Power System Design and Analysis

HRL has the experienced staff and software tools to design power and co-generation projects quickly and efficiently. We use the Thermoflow suite of programs for the analysis, design and costing of conventional steam cycle and gas turbine combined cycle plant. Additional modelling tools are used to address specific design or performance issues. This capability is supported by the fuel, combustion, materials and environmental specialists within HRL.

Steam Pro: Steam Power Plant Design

STEAM PRO is used to design steam power plants with or without cogeneration. It's speed, flexibility and detailed output enables us to quickly investigate the effects of design changes to produce an optimal plant design.

STEAM PRO's steam turbine model can be configured with ten distinct shaft/casing layouts including subcritical and supercritical cycles using saturated HP steam and steam reheating.
Using STEAM PRO, we can

- Evaluate the thermodynamic requirements of your boiler taking into account factors such as fuel type, excess air, the minimum stack temperature, etc.
- Determine the required rates of heat transfer for the economiser, evaporator, superheater(s), reheater(s) and air preheater.
- Determine the fuel flow rate; stack temperature, boiler efficiency, and forced and induced draught fan power requirements.
- Determine the size of heat exchange surfaces and provide detailed specifications on tube diameter, wall thickness, fin characteristics, and materials for each individual heat exchange section in the boiler.

Steam Master

STEAM MASTER models in detail the off-design behaviour of the boiler, condensers, feedwater heaters and piping pressure drops. With this capability, we can quickly and accurately investigate the effect of changes to plant design and operational conditions.

Factors that can be investigated include:

- Changes in the distribution of primary air and secondary air, flue gas recirculation and the introduction of tempering air.
- Different arrangements of feedwater heaters, bypassing of individual or series groups of feedwater heaters, shut off heating steam flow to individual heaters, and re-route heater drains to other destinations.
- Pressure drops of steam and water inside the tubes of boiler heat exchangers and pressure drops of flue gas over the outside of those tubes.

GT PRO: Gas Turbine Combined Cycle and Co-Generation Design

GT PRO is used to generate accurate, detailed heat balances, cycle flow schematics, equipment designs and economic analyses for combined cycle and co-generation plants.

With GT PRO, we can model a broad variety of steam systems with or without supplementary firing, ranging from simple heat recovery boilers to multi-pressure steam injected gas turbines and reheat combined cycles with numerous process steam or water extractions or additions. Additionally, we can model steam cycles with fresh air firing or utilising a hot gas stream from, for example, a blast furnace or other industrial process.

The gas turbine and steam cycle are fully integrated and provides detailed estimates on the performance of the gas turbine cycle from the inlet to the compressor, combustor, turbine down to the diffuser. We can also investigate the effect of using different fuel sources, a broad range of site and installation conditions as well as the effects of design or controls modifications, or turbomachinery degradation due to aging or fouling.

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PEACE (Plant Engineering and Construction Estimator)

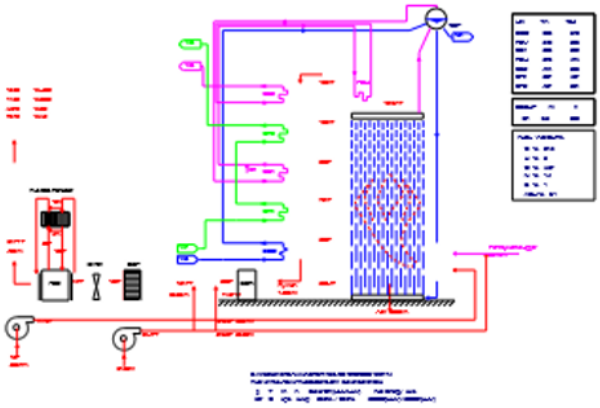
Developing a comprehensive cost estimate for all phases of power plant construction can be a tedious process.

The PEACE module performs preliminary sizing calculations for all significant plant equipment, pipes, foundations and buildings. This provides an accurate and highly detailed cost estimate for power plant design, engineering, and construction including equipment, materials and labour needed for the project.

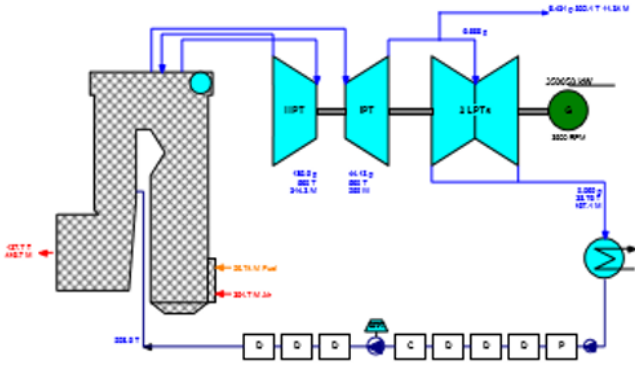
PEACE provides a quick estimate of project costs for various plant designs or modifications and allows us to optimise designs, considering in detail the trade-off between cost and performance for various options.

The annual operation and maintenance costs are combined with the capital cost estimate to produce an annual cash flow throughout the life of the project. Profitability indicators, such as internal rate of return (IRR) and net present value (NPV), are also provided.

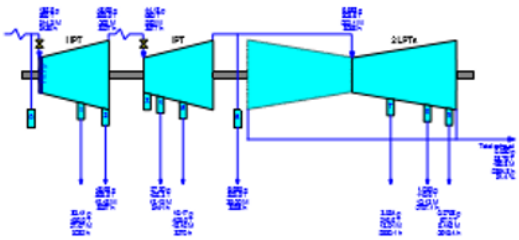
Program output examples:



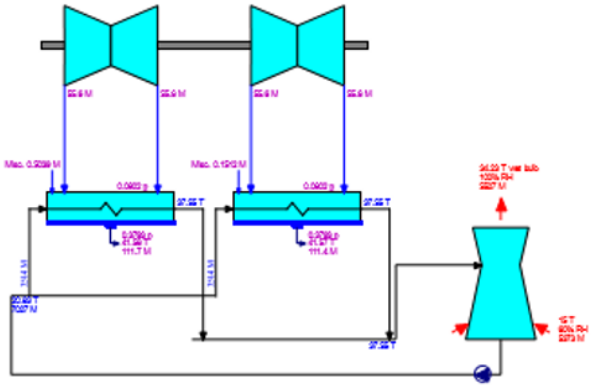
Boiler Schematic



Boiler/Turbine Overview

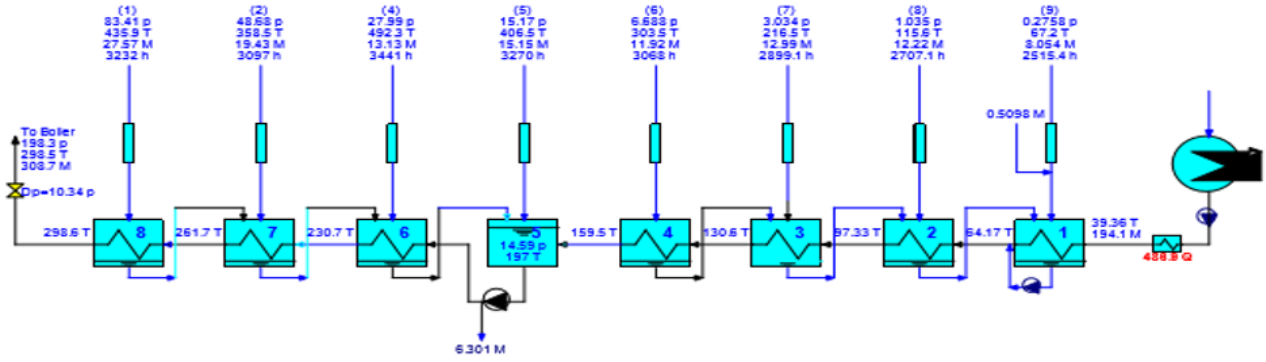


Turbine Detail

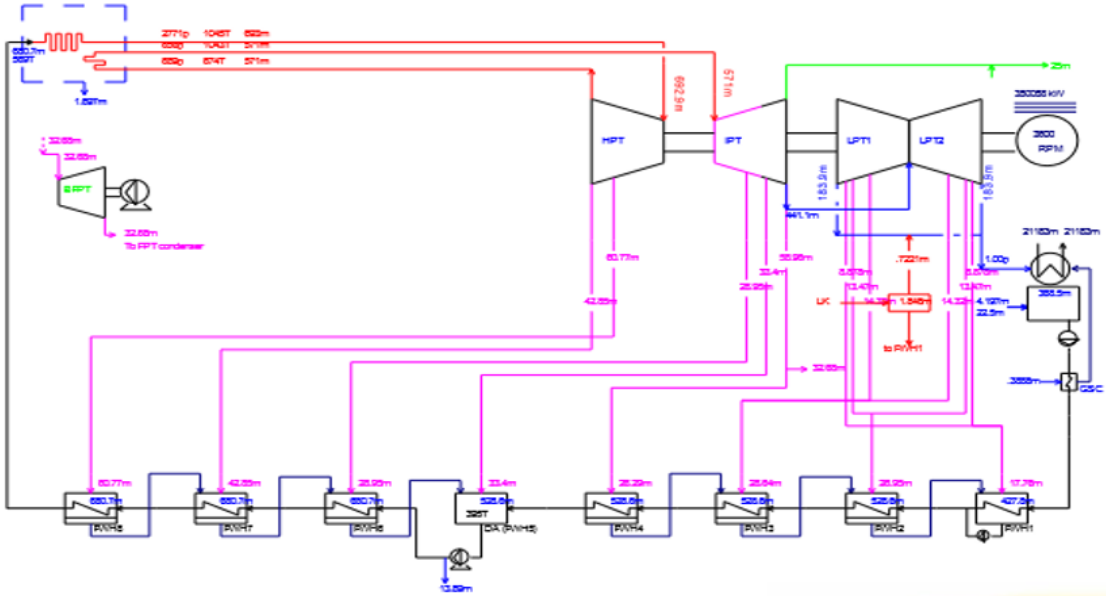


Cooling System Detail

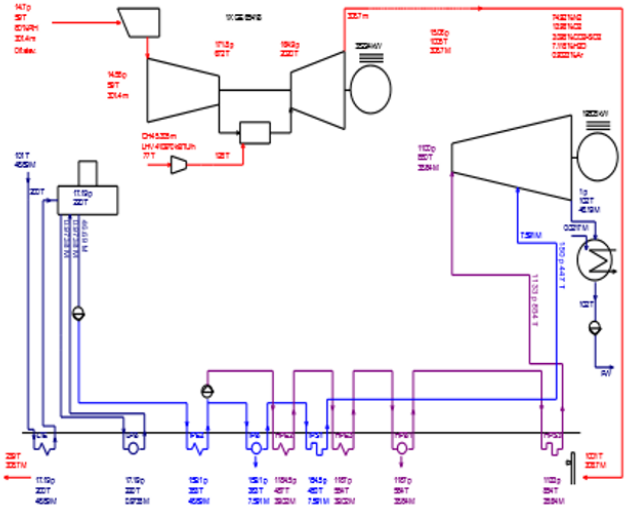
expertise in action



Feedwater Detail



Flow Schematic



GT-CC Process Diagram

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Need more information? Go to hrl.com.au

The company's NATA Accredited Laboratories number is 561.

HRL Technology Group's ISO 9001 Quality Management is certified by BSI under certificate FS605116

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