



## Pall's Ultipleat® High Flow Filter Improves the Protection of Gas Turbines on Platforms and FPSOs

### Application

A major International oil company operates a platform off the shore of Nigeria, and a Floating Production, Storage and Offloading (FPSO) unit off Angola's shore.

Several gas turbines are operated on these plants to drive compressors and generators. Aero derivative engines are normally considered on platforms and FPSO units due to space and the weight constraints. During the commissioning of the plant or during re-start activities, turbines need to run on diesel until the fuel gas (associated gas produced with the oil) is available. In some cases the gas is not readily available, meaning that the turbogenerators have to be run on diesel for extended periods of time (up to 3 months). This was the case with the FPSO. On the platform, the run on diesel was less than one day.

Diesel needs to be filtered to remove contaminants such as heavy metals, as well as additives, gums, and bacteria which is a very common problem in the diesel produced in West Africa. Aero derivative engines require a finer protection compared to heavy duty gas turbines or diesel engines.

The diesel treatment was similar in these two plants. Prior to entering the combustion chamber, the diesel was filtered through a 3 micron filter, followed by a gear pump, then a 10 micron filter, and a 5 micron "last chance" filter upstream of the injectors. The diesel flowrate is 10 m<sup>3</sup>/h (44 gpm) per turbine.

### Problem

The client has experienced severe issues with the service life of the filters during the commissioning of the turbogenerators on both the platform and the FPSO. During the first runs on the platform, the 5 micron filters fouled within 10 minutes. This was requiring the turbine to be shutdown and the production stopped in order to replace the filters. These incidents made the start-up laborious and caused significant delays in starting the units.

The same problems arose on the FPSO. In both cases, diesel analyses revealed that the diesel loads stored at the plants were of poor quality (heavy diesel containing mud-like particles).

### Solution

In both cases, Pall was called to urgently help solve the very rapid plugging issues. Pall was able to respond very quickly. Standard filter vessels that were available in stock were shipped within one week.

A single-stack Ultipleat® High Flow filter vessel was supplied for the platform and the FPSO. It was installed by the customer upstream of the diesel skid on one machine to protect the existing filters and to help start the generators. Pall's Ultipleat High Flow filter technology was well suited for this application:

- High dirt-holding capacity provided longer service life
- Only one cartridge was needed to handle the flowrate, allowing the installation of a very compact filter system which is an essential requirement for offshore applications.

In the meantime, the customer ordered new filter vessels to protect the remaining equipment. On the FPSO, a 4-stack Ultipleat High Flow filter system was ordered to maximize the service life, as the turbines had to be run on diesel for a long period of time. Pall supplied 10 micron absolute-rated filters. Polypropylene was selected as a filter media as a trade-off between cost and service life.

The customer was satisfied with the life of the filters. On the platform, the single-stack Ultipleat High Flow filter had a service life of one day, which was long enough to make the gas available. On the FPSO, the 4-stack filter system had a service life ranging between 1-3 weeks, depending on the quality of the diesel.

### Benefits

Absolute-rated, high capacity Ultipleat High Flow filters provided:

- Better protection of the existing "last chance" filters - no more shutdowns of the turbine to replace those filters
- Faster start-up of the plant leading to earlier oil production and greater revenues for the company
- Continuous operation of the turbine, regardless of the quality of the diesel

## Conclusion

The use of aero derivative gas turbines is widespread in the offshore industry. Turbines are dual fuel and can run on gas or diesel. Diesel is used to feed the turbines during the re-start activities but needs to be kept clean, typically at levels below those usually required by the turbine manufacturer. The quality of the diesel is crucial to protect the combustion chamber and the injectors of the turbine. In both cases, Pall demonstrated that a 10 micron absolute-rated filter is efficient enough to protect the turbine as well as the “last chance” filters installed by the turbine manufacturer.

The oil company documented this valuable experience and since then has included the filtration requirements in their specification covering gas turbine supply.



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