



YUANPING CHEMICAL COMPANY LIMITED

Install steam turbine to existing boiler to generate electricity from superheated steam

SUMMARY OF THE OPTION

Yuanping city Chemical Co. Ltd is a middle-sized chemical plant with 1679 staff, located in Shanxi Province in China and is Asia's largest producers of oxalic acid, and also produced products like sodium format and formic acid.

During the plant assessment the Team found that the newly installed #9 boiler yields 35 tons per hour (t/h) superheated steam (3.82MPa and 450°C), But that the superheated steam was used only for process heating. This boiler therefore had a large potential for cogeneration. Coincidentally, the company had also identified the cogeneration possibility and had purchased a second-hand 3MW turbine. The total investment was US\$ 1.43 million, annual electricity generation was 20196 MWh and the annual savings were US\$ 0.61 million. It was calculated that approximately 1700 tons of coal can be saved each year because cogeneration is more efficient than separate electricity and heat production. As a result, CO₂ emission reduction is 4260 tons per year.

KEY WORDS

China, Chemicals, Cogeneration, Boilers and Thermic Fluid Heaters, Steam

OBSERVATIONS

The following was observed during the assessment of the plant:

- In addition to the newly installed boiler #9, the company has five saturated steam boilers (1.27 MPa) and three superheated steam boilers (2.45 MPa, 400°C and 20t/h).
- The steam production rate is 130 t/h and only 40 t/h of the total steam generation (2.45MPa, 400°C) is used to generate electricity (3MWh = 30% of all electricity used on site) through two non-condensing turbine generators, and the exit steam from turbines (0.3MPa, 260°C) is used in process heating.
- The newly installed boiler #9 uses duns and coal slacks to produce 35 tons superheated steam (3.82 MPa and 450°C). However, the superheated steam is only used for process heating, which means that there is potential for cogeneration.
- Electricity use is high and electricity is one of the biggest costs to the company

OPTIONS

The team proposed to using the steam from boiler #9 for cogeneration. A detailed feasibility analysis was not necessary because the company also had identified this option prior to the assessment. The company installed an older, second-hand 3MWhr (due to financial constraints) non-condensing turbine generator to generate electricity with the 3.82MPa, 450°C superheated steam. The exit steam (0.7MPa, 250°C) from the turbine was used for process heating. Cogeneration at boiler #9 started in February 2005.



RESULTS

Financial Benefits

- Investment: US\$ 1.43 million
- Annual operation cost: US\$ 11/MWh
- Annual cost savings was US\$ 0.61 million
- Payback period: 2.3 years

Environmental Benefits

- Annual coal savings: 1700 tons (this was calculated based on an 27 % efficiency gap between cogeneration and separate production of electricity and heat)
- Annual GHG emission reduction: 4260 tons CO₂

Other results

- Using the exit steam from turbine with a lower pressure and temperature instead of superheated steam, process heating can improve the heat transfer rate and reduce the heating time.

FOR MORE INFORMATION

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