T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Maintenance, Installation and Repair for Engineering and Manufacturing

Employer-Set Project (8730-033)

Project Brief Autumn 2023

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The employer

Renewing Energising Generating Ltd (REG) are a UK based company providing a variety of engineering services on largescale industrial equipment for the energy generation sector, predominately to the electrical generation and distribution industry.

REG provide clients with reactive and planned maintenance services as well as developing maintenance instructions for their client's employees to follow.

The services provided include:

- bespoke maintenance schedules
- bespoke maintenance instructions
- supporting implementation of planned shutdowns
- support and guidance around breakdowns.

You are an engineer working for REG and have been allocated the project below.

The project

REG have been approached by an electricity generating company called EGC One, who have recently had a new gas turbine installed. The gas turbine is used to generate electricity and is located in the centre of EGC One's plant. Figure 1 shows the type of gas turbine installed.

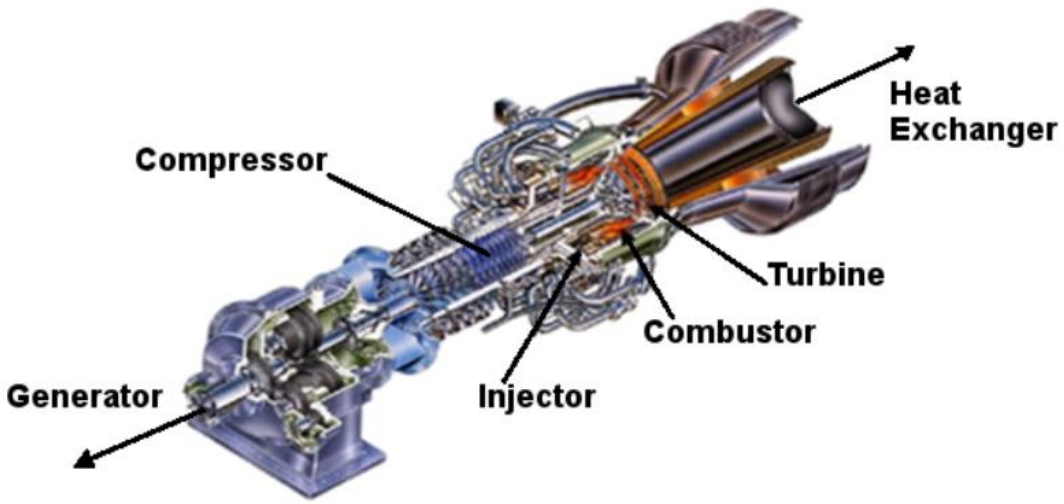

Figure 1: Layout of Gas Turbine used by EGC One
(Source of image: Types of CHP and microCHP Technologies - conservatoryhub.com)

When the gas turbine is out of operation, electricity generation stops. This could negatively impact the client due to their customers being without electricity, resulting in EGC One potentially losing substantial revenue, as well as the risk of significant regulatory action.

REG have been asked to develop and propose a schedule for maintenance going forward. This will consist of instructions which will be used by the client's on-site engineers who will carry out the maintenance. You have been asked to research potential maintenance schedules and requirements for gas turbines.

The client has requested:

- an annual maintenance schedule for their gas turbine
- strategies for implementing preventative maintenance as part of the routine maintenance and inspections
- a list of equipment and materials that will be required to complete the maintenance
- a presentation of the maintenance instructions with the schedule presented to their engineers.

The client has provided REG with the specifications and details on the access arrangements for the gas turbine.

Specification

Introduction

The requirement is to develop a maintenance schedule and instructions to carry out the maintenance. This will be presented to the senior engineering team at EGC One for consideration.

The following information should be noted:

- the gas turbine is already commissioned
- EGC One already has a minor inspection in place at 25,000 equivalent operating hours
- the gas turbine manufacturer recommends major inspection and maintenance activity at 49,000 equivalent operating hours.

Specification and maintenance requirements

	Requirement
Gas turbine specifications	Output (net) 470 MW Heat Rate (net) 8,673 kJ/kWh Efficiency (net) 41% Pressure Ratio 21:8 Final Temperature 900 °C Fuel consumption 0.142 m^3/s Exhaust Flow 0.978 kg/s Turbine Speed 3,000 rpm Combustion Zone Temperature 1500 °C Heating value of jet fuel 38.97 MJ/m^3 Initial Temperature 15 °C 30 minutes start-up time 60 MW ramping speed Gas and liquid fuelled/combined cycle Low emissions
Dimensions of the gas turbine	L11.40 m x W5.10 m x H5.20 m 396 tonnes
Areas of required inspection and maintenance	Combustion chamber Hot gas path Compressor Turbine (stator and rotor) Injector Housing Heat exchanger Exhaust frame Gearbox Turbine blades All relative components such as thrust bearings, couplings etc.

	Requirement
Access requirements	The gas turbine is located within a caged storage facility. Access will be made available with a permit, this must be inspected for safety and security, ensuring it meets HSE requirements. The facility is protected within the plant but can be accessed 24 hours a day 7 days a week (24/7). There is good accessibility to the site for delivery of equipment and components.
Shutdown	Plant shutdown is scheduled for 4 weeks out of every 18 months. Maintenance can be conducted over the course of various shifts during this time.

Budget

The budget for the maintenance activity is £200k for the purchasing of equipment, tools and materials that will be required to complete the on-going maintenance.

Costing of downtime does not need to be considered as EGC One has requested the maintenance to be performed during the planned shutdown of the plant.

Timescale

The planned shutdown takes place over 4 weeks. EGC One has requested that the maintenance takes no longer than 7 days. The additional 3 weeks are given as contingency to allow for any issues that they may come across during the maintenance.

Get in touch

City & Guilds Technicals Quality Team

We are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

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