Johnson Matthey
Inspiring science, enhancing life

COMPACT REFORMING TECHNOLOGY

Introduction

The Compact Reformer combines three process steps: combustion, heat recovery and reaction in a simple tubular module, with the aim of substantially increasing heat transfer compared to Conventional Reforming. This reduces both the size and weight of the reformer and allows for prefabrication, requiring less site construction than a Conventional Steam Methane Reformer. This makes it particularly advantageous for off-shore, remote or small scale methanol plant applications and for modular designs.

Compact Reforming

The Compact Reformer was first installed in BP's GTL demonstration plant in Nikiski, Alaska in 2001. This plant converted 0.09 million Nm^3/day of natural gas to 300 bpd of synthetic crude using the Compact Reformer and BP/Davy's fixed-bed Fischer Tropsch technology.

Since start-up in 2002, the Compact Reformer has been fully proven with over 18,000 hours of successful operation, including over fifty start-ups and shut-downs. In early 2009, an improved Compact Reformer bundle, incorporating several design improvements, was installed and successfully commissioned.

The Compact Reformer is small and lightweight and can be readily transported by road or rail, making it ideal for use in remote or offshore locations.

Figure 1 - **DAVY** compact reforming installed on the Nikiski demonstration plant.

Specifications

The Compact Reformer's configuration is similar to that of a conventional shell and tube heat exchanger with the principal difference being the innovative mechanical design required to accommodate the thermal expansion that occurs during the unit's operation. The units are installed vertically and the tubes partially charged with conventional, but smaller size, reforming catalyst. On the shell side down-firing burners, which provide the heat for the endothermic reactions, are interspersed between the closely packed tubes. This is designed to promote convective heat transfer, which accounts for approximately 90% of the total heat transfer, the balance being by radiation.

This enables a significantly more compact design compared to a conventional steam-methane reformer. To increase process efficiency, the hot syngas is used to pre-heat the combustion air and fuel and the waste heat from the exhaust flue gas is used to pre-heat the feed gas.

The Compact Reformer is a modular, factory built unit, suitable for offshore or remote locations and small scale methanol production at a wide range of plant capacities and capable of handling carbon dioxide rich feedstocks. It offers considerable savings in plot space and equipment weight of around 75% as well as savings in site construction schedule over conventional reforming.

Figure 2 - Nikiski Compact Reformer module