UNMIXING WATER FROM WASTE: THE IMPORANCE OF FILTERS, CARTRIDGES AND HOUSINGS AS A FUNCTION OF MANUFACTURING

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In manufacturing, water and water-based solutions are regularly filtered for various purposes and outcomes – including for cleaning, cooling, and movement. The filtering process is crucial to quality, performance, and cost savings. With the wrong filter in place, pumps can be destroyed, liquid being filtered can become "unusable" for the intended purpose, cleaning solvents can cause harm to an item being cleaned, and final product can become contaminated.

Most manufacturers today are looking to maximize operations and minimize costs– while meeting a growing list of performance and regulatory criteria. Proper water filtration has proven to be an important asset that can protect machinery and pumps, ensure desired outcomes – such as taste and quality in food and beverage applications – and meet other goals and objectives.

These filtering solutions are designed to remove waste from water – taking a large number of variables into consideration. By better understanding some of these variables and ensuring the proper selection and use of filters, manufacturers will be better able to realize advantages that can be achieved through their filtration systems.

- ***How clean is clean***? First and foremost, the end user must identify the most desirable outcome – or end result – of the solution being filtered. In other words, how clean does the process need to be? Once this is determined, the process of selecting the proper filtration system comes down to four basic criteria: flow, pressure, temperature, and compatibility. If the filters are selected and sized right, they will produce the most efficient and economical solution for the process.

- ***What is the use of effluent***? To determine to what degree of filtration we must achieve, the end user must know where and how the filtered liquid is being used. For example, is it a coolant for a machine tool application? Is it to clean waste water before it goes to drain? Is it for a food and beverage application, or is it for an electronics or pharmaceutical application? While requirements are vastly different for the different segments of the market, they also can be very similar.

For instance, coolant or rinse water in a machining application can range from taking out the nuts and bolts to protect a pump or downstream nozzles, to very fine filtration necessary to protect end line spray nozzles or high pressure orifices. Waste water may have to meet certain environmental objectives for parts per billion of contaminates before it is dumped or drained.

Food and beverage users must be conscious of how filtration will affect the quality and taste of the product. Electronics manufacturers must know to what degree the downstream effluent is to be cleaned so as not to contaminate the end part and render it useless – which can happen if a particle or bacteria is big enough to wipe out the process. In pharmaceutical applications, the filtering system must be efficient enough as not to let contaminates through that would aversely affect the results of cultured vaccines or medicines.

Specialized filters such as Shelco's high-purity MicroVantage filters and housings pictured here offer many configurations that meet specific industrial needs. Manufactured in a clean room environment, these filters are a strong performer meeting critical effluent needs.

- ***Know the flow***. Once we have identified how clean the process has to be, the size of the filter is the next step in identifying the solution. We must now determine the flow rates that are to be expected for the application. In picking the right size filter, a manufacturer must balance expected results with efficiencies and economics. If a filter is too big, it ultimately may cost too much for the application. If it is too small, the filter will be overworked and will not be able to deliver the required flow. Additionally, the maintenance team will have to change the filtering media on a constant basis – adding costs and downtime to the production process. Therefore, it is important to keep the life span of a filter in balance with the overall capital and maintenance costs of the project.

  Required connection sizes will depend primarily on the flow rate of the system and where the filter is being installed. For instance, if a building has 3-inch piping, the connection must match that size for maximum water flow and minimum pressure loss. To create the most efficient filter cartridge and housing system for that particular building or location, it needs to match the flow rate of the building and filtering media as well.

As a rule of thumb, particulate removing cartridges rate at 5 microns or above will give a flow rate of no more than 5 GPM per 10-inch equivalent with a clean pressure loss of no more than 2 to 3 psi from the dirty side of the system to the clean side of the system. For example, for an established flow rate of 100 GPM you would need a minimum of 20 elements (10-inch) to effectively filter this requirement. For absorption-style cartridges such as carbon, the maximum flow would drop to 2 GPM per 10-inch equivalent. So that same 100 GPM flow would need 50 cartridges (10-inch). Every cartridge manufacturer has a flow graph of their particular cartridges, and should be consulted to determine the optimum flow per 10-inch equivalent for each cartridge.

- ***What's the pressure and temperature***? It is important to understand the pressure requirements of the filtration system, and use appropriately rated filter housings. Housings and cartridges are designed for very different pressure ratings and temperature ratings. This information will greatly affect the materials of construction of both the housing and the cartridge. It will also affect the design and type of housing and closure that will be available to the application. The wrong choice can create devastating results. You do not want the housing to fail due to over pressurization, or to dissolve or melt due to incorrect compatibility with the liquid or vapor.

  Also, you do not want the cartridge to deteriorate or collapse because the solution is too hot, too acidic or too alkaline. Differential pressure must be maintained so as not to cause the cartridge to collapse inside the housing. An optimum range for differential pressure (the difference in pressure between the upstream side of the filter and the downstream side of the filter) should be between 1- 35 psi depending upon the type of cartridge. Conversely, if the housing is too big or over-designed it could add un-necessary cost to the project. There are compatibility charts available online (or from a filter manufacturer) that will tell you the most appropriate materials of construction for both the housing and the cartridge for almost every conceivable liquid or gas known.

- ***Nominal vs. Absolute:*** There are two basic types of cartridges. A nominal rated cartridge is one that can deliver cleaning efficiencies from 60% to 90%. This means they can remove up 90% of contaminates in the solution being filtered. Absolute rated cartridges can remove 99.98% to 99.9999999% of contaminates. For example, drinking water would require a nominal type of cartridge that would remove 80 - 90% of all contaminates bigger than 5 microns. A beverage application may require an Absolute rated cartridge that can deliver an effluent that is at a minimum 99.98% free of all contaminates bigger than the rated micron***.***

- ***Housing matters***. The filter housing serves a crucial purpose as well and must be compatible with the solution being filtered (alkaline or acidic). Steel housings are made to handle heavy-

duty applications. They are durable, with a wide range of compatibility (available in a many different sizes and configurations), and are able to handle higher flow rates. The material itself however makes this a more expensive choice than plastic housings.

Plastic, on the other hand, is preferable when filtering corrosive liquids, or when working pressures are very low. Plastic is not as durable, which limits the temperature and pressure ranges under which they can work. In selecting the proper housing Additionally, there are limitations to the size a plastic housing can be. However, they are less expensive than steel housings, and are an exceptional housing option under the right conditions. There are also single open ended, single o-ring sealed cartridges that are more efficient and can be used when you want to match and inexpensive housing like a standard plastic housing with a more efficient style cartridge.

The water filtration element of manufacturing is certainly a vital element of the entire production process. Essentially, the filter cartridge and housing system cleans the water properly so the manufacturing process can proceed as desired. Without proper dirt-holding capacity, correct sizing, and appropriate housing, the filter choice may not be optimal –and the entire production process will be affected. The filtration industry has responded by bringing high-quality filter cartridges and housings to the marketplace that are made from a variety of materials that can be matched to the exact needs of the manufacturer. The manufacturer stands to gain tremendously when it regards its filtration system as a valuable asset – and considers its function as a crucial part of the entire process.

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Robert LeConche is president of Shelco Filters (www.shelco.com), one of the leading manufacturers of high-end filter cartridges and housings. Based in Middletown, Conn., Shelco offers a complete line of industrial cartridge and bag housings, along with a full line of high-purity sanitary housings with absolute membrane, and high efficiency pleated cartridges.