GTO (Gas-To-Oil) System

Parr GTO System

This system incorporates three tubular reactors that can be configured as required to operate in a strictly parallel fashion or in a cascade arrangement where the products from one reactor are immediately directed to a second reactor. This type of system can support reaction schemes including but not limited to the Fisher-Tropsch process, methanation reactions, steam reforming and other similar processes.

The Fisher-Tropsch process converts carbon monoxide and hydrogen into oils or fuels that can substitute for petroleum products. The reaction uses a catalyst based on iron or cobalt and is fueled by the partial oxidation of coal or wood-based materials such as ethanol, methanol, or syngas. This reaction scheme offers a promising route to producing economical renewable transportation fuels. By carefully controlling the temperature and oxygen content, resulting products can range from syngas to "green diesel".

One of the unique features of this system is a gas blending subsystem capable of mixing up to four reactant gases followed by a controlled delivery of this blended mixture to each of the three reactors via dedicated mass flow controllers.

Downstream components for each reactor include a heat exchanger/condenser, a gas/liquid separator (product receiver) and a fully automated back pressure regulator. The system includes support for introducing liquid reactants via a high pressure metering pump. The system comes completely automated with the addition of the highly versatile 4871 Process Controller (not pictured, see chapter 4, page 95).

Combinatory Chemistry & High-Throughput Screening

16 Station Multiple Reactor System

This system is a combination of sixteen standard 4560 Mini Reactors with heaters, valves, pressure gage and rupture disc assemblies and two 4871 Process Controllers with sixteen 4875 Power Controllers. It allows the user to run multiple reactions simultaneously, applying the principles of high-throughput experimentation. Individual variables that can be controlled are gas mixtures, liquids, catalysts or other solids, stirring speed, temperature, pressure and time.

12 Station HPCL System

This system makes use of the lower cost 5500 High Pressure Compact Lab Reactors that feature a modified stand, aluminum block heaters, removable vessels and a standard gage block assembly. A control system (not pictured) automates the process, monitors the parameters and collects the data. Parr also provides a standard Multi Reactor System in the 5000 MRS pictured below.

5000 Multiple Reactor System (MRS)

The 5000 MRS comes standard with six reactors, a gas distribution panel, magnetic stirring motor and stirring bars, and a 4871 Controller to monitor and control the parameters. For more information on the 5000 MRS see page 72.

Supercritical CO2

A supercritical fluid is any substance at a temperature and pressure above its critical point. It can diffuse through solids like a gas and dissolve materials like a liquid. Near the critical point, small changes in pressure or temperature result in large changes in density, allowing many properties of a supercritical fluid to be "fine-tuned". Supercritical fluids are suitable as a substitute for organic solvents in a range of industrial and laboratory processes. Carbon dioxide is one of the many commonly used supercritical fluids. Applications that involve supercritical fluids include extractions, nano particle and nano structured film formation, supercritical drying, carbon capture and storage, as well as enhanced oil recovery studies. Parr has provided systems at one time or another for all the aforementioned applications.

The supercritical fluid extraction system pictured to the right and diagramed below incorporates a 1.2 liter vessel rated for use at 4300 psig (300 bar) at temperatures to 300 °C. The system includes an automated inlet valve and an air piloted back pressure regulator which is used to facilitate a controlled pressure release at the end of the test. The vessel is heated with a 1500W flexible mantle heater. The feed system (not pictured) includes a pump capable of delivering up to 1.5 gallons per minute (5.7 lpm) of liquid carbon dioxide at pressures up to 4000 psig (275 bar).

Supercritical CO2 System shown with automated control features.