By Marcia Rick, Pentair Water Treatment

Maximize Profits and Customer Satisfaction by Selecting the Correct Housing

The following is part one of a two-part article.

Whether a filter system is installed in a residential, commercial or industrial application, the cartridge often is thought of as the heart of the system because the cartridge's chemical and physical properties determine the filter's effectiveness in removing specific materials suspended in fluids. Flow rates, the fluid's contact time with the filtering medium and pressure drops, as well as environmental characteristics such as exposure to extreme temperatures, pressures and corrosive materials will affect your choice of a cartridge. However, the cartridge operates within a housing and even a cartridge that is perfectly matched to the application won't perform adequately if it's not also matched to a housing that meets the same application requirements. Specifying them together as an integrated system is the best way to assure they provide optimal performance.

There are many sizes and styles of housings that are made from a variety of materials and come equipped with features to enhance performance in a range of applications. Selecting the most appropriate housing involves both science and art, but it's a relatively simple process of matching the housing to the cartridge and the application requirements using a number of key factors.

Factors to Consider When Selecting Cartridges and Housings

To select the correct cartridge and housing you will need to consider the following factors.

- The contaminant needing to be filtered.
- The quantity of the contaminant needing to be filtered.
- The size of the filters available to filter the contaminant.
- The temperature of the fluid to be filtered.
- Normal and peak operating pressure.
- Application flow rate.
- Compatibility of the fluid with the housing components and cartridge.
- Pressure drop across the housing(s) and cartridge(s).
- Compatibility of the inlet and outlet connections with the piping.
- Application (residential, industrial or commercial).

Because it's almost impossible to find a filter housing that optimally addresses each factor, your ultimate choice may be the result of making compromises. In the case of large scale applications featuring many housings it often is advisable to test the filter on a more limited scale to make sure it performs to expectations before rolling it out across the installation.

Match the Cartridge to the Contaminant

Filter cartridges vary in size to accommodate the amount of material necessary to reduce contaminants to specified levels and to achieve other performance requirements such as service life, flow rates and pressure drop. Because cartridges often are designed to filter a limited number of contaminants, you can narrow your search of the many cartridges available by identifying the contaminants you want to filter. This will simplify your task of selecting the most appropriate cartridge and it should be your first step.

Select Cartridge Size for Service Life and Performance

Application parameters will have an impact on the service life you need from your filter cartridges. For example, if you are filtering sediment you will want to make sure that your cartridge has sufficient dirt-holding capacity to last between service visits. If customers are going to change the cartridge, you need to consider what is most convenient for them. If you are unsure as to how long a cartridge is likely to last, you may want to choose the largest size possible to maximize the time intervals between cartridge changes. In those situations where multiple cartridges are connected in parallel to increase capacity and service life, such as in large industrial applications, performance can be tested with a single 9¾-inch. standard cartridge at the desired flow rate per cartridge. These results then can be extrapolated to a larger multiple cartridge housing with the same flow rate per cartridge to achieve the desired service life. You also can contact the cartridge manufacturer for information.

When filtering chlorine or volatile organic chemicals (VOCs), the percent

A wide variety of filter housings and cartridges are available on the market to meet a vast array of filtration applications. With so many choices, today's water filtration professionals need to educate themselves on what is available and how to select the best filter housing/cartridge combination for the specific job.

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Certain features can take the guesswork and hassle out of cartridge changes and ease installation.

reduction required and the number of gallons that need to be filtered between cartridge changes may dictate cartridge and housing size. Longer service life generally correlates to larger cartridges that require larger housings to accommodate them. In some applications, fluids are filtered in batches and cartridge change-outs are scheduled periodically. In other applications, physical space constraints may restrict the size of cartridges and housings that can be applied. In this case you may need to install a cartridge and housing that provides the longest life possible given the space available.

Temperature can have an effect on cartridge service life. This is especially true when filtering chlorine. Most carbon cartridges are tested between 63° F and 73° F. Lower water temperatures will reduce service life and the percent reduction of chlorine, while higher water temperatures will increase the life of the cartridge and increase the percent reduction of chlorine.

Sizes of Available Filter Cartridges

Once you've determined the contaminant you will be filtering out and how much of it must be removed between cartridge change-outs, it is time to select the proper cartridge size, which will determine the housing size. Manufacturers in the water treatment industry make cartridges and housings in common sizes. The most common double open end (DOE) cartridge lengths come in 4⅞-, 9¾-, 20-, 30- and 40-inch. lengths and standard 2⅜- to 2⅞-inch. outside diameters. Cartridges also are available with 4½-inch. outside diameters and lengths of 9¾- and 20-inch. lengths. Single open end (SOE) cartridges are commonly available to fit 12-inch. or specially modified 20-inch. housings. Consult the manufacturer's literature for the types of contaminants and life of their cartridges as well as the recommended flow rates, maximum temperatures, pressure drops and other related information on the cartridges and housings you plan to use.

Lower Flow Rates Improve Filtration

Flow rate can be critical in determining the inlet and outlet size of the housing as well as the number of housings that may need to be connected in parallel to achieve the desired pressure drop. Most filtration processes improve with lower flow rates because contact time between the fluid and the filtering medium increases. At lower flow rates, pressure drops are reduced, filtration efficiency is increased and contaminant loading is maximized. Lower flow rates are achieved with larger cartridges or more housings. The savings in cartridge change out labor and better utilization of the filter cartridges can be significant. This is especially important in industrial or food service applications where down time is costly. In some applications there are space restrictions where more or larger housings are not possible. If space restrictions do not allow you to optimize the housing size to meet the requirements of the application, it's advisable to let your customer know about your concerns.

Consider Fluid Temperatures in Selecting Housings

Housings are made of various materials to maximize performance in different applications and environments. The temperature of the fluid being filtered is important in determining whether or not the material from which a housing is constructed is appropriate for a given application. Talc-filled polypropylene housings can be used with temperatures up to 125° F in general water filtration. Temperatures up to 160° F can be handled by glass reinforced nylon housings. Temperatures up to 300° F typically are handled by stainless steel housings.

Normal and Peak Operating Pressure Considerations

Peak operating pressures determine the materials of which a housing should be made and, therefore, its cost. Talc-filled polypropylene works with pressures from 90 to 125 psi depending on the size of the housing. Some stainless steel housings can operate at pressures up to 250 psi. For higher pressures and temperatures, specialty housings will be required.

Housings Must Be Chemically Compatible with the Application

Chemical compatibility will be a factor primarily in the commercial and industrial markets where different liquids, strong bases or acids may be encountered. Care must be taken to specify housings that maintain their performance characteristics in these environments. Installing housings that will be exposed to chemicals to which they are incompatible with them may cause damage and result in catastrophic failure.

The types of materials generally used in the housing market today include Lexan, Talc-filled polypropylene, styrene-acrylonitrile (SAN), glass-reinforced nylon (hot/high pressure), stainless steel and aluminum. Most manufacturers have chemical compatibility tables for quick reference with commonly encountered chemicals. If you cannot find the answer or want a second opinion, do not hesitate to call the manufacturer for technical support. It is their job to help you. WQP

Part II of this article will appear in the February issue.