Natural Gas Filtration
Filter Media Overview
European Market
Natural Gas Filtration

Parker Finite media is long established for use in the Natural Gas market and may be used in the filtering of natural gas in production, treatment, pipeline and distribution processes. Parker can provide a positive impact on efficiencies in each of these processes.

Parker Finite elements are available in a wide range of sizes but this brochure will focus and review element sizes common to the Natural Gas market with an emphasis towards filter elements used in large flow applications.

Parker Finite can also assist in supplying filter elements in sizes to suit custom built vessels. Dimensions of filter elements that differ from the ‘Standard’ offering are available from Parker. These are available in a range of configurations, custom built to meet individual application requirements.

This brochure will provide an overview to the standard Parker Finite filter media in the Natural Gas market.

To review the full technical product specification of Parker Finite media please review document S3.2.467 – Finite Filter Media Overview.

Finite® Media - High Flow Applications

Parker offers a range of high efficiency filtration media to suit almost any gas filtration application. From removal of bulk water with steel mesh separating media to 99.995% efficient glass micro-fibre coalescing elements, Parker has the capability to deliver solutions tailor made to your process requirements.

Media type 7CVP
Air Flow: Inside to Outside
Parker’s 7CVP media consists of two layers. The outer layer consists of a dense matrix of glass fibres. This coalescing layer provides highly efficient aerosol removal and very low pressure drop. The inner layer effectively traps dirt particles, protecting and extending the life of the outer layer. A metal retainer in this element is used for strength and stability. This media is used in bulk coalescing applications and when relatively high efficiency and low pressure drop are required.

Media type C/Q
Air Flow: Inside to Outside
This coalescing element is composed of an outer layer epoxy saturated, borosilicate glass micro fibre tube. Type Q has a pleated cellulose inner layer as a built-in prefilter. This element is metal retained for added strength and includes a synthetic fabric safety layer.
Grade 6 filters are used when “total removal of liquid aerosols and suspended fines” is required. Due to its overall performance characteristics, this grade is most often recommended.
Grade 10 filters are used as prefilters for grade 6 to remove gross amounts of liquid aerosols or tenacious aerosols which are difficult to drain.

Media type ME
Air Flow: Inside to Outside
Parker’s Mist Eliminator media is similar in design and construction to the 7CVP media. The Finite ME element maintains its high efficiency rating even at low flow rates, allowing the user to specify Finite housings that are oversized for the application, greatly extending the life of the element. Due to the stainless steel components used in the ME element, it is ideally suited for long life service or corrosive environments.
Media type 100WS
Air Flow: Inside to Outside
This rolled stainless steel mesh element has two retainers with rolled mesh steel in between. It is an extremely robust design. This media is used for the reduction and elimination of excess liquids in gas streams. Excellent pre-filtration for coalescing grades 6 and 10 when extreme quantities of liquid contaminant are present.

Media type A
Air Flow: Outside to Inside
This hydrocarbon vapour removal consists of ultrafine grained, highly concentrated, activated carbon sheet media. It is metal retained for added strength and includes an outer synthetic fabric layer. This media is used to remove vapour and particulate fines down to 3 micron in diameter.

Media type 3P
Air Flow: Outside to Inside
3P Particulate interceptor elements are used where very high dirt holding capacity and relatively fine pore structure are required. This pleated element is constructed of pleated cellulose with a 3 micron rating.

Note: In order to hold elements in place within your chosen housing/vessel, a special tie-rod and retainer are required. These items are available as part of the kit: KV-2SA

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<th>Coalescing Efficiency 0.3 to 0.6 µ particles</th>
<th>Max. oil carryover(1) ppm</th>
<th>Micron rating</th>
<th>Pressure Drop (bar) @ Rated Flow(2)</th>
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<td></td>
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<td></td>
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Why Filter Natural Gas?

Natural gas consumption in Europe accounts for about 20% of the world total.

New developments and improvements are constantly being made to increase the use of this clean burning, efficient fuel.

Natural gas comes from underground, and thousands of kilometres of pipeline exist in Europe to transport the gas. Compressor stations located along the length of pipeline move the gas from the wellhead to consumer distribution points. However, the raw gas from the ground requires processing and refining before it is ready for use.

The installation of Parker filters makes it possible to improve process efficiency and provide optimal process protection. The rigid, graded-density structure of Parker filter products efficiently removes solids and contaminants that would quickly plug competitive filters. Details of these products are discussed in the following application and product overview.

The figure below identifies the stages of natural gas processing and distribution. Parker can provide a positive impact on efficiencies in each of these processes.

Gas Production Flow Process

Production
Natural gas comes from the ground. Once a gas site has been identified, a well is drilled and the gas is extracted from the ground.

Treatment
Raw natural gas exists in mixtures with other hydrocarbons, water vapour, and acid gas, along with other contaminants, and must be treated prior to transport.

Pipeline
Natural gas is transported to high demand areas via an elaborate network of pipelines, and is sometimes stored when it is not required.

Distribution
Pipeline quality natural gas is ready to be delivered to consumers for use in homes and businesses.

Specific Applications

The above flow process shows how natural gas is taken from the production point to the final user. Some other natural gas applications are also outlined in this brochure.

Landfill Gas Filtration (page 7)
Landfill waste decomposes and produces landfill gas. This gas consists mainly of methane and carbon dioxide. Landfill gas is naturally dirty and contains particulate and moisture. Filtration of the collected gas entering into a compressor will eliminate contaminants that would otherwise damage downstream equipment.

Digester Gas (page 7)
Production of digester gas involves converting animal and food processing waste into digester gas, bio gas. The resultant gas will contain impurities such as water, condensed gas liquids and hydrocarbons that must be removed prior to transport for use or storage.

Fuels – Dispensing and On Board Applications (page 8)
With over 6 million CNG vehicles and 7,500 fill stations in use globally, the prevention of solid and liquid contamination from damaging CNG fuel dispensing systems and CNG vehicles is vital. The installation of Parker filters in these processes can provide an increase in the efficiencies for CNG market distributions.
Natural Gas Production

The Application
Once a natural gas well has been drilled, the gas is extracted from the ground via natural pressure and sent through a compressor prior to treatment.

The Problem
Raw natural gas, as it exists underground, contains liquid slugs, hydrogen sulphide, oil and other contaminants the wells from which the gas is extracted are dirty. Sometimes these wells are also treated with acids or gases to promote movement of the gas to the surface. Common problems include:

• Compressor fouling
• Fouling of gas treatment processes
• Equipment corrosion
• Unnecessary maintenance due to lack of filtration

The Solution
Two-stage coalescing prior to the gas entering the compressor should take care of any solids and liquids that could damage it. A coalescing filter placed after the compressor skid will eliminate compressor lube oil from the exiting gas before it is sent out for treatment.

Amine Sweetening

The Application
In a natural gas treatment facility, a process referred to as ‘sweetening’ occurs in which amines are used to remove acid gas (mainly hydrogen sulphide and carbon dioxide) from inlet gas streams. Natural gas is fed into a contactor tower where it contacts the amine ‘sweet’ gas then makes its way through a carbon bed to remove trace hydrocarbons before entering a stripper section.

The Problem
Contaminants include condensed gas liquids at the inlet, pipeline solids and dirt, amine carryover and liquid slugs, all of which contribute to:

• Contact tower foaming and fouling, resulting in less acid gas being adsorbed and amine migrating downstream
• Carbon bed fouling
• High maintenance costs due to makeup solvent, equipment repair and replacement
• Increased energy usage

The Solution
Filtration of the incoming natural gas will eliminate bulk liquids and solids prior to entering the amine sweetening process, reducing amine foaming and carryover. A coalescer should be placed downstream of the contactor tower to remove entrained amine solvent before it reaches the carbon bed. Downstream of this bed, a particulate filter will prevent carbon fines from migrating back into the gas stream.
Desiccant Dehydration

The Application
Desiccant dehydration is the primary form of natural gas ‘drying’. Wet gas enters and passes through the desiccant, where the water is adsorbed and retained and the gas exits. Two or more towers filled with a solid desiccant such as silica gel or molecular sieve, can usually be found in the system so that as the desiccant in one tower becomes saturated with water, it can be shut down and the desiccant regenerated while another tower is on-line.

The Problem
Contaminants that cannot be removed by desiccant, such as compressor lube oils (entering the system through regeneration), liquid hydrocarbons, corrosion related solids and amines will cause:
- Decreased water holding capacity of desiccant due to pore plugging
- Release of trace desiccant
- Compressor fouling
- Corrosion of downstream equipment resulting in increased costs

The Solution
Installing coalescers upstream and a filter downstream of the desiccant beds will prevent unwanted solid and liquid contaminants from interfering with desiccant adsorption.

Glycol Dehydration

The Application
Glycol dehydration is an adsorption process in which glycol, a liquid solvent, is used to remove water vapour from natural gas. Glycol is brought into contact with the wet gas stream in a contactor tower, and then dry natural gas is transported out of the tower and into a carbon bed to remove hydrocarbons from the gas before further processing.

The Problem
Solid and liquid contaminants in the wet natural gas cause or contribute to:
- Glycol foaming in the contactor tower, resulting in less water vapour being adsorbed
- Carbon bed fouling and downstream equipment failure
- Product that does not meet specification
- Increased maintenance costs and energy usage

The Solution
Two-stage coalescing for removal of liquids and particles prior to the wet natural gas entering the contactor tower will prevent foaming and downstream equipment failure. A filter upstream of the carbon bed will help to extend its life and a particulate filter downstream of the unit will remove carbon fines and further protect downstream equipment.
**Fuel Gas**

**The Application**
Pipeline and/or stored natural gas is sent through a compressor and heated, preparing it for use as a fuel gas. This gas supplies the energy needed to operate heavy duty machinery and various tools employed throughout a factory.

**Note:** The 2 pre-filter stages shown in the diagram, right, are optional, depending on the source of the gas. For dryer gases, only 1 stage may be required (Grade 6 or 7CVP media).

**The Problem**
In general, pipeline natural gas does not receive adequate filtration prior to entering a factory for use as fuel gas. This gas can contain solids such as sand, clay and iron; condensed gas liquids, water vapour and additives such as odourisers and corrosion inhibitors used in the gas pipeline, leading to:

- Compressor and burner fouling
- Instrument wear
- Frequent maintenance and repair

**The Solution**
Two stage filtration of the feed gas prior to entering the compressor station will eliminate any solids and liquids that could otherwise contribute to compressor failure.

A coalescing filter should be used after compression to eliminate compressor lube oil prior to the gas being introduced into the rest of the factory.

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**Compressor Booster Station**

**The Application**
As natural gas flows through a pipeline, it loses pressure due to friction against the inside of the pipe. The gas needs pressure to continue moving. Compressor booster stations located along the pipelines keep the pressure high enough to allow the gas to flow. Additionally, these lines are subject to periodic pigging (cleaning) processes which can dislodge solid and liquid contaminants that have accumulated over time.

**The Problem**
Natural gas traveling the length of a pipeline can pick up contaminants such as pipe scale, compressor lube oil, water and chemicals used to reduce pipe corrosion, causing:

- Compressor and burner fouling
- Instrument wear
- Increased pipeline maintenance
- Significant decrease in gas flow

**The Solution**
Sending the natural gas through Parker’s 10C or 100WS media prior to entering the compressor station will eliminate any solids and liquids that would otherwise contribute to compressor failure.

A coalescing filter should be used after compression to eliminate compressor lube oil prior to the gas being introduced back into the pipeline.
Landfill Gas Filtration

The Application
Landfill waste decomposes and produces what is known as landfill gas. This gas is composed mainly of methane and carbon dioxide, with small amounts of other gases, organic (non-methane) and inorganic compounds. Landfill gas has proven to be a reliable energy source for both industrial and residential use, and its conversion reduces greenhouse gas emissions, pollution and energy costs. Landfill gas is collected in underground wells, brought to the surface and compressed before being sent out for resale and delivery.

The Problem
Landfills are naturally dirty and retain particulate and moisture. Temperature changes increase the amount of condensate at both the heat exchanger outlet and gas collection point. Inadequate filtration of produced gas will lead to:
- **System compressor damage**
- **Heat exchanger fouling**
- **Unpleasant odours**
- **Safety hazards and other problems at energy usage sites**

The Solution
Filtration of collected landfill gas entering into the compressor will eliminate particles, liquid slugs and aerosols that could otherwise damage downstream equipment. A coalescer should be placed upstream of the heat exchanger to collect any compressor lube oil and condensed liquids.

![Diagram of Landfill Gas Filtration](image)

Note: See diagram, left. This application may require an additional pre-filter stage (Grade 10 or 100WS), depending on the source of the gas.

Digester Gas

The Application
Anaerobic digestion involves converting organic materials such as animal waste into what is known as digester gas or bio-gas. The waste material is put into an airtight container called a digester, where temperature, pH levels and the amount of time spent in the container are closely monitored. The waste is then decomposed and broken down into smaller molecules. The decomposed matter is converted to organic acids. Finally the acids are converted to digester gas. The gas can then be used as an energy source for various process components such as engines and turbines, or stored for future use.

The Problem
Once waste material has been placed in the digester, mixed and converted to gas, the resultant gas will contain impurities generated by and left from the actual digestion process. These include water, condensed gas liquids, hydrocarbons and acid gas that must be removed prior to transport for use or storage. Unfiltered gas will lead to:
- **Compressor damage**
- **Fouling of gas scrubbers, valves and other instrumentation equipment**

The Solution
The gas coming off the digester should be filtered prior to entering a gas receiver to eliminate contaminants generated by digestion. Gas leaving treatment should be filtered to remove any liquids carried over from the process. A coalescing filter is also recommended after compression to get rid of any compressor oils that may be transported downstream.

![Diagram of Digester Gas Filtration](image)
Fuels - On Board Applications

The Application
Efficient operation of a CNG vehicle requires protection of the fuel system to prevent premature failing of the fuel injectors and precision components. The gas is dispensed from the filling station to the vehicle fuel tank, finally entering the fuel injection system.

The Problem
Contaminants such as lube oil carryover from compressors, condensed liquids in fuel tanks and solids buildup during gas handling contributes to:
- System downtime
- Component repair and failure
- Increased maintenance costs

The Solution
Filtration is the key to guarding against damaging contaminants that could ruin the fuel system. Installing a coalescer upstream of the high pressure regulator extends the system’s life and reduces maintenance costs. A low pressure filter can also be used downstream of the regulator to protect other fuel injection system components.

Legislation – ECE R110
ECE R110 is a European standard for on-highway gas engine components and required for all engine components intended to come in contact with natural gas. Parker Finite has compliance to this directive.
At Parker, we’re guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 0800 27 27 5374