



CULINARY & PROCESS STEAM

Process Filtration



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Similar to compressed air, steam is often thought of as another utility—both are often used to transfer energy, and both are often generated at a central location and then distributed to various points-of-use throughout the facility. Depending on the intended use, and whether or not they come into contact with the final product itself, both will require filtration in order to prevent contaminating their process. The intended use is what drives the choice between these two utilities. When it comes to the transfer of energy, steam provides some unique characteristics which include, but are not limited to, the following:

STEAM...

- has the ability to hold a great deal of energy, stored as heat, in a given volume.
- gives up its heat energy at a constant temperature, eliminating heat gradients associated with other forms of energy transfer.
- has a high rate of heat transfer, allowing for smaller heat transfer surface areas.

INDUSTRIES

Food & Beverage
Pharmaceutical
Chemicals
Metal Processing
Pulp & Paper
Power Generation
Rubber & Plastics
Automotive

APPLICATIONS

Sterilizing
Cooking
Cleaning
Drying
Curing
Temperature Control



TYPES OF STEAM

PROCESS STEAM

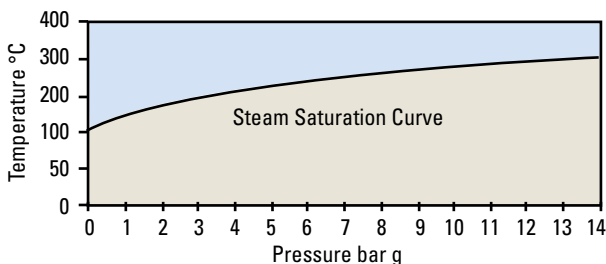
General term for steam used in process applications as a source of energy for process heating, pressure control and mechanical drives among others. Process steam may come into contact with the final product or process.

CULINARY STEAM

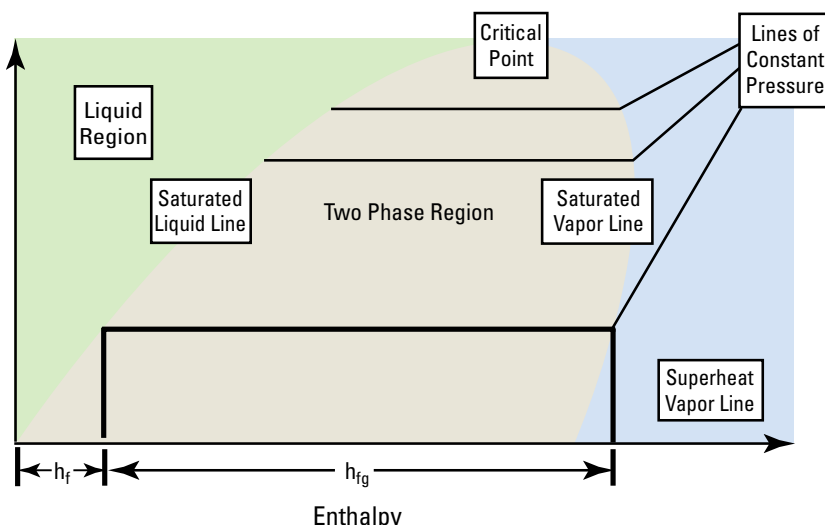
Refers specifically to steam used in food processing. This type of steam is required to meet 3-A Sanitary Standards and 3-A Accepted Practices for dairy and food processing. Culinary steam can, and often does, come into direct contact with the final product.

SATURATED STEAM

Steam is said to be "saturated" with energy at a given and constant pressure when the addition of more heat to the generation system results in more steam, but no rise in steam temperature. In this state, the steam cannot hold more heat energy in a given volume unless pressure is allowed to rise.



TEMPERATURE ENTHALPY PHASE DIAGRAM



DRY STEAM

Steam that consists of 100% water vapor in the gas phase.

DRY SATURATED STEAM

Achieving the above states of dry and saturated steam simultaneously is possible in theory. It is nearly impossible in practice when systems are optimized for generating saturated steam. The actual level achieved is measured as the "dryness fraction."

SUPERHEATED STEAM

When more heat energy is added to steam that has reached saturation, and no liquid water is present to consume that energy through evaporation, the temperature of the steam will rise. In this condition, steam is said to be "superheated."

CIP

Clean In Place (CIP) is the process of cleaning equipment where it is installed as opposed to taking it out of service and to a remote location.

SIP

Sterilize In Place (SIP) is similar to CIP, but with the goal of sterilizing the hardware where it is installed without disassembly.

FILTER ELEMENTS

P-GS – SINTERED STAINLESS STEEL

Improving the quality of steam used for filter sterilization ensures longer service life of those filters. When steam is used in culinary and other food applications such as cooking, sterilization and packaging, purifying that steam is essential to maintain integrity of the product and associated equipment.



- Absolute particulate retention rates of 1 µm, 5 µm and 25 µm
- Filter media is sintered 316L stainless steel with >50% porosity to ensure high dirt holding capacity and low pressure drop
- Can withstand a differential pressure of 5.2 bar (75 psi)
- Regenerable in an ultrasonic bath
- Meets U.S. FDA, CFR Title 21 and 1935/2004/EC requirements for food and beverage
- Recommended with P-EG and PG-EG housings

P-GSL N – STAINLESS STEEL

The Donaldson P-GSL N offers high dirt holding capacity combined with low differential pressure for a wide variety of applications in a highly durable, all stainless steel filter element. The P-GSL N is an ideal solution for low pressure steam.



- Absolute retention rates at 1 to 250 µm in steam
- 100% stainless steel construction
- Approved for Food Contact according to U.S. FDA, CFR Title 21 & 1935/2004/EC
- Contains no binders, adhesives, additives, or surfactants
- Regenerable by back-flushing or ultrasonication
- Withstands differential pressure up to 5.2 bar (75 psi)
- Recommended with P-EG and PG-EG housings

FILTER HOUSINGS

P-EG GAS & STEAM FILTER HOUSING

An economical solution when filtering air, gases or steam.



- Available in 304 or 316L stainless steel
- 18 sizes in flow capacities from 59 to 22,087 m³/hr (35 to 13,000 scfm)
- Low differential pressure at high flow rates
- Inner surface:
 - Models 0006 – 0288, pickled and passivated to 1.6 Ra µm (63 Ra µin)
 - Models 0432 – 1920, bead blast
- Outer surface finish:
 - Models 0006 – 0288, pickled, passivated and polished to 1.6 Ra µm (63 Ra µin)
 - Models 0432 – 1920, bead blast
- NPT & ANSI connections (alternative connections available upon request)

PG-EG SANITARY GAS & STEAM FILTER HOUSING

The PG-EG sanitary filter housing is designed for the purification of compressed air or technical gases in sanitary and hygienic applications.



- 3-A certification for Models 0006 - 0192
- Available in 304 or 316L stainless steel
- 12 sizes in flow capacities from 59 to 22,087 m³/hr (35 to 13,000 scfm)
- Low differential pressure at high flow rates
- Inner & Outer Surface:
 - Models 0006 – 0192, Electropolished to to 0.8 Ra µm (32 Ra µin)
 - Models 0432 – 1920, Nitric passivated to 0.8 Ra µm (32 Ra µin)
- Connections:
 - Models 0006 – 0192, Tri-Clamp (alternate connections available upon request)
 - Models 0432 – 1920, ANSI flange connection

SIZING & SELECTION GUIDELINES

Proper sizing and component selection of a steam filtration system is essential to assuring that your application is operating as effectively and efficiently as possible. The following are some general guidelines, but additional sizing and selection tools are available to better optimize product selection to your specific needs.

HOUSINGS

Donaldson P-EG NPT housing in 304 SS is suitable for process steam filtration applications. In applications or installations where chemical corrosion is a concern, 316L SS as the material of construction is advisable.

For culinary steam, food contact and other sanitary applications the PG-EG Sanitary Grade, 3-A certified housing is used. 304 SS is also suitable for most applications, but 316L is often selected due to its higher resistance to corrosion.

SIZING

Properly sizing a steam filter system will depend on a number of variables, which include:

- Flow rate
- Pressure and temperature
- Element micron rating
- Acceptable pressure drop across filtration system

ELEMENTS

The Donaldson P-GS steam filter element is available in a number of different rated micron sizes. For culinary steam applications, the 5 micron element exceeds the 3-A requirement of 2 micron at 95% efficiency. The micron rating selection for other applications will depend on the challenge rate, size of particles to be filtered, and the purity requirements of the downstream process using the filtered steam.

If the challenge is high in terms of particle count and/or size, use of a P-GSL N prefilter is advised. Both the P-GSL N and P-GS elements can be regenerated, and a combination of both as prefilter and after-filter will assure the most reliable and economic installation.

CLEAN STEAM

In many applications, steam comes into contact with the product itself. For example, direct injection of steam into large vats of processed foods is one method used to cook food. In other cases, steam is used to clean or sterilize surfaces, tools and containers used in processing and packaging. In all cases, steam is being generated and distributed in piping systems, and these often end in small orifices or nozzles that can be easily fouled by contaminants in the steam.

Filtration of steam is essential to avoid product contamination and equipment downtime. Particulate contaminants found in steam can include rust, scale, dirt and sediments carried over from the water source.

CAPACITIES & GUIDELINES

REGENERATION GUIDELINES

Both Donaldson P-GS and P-GSL N filter elements can be regenerated using a number of different techniques. In general, the more frequently an element is cleaned, the better the regeneration. The following is some general background on methods of filter regeneration.

COUNTER-FLOW

The filter media can be washed with either clean liquid or clean gas in a reverse, or counter-flow, cycle. Pulsing the flow to loosen attached particles can enhance cleaning. This method is excellent when retained particles are on the surface of the media rather than penetrated deeper into the media pores. Use of a wire or nylon brush can also enhance this method of cleaning.

SOLVENT CLEANING

In some cases, oil and other contaminants in the steam cause particles to be retained on or within the filter media. Detergents and/or solvent cleaning might be required in these instances, not only to remove the oil or oil-like contaminants, but to release particles as well.

ULTRASONIC CLEANING

The most thorough regeneration can be achieved using ultrasonic cleaning. In this method, filter elements are immersed in a solvent or water bath in which ultrasonic vibrations loosen and remove particles embedded in the media. Regeneration leaves elements close to their original state.

HOUSING CAPACITIES*

Model Number	Steam Capacity (kg/hr)	Steam Capacity (lbs/hr)	Model Number	Steam Capacity (kg/hr)	Steam Capacity (lbs/hr)
P-EG 0006	45	100	PG-EG 0006	45	100
P-EG 0009	68	150	PG-EG 0018	73	160
P-EG 0012	79	175	PG-EG 0032	181	400
P-EG 0018	102	225	PG-EG 0072	363	800
P-EG 0027	136	300	PG-EG 0144	816	1,800
P-EG 0036	195	430	PG-EG 0192	1134	2,500
P-EG 0048	277	610	PG-EG 0432	2041	4,500
P-EG 0072	363	800	PG-EG 0576	2654	5,850
P-EG 0108	488	1,075	PG-EG 0768	4173	9,200
P-EG 0144	748	1,650	PG-EG 1152	5443	12,000
P-EG 0192	930	2,050	PG-EG 1536	6759	14,900
P-EG 0288	1148	2,530	PG-EG 1920	7756	17,100
P-EG 0432	2041	4,500			
P-EG 0576	2654	5,850			
P-EG 0768	4173	9,200			
P-EG 1152	5443	12,000			
P-EG 1536	6759	14,900			
P-EG 1920	7756	17,100			

* Assumptions – Pressure 3.4 bar (50 psig)



SUPPORTING PROCESS AND PRODUCT INTEGRITY

Extensive Product Portfolio

- Process air, steam and liquid filtration products
- Performance engineered to sanitary guidelines
- Wide range of filtration media for any application
- Housings, elements, and parts in-stock, ready to ship

Advanced Technology

- Optimized filtration performance and efficiency
- Extensive research and development capabilities
- Advanced design and testing capabilities
- Over 1,000 engineers and scientists worldwide

Unrivalled Support and Expertise

- Expert technical specialists available as resource
- Comprehensive pre- and post-sale support
- Extensive filter analysis and trouble-shooting
- 100 years of successful global manufacturing



Registered



Standard No. 10-04*



Member of



Member of



Member of



Important Notice

Many factors beyond the control of Donaldson can affect the use and performance of Donaldson products in a particular application, including the conditions under which the product is used. Since these factors are uniquely within the user's knowledge and control, it is essential the user evaluate the products to determine whether the product is fit for the particular purpose and suitable for the user's application. All products, specifications, availability and data are subject to change without notice, and may vary by region or country.



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