

Detta är en oregistrerad handling om den ej sitter i samling med tillhörande förteckning över gällande dokument.

This is an unregistered document, unless it is filed in a collection with an associated list of valid documents.

1 INTRODUCTION

The fuel entering the gas turbine must always fulfill the specification given by the gas turbine supplier. A fuel which does not fulfill the specification for the given gasturbine and/or a contaminated fuel may cause corrosion and damage to the turbine and other components of the system (filter blocking etc.). All reasonable means must be used to avoid contamination. Correct storage and handling of the fuel and an appropriate fuel treatment system will ensure that fuel of high quality will be supplied to the turbine.

2 GENERAL

The fuel used in the gas turbine must be of the highest quality and fulfill the specifications given by gas turbine supplier to ensure high and expected performance, high reliability and long useful life of the gas turbine. Fuel from a refinery is usually of very high quality, but contamination and degradation may take place during transportation and storage of the fuel. Fuel contaminants that are of interest are materials introduced in the distribution system (contaminations from suppliers storage tanks, pipelines, trucks, barges etc.) or in the user's storage and handling system, or generated within these systems (rust, sludge etc.).

Water may be present in the fuel as dissolved water and as free water. Contamination by salt water during transportation in barges and tankers is not uncommon and will usually result in unacceptably high level of sodium in the fuel. Transportation, storage, pumping and piping facilities used for residual fuels or leaded gasoline causes vanadium or lead contamination of distillate fuels if these facilities are not adequately cleansed prior to their use. The amount of solid particles and sediment in the fuel increases during storage due to corrosion products from the tank and piping and degradation of the fuel. These can cause filter blocking, fuel nozzle blocking etc.

It is important that only fuels that fulfill the specification given by us are used in the gasturbine. Fuels outside the specification may create severe damage.

3 FUEL SYSTEM

Fuel storage and handling must be done according to our recommendations given in K-8436-1. The fuel system has to be designed upon the fuel used in the gas turbine. We recommend in all application that two storage tanks for each fuel type should be installed. This allows the fuel to be used from one storage tank while the fuel is filled, settled, water and sediment drained, and fuel analysed from the other tank, before taken in use. We recommend further that in all applications coalescer filters and/or separators should be installed in the external fuel system.

4 EXAMINATION OF FUEL

Regular checks of the quality of the fuel will minimise the risk of corrosion and erosion of the gas turbine components and therefore contribute to a long trouble-free operation of the turbine.

4.1 Examination of fuel in fuel storage tank

All incoming supplies should be checked in order to avoid incorrect or contaminated fuel being delivered. The fuel should be left to settle and water should be withdrawn before the use. Samples of the fuel should be taken from the storage tank after filling and sedimentation of the fuel. The required quality of the fuel in the storage tank is depending on type of gasturbine and the pretreatment system (coalescer filter, separator and dosage equipment etc.) installed for the specific application. The tests done on the fuels should be chosen in regard to the type of fuel used in the gas turbine (distillate, heavy fuel oil, crude etc.) and the risk factors of the fuel, i.e. properties that are likely to fall outside our fuel specification. We recommend that at least the following tests should be done to insure correct delivery:

- appearance and colour
- viscosity, ASTM D 445
- water (Karl Fischer), ASTM E 1064
- sediment, ASTM D 5452
- following elements:
Na, K, Ca, Mg, V, Pb, Zn and Ni
- ash content, ASTM D 482
- ash sticking temperature, SIS 15 51 37
- density, ASTM D 4052

4.2 Regular examination of fuel entering the combustor

The fuel entering the gas turbine must always fulfill the specification given by us. Regular checks of the fuel entering the gas turbine is therefore necessary. The tests done on the fuels as well as the sampling frequency should be chosen in regard to the type of fuel used in the gas turbine (distillate, heavy fuel oil, crude etc.) and the risk factors of the fuel, i.e. properties that are likely to fall outside our fuel specification. We recommend that at least following tests should be done to insure that correct fuel enters the combustor chamber:

- appearance and colour
- viscosity, ASTM D 445
- water (Karl Fischer), ASTM E 1064
- sediment, ASTM D 5452
- following elements:
Na, K, Ca, Mg, V, Pb, Zn and Ni
- ash content, ASTM D 482
- ash sticking temperature, SIS 15 51 37
- density, ASTM D 4052

5 CONTINUOUS MONITORING AND SUPERVISION OF THE FUEL SYSTEM

Continuous supervision of the fuel system ensures optimum efficiency and high availability.

1. The tanks, pipeworks and equipments shall be regularly inspected in order to ensure that the tanks perform satisfactorily in accordance with the requirements in force in the relevant country.
2. Any filters installed should be drained, cleaned and changed at regular intervals.
3. The separator installation, if any, should be regularly inspected.
4. Water should be drained from the storage tank at regular intervals. This should be done through the special drain valve fitted to the lowest point of the tank. A quantity corresponding to at least the volume of the pipe should be drained in order to ensure that any water that has collected at the bottom of the tank will be discharged through the drain pipe. (Note that oil will first be discharged through the drain pipe and will then be followed by water. This is because the drain pipe is at a higher level than the bottom of the tank). Water should be drained at intervals determined by experience. However, the tank should be drained of water about 24 hours after filling. This time should be somewhat longer for heavier fuels.
5. The tank should regularly be cleaned. Approved sludge extraction contractors should be retained for removing sludge. However, care should be taken

during this work, since there is serious risk of bacterial contamination.

6. Representative samples of the fuel should be taken, accordingly to the schedules, by the personnel on site and sent for analysis
7. The personnel on site should check for any disturbance in the fuel system. Check for accumulation of **sludge** or **deposits** in any part of a turbine fuel system. Samples of the deposits as well as a sample of the fuel should be taken for analysis, if sludge or deposits are found.

Openings in tank and pipes should only be uncovered for a short time and only if absolutely necessary.

6 SAMPLING OF FUELS

It can not be overemphasised that an incorrect sample invalidates all the work done by the laboratory on the fuel. Samples submitted for examination must be representative of the product being sampled. The sample from the storage tank should be representative of the fuel in the storage tank as well as the sample taken from the internal fuel system should be representative of the fuel entering the turbine.

The samples should be taken in clean bottles. If no directions are given by us the samples should be taken according to ISO 3170-1988.

The samples should be marked with sampling date, site B-No, product name, supplier, sampling point, sampler and contact person.

6.1 Sampling from line

The sampling line as well as bottles should be rinsed thoroughly to avoid contamination. The sampling pipeline should not be shut between the flushing and sampling, in order not to remove any dirt from the shut-off valve. Adequate amount of flushing will depend on the dimensions of the sampling line.

6.2 Sampling from tank

Samples from tank should be taken by dipping from the tank top. The fuel should be settled and water and sediment drained before taking the sample when sampling from storage tank. The fuel should be thoroughly circulated with the pumps if possible before the sample is taken in the internal fuel system.