ACME Fluid Systems

STRAINER SELECTION GUIDELINES

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Introduction

This document provides a general introduction to the parameters to be kept in mind while selecting a strainer. It is aimed at the selection of the strainer which is used in the general process industry (like oil and gas sector) rather than a specialized sector.

Strainers are different from the filters as they have a single barrier to the process stream and a fixed opening of close to 5mm Diameter perforated holes. Filters are made from thick fibrous material which provides a path to the process stream to flow through of varying, random apertures; the debris gets deposited and has to be cleared periodically.

The customer has to be thus very prudent while selecting a required strainer, a consultation from an expert always help.

Specific Requirement

While selecting any strainer following parameters should be kept in mind:

1. **Filtration Size**: The user or the industry expert should be aware about the maximum particle size that could be encountered in a process stream. Strainers with 25micron fine woven wire mesh to 10mm-D perforation sizes are available. The filtration size has to be very close to the debris size as a very large filter size can allow the escape of debris and hence can cause damage to the downstream equipment. A small filter size can cause an increase in maintenance required to clean the deposited debris on the strainers and also an increase in the pressure drop.

Mesh	Micron Rating	Gap Size(mm)	% open area
4	5000	5.0	65
6	3400	3.4	60
8	2600	2.6	58
10	2000	2.0	57
12	1600	1.6	54
14	1400	1.4	52

18	1000	1.0	51
20	930	0.93	50.2
24	750	0.75	50
30	570	0.57	46
40	440	0.4	48
60	250	0.25	35
80	190	0.19	34.5
100	150	0.15	36
150	98	0.098	34
200	77	0.077	36.7
300	45	0.045	27.8
400	36	0.036	31.25
500	26	0.026	25.79

Note: Gap size and micron rating is subject to mesh wire thickness. *Data is indicative only

2. **Solids Content**: It is important to ensure the solids content in the process flow stream. The user should ensure that the strainer size can easily accommodate the solids content present in the stream. When the solid content is expected to be very high then ACME duplex strainers should be used to make the process continuous and to ensure the easy cleaning of the strainers.

3. **Strainer Sizing**: Strainer Sizing is based on the potential volume of the dirt in addition to the line size. It should also be selected keeping in mind the maximum allowable pressure drop for the strainer. Wrong selection may create maintenance problems and pressure drop issues.

4. **Free Open Area Ratio**: Free Open Area for strainers refers to the amount of free open area of the strainer and basket/element.

   It is the ratio: $\frac{\textit{Open area through the strainer and basket}}{\textit{Cross Sectional Area of the Pipeline}}$

   An ideal strainer with a good design should have this ratio of at least 4:1. The ratio drops when there is a dirt clogging in the strainer which causes a pressure drop. A small free open area results in the holding capacity which may affect the amount of solids to be handled. All ACME Strainers have a large open area ratio.

5. **Maximum Allowable Pressure Drop**: It is important to understand the maximum pressure that the strainers would have to encounter due to the flow stream. The design of the strainer should not affect the performance of the downstream process equipment. Failure to do this can cause the Pump Cavitations as a result of insufficient pump head.

   To ensure the protection of the downstream equipment it is necessary to ensure the continuous monitoring of the pressure drop across the strainer. DP transmitters can be used to send alarm signals in case of an abnormal pressure head.

6. **Strainer Clean Pressure Drop**: Strainer size with respect to a particular application is important. It is essential to have pressure drop information for a particular strainer. It is necessary that the pressure drop through the strainer should not be more than 0.1 bar in the clean condition. Factors like Specific Gravity, Viscosity and Mesh Lining Size play a crucial role in judging the pressure drop through the unit and should be considered while selecting a strainer for a specific application.

7. **Design Pressure Drop across the Strainer Basket**: Strainer Housings are usually designed to withstand design pressure far in excess of their limits, but the baskets are not typically designed for a high pressure differential through them.

   The basket can collapse under high pressure condition. When the baskets are completely blocked the pressure differential that they can handle is considerably less than the rated strainer operating pressure. ACME Fluid Systems recommend its users to contact us if the basket is exposed to a pressure more than 0.5 bar pressure drop for any reason. Size of the basket is inversely proportional to the differential pressure it can handle. For high differential pressure heads ACME Fluid Systems has an expertise to design the customized baskets.

8. **Maximum Design Pressure/Temperature Range**: For a good design of the strainer it is important to provide the maximum design pressure and temperature range though it forms an essential part of the piping field but still holds an equal importance for the strainer.

9. **Materials**: Materials required for the strainer design usually finds a mention in the piping class. The element material should be of a better or a similar quality as compared to the body unless they are used for a temporary service only like Bathtub Strainer Element.

Simplex or Basket Strainer

Advantages	Disadvantages
1. Superior Filtration Area 2. Debris collection is away from the filtration stream 3. Excellent Volume Holding Capacity 4. Customized Design Available	1. Heavy Weight 2. Large Size 3. Large Cost 4. Isolation of the process is required prior to the cleaning of the element

Typical Size Range: 1 inch to 48 inch
Typical Pressure Class Range: 150# up to 300# for cast units
150# to 600# for Fabricated units

Features	Options
Large filtration area	Flanged end/butt weld end
Quick opening cover	Higher ANSI pressure rating
Low pressure drop	Steam jacketing
Compact size and weight	Magnetic basket inserts

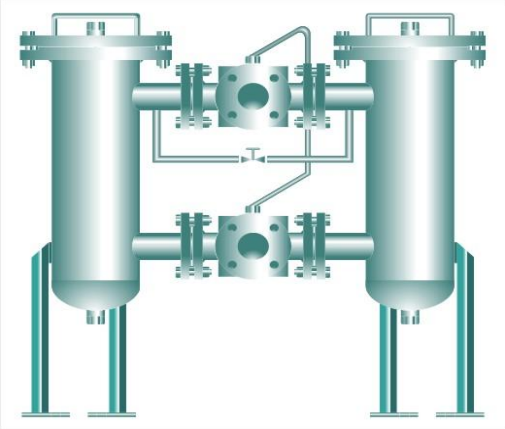
Basket Strainers are manufactured as cast, forged or fabricated units typically to piping or pressure vessel standards with a choice of different screwed or flanged connections. They are relatively larger than the Y-Type Strainers. The strainer element comes in the form of a removal basket which collects the dust debris away from the process stream. Basket strainers are well suited for the applications where high dirt loads are expected in a process stream as they have an effective filtration area.

Baskets are constructed from perforated plate with mesh provided as required to achieve even greater filtration capability. Basket strainers provide filtration from 10mm with perforated plate down to 25 microns with mesh inserts.

Proprietary design cast units are normally proven and tested to ASME B31.3. Pressure Vessel Standard such as PD 5500 or ASME VIII are adopted for the design, manufacturing and testing of the fabrication units.

Duplex Strainer

Advantages	Disadvantages
1. Superior Filtration Area 2. Customized Design Possible 3. Isolation of the Process Stream from the Debris Collection 4. Continuous Filtration during Basket Change-Out	1. Higher Cost 2. Large Size 3. Weight



Typical Size Range: 1 inch to 24 inch
Typical Size Range: 150# to 600# for fabricated units

Features
Continues flow-No shut down for basket cleaning Single lever operation for safety and simplicity Foot pads for rock solid installation Ball valve and Butterfly valve systems available

The duplex strainer has two basket strainers with a valve arrangement to provide a solution where the strainer basket can be removed and cleaned without shutting down the process. The process of switching is a manual however.

They are manufactured for low pressure applications as a cast unit with proprietary design and integral valve arrangements or can be manufactured with independent valves as a packaged arrangement for all pressure classes. Baskets are normally constructed with perforated plate with wire mesh necessary top provide higher filtration capabilities.

When the continuous filtration is necessary without shutting down the actual process, Duplex Strainers can be used. Designs normally follow ASME B31.3. Pressure Vessel Standard such as PD 5500 or ASME VIII is adopted for the design and manufacturing of the fabricated units. Duplex Strainers don't have a NORSOK standard

Y-Type Strainer

Advantages	Disadvantages
1. Low Cost 2. Low Weight 3. Compact 4. Effective Filtration Area 5. Debris are collected away from the process stream 6. Blow Down purging of the debris is possible in the middle of an operation through the drain connection.	1. Limited Dirt Holding Capacity 2. Isolation of the process required during the cleaning of the element

Typical Size Range: ½ inches to 14 inches for cast units
2 inches to 48n inches for fabricated units
Typical Pressure: Class Range: 150# to 2500#

Features	Options
Suitable for liquid, gas or steam Installed in either horizontal or vertical position Better degree of filtration No contamination between filtered and unfiltered liquids	Special finish/linings Higher ANSI pressure rating Differential pressure indicators Larger size available

Y –Type strainers are compact strainer solutions and can be manufactured as a cast, forged or fabricated units typically to the standards such as ASME B31.3 with a choice of different flanged connections typically butt weld, NPT etc.
They are well suited for protecting pumps and compressors as they can allow the strainers to collect a considerable amount of debris without affecting the pressure drops. The element is typical cylindrical and sits in the strainer such that any debris enters the element and is collected away from the process stream.

Y-Type strainers are usually constructed from a perforated plate with wire mesh welded in as required to provide greater filtration. They can provide filtration from 10mm with perforated plate down to 25 microns with mesh inserts.

T-Type Strainer

Advantages	Disadvantages
1. Low Cost 2. Low Weight 3. Compact	1. Debris Collection is in the path of the process stream 2. Isolation of the process required prior to the cleaning of the element 3. High Pressure Drop 4. Low Effective Filtration Area

Typical Size Range: 2inch to 24inch
Typical Pressure Class Range: 150inch to 2500inch

Features
Straight through flow design Quick opening cover Installed in either horizontal or vertical position Bigger size and ANSI ratings available

T-Type Strainers are used as a temporary strainer for commissioning or as a guard strainer protecting equipment against accidental debris in the process stream. Standard flanges and fittings, typically an equal tee and a weld neck flange/blind flange combination is used in its construction. The strainer element sits inside the tee and is designed to provide optimum free area.

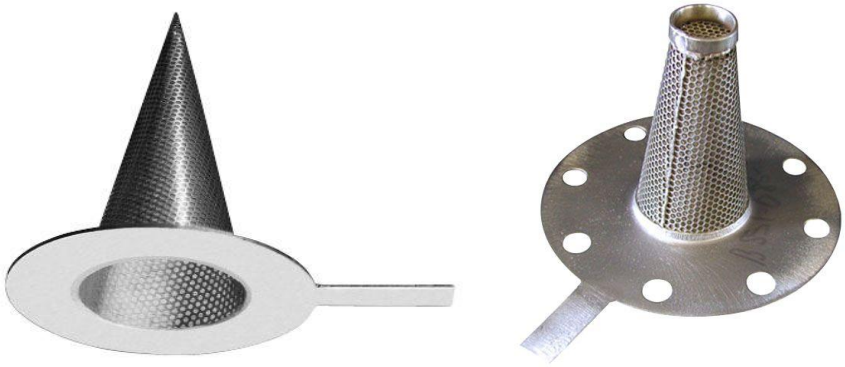
Perforated Plate with wire mesh is used in the construction of elements to provide even greater filtration capabilities. It can provide filtration from 10mm with perforated plate down to 25microns with mesh inserts.

It is not a recommended solution for the process streams with high dirt load due to the collection of debris in the strainer but ideal as a guard filter to protect against accidental debris in the process stream.

Temporary Strainers

Advantages	Disadvantages
1. Low cost 2. Compact 3. Low weight 4. Temporary	1. Low effective filtration area 2. High Pressure Drop 3. Debris collected in the path of process stream 4. Isolation of the process required prior to the cleaning of the element 5. Pipe Work to be broken to allow the strainer to be removed from the line

Typical Size Range: 1inch to 48inch
Typical Pressure Class Range: 150# to 600#



Feature: *Specially designed for filtration of unwanted accidental particles, for protection of fluid and gas handling equipments during commissioning of plant or during maintenance*.

The conical strainer is normally designed for the commissioning purpose where a low cost temporary strainer is required. It is normally installed between two flanges in a pipe spool allowing its removal after it serves the purpose. It has a cone shape construction having a perforated plate with welded mesh for the necessary filtration. Strainer is supported by a ring between the flanges and operation is identified by a tag when the strainer is installed.

The strainer should be installed with the flow travelling outside into the conical strainer as all the debris collect in the process stream and can cause blockage problems resulting in a drop in the pressure as the filtration area reduces. It is not an ideal selection for the streams with high dirt load but ideal as a guard filter for any accidental debris.

Bag Filter Housings

Typical Size Range: 4inch to 32inch

Features
Highly durable SS316/304 material Positive sealing arrangement to avoid bypassing Lower pressure drop and high flow rates Multiple bag filter/duplex bag filter unit designs available

Bag filter is designed for optimum filtration performance. They can be used for a wide variety of processing industry. Filtration of a large volume of a high viscous fluid is best done with the ACME Bag Filter Housing. Bag filter is constructed of filter housing, filter bags, internal cage to support bags, positive sealing arrangement and choice of end connections. The Bag filter has an internal support which protects the bag from bursting in case of a high differential pressure during an operation.

Filtrations through a bag filter take from inside to outside. Solids are collected on the inside of filter bag for easy removal. The filtered fluid then exits through the outlet pipe.