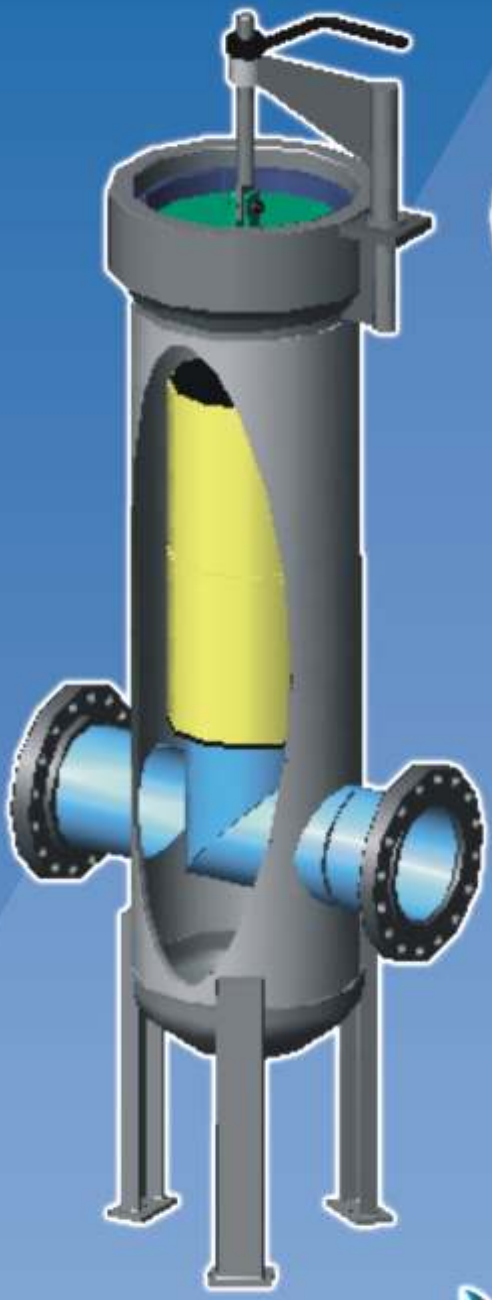
Natural Gas Filter Technology



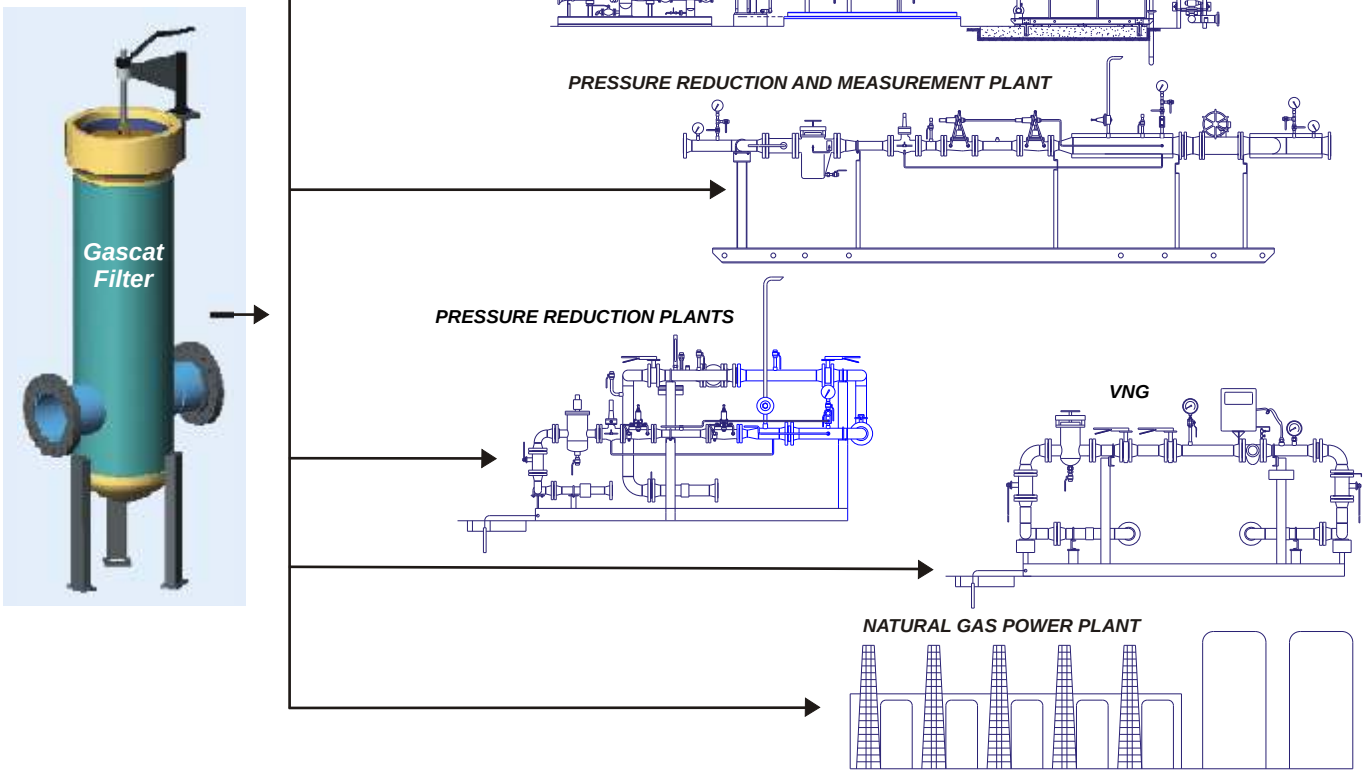
- Separator Filters
- Vertical and Horizontal Coalescent Filters
- Single and Combined Cyclone Filters
- Filtering Elements
- Pressure Classes 150/300/600 and 900
- Quick Opening - (QOC)

GASCAT

Typical ApPLICAtions

- **Compressor Protection**
- **Gas Turbine Protection** - Prevents corrosion, erosion and inner walls scaling.
- **Compressor Discharge** - Removes submicronic solids and lubricants from the gas stream.
- **Pressure Reduction Plants (ERPM)** - Protects the plant as well as the measuring and control equipment, besides ensuring gas quality.
- **Drying Columns and Molecular Sieves** - Protects the desiccants and the screen beds from compressor-generated contaminants, such as: lubricants, glycol and amines.
- **Gas Heater Protection (Gascat exclusivity)** - Attenuates piping wear improving thermal exchange due to nonexistence of oils and other contaminants, offering total protection to burner nozzles.

APpLICAtions

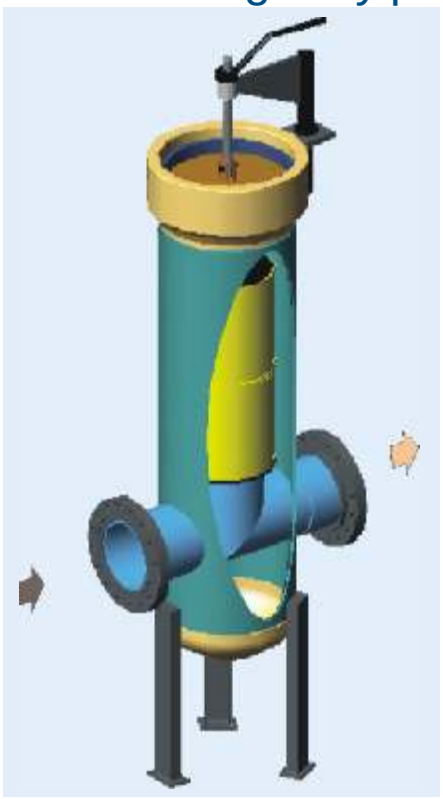


Main advantages of gascat filters

- Quick closure/opening system to allow easy filter access.
- Designed and manufactured to be used with **natural gas** only.
- Equipment manufactured at Gascat, with ISO 9000 certification.
- Standard dimensions, allowing for the replacement of installed filters.
- Filtering elements stored for immediate replacement.
- Filtering media with 304/316 stainless steel, cellulose and other pieces upon request.
- Stainless steel, washable filtering elements may be supplied as an option, or to be used under larger pressure loss.
- Gascat has 22 years' experience in manufacture and installation of natural gas industry equipment.
- Servicing throughout Brazil, including expert engineers and technicians.
- Training Center available to qualify and train our equipment users.

Design and Assembly Details	
• Designed and assembled accordingly ASME VIII Div. I	• 150, 300, 600 e 900# pressure (higher upon request)
• 1 a 20 " connections (larger upon request)	• 4.000.000m³/day f lows @ 1atm and 20ºC (larger upon request)
• Material, as per ASTM	• 1 micron minimum rate filtering level
• Filter Quick Opening/Closure System	• Finite element analysis stress (FEA)
• Metallic filtering elements (Upon request)	

Cartridge type separator filters



The cartridge or basket type separator filter with a filtering grade 3, 5, 10, 20 micra or larger, using cellulose membrane and phenolic resin or steel screen (pressure over 600#) as the filtering media is largely applied in solid/gas separation, preventing and retaining gas flow fines. Such abrasive particles (corrosion, scaling, silica, sulfites, etc) cause irreversible damages to compressors, turbines, meters, regulators and piping.

The pleated cellulose membrane has a large filtering area, which allows longer life to the filtering media, greater solid retention capacity and, therefore, offers the customer saving advantages.

The filters are built in carbon steel, classified as per ASME/ASTM, and include internal partitions that keep dirt from falling into the discharge pipe upon changing the filtering element. The mobile inner pieces are SS 304 made, corrosion resistant, which ensures total chemical and mechanical compatibility for natural gas applications.

The filter and filtering element designs are compliant to applicable non-turbulent flow, therefore, the discharge loss is minimum, not interfering in the other equipment placed after the filter.

The filtering media are 100% Brazilian made and available to regular supply, allowing for quick response to customer needs, preventing heavy and useless replacement inventories.

Metallic screen filtering elements supporting larger pressure loss, washable, can be assembled upon request to our engineering department.

Cyclone type separator filters

Single and combined

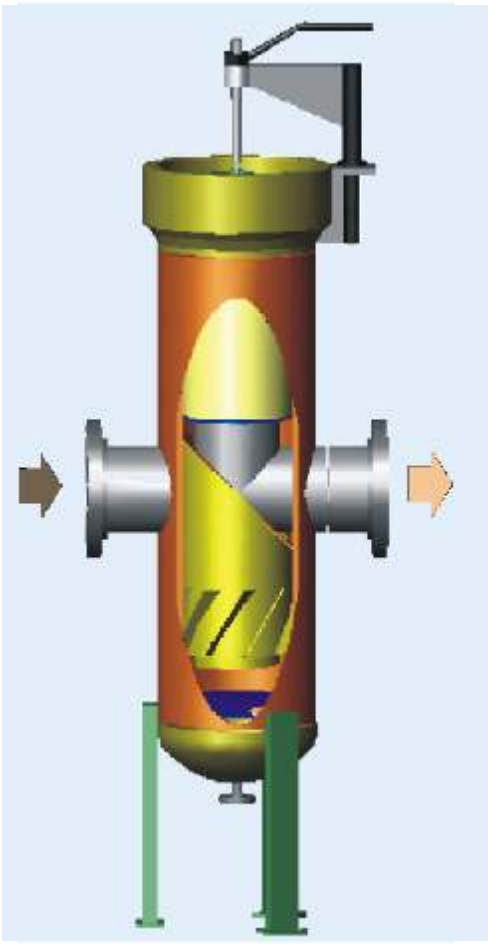
Cyclone filters work under a centrifugal system and are specifically indicated and designed for separation of solids and liquids found in large concentrations in gas flows.

Cyclones design and construction ensure solid and liquid filtering with a high retention level and effective drainage for gases with high contaminant contents. The filter application ensures a gas flow free of solid and liquid particles, which usually cause serious damages to gas equipment, in addition to damaging piping as well as other metering and controlling equipment.

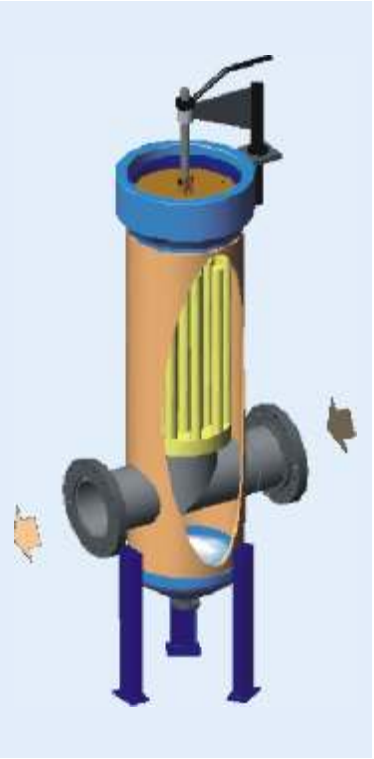
The single cyclone filters are highly efficient to control particles over 10 micra, however, in some applications the need arises for smaller particle retention, and for this kind of application Gascat has developed a line that matches, in one single housing, cyclone filtering and then finer filtering with micronic or coalescent elements, providing a solid and liquid-free gas.

The combination of these filters allows for smaller facilities and saves time during stoppage and servicing operations. The single cyclone filter elements do not need to be changed or cleaned, as they are designed and built in one single welded and fixed structure, allowing for a simple, safe and cost-effective operation.

Meters, liquid level gauges, pressure valves and switches as well as other fixtures may be supplied upon demand.



Coalescent filters
Horizontal and vertical



Natural gas, during the production, transportation and distribution processes, besides containing solids circulating in the flow, also has liquids in several phases, which also cause equipment damages.

Such liquid contaminants are lubricant oil, water, condensed material, amines, glycol, corrosion inhibitors and/or a mix of these products.

Retention or separation of fine liquids and solids contained in natural gas requires a specific technology matching inertial impactation processes, when the flow direction changes due to barriers resulting from the filtering element or filter geometry, and diffusional interception, which retains and glues liquid particles, to later separate them by gravity.

The filter and element drainage speed control optimizes the filter and separation efficiency.

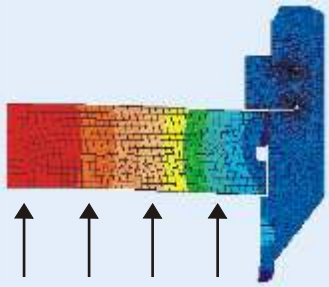
The horizontal and vertical Gascat coalescent filters have filtering elements that gather the above-mentioned techniques, allowing for great operation functionality, and include design details that enable quick and complete drainage of the coalesced contaminants.

The perfect balance among filter size, element number, element type and drainage speed will enable filtering of 99.98% of the particles greater than 1 micron.

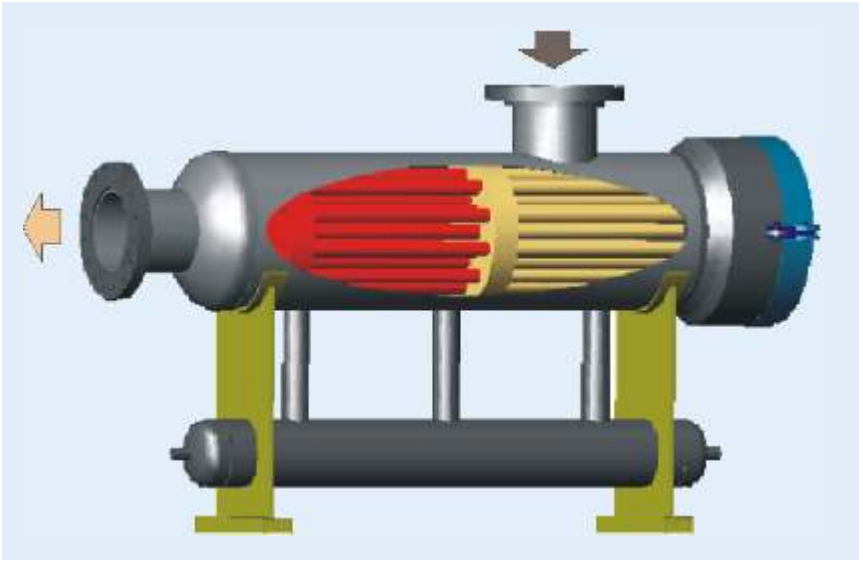
The quick opening system, requiring one single operator, allows for easy servicing, offering significant savings in stoppages for cleaning and replacement of the filtering elements.

The equipment may be supplied with instruments, meters, gauges and valves, which will ensure a fully automated and safe liquid drainage.

Detail of the quick opening cap cross-section



Color grading representing the stresses found in the finite element analysis.



Significant data for adequate filter choice and dimensions	
• Working pressure (min. e máx.)	• Gas x Flow (min. e máx.)
• Working Temperature (min. e máx.)	• Design pressure
• Design temperature	• Types of contaminants
• Contaminant amount and size	• Corrosion thickness required
• Specific assembly or operation details	• Applicable standards

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