



Pall's Coalescer Protects Gas Turbine Burners

Application

A Middle East oil and gas production company operates three gas turbine generators for power production and four gas turbine driven injection compressors for gas re-injection, on its offshore platforms.

The fuel gas feeding the gas turbines needs to be treated in order to remove solid and liquid contaminants which can cause fouling of burner tips, flame instability, turbine tripping, etc.

Problem

Gas Turbine Generators

Gas from a knock-out (KO) drum equipped with a demister pad was fed through a duty / standby fuel gas filter to each gas turbine. The filters were designed to remove solids. The only liquid removal device installed was the KO drum.

The operating company suspected liquids were passing the KO drum and filters, and entering the gas turbine, due to operating issues at the turbines.

Gas Turbine Gas Injection Compressors

The gas turbine generators took fuel gas from KO drums (with demisters) to a fuel gas header. Non-Pall vertical glass fiber coalescers were installed after the header at the inlet to each of the four turbines to remove 3 micron solids and liquids from the fuel gas.

Liquids were suspected to enter the combustion chamber because the 3 micron removal rating was incapable of removing fine aerosols from the fuel gas. The operating company also suspected that the vessels were undersized, adding to the liquid carryover problem.

With both of the above fuel gas systems, liquid carryover caused:

- 1) Operating problems - turbines tripped every 1-2 weeks
- 2) High exhaust temperature scatter
- 3) Burner tips fouling

As a result:

- Regular costly unplanned maintenance - burner tips cleaning and replacement required every few weeks
- Reduction of equipment availability during these unplanned shut downs.

Solution

In 1998 Pall made a visit to the offshore platforms where a study was conducted and a solution to the problem was presented. The solution consisted of installing high efficiency liquid/gas coalescers on the fuel gas supply to each turbine generator. At first, one gas turbine generator was fitted with a 3-stack SepraSol™ liquid/gas coalescer to remove sub-micron liquids and solids.

Operating Feedback

The performance of the three gas turbines was monitored for a year. The results after installing Pall's coalescer were clear:

- Gas turbine fitted with Pall's coalescer did not suffer over temperature scatter
- Burners remained clean
- Gas turbine ran smoothly

The other two gas turbines, with non-Pall filters suffered tripping and the burners required cleaning. In 2001, the remaining two gas generators were equipped with a 3-stack SepraSol liquid/gas coalescer system. In 2003, four more 3-stack SepraSol liquid/gas coalescers were installed on the fuel gas supply to four additional gas turbines, driving the gas injection compressors. This made a total of seven of Pall's liquid/gas coalescers protecting seven gas turbines.

Benefits

By removing solids and liquids from the gas turbine fuel gas, Pall's liquid/gas coalescers provided:

- Complete protection of the gas turbines
- Stable turbine operation of the gas turbines

As a result, the customer experienced:

- Reduction of maintenance workload
- Reduction of maintenance costs
- Increase in equipment availability
- Availability of gas injection for oil recovery

In a letter written from the customer to Pall, the customer stated: "The system has been in smooth operation using the first coalescer element since 1999 to our satisfaction. This has eliminated the source of corrosion and burner tip blockage problems in our turbine."

Conclusion

Knock-out vessels and demisters, and commodity coalescers cannot remove fine aerosols from gas streams. Pall worked closely with the operating company to fully understand the process, and operating problems. This enabled Pall to provide a solution, using correctly sized and designed high efficiency liquid/gas coalescers. Pall's coalescers effectively removed the fine sub-micron liquids and solids from the fuel gas, enabling the gas turbines to run smoothly, saving in maintenance and unplanned shutdowns, and increasing equipment availability.



A fouled burner tip



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