process specifications



- Cleaning and sanitization requirements
 - No filter cleaning was done, and the same steam sterilization procedure was used for all batches
- Target batch size, expected processing time
 - Normal process sizes, though **process time was longer** when the filters fouled
- Filtrate testing and acceptance criteria
 - The fluid filtered before each fouling event was within specifications, indicating filter performance was also within specifications

At the conclusion of the meeting, no cause for the filter fouling was evident, so the Technical Service Team asked to analyze a fouled filter. There were no fouled filters retained by the customer. (Their waste handling procedures required prompt disposal according to strict protocols and forbade shipping the filters anywhere outside their facility.)

The only remaining avenue of investigation was direct observation of the process inside the facility.

Process Observation

After satisfying all of the customer's required security clearances, members of the Technical Services Team were allowed to observe batch processing inside the facility. That included watching the way the process was managed and how and where parameters were monitored.

Multiple batches were processed without incident. Then, after a shift change during a single batch, the filters were fouled and would not allow flow.

The filters were immediately replaced and the fouled filters brought to an on-site laboratory for analysis. The results were:

- The filters were fouled with crystals of product (not contaminants)
- The customer process staff stated that the crystals would not form unless the liquid temperature dropped below a specified limit.
- The temperature in the reaction vessel was always above the limit
- The temperature in the transfer line and filter housing WAS NOT MONITORED

Further investigation found that the reaction vessel was temperature controlled and insulated. The transfer piping was NOT TEMPERATURE CONTROLLED OR INSULATED. Still more investigation found that, under normal operating conditions, the liquid flowed through the transfer line quickly enough to not fall below the temperature limit. However, if the process was stopped for too long a time for an extended shift change or because of an upset elsewhere in the process stream, the temperature could drop below the limit.

Review of operating records (which included documentations of process upsets) showed that the flow through the transfer pipe was stopped for extended periods before each filter fouling incident.

Solution Implementation

The Customer chose to install temperature control and monitoring equipment on the transfer line and to insulate the piping. There have been no further filter fouling events on that transfer line.

The Critical Process Filtration Technical Services Team performs process evaluations, troubleshooting analyses, filter process development tests and application consulting every day. In some cases, like this one, a change in filters or filtration processes wasn't needed. Instead, calling us in to have a fresh perspective on a vexing challenge resulted in a simple solution.

Visit our [website](#) for more information on this and other applications and to access data sheets on all of our products, or [contact us](#) to ask one of experienced technical staff to help with your filtration challenge.



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