

# Power Generation

Power Generation and the Environment working together in a Clean Air World



**VOKES AIR**

Taking small steps together, always ahead, towards a better world

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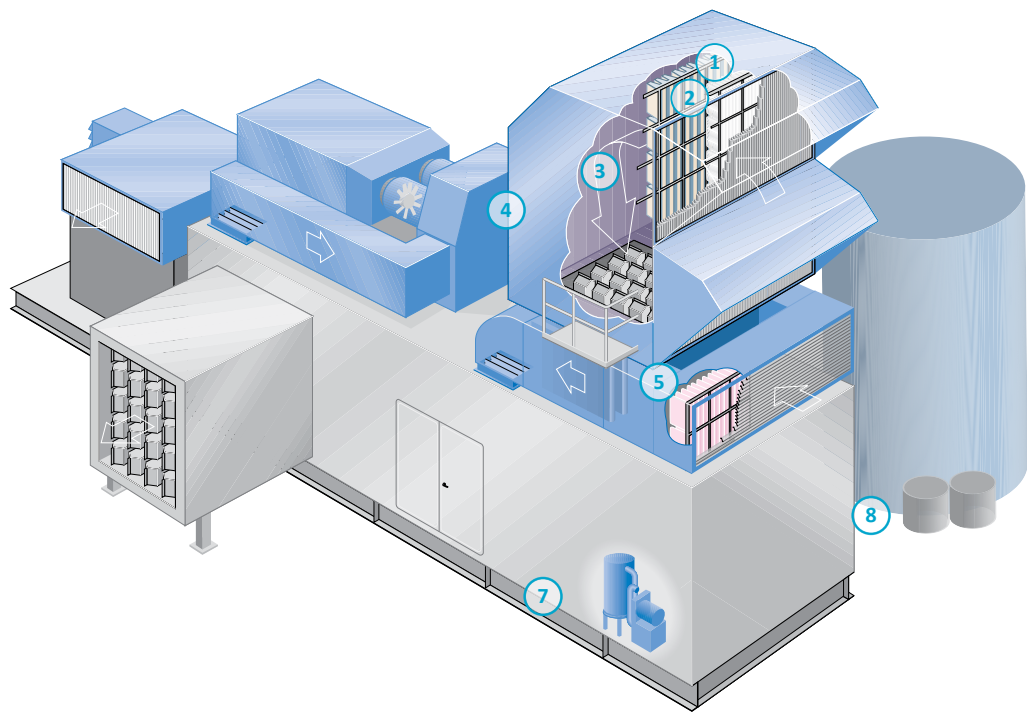
**Vokes Air designs and manufactures air cleaning solutions to protect power engines from environmental challenges as well as to reduce the impact of power stations over the surrounding environment.**

Facing increasing external pressure, leading utility companies are investing ever more to improve the compatibility of fossil-fuelled power plants with the environment. These organisations recognise the importance of utilising the best available technology to reduce the environmental impact of power stations, in accordance with ISO 14001.

Similarly, an increasingly polluted world has an impact on power generation operators, with valuable equipment facing threat from increased atmospheric pollutants.

In this situation, air filtration plays a primary role in protecting power generation equipment from the environment and the environment from power generation.

Air intake filters protect the most valuable equipment of a modern power station from degradation caused by exposure to outdoor air pollutants, whilst specialised process filters prevent the spilling of pollutant exhausts, like lube oil mists, into the atmosphere.



**Vokes Air offers a wide range of air filtration products, systems, technologies and services for the manufacturers and operators of gas turbines across the world.**

- 1 Weather louvres (vane separators) and mist separators
- 2 Intake air filters and coalescers (coarse dust, mist, fog)
- 3 High efficiency intake air filters (fine and sub-micron particles)
- 4 Air intake housings
- 5 Ventilation/filtration systems (engine room cooling)
- 6 Silencers
- 7 Oil mist eliminators for the breathers on lubricating systems
- 8 Filters for tanks venting

## Keeping Salts & Water At Bay

ScandVane is a highly efficient weather louvre system especially designed for heavy rains, sea spray and mist.

The vertical vanes, made from extruded marine grade aluminium (or alternatively stainless steel or polymers) ensure efficient inertial interception of droplets and rapid drainage.

**No matter how it comes: rain drops; sea spray; mist; fogs; flying ice crystals, no matter where it comes: land based gas turbine; offshore platform; marine ventilation intake, water and atmospheric particles are intercepted and removed from the air flow.**



▲ ScandVane weather louvre system in a marine application





ScandGlas is a fine-mist coalescing system based upon a selection of special weather-resistant glass filament blankets, as efficient at removing coarse dust as it is in the interception and drainage of fine mists.

ScandVane and ScandGlas can be applied alone, or in combination to form an efficient and durable water barrier on board vessels and sea platforms, as well as on large, land-based power engines air intakes.

**Seasonal peak loads of macroscopic contamination such as poplar pollen, insect swarms and leaves can clog the air intake barriers. A suitable intake design simplifies the clean-up process, making it quicker, easier and safer.**

VWS is an all metal, corrosion resistant panel designed to intercept minute water droplets, as well as insects, leaves, pollens and coarse dust. Mounted either horizontally or vertically, it can be easily washed clean on-site, even during operation.

V 2130 is a cost effective, non-corrodible honeycomb demister pack. Easily replaceable, it is designed for horizontal installation in areas such as inside the inclined air inlets of gas turbines.

► See also: Macrogen GT Duo – Combined Water Coalescer and Particle Filtration in One Stage – page 8





## Higher Output, Longer Life

By removing more than 80% of the airborne fine particulate, high efficiency air intake filters prevent fast fouling of compressor blades. However, some high efficiency filters create an excess of under pressure on the air intake, affecting the performance of the compressor and reducing the electric output. Here, a filter's pressure drop performance is the key consideration, and by selecting the correct filter, high efficiency can be achieved without compromising output.

The Compatex range is the latest incarnation of a long-line of fine dust air intake filters – our first 'W' filter for gas turbines was the FP, introduced over 30 years ago. Today, the Compatex range comprises of three models, all featuring unequalled, long-lasting performance, even in the most extreme and demanding of climates and operating conditions. Moreover, for the same air flow and filtration efficiency, the Compatex range requires 15% LESS ENERGY\* than competitive products.

\* The pressure drop of Compatex fine filters is 15% lower than the average of competing products, for the same rating and efficiency class.

**In industrial and urban districts, with high content of PM 2.5 (particulate matter  $\leq 2.5 \mu\text{m}$ ), sub-micron particulate impacts on blades to form fouling – a thin layer of greasy soot that progressively affects the performance of the axial compressor and reduces the power output of the plant.**





### Fine dust filters – for ultimate protection from atmospheric pollutants.

Recently redesigned for even greater rigidity, Compatex TMP now features an integrated handle for easier handling and installation/removal. Constructed to minimise energy consumption, Compatex TMP is available in four efficiency grades (F6 to F9 acc. EN779), two variants of active filtration area and with optional faceguards.

An established, well-proven design, Compatex TMPC is renowned for reliable operation and an industry-leading burst pressure. Excellent water tightness and a self-draining system mean that even in the wettest of environments, Compatex TMPC provides ultimate performance and reliability in operation. Compact and solid, Compatex TMPC also features an ultrasonically-welded, all-plastic frame.

Compatex TMPC-E features the same great properties and performance reliability of the Compatex TMPC, but at EPA grade efficiency. Designed to answer an increasing demand for greater air cleanliness from high performance GT plants, Compatex TMPC-E provide ultimate protection from sub-micron particles and are available in grades E10 to E12.

Our pioneering three-stage GT filtration system, features a final EPA stage and provides an efficiency of 99.99% toward fine particulate. In practical application, this effectively reduces the annual contaminant level entering the turbine from dozens of kilograms down to just a few grams per year. Blade fouling is virtually eliminated and the initial compression performance is preserved much longer. In addition, costs and downtimes required to perform a thorough compressor wash are equally reduced.



◀ Left to right: Compatex TMPC, Compatex TMP & Compatex TMPC-E



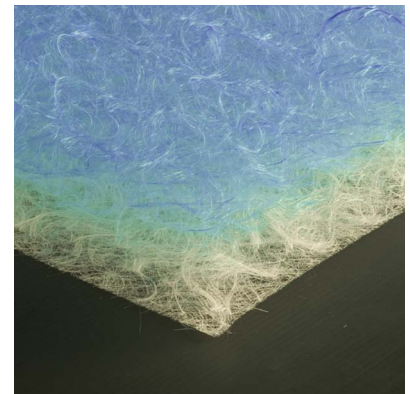
## Protection From Environmental Challenges

As wind moves over arid terrains, piles of coal and other powdered minerals, it collects coarse dust, creating an air flow with dust concentrations of up to 0.3 mg/m<sup>3</sup>. In these conditions, the operating life of fine intake filters is jeopardized dramatically, as they become clogged with larger dust particles. In this instance, the adoption of coarse dust filters capable of collecting high dust loads, helps retain acceptable maintenance intervals, low intake pressure drop, and increase the life of the fine dust filters.

TI-APM blankets are made from continuous glass filaments, coated with a film of tixotropic, permanent adhesive. As cost-effective primary filters, TI-APM are designed to collect and retain substantial amounts of dust within their hi-loft, labyrinth structure.

Available with a synthetic media pleated either cylindrically or conically, Pulsatex GT is ideally suited to capture high concentrations of dry, coarse dust particles. To remove the build-up of coarse particles deposited on the outer surface of the filter, Pulsatex GT is designed to accept a blow-back jet of compressed air or a shaking cycle in off-flow conditions.

**In desert/arid environments, winds blow large quantities of sand and coarse dust into air intakes. In these harsh environments, the adoption of high performance and cleanable pre-filters is essential.**



▲ TI-APM media blankets

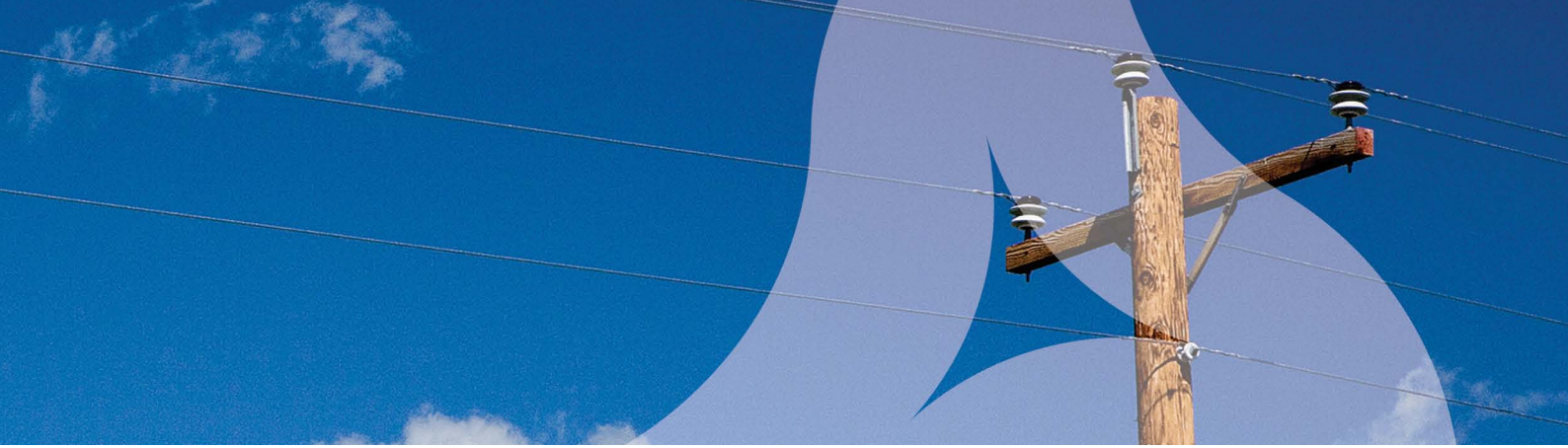


▲ Dust-loaded TI-APM blankets



▲ Pulsatex GT





In many coastal locations, dry periods alternate with humid, foggy days. Dust-laden final filters hit by fog droplets soon become wetted by a muddy, salty solution that causes a steep pressure drop rise – even imposing an emergency plant stop. Furthermore, eventual condensate leakages into the engine are a main cause of corrosion and fouling.

It is imperative to protect final filters from this danger and Macrogen GT Duo is the answer. A patented, all-in-one system, Macrogen GT Duo combines efficient coarse particle filtration with unequalled water coalescing properties.

**Vokes Air produces a diverse range of extended surface pre-filters, which vary by shape, efficiency and size to fulfil specific requirements and operating conditions for power and marine applications.**

One of our most popular bag filters, Novatex GT is an all-purpose, welded multi-pocket pre-filter. Made from special binary, synthetic media, Novatex GT is fully incinerable and available in efficiency grades G3 to F5 (EN 779). Novatex GT are especially suited for environments with average coarse and fine dust particulate content.



## Engineered Solutions

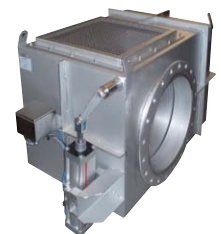
The smooth operation of power plants and marine propulsion systems is the result of a careful evaluation of a number of factors. Operational stress, the environment, and health and safety all have an impact on power generation, and filtration can provide assistance in meeting targets for each.

- 1 Steam and gas turbines expose lubricating oil to high temperatures and pressures; generating large quantities of fine oil mist. When the oil tank is vented, atmospheric pollution and oil wastage is a natural by-product.
- 2 When carbon dioxide, largely present in the atmosphere, comes into contact with stocked demineralised water, a water-soluble hydrocarbonic acid is formed that reduces Ph and causes corrosion in heat exchanger pipings.
- 3 During the start-up phase, large stationary gas installed in cold climates requires relatively warm air (normally  $\geq 15^{\circ}\text{C}$ ).

**Vokes Air offers an array of engineered solutions, tailored for specific applications in power generation and marine propulsion.**



DemiGuard filters, installed on air tank venting inlets, preserve the demineralised water reserve from hydro-carbonation. DemiGuard provides complete chemisorption of carbon dioxide and HEPA grade air sterilisation, ensuring demi-water is preserved pure and PH neutral.



Scandiverter D is a three way diverter damper that conveys tempered air into the engine, to assist the start up in cold areas.



Scandmist FBT collects oil mist from the breathers on the lubricating systems of engines, gas turbines, steam turbines, pumps and compressors. Oil mist is collected and directly recycled into the tank, providing significant operational savings. With an integral processor control and inverter-driven fan, Scandmist FBT optimises power consumption, while maintaining constant under-pressure in the oil tank.

### Vokes Air's sub-systems for power engines include:

- ▶ Air intake units for gas turbines (up to 45 MW) and diesel engines
- ▶ Ventilation, filtration and noise reduction systems for engine, generator and auxiliary rooms
- ▶ Holding frames and customised filter wall systems for new and refurbished air intake housings



**Vokes Air aims to fulfil specific progress targets within the framework of advancing sustainable technologies and reducing the environmental impact of different technological activities.**

#### **TARGET 1: OPTIMISATION OF PERFORMANCE**

More and more power generation designers and end-users leverage the vast Vokes Air know-how in air filtration to optimise their systems. Site climate and pollution analysis, laboratory R&D capability, and consultancy programmes give a scientific basis to key decisions concerning air filtration systems, such as:

- ▶ to improve the power system output and performance
- ▶ to reduce the plant maintenance budget
- ▶ to reduce off times and frequency of filter maintenance operations
- ▶ to upgrade air flow, efficiency, filter lifetime, etc.

#### **TARGET 2: ENERGY REDUCTION**

Air filters induce a drag to the air stream proportional to the operational pressure drop. For a filter rated at 4250 m<sup>3</sup>/h (2500 cfm) a difference in pressure drop of only 20 Pa means an annual extra energy output of 350 kWh.

Vokes Air's R&D department is focused on developing new filters requiring less energy for the same air cleaning performance. For example, the Compatex range of fine filters require an average of 15% less energy than main competing products of same rating and efficiency class.

#### **TARGET 3: OPERATIONAL SAFETY**

Vokes Air filters are designed for easy and safe handling and disposal. A complex sequence of specific laboratory tests simulates the most extreme temperature, humidity, and overload conditions, accurately predicting filter performance for each climate, environment and design situation.

#### **TARGET 4: TRANSPARENCY AND CONSISTENCY**

Vokes Air's in-house engineers contribute to ISO and CEN International activity for the publication of new standards in the field of air filtration. The extensive Vokes Air Quality Assurance Programme utilises both internal and external laboratories and independent testing institutions for regular testing, in compliance with ISO 9001, ISO 14001, EN 779 and EN 1822.

Vokes Air is also a founding member of the Eurovent Certification scheme – an impartial European trade association managing various product certification programmes. Through random testing, the Eurovent scheme ensures the performance of the filters supplied match the manufacturer published data.

Only manufacturers whose products are found to be in compliance with Eurovent acceptance criteria are awarded certification (for further information, please visit: [www.eurovent-certification.com](http://www.eurovent-certification.com)).

## OUR LOCATIONS

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