RETROFIT SOLUTIONS

For Gas Turbines And Rotating Machinery

BETTER AIR IS OUR BUSINESS®

AmericanAirFilter®

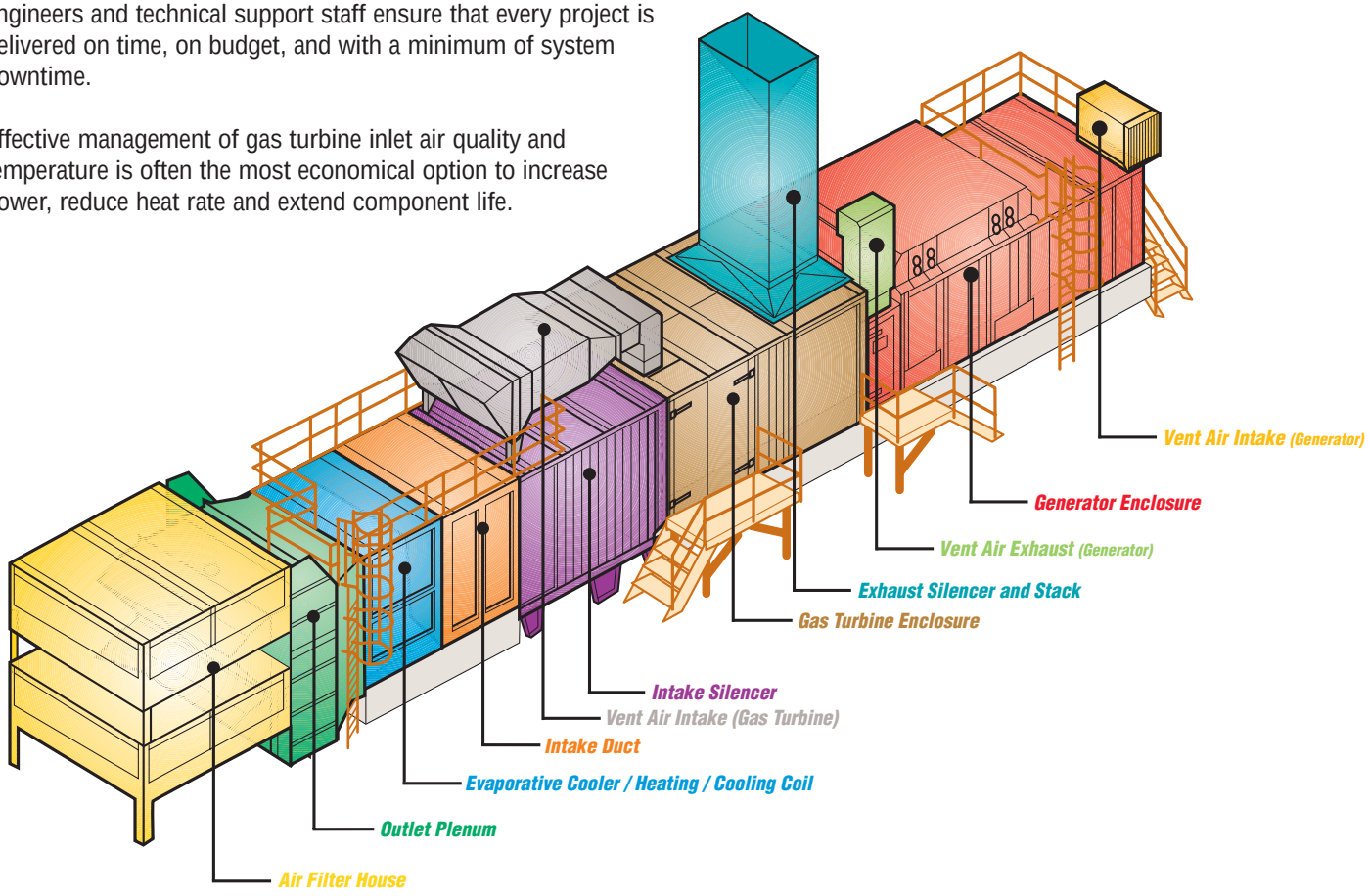
PERFORMANCE ENHANCING RETROFIT SOLUTIONS FOR GAS TURBINES AND ROTATING MACHINERY

OUR AFTERMARKET QUALIFICATIONS

For more than 65 years, AAF International has been providing filtration systems to clean intake air for high-performance rotating machinery. Over time, AAF added inlet air filtration systems, noise control and inlet air cooling systems for all classes of gas turbines and rotating machinery. As the first choice of many gas turbine original equipment manufacturers (OEM), we understand power generation and know that owners must keep their equipment operating at maximum efficiency to compete in today's power marketplace.

We specialize in retrofitting aging gas turbines, rotating machinery and internal combustion engines to enhance performance. We can repair and return deteriorated structures to original specification. Utilizing our engineering expertise and low-cost global manufacturing facilities, we can cost-effectively upgrade equipment from any OEM. More importantly, our engineers and technical support staff ensure that every project is delivered on time, on budget, and with a minimum of system downtime.

Effective management of gas turbine inlet air quality and temperature is often the most economical option to increase power, reduce heat rate and extend component life.



AAF RETROFIT PROJECTS

Here are some of the typical retrofit modifications we have made to transform older gas turbines and rotating machinery from underutilized assets into profitable resources. To decrease heat rate and increase power output, we have:

- Replaced or repaired filter housing to increase filtration efficiency, improve airflow, and minimize resistance;
- Installed inlet air cooling to increase the mass flow through the compressor, reduce heat rate, and boost turbine output;
- Modified or repaired existing ductwork and equipment to improve airflow and minimize resistance;
- Installed anti-icing systems to increase equipment availability and improve turbine performance;
- Provided streamlined duct systems to improve efficient gas flow;
- Replaced or rebuilt inlet and exhaust silencers to reduce pressure drop and control noise.

These enhancements often result in increased total system output and an immediate positive impact on profitability. Often, the payback on similar retrofit projects is measured in months, not years.

AAF supplied a retrofit inlet air system with evaporative cooling for a compressor at a refinery in LA.

HIGH EFFICIENCY AIR FILTRATION

Gas turbine performance is negatively impacted by inlet airflow restrictions. Research has shown that a high-efficiency air filtration system can improve turbine performance by reducing compressor blade fouling. Since gas turbines are installed in all types of environments from inner cities to harsh deserts to coastal regions, the air filtration system must be designed for specific environmental conditions. Properly conditioned inlet air is critical to keep turbines operating at peak performance.

AAF offers a wide range of filter houses and filters including self-cleaning, reverse-pulse, barrier, mist eliminators, and salt-removal systems. We can repair or rebuild rusted or corroded metal housing and support structures. We also offer a complete line of replacement filters for all classes of gas turbines and all types of filter housings.

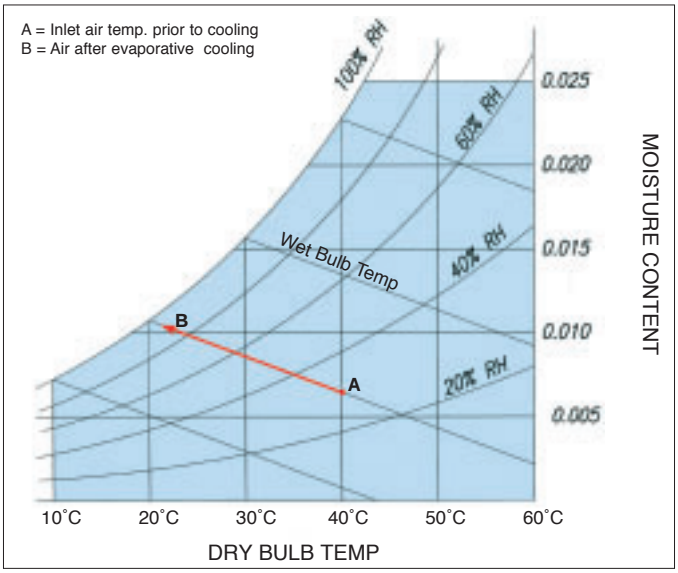
AAF offers a wide range of replacement air filters in most cartridge and panel sizes.

INLET AIR COOLING TO MEET YOUR SPECIFICATIONS

Gas turbines ingest a constant volume of air regardless of the ambient air temperature. The density of the air entering the compressor affects the power output of the turbine. As the ambient temperature increases, the power output decreases. Typically, a 1˚F temperature increase will result in a 0.5% decrease in power. In hot climates this reduction in power output can be significant and costly.

One of the simplest and most cost-effective ways to increase the output of a gas turbine is to increase air density. Cooling the inlet air recovers the power lost to high ambient air temperature and reduces heat rate.

There are several proven methods to cool inlet air and increase density. AAF provides a complete line of inlet air cooling systems including evaporation, fogging, and refrigerated chillers. There are many different power plant configurations and operating conditions. We evaluate your specific situation and recommend the best inlet cooling option for your facility. The best inlet cooling system for a particular gas turbine will depend on its age, location, and operating cycle.



AAF high-pressure fogging nozzles produce very small droplets for quick evaporation.

COOLING BY EVAPORATION

Evaporative cooling and fogging systems use water to absorb heat from the incoming air. As the water evaporates, the air is cooled. Mist eliminators may be required depending on the distance from the turbine inlet and amount of water used. AAF offers both the AmerKool Evaporative Cooler and a custom designed fogging system.

The AmerKool Evaporative Cooler uses a patented fluted media to create the maximum evaporating interface between the air and wetted surfaces. The AmerKool was developed to provide maximum performance with minimum pressure loss and negligible water carryover.

The high-pressure spray nozzles used in all AAF fogging systems were engineered to generate extremely small droplets. Most gas turbines gradually lose power due to increased ambient temperature. The AAF fogging system uses a modulated control system to monitor both temperature and humidity to ensure that fogging is introduced when needed. This continuous measurement process establishes the correct amount of fog mass flow and minimizes water build-up in the duct.

AmerKool Evaporative Cooler
- Up to 95% cooling efficiency
- Low capital investment
- Low pressure drop
- Rapid payback

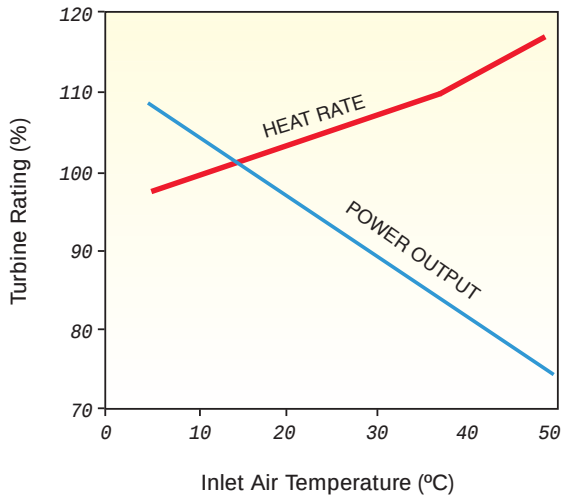
AAF Fogging System
- Approach 100% saturation
- Low capital investment
- Rapid payback
- Minimal pressure drop
- Modulated control system

COOLING BY REFRIGERATION

When you require gas turbine design inlet temperature even on the hottest days, the AAF-McQuay packaged chiller system can extend the range and capacity of inlet cooling instantaneously. Featuring an efficient McQuay centrifugal chiller with environmentally friendly HFC-134a refrigerant, the AAF-McQuay packaged chiller was specifically designed for the power generation industry. Selecting an AAF-McQuay packaged chiller for your continuous cooling needs will reduce engineering design time, shorten your construction cycle, and provide a single source of responsibility.

Factory engineered and assembled, the compact package includes chillers, pumps, controls, electrical switchgear, weatherproof enclosure and interconnecting wiring and piping. The packaged chiller ships to the site ready to be connected to electricity and a chilled water system. Suitable for indoor or outdoor locations, the packaged chillers are available in 80 to 4000 ton capacity.

Typical Gas Turbine Performance

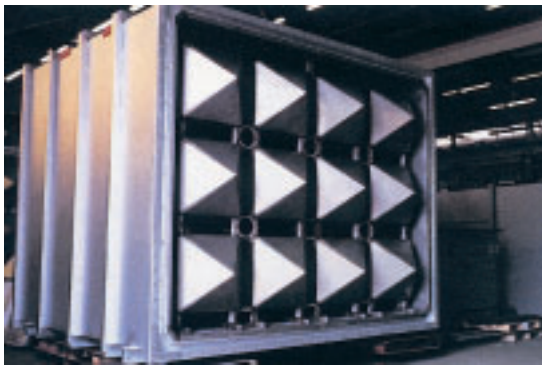


An AAF packaged chiller cools inlet air for GE LM6000 gas turbines at a California utility.

AAF-McQuay Packaged Chiller

- Designed for power generation
- Ideal for all climates
- Reduces engineering time
- Reduces construction cycle
- Single supply source
- Fully assembled
- Skid mounted
- Integrated controls
- Rapid payback

Efficient McQuay centrifugal chiller with interconnecting pipes, valves, and wiring.



AAF modular exhaust silencer.

AAF inlet silencer.

NOISE CONTROL

Gas turbines and other high-performance rotating machinery generate intense noise levels and vibration. Reducing noise emissions is a necessity for personnel safety, proper system operation, and compliance with governmental regulations. Existing power plants often require additional noise abatement due to community-zoning changes, more industrial development and more stringent environmental regulations. AAF provides effective solutions based on a solid understanding of acoustical principles and extensive power generation experience. After we measure and isolate your individual noise sources, we will recommend the best noise attenuation for your specific requirements.

Our extensive line of acoustical products includes 'tuned' inlet and exhaust silencers in a wide range of sizes and styles. We supply all types of acoustical enclosures from simple panel to fully welded steel fireproof housings in many sizes and dimensions for new or existing machinery. This broad range of attenuation products can be closely matched to any sound spectrum. We can also return deteriorated acoustical structures to their original specifications.

OUR TOTAL RETROFIT CAPABILITIES

We are well positioned to meet inlet air requirements for all classes of gas turbines and other high-performance rotating machinery. Our approach focuses on careful planning and design, state-of-the-art engineering and manufacturing, and a continuing dialogue between our project managers and our customers. These are the reasons so many customers have chosen AAF as their single source for new or rebuilt:

- Inlet Filtration
- Anti-Icing Systems
- Inlet Silencers
- Exhaust Silencers
- Ventilation Systems
- Inlet Cooling Systems
- Inlet Ductwork
- Acoustical Enclosures
- Support Structure
- Bleed Systems

WORLD CLASS QUALITY

AAF has extensive experience in the design and application of air filtration systems for all environments. In fact, we pioneered many of the clean air technologies used in the protection of gas turbines and other rotating machinery. Our systems can be found in thousands of installations around the world. During the entire production process, our operations are governed by our ISO 9001 certified quality system.

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MFAS-1-344 NOV '02 MP 5M