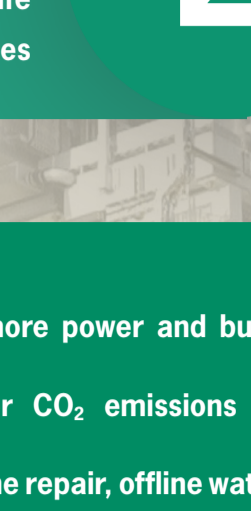
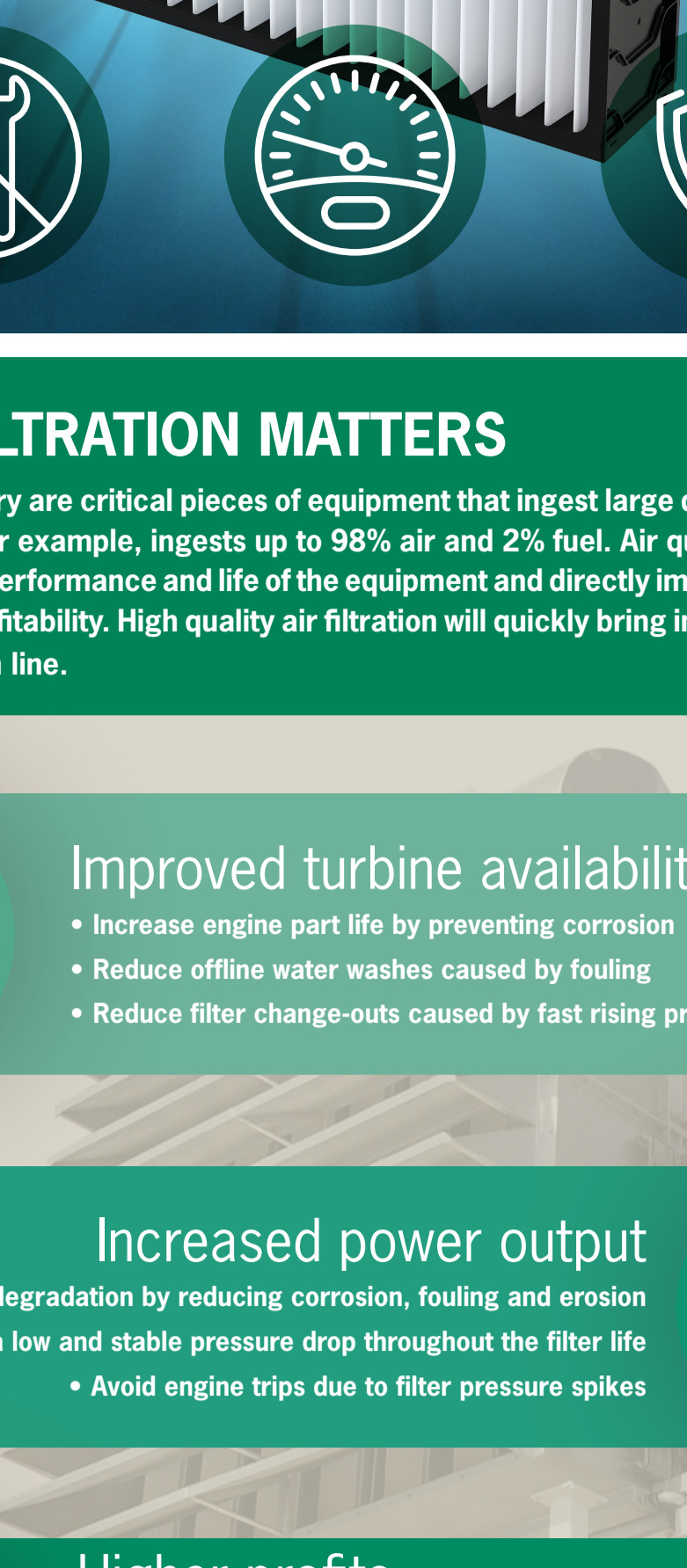


GAS TURBINE PRE-FILTERS:

IMPORTANCE, CONSIDERATIONS & LATEST INNOVATIONS



WHY FILTRATION MATTERS

Turbomachinery are critical pieces of equipment that ingest large quantities of air. A gas turbine, for example, ingests up to 98% air and 2% fuel. Air quality is therefore critical to the performance and life of the equipment and directly impacts availability, output and profitability. High quality air filtration will quickly bring important benefits to your bottom line.

1

Improved turbine availability

- Increase engine part life by preventing corrosion
- Reduce offline water washes caused by fouling
- Reduce filter change-outs caused by fast rising pressure drop

2

Increased power output

- Eliminate degradation by reducing corrosion, fouling and erosion
- Maintain a low and stable pressure drop throughout the filter life
- Avoid engine trips due to filter pressure spikes

3

Higher profits

- Increase engine efficiency by producing more power and burning less fuel per MWh produced
- Improve sustainability by producing lower CO₂ emissions per MWh produced
- Reduce operating expenses by limiting engine repair, offline water washes and filter replacement

THE IMPORTANCE OF PRE-FILTRATION THAT IS OFTEN OVERLOOKED

Pre-filters have an important impact on the overall performance of a filtration system. Choosing the right pre-filter will extend the final filter life, thereby reducing downtime. It will also improve your overall efficiency, leading to a reduction in fouling. This enables you to remain online for a longer period of time and improves your operational availability and reliability.

Camfil's Life Cycle Cost (LCC Power) software evaluates total cost of ownership, and shows the overall impact of choosing the right filter combination.

To demonstrate the benefits of using a pre-filter, two different solutions were compared using the LCC Power software. Solution 1: F9 with no pre-filter and Solution 2: F9 with an M6 pre-filter.

Assumptions: 8000 hours, Offshore installation with four mechanical drive units 32MW each, Simple cycle, 5 year period LCC

Downtime Costs	Fouling Costs
>30% savings when using pre-filters	>25% savings when using pre-filters

Final Filter (F9) Lifetime



HOW TO SELECT A PRE-FILTER

Pre-filters are the first line of defense against the elements, and should therefore be robust and resistant to turbulent airflows, have good water handling performance and the capability to remove large amounts of coarse/heavy particulate from the air stream. To ensure stable performance, excellent protection and easy maintenance consider these top three features when selecting a pre-filter.

1

Robustness

Turbomachinery installations are more demanding and require a higher level of robustness compared to other applications. Select a filter with a solid frame and media support, as well as high burst strength.

2

Stable Pressure Drop

A filter should be able to handle wet conditions without the risk of pressure drop spikes. Consider filters with good sealing, drainage and high dust holding capacity.

3

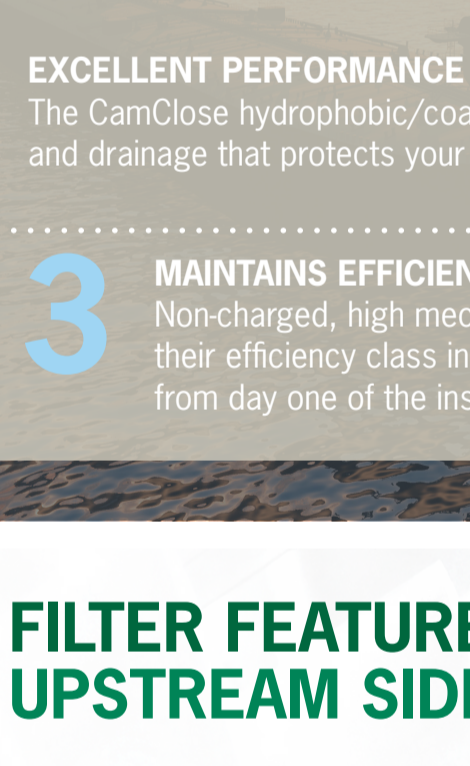
Water Handling

Coalescing filters reduce the amount of water reaching the final filter and hydrophobic filters eliminate water bypass completely. These properties help protect the final filters and extend their life in wet conditions such as for coastal & offshore applications.

NEW GENERATION CAMCLOSE

PANEL AIR FILTER FOR GAS TURBINES AND OTHER TURBOMACHINERY

Gas turbines need to produce maximum power with the lowest maintenance requirements and operational costs. The new generation CamClose pleated panel air filter has been specially engineered to provide excellent protection for final filters and turbomachinery.



3 FILTER EFFICIENCY CLASSES

(per EN779:2012 and ISO16890:2016)

G4 / ISO COARSE 60%

M5 / ISO ePM₁₀ 65%

M6 / ISO ePM_{2.5} 50%

KEY FEATURES

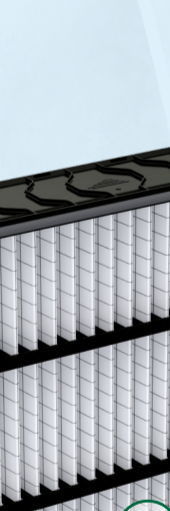
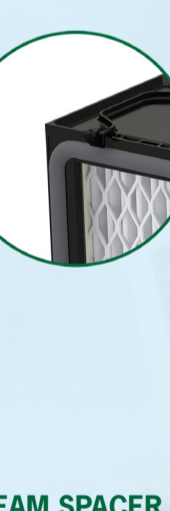
Built-in plastic clips for easy installation, without any additional hardware	Measure pressure drop more accurately with the new patented pressure drop measurement port	Lowest pressure drop in the G4 panel filter class
Advanced media for low pressure drop, long life, and good water handling	High burst strength at 6250 Pa and robust frame maintains filter integrity	Optimal and proper sealing give best-in-class water and contaminant handling, as well as a low and stable pressure drop

APPLICATION AREAS

Pre-filter for gas turbines and other turbomachinery

Suitable for most areas, including wet and coastal installations

HASSLE-FREE OPERATIONS



1

QUICK INSTALLATION WITH BUILT-IN CLIPS
Built-in filter clips allow for an easy close-coupling to the gas turbine final filter, without any additional hardware.

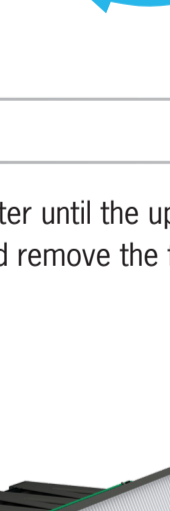
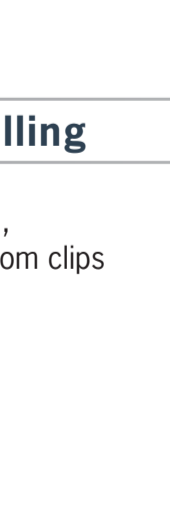
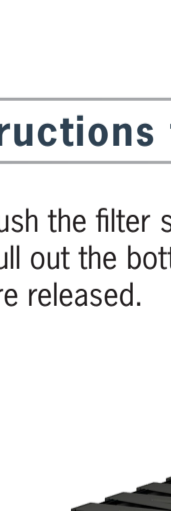
2

KNOW WHEN TO REPLACE YOUR FILTERS
The patented built-in pressure drop measurement port helps to accurately monitor filter pressure drop across each filter stage separately, enabling the operator to better plan for filter replacement.

3

ONLINE FILTER CHANGE
Filters can be quickly changed without shutting down your operations.

INCREASED PERFORMANCE



1

EXTENDED LIFE
The pre-filters have a low initial pressure drop and high dust holding capacity, meaning fewer changeouts.

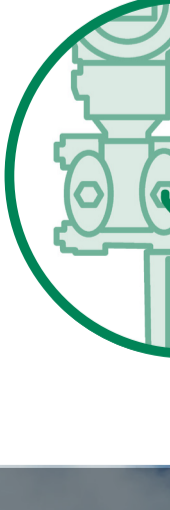
2

STABLE PRESSURE DROP
Low and stable pressure drop in wet conditions lead to higher power output and lower fuel consumption.

3

PROLONG FINAL FILTER LIFE
High efficiency pre-filter protects the final filter better, prolonging its life.

EXCELLENT PROTECTION



1

HURD STRENGTH > 6250 Pa (25" w.g.)
Sturdy construction ensures the filter can operate in high airflows and demanding applications while protecting the final filter and gas turbine.

2

EXCELLENT PERFORMANCE IN WET CONDITIONS
The CamClose hydrophobic/coalescing air filter offers excellent water-handling and drainage that protects your engine from pressure spikes.

3

MAINTAINS EFFICIENCY AT HIGH AIRFLOWS
Non-charged, high mechanical efficiency ensures gas turbine filters maintain their efficiency class in high velocity applications and protect the gas turbine from day one of the installation.

FILTER FEATURES UPSTREAM SIDE

The CamClose pre-filters have been designed with unique features both on the upstream and downstream side of the filter to ensure hassle-free operations, increased performance and excellent protection.

ROBUST CONSTRUCTION
The endless polyurethane (PU) gasket withstands the toughest conditions, offering maximum availability and reliability.

PATENTED BUILT-IN PRESSURE DROP PORT
The downstream built-in pressure drop port allows for online measurement of pressure drop across different stages in a close-coupled arrangement.



ADVANCED MEDIA DESIGN
The endless polyurethane (PU) gasket offers the optimal combination of low pressure drop, long life and good water handling for demanding applications. *G4 version, as shown in image is synthetic media. *M5, M6 available in glass-fibre media with hydrophobic properties

BEST-IN-CLASS DRAINAGE
The upstream flange shields the pooled water from incoming airflow and the large slots drain the water rapidly for superior performance in wet environments.

FILTER FEATURES DOWNSTREAM SIDE

PROPER SEALING
The endless polyurethane (PU) gasket eliminates bypass to offer optimal protection for the final filter and gas turbine. It is also available with a foam (PE) gasket.

BUILT-IN CLIPS
CamClose offers two options for filter installation. The built-in plastic clips offer a hassle-free installation right out of the box. The filter can also be installed using mini-clips in the slots or conventional clips.

DOWNSTREAM SPACER
The endless spacer allows for optimal airflow development and offers a pressure drop benefit for close-coupled installations.

AERODYNAMIC SEPARATOR
The downstream pleat separator (G4 variant) provides the optimal balance of strength and pressure drop while ensuring the filter has a long life in high airflow applications. *G4 version only

MEDIA SUPPORT
Media support offers increased strength in high airflow applications. *G4: wire-backing and aerodynamic pleat separator *M5, M6: expanded metal grid

INSTRUCTIONS FOR INSTALLATION

The CamClose panel air filter extends the service life of the final filter by offering a low initial pressure drop and high dust loading capacity. It has been engineered with unique built-in clips which allows it to be close-coupled to a final filter, enabling a quick and efficient installation.

Instructions for installing

1. Hook the upper clips onto the downstream filter.
2. Push the filter gently downwards. 3. Push the filter bottom until the bottom clips snap onto the downstream filter.

Instructions for uninstalling

4. Push the filter straight down and, 5. pull out the bottom until the bottom clips are released.
6. Lift the filter until the upper clips are released and remove the filter.

BUILT-IN MEASUREMENT PORT INSTALLATION INSTRUCTIONS

1. Break the port at the bottom of the filter (using a screwdriver and a mallet) taking care to not damage the media.
2. Deburr the hole edge (only for large bits sticking out).
3. Install the gasket directly onto the fitting.
4. Insert the bars into the pressure tubing.
5. Insert the fitting into the port and make sure it is well sealed.
6. Connect pressure tube to the pressure drop transmitter/gauge.

WHAT ELSE IS NEW?

PREVIOUS VERSION: GREEN FRAME

NEW VERSION: BLACK FRAME

LIGHTER AND RECYCLED
CamClose filters use recycled plastics and optimized gluing technologies when manufacturing filter frames to further reduce the use of petrochemicals, and thereby, our carbon footprint.

Visit www.Camfil.com/CamClose to learn more.

camfilpowersystems

POWER SYSTEMS