



HydroCel

Performance Enhancement
for Gas Turbines

| Marine Grade (H)EPA Filters



BETTER AIR IS OUR BUSINESS®



GAS TURBINE
DIVISION

The HydroCel advantage

AAF's HydroCel proprietary media system is designed to offer maximum protection in environments where excessive moisture, salt and hydrocarbons are prevalent.



Depth-loading filtration technology

HydroCel employs a specially designed proprietary media with unique depth-loading technology that acts as a reservoir for water, oil, hydrocarbons and dust capture. The media has been optimised to offer F8 through to E12 HEPA efficiency grades.

The HydroCel can be installed as a direct replacement filter for the majority of OEM supplied air intake housings, without the requirement for housing modification.

Water and salt repellent

To correctly maintain power and efficiency in the most arduous conditions, a gas turbine filter must resist not only dust and dirt, but also repeated and cyclic exposure to fog, moisture and salt spray. To ensure HydroCel filters exceed expectations in any application, AAF developed a purpose-built offshore testing facility to simulate the harsh, damp conditions found in coastal and marine environments.

By testing seawater resistance in a variety of conditions, AAF has been able to create a barrier that can consistently deliver excellent results regardless of the type and quantity of moisture present.

Lower, stabilised pressure drop

The HydroCel has proven its pedigree to reliably match operator maintenance cycles where filter life of 12 to 24 months or longer can be guaranteed. Depth-loading media results in a lower initial pressure drop coupled with better dust capture and distribution during operation.




Optimal media pleating

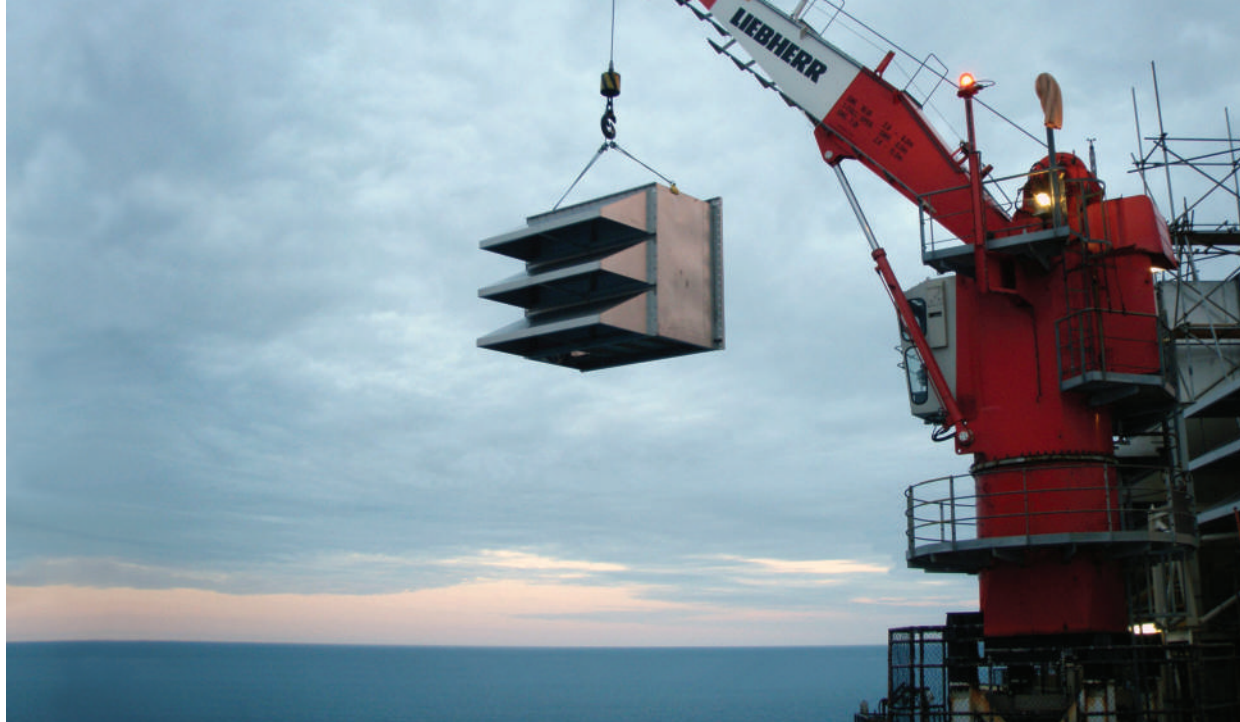
HydroCel filters are perfected down to the last detail. The pleat in the HydroCel filter has been optimised to ensure low airflow resistance and high dust-holding capacity. The media is uniformly spaced to present a consistent, open structure. The open-pleat geometry protects against media bridging during excessive contaminant and water exposure.



Choose the right efficiency for your application

AAF offers a wide variety of filters that are optimised to different climates and environments around the world.

	Fine Filters	Specialist (H)EPA Filters		
	Due to the unique media oil, salt and water resistance the HydroCel significantly contributes towards less downtime and higher production with even longer turbine component life than that achieved by the regular OEM specified filters.	The absolute filtration stage for removal of ultra-fine (sub-micron) particulate. Technology designed specifically for turbo machinery application to guarantee the elimination of compressor fouling. Proven technology which negates the requirement for on or offline water washing while retaining otherwise reduced engine output and fuel economy. AAF (H)EPA filters allow investment in cleaner combustion air which enhances your business profitability.		
Key Data	HydroCel 95	HydroCel E10	HydroCel E12	
				
Filter Class to EN779:2012 / EN1822:2009	F8	E10	E12	
Filter Class to ASHRAE 52.2 - 2007	MERV 14	MERV 16	-	
Features & benefits	HydroCel 95, proven technology. HydroCel 95 has achieved a remarkable reputation for providing clean air to Gas Turbines operating in the hostile environment offshore. Operators have achieved air cleanliness not previously found and have quickly moved to establish the HydroCel as their number one choice to remove sea-salt and water, in addition to the locally generated industrial pollution.	HydroCel E10, advanced technology. HydroCel E10 is a product developed on the back of the success of the 95, using the same construction, but with very high performance media. With this product continuous turbine operation with only two water wash cycles per year easily can be achieved.	HydroCel E12, advanced technology. HydroCel E12 is a product developed on the back of the success of the 95, using the same construction, but with very high performance media. With this product, continuous turbine operation with only one water wash cycle per year easily can be achieved. The E12 significantly contributes towards less downtime and higher production with even longer turbine component life than that achieved by both the 95 & E10.	
Case Material	Galv Steel & Plastic	Galv Steel & Plastic	Galv Steel & Plastic	
Nominal air flow rate	4250 m ³ /h 2500 cfm	4250 m ³ /h 2500 cfm	3400 m ³ /h 2000 cfm	
Initial pressure drop at nominal air flow rate	155 Pa 0.62" WG	312 Pa 1.25" WG	517 Pa 2.08" WG	
Recommended pressure drop	635 Pa 2.55" WG	635 Pa 2.55" WG	1000 Pa 4.02" WG	
Bursting Strength	>40" WG >9964 Pa	>40" WG >9964 Pa	>40" WG >9964 Pa	
Average arrestance	> 99%	> 99%	100%	
Average efficiency	91%	99%	99.97%	
Initial efficiency @MPPS	69%	98%	99.98%	
Water Washing Intervals	> 2000 hrs	> 4000 hrs	> 8000 hrs	
Dimensions	Nominal: 24" x 24" x 12" Exact: 592 x 592 x 292mm	Nominal: 24" x 24" x 12" Exact: 592 x 592 x 292mm	Nominal: 24" x 24" x 12" Exact: 592 x 592 x 292mm	



Economic benefits to you the operator

Proven Technology

The AAF HydroCel has achieved a remarkable reputation for providing clean air to Gas Turbines operating in hostile environments prevailing in offshore and coastal locations. Operators have achieved air cleanliness not previously found and have moved quickly to establish the HydroCel as their number one choice to remove sea-salt and water, in addition to locally generated industrial pollution.

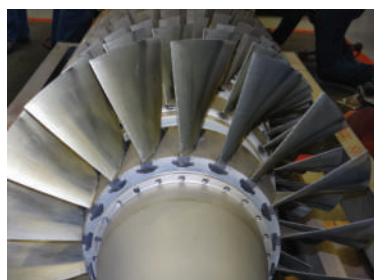
Economic Benefits to the Operator Oil and Gas Production

For the oil and gas company, the main benefit will be machine availability for production. Removing the need to shut down the GT ensures maximum production yield. For an economic assessment of a proven operating regime (Table 1) see below.

This is achieved through removing the requirement for compressor washing on and offline for periods up to and beyond 24,000 hours. Additionally protection of critical parts over the extended life of the engine results in a reduction in overhaul periods as machines are far easier to service when clean and require less frequent component replacement.



Titan 130 Compressor - 8,000 Hours with Frequent Water Washes



Post AAF E12 16,000 Hours (H)EPA

Table 1: Economic Assessment for Three Filter Operating Regimes

Filtration Efficiency	High Velocity	E10 (EN 1822)	E12 (EN 1822)
Wash frequency (hours)	<1,000	>4,380	>8,760
Filter life (months)*	18-24	18-24	12-18
No. of Filter Elements	48	64	80
Filter costing (filters)/year	\$8,000	\$14,000	\$29,000
Annual washing cost (24 hour offline/event)	\$40,000	\$10,000	\$5,000
Annual production loss (20,000 barrels boe/d @ US\$105/barrel)	\$16,800,000	\$4,200,000	\$2,100,000
Total annual cost impact	\$16,848,000	\$4,224,000	\$2,134,000
Net annual benefit with HydroCel filtration per machine		\$12,642,000	\$14,714,000

*Filter life calculated at max number of months. Example based on 28.5MW gas turbine.

Increase machine availability

The advanced filtration of AAF HydroCel filters help engine cores remain in close to new condition during operation. As a result, planned cycles between on or offline cleaning can exceed 8,000 hours where 24,000 and more is achievable. More time online means greater productivity.

Longest engine life—setting world records

The protection offered by AAF (H)EPA technology keeps engines so clean, operators can enjoy substantially longer component life and engine reliability. In fact, a record 84,000 hours hot gas path section life has been logged on one engine using AAF filtration to protect from aggressive salt ingestion.

Recover lost power

With an initial filtration efficiency of 99.5% or greater at the smallest penetrating particle size, AAF (H)EPA filters can help maintain gas compressor cleanliness by recovering 6% of the power output normally lost to engine fouling in none power loss megawatt hours (Mw/hrs).

Enhancing fuel efficiency

Today's modern gas turbines have incredibly tight tolerances and critical profiles for maximum efficiency. AAF's advanced filtration removes airborne pollution that can foul the engine compressor stator and rotor blades, helping gas turbines run with like-new efficiency even after extensive operation.

Recover lost power

- Reduced fuel cost
- Direct replacement filter
- Constant power output
- Increased turbine availability
- Lower maintenance costs
- Avoid expensive core engine damage



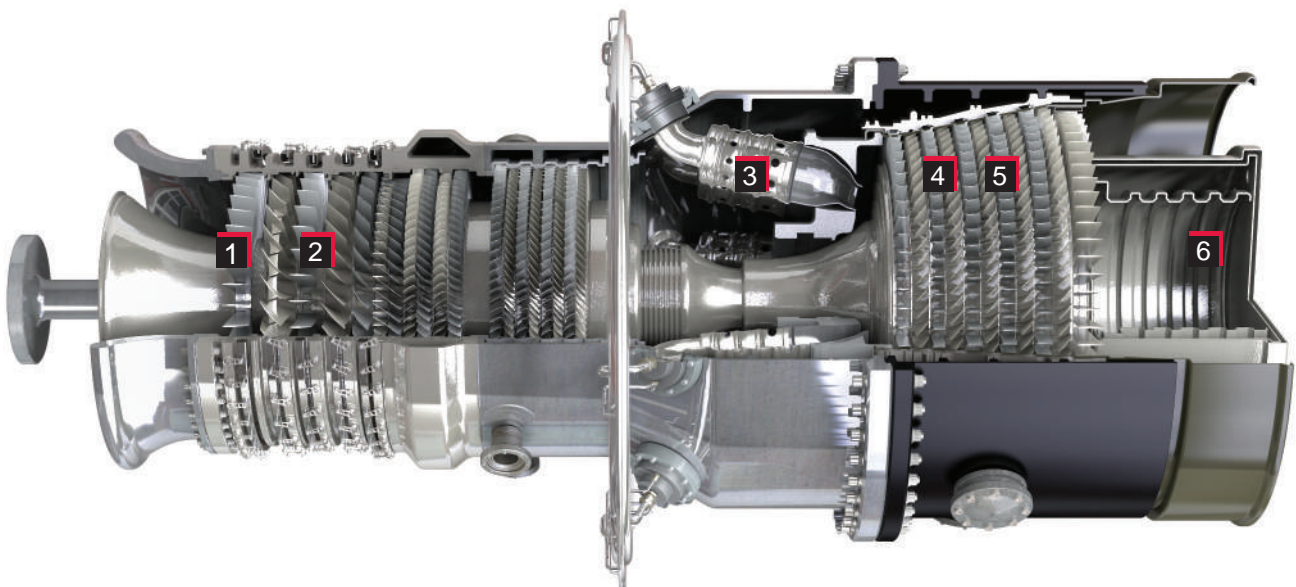
With AAF (H)EPA (8000 hours)



Without AAF (H)EPA (2000 hours)

Lower Operating Costs with Increased Turbine Reliability

- 1 | Eliminates compressor fouling
- 2 | Eliminate or reduce the need for compressor washing
- 3 | Increased fuel efficiency
- 4 | Extended lifetime of engine components
- 5 | Cooling ports clear of blockage
- 6 | Constant power output





Familiar with the problem







As Gas Turbines consume vast amounts of atmospheric air heavily contaminated in offshore locations by natural pollutants such as salt and seawater spray, plus those self generated from drilling, shot-blasting and engine exhausts. As an accumulated mass in fluctuating humidity, these pollutants can seriously effect the performance and operating efficiency of a precision gas turbine engine.

- Abrasive solids attack rotating parts
- Dirt in the compressor stage is responsible for blade fouling which contributes to an alteration in profile and losses in efficiency
- Fouling in the intercoolers reduces compression heat removal
- Wet corrosion caused by salt can lead to damage particularly in the compressor stages
- High temperature corrosion at the turbine stage is primarily a fuel problem but air pollution adds to any corrosion damage
- Plugging of the turbine blade cooling slits is caused by sub-micron particles which promotes fatigue from overheating

Choose the complimenting pre-filter for your application

AAF offers a wide variety of filter combinations that are optimised to different climates and environments around the world.

Moisture Removal	Pre-Filters
<p>The presence of water and salt can cause irreversible harm to pre, fine and (H)EPA filter medias. Free-moisture allowed to interact with pre and fine filters coalesces on media fibers, mixing with captured dirt particles which absorb the moisture, swell and increase pressure drop.</p> <p>Water accelerates dirt- and salt-laden water leaching which carries over to foul the engine compressor.</p>	<p>The AAF pre-filtration range of filters is designed to offer operators a wide range of proven brands. Regardless of the environment, life requirements or air quality, AAF have the technology to ensure reliable and continuous performance matched with optimising protection to the down stream high efficiency stage.</p>

Key Data	AmerDrop	AmerVane VI	AmerKleen	AmerShield	DriPak GTR	DriPak GT
						
Filter Class to EN779:2012 / EN1822:2009	Droplets	Fine Mist	G4	G4	G4 M5	M6 F7
Filter Class to ASHRAE 52.2 - 2007	99% @ 65 micron	96% @ 25 micron	MERV 8	MERV 8	MERV 7- 9	MERV 9, 13
Features & benefits	<p>AmerDrop is a low pressure loss droplet catcher. The AmerDrop is interchangeable with all other manufacturers units and is a good compliment to improve intake filter weather hoods or down stream of evaporative cooling systems.</p>	<p>The AmerVane VI high velocity louver, designed and patented by AAF, is a heavy-duty, high efficiency, mist eliminator. Ultra-low operating pressure drop makes the AmerVane VI a truly cost-effective, first-stage separator to any intake filter system.</p>	<p>AmerKleen filter media is designed with "Progressive Density" construction. Fibres on the air entering side are interlaced in an open pattern which becomes progressively tighter. Dirt loads from back to front, taking advantage of the entire thickness of the media. This construction prevents faceloading, and increases arrestance and dust holding capacity</p>	<p>Offering state-of-the-art pre-filter technology, AmerShield provides maximum protection to fine and entry-grade (H)EPA filters, moisture coalescing and particle protection to fine and entry-grade (H)EPAclass filters</p>	<p>A unique self-supporting, fully plastic, high-velocity filter which close couples directly to fine and (H)EPA filters. Reverse flow enhances water capture and run-off while providing installed life up to and over 16k hours.</p>	<p>A premium-engineered rigid pocket filter, the DriPak GT is well suited for moisture laden environments compounded by a heavy dust load. Its class-leading capacity makes it ideal as a tertiary filter or as a pre-filter to the AAF high efficiency and (H)EPA filters.</p>
Nominal air flow rate	4.5 m/s (900 FPM)	4.5 m/s (900 FPM)	4250 m ³ /h 2500 CFM	4250 m ³ /h 2500 CFM	4250 m ³ /h 2500 CFM	4250 m ³ /h 2500 CFM
Initial pressure drop at nominal air flow rate	5 Pa @ 2.5m/s 0.021" WG @ 490 FPM	27 Pa @ 2.5m/s 0.11" WG @ 490 FPM	125 Pa 0.5" WG	70 Pa 0.28" WG	58 Pa 0.24" WG	72 Pa 137 Pa 0.29" WG 0.55" WG
Recommended pressure drop	-	-	374 Pa 1.5" WG	450 Pa 1.8" WG	450 Pa 1.8" WG	635 Pa 2.55" WG
Average arrestance	-	-	89%	> 90%	> 90%	98% 99%
Dimensions	135mm deep. Length and width of mist eliminator to suit filter housing	185mm deep vane. Length and quantity of vanes to suit filter housing.	Std Nominal: 24" x 24" x 4" Std Exact: 592 x 592 x 95mm Non-standard size pads and rolls also available upon request.	Nominal: 24" x 24" x 4" Exact: 592 x 592 x 95mm Nominal: 24" x 24" x 6" Exact: 592 x 592 x 150mm	Nominal: 24" x 24" x 13" Exact: 592 x 592 x 330mm	Nominal: 24" x 24" x 26" Exact: 592 x 592 x 650mm

Quality, expertise and innovation

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