

Research topics

Integrated Gasification Combined Cycle Processes

Dr Nan Zhang

Abstract

This project is investigating the use of integrated gasification combined cycles (IGCC) in the context of overall refinery operation. The use of IGCC allows improvements in the design of the hydrogen system and improvements in economic margins. This requires overall optimisation of refinery processes together with IGCC and the hydrogen and utility networks.

Project description

As a result of the world-wide trend towards processing of heavier crude oils, stricter environmental regulations and increased demand for better quality products, integrated gasification combined cycle technology has become an attractive option for the refining industry. Gasification converts the 'bottom of barrel' into valuable products such as hydrogen, clean fuel and power. The production of hydrogen is important because of increased demands for hydrogen in hydrotreating operations as a result of changing environmental regulations. However, IGCC must be considered within the context of the whole refinery. Effective integration of IGCC will be important in establishing the economic viability of the process.

The major issues to be addressed include investigation of integration opportunities in the existing refinery infrastructure to select the most appropriate feedstock for IGCC and better utilisation of the existing facilities. In this optimisation, the existing bottlenecks can be identified and relaxed to enhance throughput. The existing unit connections, allocations of utilities and operating modes are also optimised in order to maximise the refinery economic margins.

In order to minimise the capital investment for IGCC the most appropriate configuration for hydrogen production and recovery can be determined from optimisation. This allows the trade-off to be made between the benefit achieved by integrating IGCC and the capital investment required.