aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

# Natural Gas Solutions

Applications, Features, Specifications

Parker

ENGINEERING YOUR SUCCESS.

# 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.

**Natural Gas Production, page 2**

### 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.

**Amine Sweetening, page 2**
**Desiccant Dehydration, page 3**
**Glycol Dehydration, page 3**

### Pipeline

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

**Fuel Gas, page 4**

### Distribution

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

**Booster Station, page 4**

## Alternative Fuel 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 5)**
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 5)**
Production of digester gas involves converting animal and food processing waste into digester gas, or biogas. 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.

**Alternative Fuels – Compressed natural gas (page 6)**
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

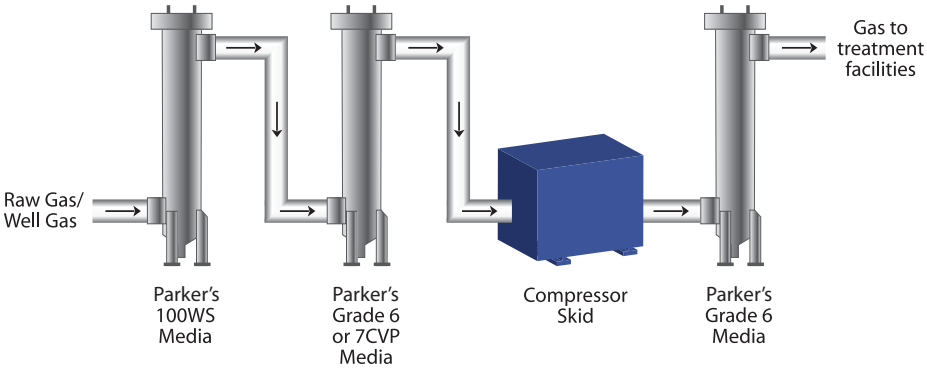
Production

**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 sulfide, 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

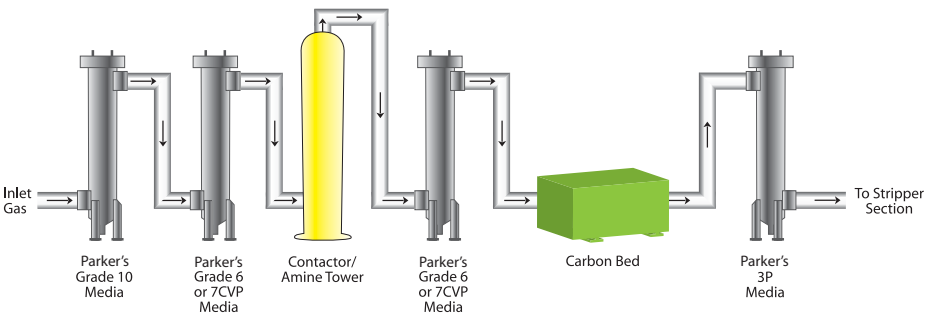
Treatment

**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 sulfide and carbon dioxide) from inlet gas streams. Natural gas is fed into a contactor tower where it contacts the amine. The "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**
Two-stage 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

Treatment

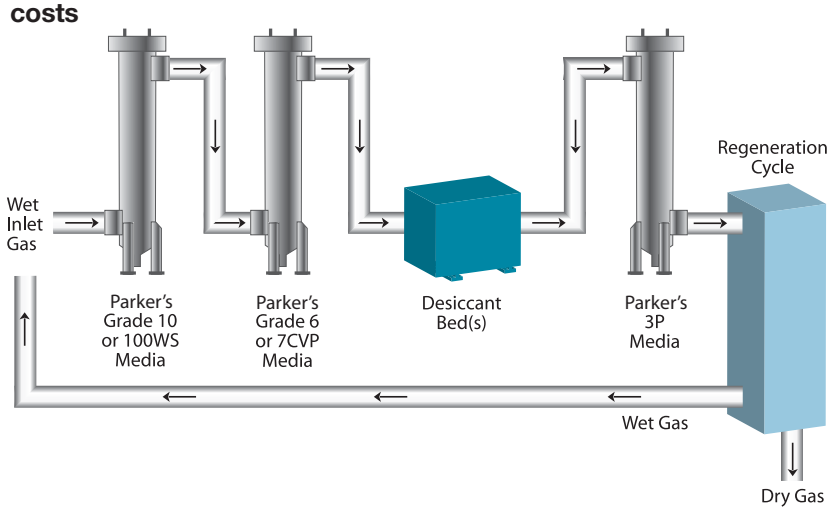
**The Application**
Desiccant dehydration is the primary form of natural gas "drying". Wet gas enters and passes through the desiccant, where the water is adsorbed and retained and the gas exits. Two or more towers, filled with a solid desiccant such as silica gel or molecular sieve, can usually be found 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 natural gas is then sent through a regeneration cycle. In this cycle, dry gas exits the bed, is cooled and wet gas is diverted back to the wet inlet gas stream.

**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 particulate filter downstream of the desiccant beds will prevent unwanted solid and liquid contaminants from interfering with desiccant adsorption.




# Glycol Dehydration

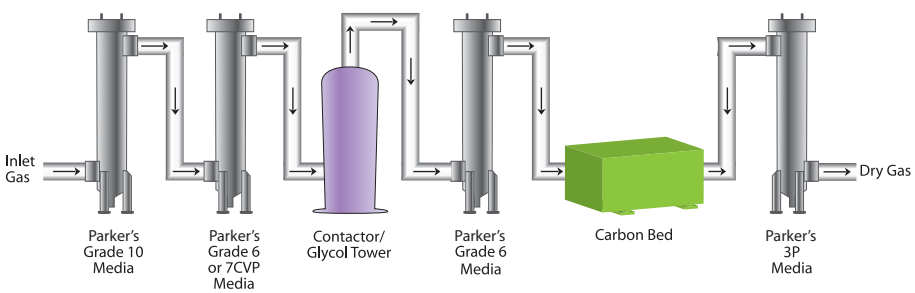
Treatment

**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 coalescing 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

Pipeline

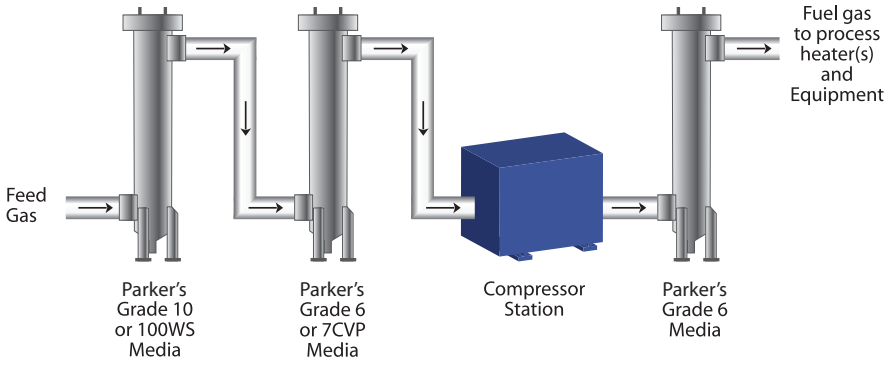
**The Application**
Pipeline and/or stored natural gas is sent through a compressor and heated, preparing it for use as a fuel gas. This gas supplies the energy needed to operate heavy duty machinery and various tools employed throughout a factory.

**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.




# Compressor Booster Station

Distribution

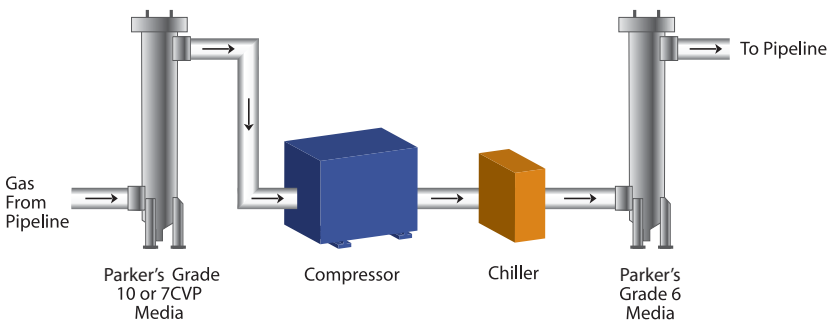
**The Application**
As natural gas flows through a pipeline, it loses pressure due to friction against the inside of the pipe. The gas needs pressure to continue moving. Compressor booster stations located along the pipelines keep the pressure high enough to allow the gas to flow. Additionally, these 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 damage**
- **Chiller coil damage**
- **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

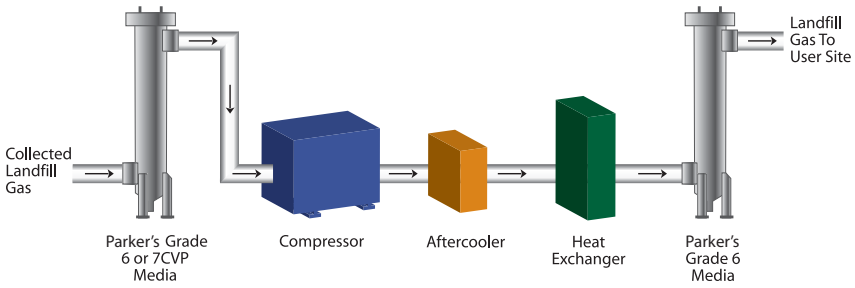
**The Application**
Landfill waste decomposes and produces what is known as landfill gas. This gas is composed mainly of methane and carbon dioxide, with small amounts of other gases, organic (non-methane) and inorganic compounds. Landfill gas has proven to be a reliable energy source for both industrial 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 downstream of the heat exchanger to collect any compressor lube oil and condensed liquids.




# Digester Gas

**The Application**
Anaerobic digestion involves converting organic materials such as animal waste and food processing waste into what is known as digester gas, or biogas. 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.

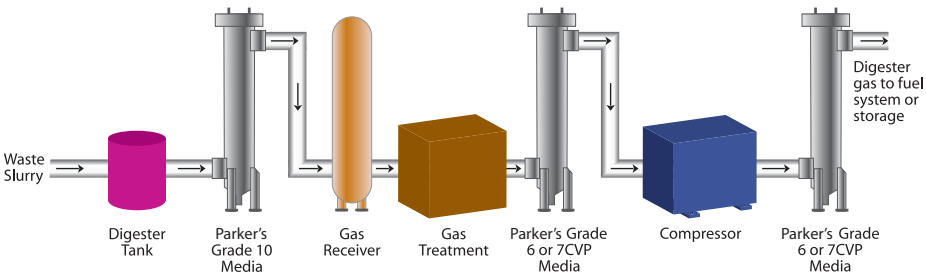
The waste is then decomposed and broken down into smaller molecules. The decomposed matter is converted to organic acids.

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 can be stored for future use.

**The Problem**
Once the waste material has been placed in the digester, mixed and converted to gas, the resultant gas will contain impurities generated by and left over from the actual digestion process. This includes 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 of 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.



# Alternative Fuels - Fuel Dispensing

**The Application**
Compressed Natural Gas (CNG) is a leading alternative to traditional fuel for the automotive industry. CNG is used in passenger vehicles, pickup trucks, in transit and on school buses. It is less expensive than diesel or petroleum and is more environmentally friendly – it reduces the amount of carbon monoxide, carbon dioxide and hydrocarbon vehicle exhaust emissions.

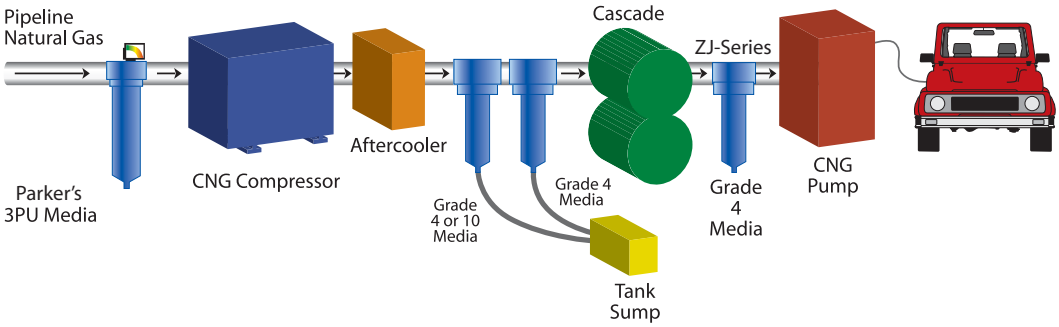
Natural gas is gathered from a pipeline and travels to a connecting compressor station. The gas is elevated to pressures ranging from 138 barg up to 345 barg and the resultant CNG is stored in large tanks. The CNG then makes its way to a gas dispenser where it is ready for use in natural gas vehicles.

**The Problem**
CNG is prone to the same types of contamination that is present in traditional fuels – solids that collect during handling, water that condenses in tanks and compressor lube oils that carry over into the CNG stream. During its transport to the dispenser, the CNG will also have contaminants that are generated within the delivery system. This leads to:

- **Compressor fouling**
- **Vehicle fuel system repair**
- **Liquids in storage tanks**
- **Gas dispenser replacement**

**The Solution**
Installing a lower pressure particulate filter before the compressor station will remove pipe scale to prevent compressor damage. Before the gas is transported from storage to the dispenser, pre-filtration of the gas with two-stage coalescing will eliminate solids, oil and water generated during underground transit.

For extra protection, a high efficiency coalescer should be placed at the gas dispenser to protect sensitive dispenser metering equipment and prevent oil from making its way into the vehicle.



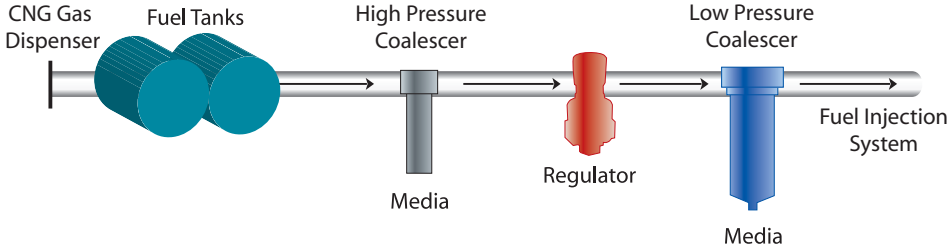

# Alternative Fuels - On Board Applications

**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.



# Filters for Natural Gas Applications

## PED Compliant Vessels

Parker offers an array of filters sized to handle natural gas flows to 228, 204 $Nm^3$/ hr and several media choices to meet natural gas application demands. PED compliant filter housings are constructed from carbon steel or stainless steel.

Choices of filter media types include glass fibre for coalescing liquids, cellulose for particulate removal and activated carbon materials for oil vapour and hydrocarbon removal. Filter element ratings are available from 100 micron down to 0.01 micron.

- **Pressures to 350 bar**
- **Coalescing, particulate and adsorption elements available**
- **Connections to DN200**
- **Flows from 1429 $Nm^3$/hr - 228,204 $Nm^3$/hr**
- **Temperatures to 232°C**
- **Optional indicators, gauges, drains and ATEX approval**
- **Design: PED**
- **Available Options: High Temperature, High Pressure, All Stainless Construction**
- **Media types available: C (grades 4, 6 and 10), 7CVP, 3P, A & 100WS (See opposite page)**

## Natural Gas

### ZA-Series

- **Pressure rating 16 to 100 barg**
- **Flanges to DN200**
- **100% retention of 1 micron droplets and liquids**
- **PED Compliant**
- **ATEX approved option avaliable**

## Alternative Fuels

### ZJ-Series

- **Gas dispensing filter**
- **1/2" - 2 Line Size**
- **Pressure Rating 350 bar**
- **PED compliant**
- **ATEX approved option avaliable**

High Pressure Low Pressure

### FFC-Series

- **On board alternative fuel filter**
- **ECER110 Approval on request - Standard Governing CNG components**
- **Complete removal of solid particles, condensed water and oils**
- **Protection of Fuel Injectors and other precision components**
- **Reduce maintenance and extend equipment life**

For more detailed information on these product lines, please see Catalogue S3.2.206

Parker offers a range of high efficiency filtration media to suite 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.

# Filtration Media

## 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

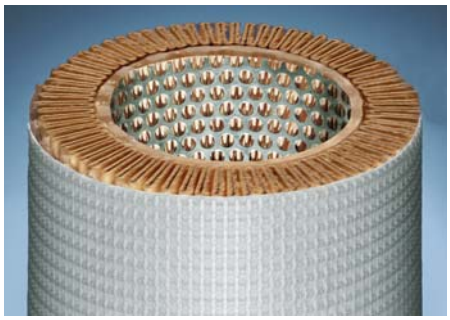
Available in grades 4, 6 or 10
Air Flow: Inside to Outside

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 4** filters are very high efficiency coalescers. They are used for elevated pressures or lighter weight gases.

**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 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.

## Media type A

Air Flow: Outside to Inside

This hydrocarbon vapour removal element consists of an 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 hydrocarbon vapour and particulate fines down to 3µ in diameter.

## Media type 100WS

Air Flow: Inside to Outside

This rolled stainless steel mesh element has two metal 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 contaminants are present.

**Media Specifications**

| Grade Designation | Coalescing Efficiency .3 to .6 Micron Particles | Maximum Oil Carryover[1] PPM w/w | Micron Rating | Pressure Drop (PSID) @ Rated Flow[2] | |
|---|---|---|---|---|---|
| | | | | Media Dry | Media Wet With 10-20 wt. oil |
| 4 | 99.995% | .003 | .01 | 1.25 | 3-4 |
| 6 | 99.97% | .008 | .01 | 1.0 | 2-3 |
| 7 | 99.5% | .09 | .50 | .25 | 0.5 - 0.7 |
| 10 | 95% | .85 | 1.0 | 0.5 | 0.5 |
| 100WS | N/A | N/A | 100 | <0.25 | 0.25 |
| 3P | N/A | N/A | 3.0 | 0.25 | N/A |
| A | 99%+[3] | N/A | N/A | 1 | N/A |

1 Tested per ADF-400 at 40 ppm inlet.
2 Add dry + wet for total pressure drop.

# Global Company, Local Support

Parker is the leader in motion and control, partnering with its customers to increase their productivity and profitability.

With an annual turnover of over $10 billion and 57,000 employees Parker measures its success by what it does for you.

Guided by a relentless drive to improve your products and processes, we bring our engineering know-how to your application, wherever it may be.

From 60 sales offices in 44 counties around the world Parker services 12,000 distributors and 427,000 customers.

| | |
|---|---|
| **$10.7** | **Billion in Revenues** |
| **900,000** | **Products** |
| **427,000** | **Customers** |
| **57,000** | **Employees** |
| **12,000** | **Distribution/MRO Outlets** |
| **1,200** | **Markets** |
| **287** | **Manufacturing Plants** |
| **125** | **Divisions** |

# Partnerships

Parker knows that no two construction projects are the same, but we also understand that owners, engineering houses and contractors face similar issues around the world.

By involving us at the earliest possible stage of your project, we can deliver Filtration and Separation solutions that out-perform in critical areas, such as cost-effective logistics, the most appropriate product selection, and commercial agreements that add value by being simpler, clearer and as far-reaching as you want them to be.

By partnering with Parker at an early stage of your project you can be sure of:

- **The lowest overall cost**
- **A safe, reliable, quality system**
- **Global availability and support**
- **The best technical solution**

Parker Filtration and Separation - the most complete and flexible offering available today.

# Quality Manufacturing

With over 250 manufacturing plants, Parker's manufacturing experience spans more than half a century.

Our global reputation as a reliable supplier of superior products results from a focused and integrated development and manufacturing system.

This begins with the customer – identifying needs, exploring opportunities and meeting the challenge of change.

# Solutions

Parker has been designing and developing engineering-led solutions for over 40 years.

Today, having grown with the natural gas market, we continue to provide complete technical solutions for a broad spectrum of companies, from super majors to smaller independents.

While we are passionate about engineering, we know how important our customers' service and commercial needs are to them. That's why, whoever you are, from the smallest to the largest, and wherever you operate, you are assured prompt service as well as technical, commercial and logistical solutions that are second to none.

Whatever your technical requirements, from replacement parts to new builds, we can provide you with the most appropriate safe, reliable and environmentally secure solution.

Because we understand what you need to make your project work, our experience of working in partnership with major constructors, from the earliest stages of design to supplying existing projects, gives us the technical know-how to add value to your business with high integrity filtration and separation solutions.

Our proactive, forward-looking approach also means we can work with you to design tailor made solutions that won't just help you realise the full potential of your project, but will also meet all safety guidelines, operate within all environmental criteria and exceed all current legislative requirements - wherever in the world you operate.

# Innovation

We are leveraging our engineering expertise and breadth of product to create breakthrough innovations, processes and services that anticipate, rather than react, to customer needs.

We're adapting our technology platforms across the markets we serve, combining what we know in new ways to better serve our customers. And we're creating smarter products by blending our expertise in electronic controls with our mechanical devices.

# Premier Customer Service

We are doing more for our customers than ever before.

Globally, we have localized service to provide fast, hassle free response and on-site support.

We're staying close to our customers and integrating systems to help them become more profitable.
We are committed to delivering our highly engineered products on-time, on-promise.

Parker's global customer service centres respond to more than 20,000 inquiries each month, helping callers quickly find the products and solutions they need.

# EPIC

For further information on other Parker products call the European Product Information Centre free of charge on 00800 27 27 5374 or email: epic@parker.com

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