

VARIOUS FUELS AND PROCEDURE FOR THEIR CHANGE OVER IN A GAS TURBINE

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Abstract: We are going to deal with various liquid or gaseous fuels (and their inter changeover) used in a gas turbine for combustion to give exhaust gases that would hit the blades of turbine to generate mechanical energy that can be converted to electrical energy

Keywords: High Speed Diesel (HSD), Naphtha, Regassified Liquefied Natural Gas (RLNG), Mark-6E

1. Introduction

In a gas turbine three different fuels are used for combustion for generating exhaust gas (the driving force for turbine) namely: HSD, Naphtha and RLNG. Each fuel will be chosen based on dynamical viability on economical basis in frequent intervals, in turn each fuel has different calorific values with RLNG having the highest among them. Moreover, RLNG is called a cleaner fuel as life time of gas turbine increases with its use.

2. Fuel changeover methods

Let us go through fuel changeover procedure from one to another.

HSD to Naphtha

- 1) Ensure Naphtha pump is running and pressure kept at 6.0 kg
- 2) Ensure Reserve naphtha pump availability and keep in auto
- 3) Ensure Naphtha PCV in AUTO mode
- 4) Establish Hi-tech flow
- 5) Ensure atomizing air pressure is normal
- 6) Ensure naphtha system OK in Mark-6E panel
- 7) Give Change over command from Mark-6E panel
- 8) If Change over command not taken by mark-6E then ensure L3FU is in 1 status

- 9) After fuel C/O put Hi-tech in cascade and ensure HSD supply & R/C C/V in cascade mode

Note1: If Fuel C/O command not established ensure L3FU logic in 1 status

Note2: If required keep naphtha pressure at 6.5 kg during fuel C/O time

Naphtha to HSD

- 1) Ensure HSD pump is running and pressure kept at 5.0 kg
- 2) Ensure Reserve HSD pump availability and keep in auto
- 3) Ensure HSD supply & R/C PCV in cascade mode
- 4) Keep load at 5.0 mw
- 5) Ensure HSD OK in Mark-6E panel
- 6) Give Change over command from Mark-6E panel

HSD to RLNG

- 1) Ensure RLNG lined up to GVM I/L
- 2) Ensure GVM I/L RLNG SOV opened and vent SOV closed
- 3) Ensure GVM I/L block valve in open condition
- 4) Ensure P1 pressure is normal (21Kg)
- 5) Reduce load to 5.0Mw
- 6) Give Fuel selection to GAS in mark-6E panel
- 7) Fill timer will start and run for 30 seconds
- 8) Gas will enter gas FSR increase & Liquid FSR will reduce
- 9) After 100% gas ensure Gas FSR & GCV opening are normal
- 10) Keep HSD system in circulation with PCVs in cascade
- 11) Switch off naphtha & hi-tech system

Naphtha to RLNG

Naphtha to RLNG can't be done directly first fuel to be changed to HSD then only RLNG can be changed

- 12) Ensure RLNG lined up to GVM I/L

- 13) Ensure GVM I/L RLNG SOV opened and vent SOV closed
- 14) Ensure GVM I/L block valve in open condition
- 15) Ensure P1 pressure is normal (21Kg)
- 16) Follow Naphtha to HSD Change over procedure and change over to HSD
- 17) Keep load at 5.0Mw
- 18) Give Fuel selection to GAS in mark-6E panel
- 19) Fill timer will start and run for 30 seconds
- 20) Gas will enter gas FSR increase & Liquid FSR will reduce
- 21) After 100% gas ensure Gas FSR & GCV opening are normal
- 22) Keep HSD system in circulation with PCVs in cascade
- 23) Switch off naphtha & hi-tech system

RLNG to HSD

- 1) Ensure HSD pump is running and pressure kept at 5.0 kg
- 2) Ensure Reserve HSD pump availability and keep in auto
- 3) Ensure HSD supply & R/C PCV in cascade mode
- 4) Keep load at 5.0 mw
- 5) Give HSD selection
- 6) Fill timer will start and run for 30 seconds
- 7) After fill timer start check whether Fuel stop valve 20FL & 20 VS got opened and warren pump suction pressure reaches 5.0 kg
- 8) After fill time of 30 seconds warren pump clutch engages, gets started and Liquid FSR increases from 0 to 100 % slowly
- 9) Check for Fuel flow in DCS/FQL/spread
- 10) If required keep HSD pressure at 6.5 kg during fuel C/O time

RLNG to Naphtha

- 1) RLNG to Naphtha can't be done directly first fuel to be changed to HSD then only to Naphtha can be changed
- 2) Follow RLNG to HSD procedure first
- 3) Then follow HSD to Naphtha Procedure

Abbreviations

High Speed Diesel (HSD)

Regassified Liquefied Natural Gas (RLNG)

Distributed Control System (DCS)

Fuel flow rate feedback (FQL)

Fuel Stroke Reference (FSR)

Gas Control Valve (GCV)

Recirculation (R/C)

Pressure Control Valve (PCV)

Solenoid Operated Valve (SOV)

Gas Valve Module (GVM)

Changeover (C/O)

CONCLUSION:

In this paper we discuss, in a gas turbine three different fuels are used for combustion for generating exhaust gas (the driving force for turbine) namely: HSD, Naphtha and RLNG. Each fuel will be choosed based on dynamical viability on economical basis in frequent intervals, in turn each fuel has different calorific values with RLNG having the highest among them. Moreover, RLNG is called a cleaner fuel as life time of gas turbine increases with it's use, and there is so much further scope for research in this subject.

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