



NCUT

National Centre for Upgrading Technology

'a Canada-Alberta alliance for bitumen and heavy oil research'

Semicontinuous Autoclaves

PP-6, 10, & 11

The three semi-continuous autoclaves that NCUT has in service range in size from 17 mL to 2000 mL. The liquid is placed in the autoclave in a batch mode, but gas can be added and removed on a continuous basis. These units are attended full time while in operation. Any one of these units is ideal for preliminary experiments or subjecting materials to various process conditions.

Table 1. Autoclave capabilities at a glance

| | | |
|---------------------|-------------|---------|
| Maximum temperature | 500°C | 932°F |
| Maximum pressure | 4000 psig | 275 bar |
| Mixer RPM | 100 to 1500 | |

Design Features

Each autoclave is a stainless steel vessel equipped with a stirrer that can be run at any RPM required. The mixer itself can be changed to meet program needs. All autoclaves are provided with a complete set of utilities: hydrogen, hydrogen sulfide, ammonia, nitrogen, water, and air. Other specialty gases can be provided as required. Temperature control is achieved by either one or two electric heating zones. The units are normally depressurized slowly and all the gas is collected from an experiment.

PP-6 (the 17-mL autoclave) is unique in that it can be heated up very quickly and then cooled in approximately three minutes from temperatures above 400°C (752°F) to ambient by lowering the reactor in an ice bath.

Stream Analysis

The products are typically analyzed for density on an Anton Parr automated densitometer and characterized by boiling range on a Hewlett Packard 5890 SimDis gas chromatograph. The gas is analyzed on an MTI GC.

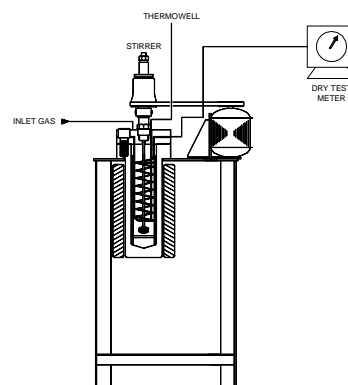


Figure 1. Configuration of PP-6, 10, & 11

Data Work-up

Data reconciliation and mass balance calculations are performed in a customized Microsoft Excel spreadsheet developed at NCUT. The spreadsheet automatically generates trend plots of the key operating conditions, raw analytical results, and calculated data to facilitate quality monitoring of the data generated. This spreadsheet application is used throughout the program to monitor performance of the unit, to facilitate communications between project staff, to store and manipulate program data, and to communicate with the client. Printouts of this spreadsheet, including tables and figures, form part of the final report prepared for the client at the end of each program.

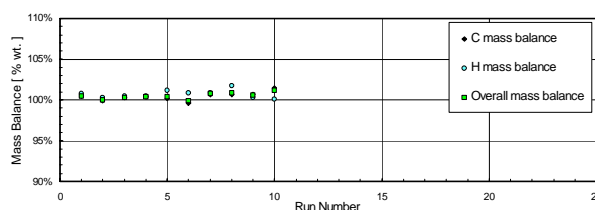


Figure 2. Mass balance data in a typical program

Contact:

Dr. Chandra Khulbe
Research Scientist
Phone: (780) 987-8671
Fax: (780) 987-5349
E-mail: ckhulbe@nrcan.gc.ca