

(Note: David Hall was the Managing Director and former part owner of Steam & Technical Services P/L, (STS) South Africa. The experience from which was transferred to Energy Developments & Resources P/L).

Elgen Project – Electricity from Lean Furnace Waste Gas

STS were contracted by Billiton (now BHP-Billiton) to provide specialist process engineering and project management services for the development of a 50 MWe thermal power station at Samancor's Metalloids plant in Meyerton, South Africa.

A feasibility study first identified the potential for utilising the off gases from three electric arc furnaces which were being flared to atmosphere.



The gas, with main combustible constituents of CO and H₂, is fed from the furnaces via wet scrubbers to a custom designed water tube boiler. The resulting high pressure steam is then passed through a fully condensing steam turbine attached to a 50 MWe generator. The steam is condensed in an air cooled condenser rather than a water cooled system in order to conserve water.

Reference should be made to, "STS BULLETIN 001 ELGEN" for more specific information about this power plant project.

Scope of Services

Billiton's consulting engineering department took the lead as overall project managers and took responsibility for the civil works, electrical and control integration.

STS were responsible to Billiton for the overall process design, integration and project management of the "process packages," namely:

- Water treatment
- Boiler island
- Steam turbine
- Air cooled condenser (ACC)

STS completed the conceptual investigations and process definition through to detail engineering, construction and commissioning for the Elgen project.

The following services were also completed by STS:

- Gas Measurement and Analysis

- Gas measurement and analysis were conducted to determine the volume of gas available from the furnaces for use in an energy recovery plant as well as the gas quality and the calorific value of the gas. Because of the specialized nature of the work, the CSIR (Council for Scientific and Industrial Research) was engaged to do the gas flow measurement and calorific value analysis.
- Feasibility Studies
 - Feasibility studies were done to evaluate energy recovery technologies to identify the most cost-effective process for converting the furnace waste gas into electrical energy. Typical processes evaluated were:
 - Gas turbine driven generator
 - Combined-cycle plant comprising a gas turbine generator, waste heat boiler and steam turbine driven generator
 - Gas-fired boiler and steam turbine driven generator
 - The gas-fired boiler option was selected because of the dust content of the furnace off-gas and the variability of the gas supply which is dependent on the furnace operations
- Plant Engineering
 - Plant engineering included process definition, plant, equipment and services design and specification for all process packages including management of the engineering interface with the Billiton scope of work.
 - STS engineers and project management provided the specialist support to Billiton during the plant construction, commissioning and lead the plant performance testing.
- Project Management
 - STS were responsible for the project management of the process packages and interface with the Billiton scope of work.

The project was completed on time, to specification and within budget!



Completed 50MWe Lean Gas Fired Power Station