STRAINER

APF-STR

APADANA PETRO FARAYAND

Knowledge is our difference

APADANA PETRO FARAYAND strainers protect pumps, filters, nozzles, flow meters, valves, heat exchangers, condensers, oil burners, boilers and other process system components from damaging pipeline debris.

Introduction

A pipe line strainer is a device which provides a means of mechanically removing solids form a flowing fluid by utilizing a perforated, mesh or wedge wire straining element. The most common range of strainer particle retention is 1 inch to 40 micron (.0016 inch). Strainers are employed in pipe lines to protect downstream mechanical equipment such as condensers, heat exchanges, pumps, compressor, meters, spray nozzles, turbines, steam traps, etc. from the detrimental effect of sediment, rust, pipe scale or other extraneous debris.

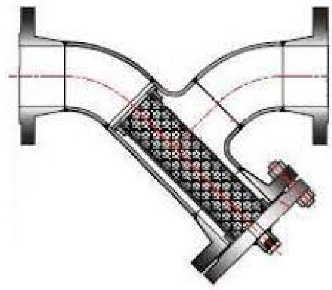
How it works: The strainer removes debris from pipelines by directing the flow through a screen. There are different mesh options available which allows optimum selection for each specific application and type of fluid. All strainer screens have a large screening and free area, designed to remove as much dirt as possible without 'clogging up'. For example, the sum of the area of holes in some strainer screen is nearly five times the cross-sectional area of the pipe. This is why the pressure drop through our strainers is very low, not to say negligible, even allowing for screen blockage between servicing. To assist with servicing on dirty systems, the fitting of a drain valve or a blowdown valve on the bottom cap of the strainer is recommended. This allows the strainer screen to be cleaned in service under pressure. For very viscous fluids where resistance to flow can affect pressure drop, and therefore pumping requirements, APADANA PETRO FARAYAND engineers can size strainers to offer the best strainer diameter and screen option. Standard strainers are equipped with screens for the average service of most gases & fluids (steam, gas, air, oil, chemicals, ect.). A large screen open area ensures an efficient filtering action with a low pressure drop.

Different Types of Strainers

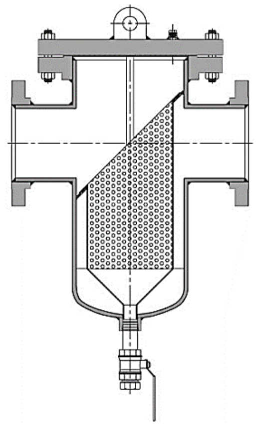
- Y Strainers (APF-YST), Basket Strainers (APF-BST)

Vertical piping, frequently found at pump inlets, necessitates the use of a Y strainers or a basket type. Most basket strainers are intended for horizontal or slightly inclined piping. Special attention must be given to the orientation of the debris collection chamber and the drain connection of the strainer. The strainer must be installed such that it is located at the lowest possible position. A Y type strainer in vertical piping must be placed with its screen in the downward position to trap the sediment in the debris collection chamber. Y-type and most variation of basket type strainers can be self-cleaning. With addition of a blowdown valve and some modification of the straining element of a basket strainer, the element can be flushed out by opening and closing the blowdown valve. This can be accomplished without flow stoppage or disassembling and piping.

In sizes above 4”, a single basket strainer creates less pressure drop than a Y-type. In basket type, top cover is made of quick opening closure so it can be easily removed in order to service and cleaning the basket.



Y-Type



Basket Type

- Temporary Strainers

Where cost is of prime importance, a temporary strainer may be installed between flanges in a pipeline. Variations include cone, truncated cone and flat geometries. The design considerations with these types of strainers are:

1. They have a lower net open area than basket strainers.
2. The pipeline must be disassembled to inspect, clean or remove these strainers.
3. Structural strength can be difficult to achieve, particularly in large sizes and in the case of using wire mesh as filtration element.

These strainers are frequently used for startup and they remain in pipeline during operation. As all other types, temporary strainers need periodic maintenance to ensure efficient operation.

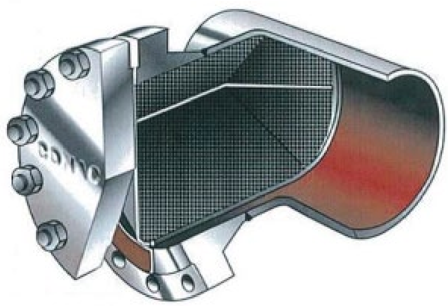
cone-Type

truncated cone -Type

flat-Type

- T-type (APF-TST)

T-type strainer, typically used for pump protection or other low solids applications has several advantages over other strainer designs. Its compact design is perfect for applications with restricted space, either vertical or horizontal installations are possible, and when cleaning the strainer, draining the vessel is not necessary. It also can be adapted for straight through or right-angle flow, making it ideal for retrofit situations. Strainer screens are stainless steel or other specified materials. For applications with infrequent basket changing, APADANA PETRO FARAYAND offers a simple, cost-effective, bolted cover type. It’s available with a davit assembly cover for larger strainers with heavy covers, this makes it possible for a one-person operation. For applications with more frequent changing, APADANA PETRO FARAYAND offers a hinged, quick opening cover secured by swing bolts. This permits one operator to open the cover. Fabricated strainers are available with many nozzle design options to adapt to existing or planned piping schemes.



T-type strainer

Applications

- Chemicals: The presence of a pipeline strainer means a cleaner product, protection of equipment and simple separation of solids from liquids. By installing a pipeline strainer, noticeable improvements in chemical operations and guaranteed longer running life of equipment are possible.
- Petroleum: Pipeline strainers clean unwanted material from petroleum products ranging from crude oil to gasoline. Fuel oil can contain gums, tars or other dirt that can plug the nozzles of an oil burner. Every industrial oil burner is equipped with a strainer to screen these out. Similarly, refineries use strainers in oil handling operations to keep debris away from pumps and meters.
- Process equipment: By installing a pipeline strainer ahead of expensive process equipment, the strainers protect against damage from scale, dirt or by-products, preventing costly shutdowns. Heat exchangers, condensers and pumps use strainers on their intake sides. Pipeline strainers keep flow meters and spray nozzles from clogging.
- Power generation: The electric power industry uses strainers to clean water for cooling and to protect equipment. They also strain transformer oil to avoid clogging of the circulating lines.
- Pulp and paper: Smooth paper finishes require coatings be free of pigment clumps. Strainers in the coating lines catch and retain the lumps. They also clean traces of pulp or paper from white water effluent before it is discharged.
- Industrial and municipal water: Strainers remove debris from lakes, streams and wells that can damage or clog equipment. They also remove leaves, insects, feathers, etc. from cooling tower water where the system is open to the atmosphere. For desalinization equipment, they take out unwanted matter from the water before it is treated for salt removal. Spent wastewater often passes through a basket strainer to take out material that should not go into a sewer or a waterway.
- Food industry: Strainers remove bits of pulp, skins or other unwanted matter from fruit juices. They remove lumps from chocolate syrup and wax from honey. The baking industry strains bone and gristle from molten lard with basket strainers and uses them to remove bits of dough, seeds, etc. From discharge water. Straining water allows it to be recycled and used for other purposes.
- Marine industry: Pipeline strainers are vital in handling seawater, which can contain a good deal of undesirable matter. Cooling lines, fire control lines, sanitary lines and general cleaning lines use strainers. Strainers also clean fuel, hydraulic and lubrication systems.

Pressure Drop

In order to calculate the pressure drop we need the pressure drop coefficient, which is related to the pressure drop with the following equation:

$$\Delta P = \xi * \frac{\rho v^2}{2}$$

In the above formula, ξ, ρ, v are the pressure drop coefficient fluid density and fluid velocity respectively. The pressure drop coefficient is dictated by the geometry and Reynolds number. The Reynolds number on perforated plates and wire mesh is as follows:

$$Re = \frac{\rho u d}{\mu}$$

In the above equation, u is fluid velocity inside wire mesh or perforated plate holes and μ is fluid viscosity. Also, in perforated plates and nets, d is the diameter of the holes and the thickness of the fibers constitute the wire mesh, respectively. After calculating the Reynolds number and using the appropriate formula, the pressure drop coefficient parameter is calculated and the pressure drop is calculated in this way. In perforated plates, the formula for calculating the pressure drop with respect to the Reynolds number is as follows:

$$\xi = \xi_{\varphi} + \varepsilon_0 \xi_{liquid}$$

$$\xi_{\varphi} = \left[18.78 - \frac{7.768}{f} + \frac{6.337}{f^2}\right] * \exp\{(-0.942 - 7.246f - 3.878f^2) log Re\}$$

And the pressure drop coefficient in the wire mesh is calculated according to the Reynolds number with the following equation:

$$\xi = 1.1 * \left(1.3 * (1 - f) + \left(\frac{1}{f} - 1\right)^2\right)$$

In all the above formulas, f means the percentage of free area of the mesh or perforated plate.

Selection of Suitable Strainer

Selecting a strainer is one of the essential aspects that you have to take with a lot of precision. When selecting the strainer, be keen to consider the following critical factors.

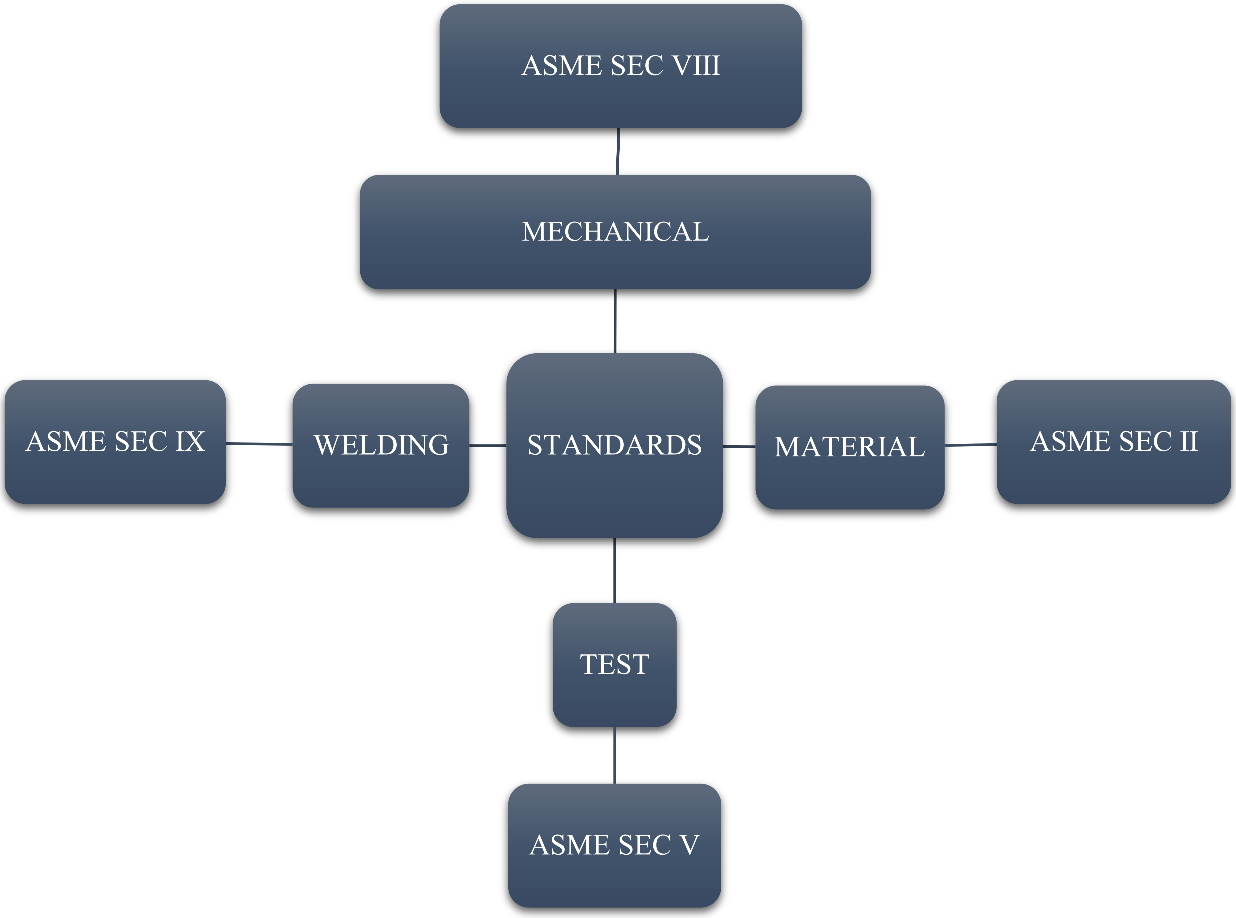
1. **Strainer Size:** Pipeline sizing is the normal requisite for selecting a strainer. However, on some applications such as pumped water systems the strainer should be sized by pressure drop. The strainer must be selected so that it is suitable for the maximum operation and design conditions of pressure and temperature. These values will influence the body material and end connections.

2. **Material:** The APADANA PETRO FARAYAND range of strainers are available in a wide range of materials. Certain fluids, due to their corrosive nature, will prohibit the use of some materials for specific applications.

3. **Geometry:** The design and layout of the pipework dictates the inlet and outlet geometry of the required strainer(s).

4. **Screen Type**:
    - Perforated strainer screen: These are relatively course strainer screens produced from sheet metal having multiple punched holes designed to remove general pipeline debris. The term perforation indicates the diameter of each hole.
    - Mesh strainer screen: These provide much finer screen protection for items such as control valves and pressure reducing valves where small orifices can become easily blocked.

STANDARDS



Knowledge is our difference…

We believe that investment on research and development is an essential component for long term success. Computational Fluid Dynamics is a reliable tool for design optimization, troubleshooting, and product development. Flow distribution is critical in all gas-liquid and liquid-liquid separation vessels. As vessel sizes are reduced or more capacity is expected from existing equipment, traditional design rules for vessel geometry and flow distribution must be reviewed for all elements that can affect separation performance such as flow velocity through inlet and outlet nozzles, spacing between nozzles, internals and liquid levels. CFD modeling is used by engineers at APADANA PETRO FARAYAND to simulate flow conditions and vessel geometry. The modeling provides a close approximation of the fluid flow profile inside the vessel.

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