NEW TECHNOLOGY FOR MATURE POWER PLANTS

University of Texas: Austin, TX

Combined cycle plant performance assessment

1,676 Btu/kWh reduction in heat rate on LHV

ROI: less than one-year

Returning energy and efficiency to your power investments.

AFTERMARKET SERVICES

Vogt Power International

A Babcock Power Inc. Company

UNIVERSITY OF TEXAS: AUSTIN, TX

PLANT TYPE:

Power and steam plant utilizing HRSG, boiler, and turbine technology

SCOPE:

- Assess plant equipment operation to determine optimal performance capabilities
- Suggest operational conditions and modifications for reduction of Net Plant Heat Rate (NPHR)

RESULTS:

- Identified and eliminated load-limiting factors
- Designed bypass system
- Suggested modified control logic for steam turbine

VOGT POWER ADVANTAGES:

- Performance testing and evaluations executed by engineers creating optimal, achievable solutions
- In addition to optimization, evaluated backup systems to ensure constant steam supply
- Provide viable options and cost benefit analysis so you can decide best approach

The University of Texas (UT) in Austin is a major research university with strong curricula in engineering and agriculture. As a result, there is a great demand for steam for research experiments. Due to the significance of the work being performed, the campus can never lose steam supply to these experiments.

Steam supply is managed by the UT Department of Utilities and Energy Management, which is responsible for the production of adequate steam to maintain the research experiments as well as enough steam to feed to turbines and ventilation systems providing electricity and heat to the entire campus. This steam and energy supply is produced from a combined cycle system that includes an HRSG originally designed for baseload operation and feedwater supply to conventional on-site boilers. Eventually, steam demand from campus was significantly reduced, resulting in the need for operation of fewer components. The need to maintain both adequate steam production and backup capability, coupled with existing equipment limitations, resulted in operation of campus equipment as shown in the "before" diagram at right.

UT consulted with Vogt Power International (VPI) to determine the optimal way to operate their plant taking into consideration the current demand dynamics. VPI took the following steps to achieve a viable solution:

- On-site inspection including performance testing and engineering evaluations of units – the conventional boilers, HRSGs, steam turbines, and gas turbine – to determine the efficiencies and heat rates of the units.
- Formulated most efficient way to operate/dispatch units under multiple load conditions.
- Identified the load limiting factors that prevented optimal performance.
- Provided engineering solutions to eliminate load-limiting factors.

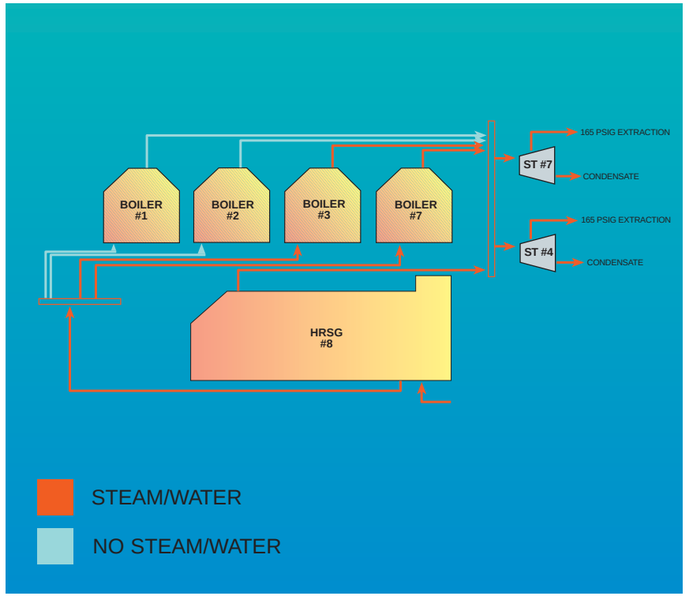
To achieve optimal balance of power generation versus internal process steam use as well as supplement a need for additional backup systems to prevent loss of steam production, VPI suggested modifications such as:

- A water preheater bypass to prevent the outlet temperature from exceeding the set point temperature regardless of the load.
- Modification of the control logic for the steam turbine to maintain a set back pressure on the HRSG under all conditions. This prevents the HRSG from experiencing a "trip" condition when steam pressure is lost at the superheater non-return valve.

Overall, modifications as detailed in the "after" diagram at right demonstrate potential and significant improvements in plant operation.

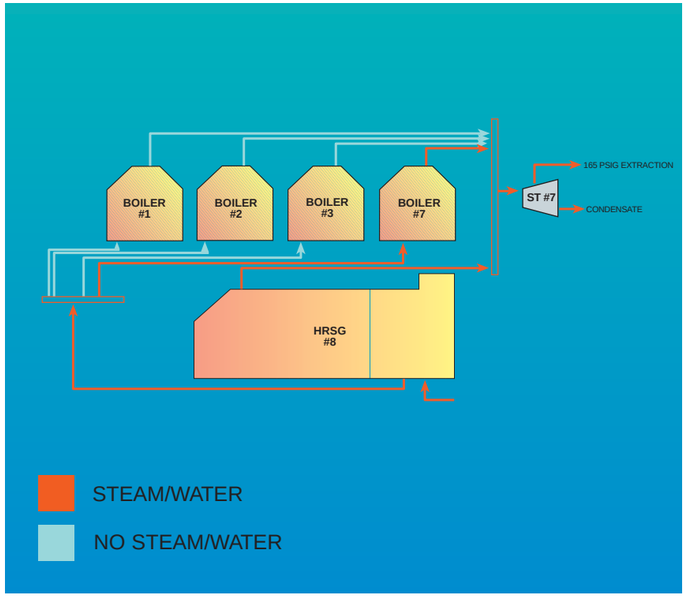
BEFORE ASSESSMENT STATS

Steam Flow (lb/hr)	
HRSG 8	127,000
Boiler 7	115,000
Boiler 3	71,000
Total Steam Flow	313,000
Fuel Flow (lb/hr)	
Gas Turbine 8	17,564
HRSG 8 Duct Burner	–
Boiler 7	6,006
Boiler 3	4,073
Total Fuel Flow	27,643
Heat Rate	
Heat Rate Based on LHV (Btu/kWh)	9,115
Heat Rate Based on HHV (Btu/kWh)	10,602



AFTER ASSESSMENT STATS

Steam Flow (lb/hr)	
HRSG 8	174,729
Boiler 7	50,000
Total Steam Flow	224,729
Fuel Flow (lb/hr)	
Gas Turbine 8	20,505
Boiler 7	2,756
HRSG 8 Duct Burner	843
Total Fuel Flow	24,104
Heat Rate	
Heat Rate Based on LHV (Btu/kWh)	7,439
Heat Rate Based on HHV (Btu/kWh)	8,736



Our experience shows that 90% of installed plants have potential for performance improvement opportunities.
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Get dedicated, fast Aftermarket Service from the company that supplies more HRSGs than any other manufacturer in the world.

AFTERMARKET PRODUCTS:

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- *Complete modules*
- *Bare and finned tubes and headers*
- *Steam drums*
- *Heat exchangers*
- *Valves/instruments*
- *Control systems*
- *Diverter valves/dampers*
- *Burner management systems*
- *Environmental controls (CO/NOx systems)*
- *Freeze protection*
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- *Performance testing*
- *Casing and insulation*
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- *Pressure vessels*
- *Feedwater heaters*
- *Rolled cylinders*
- *Deaerators*
- *Stacks*
- *Access doors*
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- *Return On Investment (ROI) analysis*
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