RMC™

Effective Cleaning Technology for Gas Turbines




Effective Cleaning Technology

RMC™ - improving output, fuel consumption, reliability and longevity.

Since the early days of axial compressor operation (in large turbochargers) engineers have noticed the phenomenon of output degradation due to compressor fouling. That is, the build-up of deposits on the compressor blades, leading to a gradual reduction in the aerodynamic efficiency of the blade, causing an overall reduction in compressor efficiency. Despite improvements in air filtration, fouling remains a serious problem; microscopic particulates (which would otherwise be harmless) pass through filters and are 'glued' together by hydrocarbons present as oil vapour, becoming sticky deposits on the blade surfaces.

Historically, abrasive materials such as powdered nutshells were introduced into the inlet air stream, in order to scrub the surface of the blade clean, but this method was abandoned as compressor architecture developed.

More recently, 'crank washing', often using solvent-based cleaning fluids, has been adopted by many operators. The engine has to be brought off-line for several hours to perform the wash however, and solvent-based fluids are hazardous in use and not environmentally friendly.

Why wash on-line?

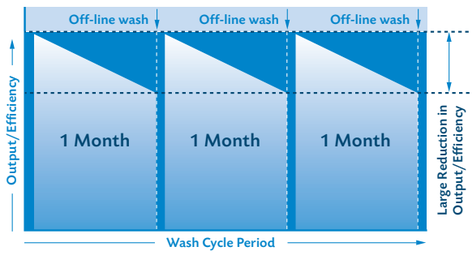
A typical off-line washing regime for a gas turbine results in a pronounced 'saw-tooth' output/efficiency profile and a large overall loss of output over any given period. Frequent stop/start cycles also have a negative maintenance implication.

The solution is to combine a highly effective cleaning fluid with a state-of-the-art delivery system, which will allow the compressor to be cleaned on-line. With the correct combination of fluid and delivery system, there are some tremendous benefits to be gleaned through regular on-line washing;

- Output degradation can be dramatically reduced (almost eliminated in some instances), meaning more kilowatts are available to sell
- Compressor efficiency is maintained near design levels, giving reduced overall fuel consumption
- Fewer stops and starts means reduced stress and lower maintenance costs
- Fewer off-line washes means less effluent to dispose of

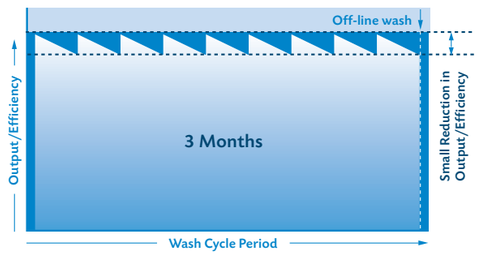
Typical OFF-LINE Washing Regime

Reduction in Output/Efficiency due to Off-line Washing Regime



Typical ON-LINE Washing Regime

Output/Efficiency are Maintained at Higher Levels, with an Effective On-line Washing Regime



R-MC Power Guard and R-MC Atomax

The most effective combination of cleaning fluid and delivery system available today

R-MC Power Guard

Power Guard is a blend of powerful cleaning agents and inhibitors with the following attributes;

- Patented water-based formulation.
- Non-toxic
- Non-flammable
- Non-corrosive
- Readily biodegradable
- Ready to use or available as concentrate
- No harmful effects on engine or gas turbines
- Broad spectrum cleaning of fouled compressor blades

The unique performance of R-MC Power Guard is attributed to four main constituents;

Surfactant

Power Guard contains a patented blend of non-ionic surfactants, the main action of which is to break down the hydrocarbon bonds between the soil particles. The surfactant also:

- Wets surfaces by reducing surface tension and breaks down the soil layer.
- Emulsifies and disperses organic and inorganic soils
- Prevents soil re-depositing by forming a 'coating' around the soil particle

Inhibitor

The inhibitor contained within Power Guard forms a sacrificial, fluid layer of molecular thickness on the compressor blades. When the fluid layer is struck by a soil particle, a portion of the inhibitor layer detaches from the blade and wraps itself around the soil particle, preventing it being re-deposited elsewhere in the compressor. The inhibitor layer typically lasts for 72hours, this being the maximum period between on-line washes in most cases.

High Temperature Carrier

By around stage 7 in a typical gas turbine compressor, most water-based cleaning fluids have 'flashed off' to vapour, rendering them useless and causing any soils so far removed to be re-deposited onto the later stages of the compressor.

Power Guard contains a High Temperature Carrier that ensures that the active ingredients remain in droplet form throughout the entire length of the compressor. This means that Power Guard is able to effectively clean the compressor from front to back.

Chelates

Chelates break down inorganic scale deposits by sequestering or chelating calcium and magnesium ions.

R-MC Atomax

Even the best cleaning fluid available must be delivered efficiently to ensure effective cleaning; the key to optimising delivery of cleaning fluid into the compressor is control of droplet size; if the droplet is too small, it will be deflected by the boundary layer of air surrounding the compressor blade. If it is too large, the fluid is simply centrifuged to the blade tips in the early stages of the compressor providing little useful cleaning. These larger droplet sizes are also considered to be a possible cause of blade surface erosion.

A conventional low-pressure delivery system produces droplets in a very wide spectrum of sizes, the average being above the optimum size. High-pressure systems produce a much narrower size range and a greater number of droplets in the optimum range.

The R-MC Atomax system provides even greater control of droplet size; heating the fluid allows the surface tension of the droplet to be manipulated producing an even greater percentage of droplets within the optimum size range. Much less fluid is needed for each wash, and the potential for blade erosion is eliminated.

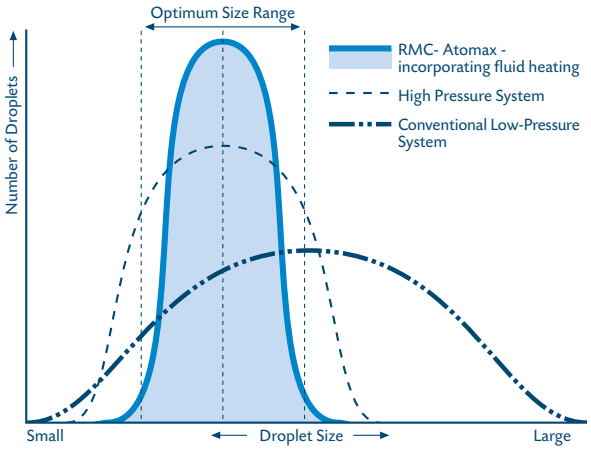


Diagram 1. Range of Droplet Sizes Produced by Various Delivery Systems

A further unique benefit of the Atomax is the ability to clean the full length of the compressor; as described previously, any water content within the fluid droplets disappears in the middle stages of the compressor. Although the High Temperature Carrier within Power Guard ensures that the fluid remains in droplet form even after the water content has evaporated, the droplets would be below the ideal size at this stage. Thus, halfway through the wash cycle, the delivery pressure from the Atomax is automatically reduced to produce larger droplets. These become optimum sized droplets once the water has evaporated.

All R-MC products are approved by the major OEM engine manufacturers. R-MC also produces fluids and delivery systems designed specifically for reciprocating engined power plants. So, whatever type of station you operate, R-MC can provide cleaning solutions to enhance the performance of your engines.

RMC™
Enhancing Engine Performance

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