GDF SUEZ BETS RIGHT ON CAMGT

ENGIE ENERGY NORTH AMERICA (FORMERLY GDF SUEZ) RETROFIT 6 ALSTOM GT24 GAS TURBINES AT THEIR MIDLOTHIAN SITE, TX

Dissatisfied with the performance of an inherited pulse-filter system, ENGIE Energy North America (formerly GDF Suez), analyzed some 30 alternative filtration choices from seven companies and opted for a CamGT 3V-600 for the retrofit of six gas turbines at its Midlothian plant in Texas. A mobile CamLab was used to verify the filter's performance, right on site.

Inlet filtration systems for gas turbines are usually supplied either as pulse systems for high dust load environment or as static systems when humidity, sticky dust or salt presence are a concern. In extremely dusty environments, a pulse filter system is the right choice. This kind of self-cleaning system allows full continuous operation at a low stable pressure drop. In other areas, low levels of coarse dust reduces the overall system efficiency as there is no dust cake formation. Most pulse filter, when tested for filter efficiency, start at a low level and increases as the filter is loaded with dust. In the field, if the filter doesn't load, it will run at its lowest efficiency for a long period of time. One stage filtration means all particles need to be captured in one stage. It doesn't allow for a coalescing stage and thus is more difficult to optimize collection of humidity, salt and dust.

In other environments, multiple stage barrier filters usually offer better life cycle-costs. Pre-filters are selected to fine tune the life of the higher efficiency final filter stage and in doing so prolongs the time between shutdowns. The multiple stages offer better water handling and overall efficiency. Unfortunately, high competition between gas turbine OEMs has brought high cost pressure leading to general standardization, in turn leading to many misapplied applications.

30 filter configurations analysed

ENGIE Midlothian in Dallas, TX is one end user that was never happy with the pulse system they inherited with their original installation. Dallas, Texas, while hot and humid, is not particularly dusty. It has average temperatures of over 75°F with relative humidity of over 70%. The annual PM2.5[1] dust concentration in Dallas is 10 ug/m^3, while maximum daily PM10[1] was 50 ug/m^3, a low dust concentration considering the PM10 national average varies between 40 to 100ug/m^3. Their 6 Alstom GT24 engines were equipped with V-shape type pulse filters, averaging M6[2] efficiency .

The plant manager at Midlothian thought the unit was misapplied for their location. Other ENGIE sites equipped with static systems in continental USA were happier with their selection and had better performance. Despite being a peaking unit, the site measured significant performance degradation, mainly due to fouling.

Retrofitting a unit is a high capital investment that is not always easy to justify, however ENGIE has been quick to understand the value of filtration. In recent years, they have created a group to look specifically into the economics of inlet filtration and developed their own life-cycle cost software. They used it to compare a total of over 30 filtration solutions from 7 different companies finally opted to go with a Camfil solution. It involved removing the pulse module and adding a static filter module with two CamGT 3V-600s in F8 and E10 efficiency installed back-to-back.

The CamGT 3V-600 is a mini-pleat 24" deep static filter offered from F8 to H13 efficiency. The 24" filter allows for an aerodynamic shape and increased media area, leading to the lowest pressure drop and maximal filter life. Using a mini-pleat pre-filter is atypical; however the added life justifies the premium purchase price when looked at from a life-cycle cost perspective.

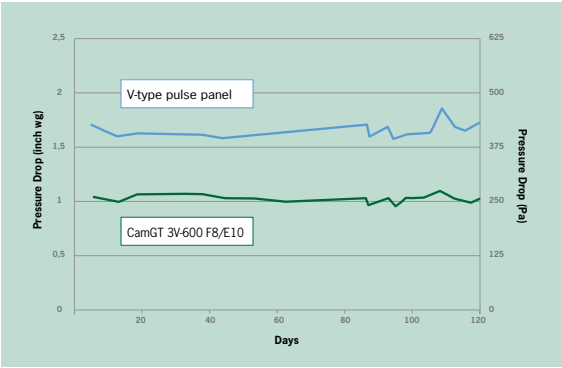
Undertaking a major retrofit is always risky and the CamGT 3V-600 was still under development in 2013 and as such represented an additional risk for the user. They could not rely on other users' testimonies or operational proof at the time. To confirm the lab data and operational performance in the field, ENGIE asked that Camfil prove its performance by using the Camlab, an onsite mobile testing lab that allows users to do side-by-side comparison between the CamGT 3V-600 and the existing V-shape pulse filter.
The Camlab ran over the summer of 2014 at Midlothian for a continuous 4 months.

The results were convincing:

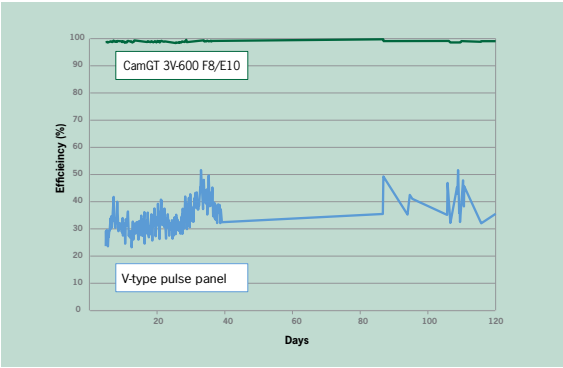
- **Large increase in efficiency: 98% on 0.4µm for the Camfil combination against 31% for the existing system**
- **40% lower pressure drop on the CamGT 3V-600 combination. 1.75" wg against 1.1" wg**
- **Minimal pressure drop increase over the 4 months continuous runtime**

Midlothian's 6 units were retrofitted between October 2014 and April 2015. In order to minimize downtime, the units were shut down one at a time. The first unit was retrofitted in 18 days and the others in 12 days.

CAMLAB ON SITE MOBILE LAB PLACED NEAR THE AIR INLET



CamLab data 1: Pressure drop over time



CamLab data 2: Particle filtration efficiency

[1]PM2.5 dust concentration is measured in µg/m³ and is the total mass of all particles with a size smaller and equal to 2.5µm found in one m³ of air. PM10 is measured in the same way but then related to the total mass of all particles with a size smaller and equal to 10µm.
[2]30% initial efficiency on 0.4um