



Combined Cycle Course Questionnaire

For

Special Courses Designed for your Company

The attached questionnaire is designed for the upcoming course on “Gas Turbine Technology and Planned Optimization of Combined Cycle Power Plants” to be held at your facilities. This questionnaire has two purposes the first is to get the student to take a more in-depth look at the plant he/she works with and the second purpose is to enable the student to inform the lecturer regarding their needs which they would like to see covered in this course.

COMBINED CYCLE PLANT

Describe the layout of your Combined Cycle Power Plant. Is the plant a 1x1x1 plant (1 GT x1 HRSG x 1 ST), or (2 GT x 2 HRSG x 1 ST) or other combinations.

The Plant Mode of Operation. Is the plant operated as a base loaded plant, i.e. the plant operates at full load with 1 start /1000 hours of operation, or the plant is cycled daily from full load to about 40% - 60% load on a daily basis, or the plant is started on a weekly basis operated Monday to Friday, cycled from full load to about 40% - 60% load during the day and shutdown during the weekends, or the plant is started up daily. What are the average number of starts/operation hours.

The time for start up of the Combined Cycle Power Plant. Gas Turbine start-up time, the steam turbine start up time.

ADVANCED GAS TURBINES

Make and Model of Gas Turbines, Compressor Pressure ratio, firing Temperature, type of Combustor, Transition Piece and Turbine Nozzle and Blade cooling (steam cooling or air cooling after the compressor air has been taken to an external heat exchanger to cool it down)

Types of Inlet Systems (Inlet Filter Types, Evaporative Systems, Refrigerated Inlet)

Inlet Guide Vanes, Compressor Blades and Vanes

Bleed Valve Problems

Exhaust Guide Vane Problems

COMBUSTION SYSTEMS

Can Annular Type Combustors (GE Frame Units, W501 Units)

Annular Type Combustors (Siemens V Series, GE AeroEngines)

Diffusion Combustors (Wet Combustors)

Dry Low NO_x Combustors

Fuel Nozzles

Combustor Cans and Cross Fire Tubes

Transition Pieces

Water Injection Systems (NOx Control, Power Augmentation)

TURBINE SECTION

First Stage Turbine Nozzles

First Stage Turbine Blades

Second Stage Turbine Nozzles

Second Stage Turbine Blades

All Other Stage Turbine Nozzles and Blades

EXHAUST CASING and EXHAUST DUCTING

HEAT RECOVERY STEAM GENERATORS

Describe the steam generator set-up that is in your plant. Is it a Multi-Pressure Steam Generator, is there supplementary firing of the exhaust gases, number of stages, the pressure and temperature of the steam exiting from the HRSG. Is the HRSG a Vertical or Horizontal flow system, are there drums in the system? Is the HRSG a once through HRSG? Does the system have a Deaerator, are water polishers used, make up water treatment system, number of pumps in the system, number of drums in the system, is there a preheater in the system:

Heat Recovery Steam Generator Description

Describe the problems that your HRSG system has encountered:

Is steam used for gas turbine cooling if yes describe the system:

Is steam used for NOx Reduction:

Is steam used for Power Augmentation?

STEAM TURBINE

Describe the steam turbine used. Is the steam turbine a condensing steam turbine or a back pressure steam? How many sections are there on the steam turbine (High Pressure, Intermediate Pressure, Low Pressure). Describe the flow from each section, does the flow reenter the boiler where it is reheated, is it used for cooling the gas turbine and reheated in that process.

Have you had problems with the steam turbine blades in the HP and IP turbines?

Have you had problems last two stages of the turbine blades in the LP section?

CONDENSER

What type of Condensers are used, are the condenser's Water or Air.

Are the water pumps delivering the cooling water 2 x 50, or 2x100 or other combinations? Is the water being pumped from the ocean, or a river and what are the problems of silt, and other blockages you have with these units?
