

**ON-LINE GAS/LIQUID CHROMATOGRAPHY
APPLICATIONS
NATURAL GAS PROCESSING NGL FRACTIONATION (Part 2 Liquid- phase samples)**

Daniel on-line chromatographs can improve process control by providing measured results of composition in NGL fractionation facilities. The compositional data provided by the gas chromatograph in column overheads (gas-phase), column bottoms and inlets (liquid phase) can be used to produce tighter overhead product specifications and reduce operating costs. This application addresses the analysis of liquid-phase streams produced from depropanizer and debutanizer bottoms

Liquid Phase Sample Inject

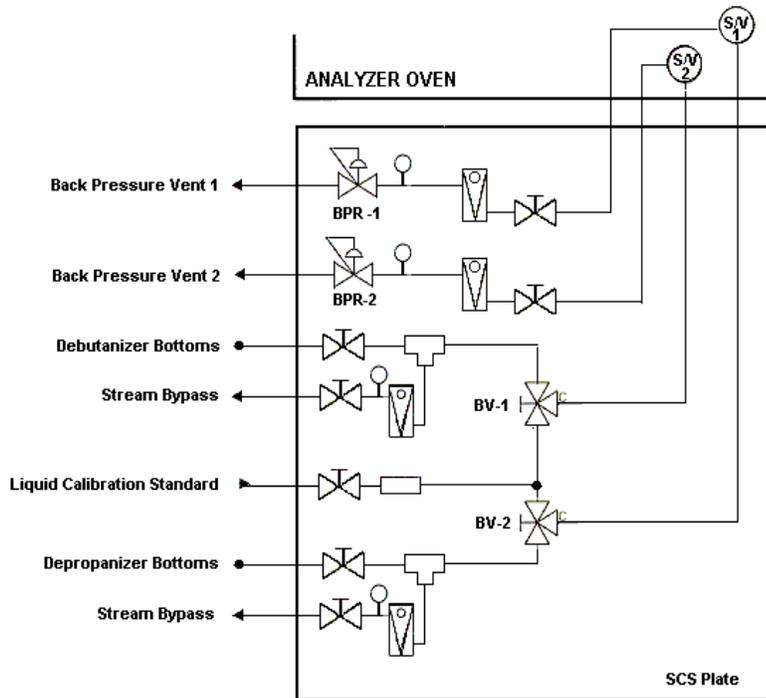
Depropanizer bottoms and debutanizer bottoms are sampled and transported in the liquid phase at fairly high pressures and temperatures. As a result, care must be taken that the lightest component, propane, does not bubble into the vapor phase as a result of the higher temperatures. Any reductions in sample pressure may cause propane to vaporize. In this case both bottoms products will be liquid phase right up to the sample valve in the GC oven without pressure regulation until after the sample valve. This back pressure regulator maintains a constant pressure in the sample valve at the highest possible pressure to ensure a single phase liquid sample for injection.

Any bubbling of lighter components at this point will affect the measured volume injected into the columns for measurement. This injected volume must be repeatable from one analysis to another to ensure reliable, accurate results. In most cases the process pressure is adequate for these types of liquid streams. If the potential for bubbling is too great, the stream may be better suited to vapor-phase sample handling.

A low pressure sample return point will be required from the process with a large enough differential to create flow in the sample transport system. These liquid samples remain in the liquid phase from the process to the sample valve and are injected in the liquid phase. Vaporization occurs after sample injection when oven heat and a light carrier gas (usually helium) combine to vaporize these heavy samples.

Very significant differences exist in design considerations for liquid sample systems as opposed to gases. The primary difference centers around the fact that liquids are less active than gases. Gas molecules are much more active and are more suited to multi-stream sample systems where stream-to-stream purging techniques like solenoid purge or double block and bleed can adequately purge common tubing and a common sample valve. For this reason each liquid stream should have its own isolated flow path and a separate sample valve.

The manual block valves (BV-1 and BV-2) allow for manual introduction of a common liquid calibration standard for each sample valve, as opposed to the solenoid actuated calibration standard. Manual control is preferable on liquids because of an increased need for operator attention during liquid calibrations to ensure accurate results. The back pressure regulators (BPR-1 and BPR-2) are required to maintain a suitable back pressure on the liquid sample volume in the sample valve to ensure that a single-phase liquid sample is injected. As stated earlier, bubbling of the lighter components must not occur or the injected volume will not be repeatable. Stream bypasses must return to a lower pressure to ensure sample flow.



Sample flow and back pressure settings can be critical factors in determining the sample transport lag time. Consideration must be given to liquid volume in the sample transport system and distance the sample has to travel. For example, a high pressure liquid sample (400 psig) traveling 300 feet with a stream bypass returning to the process at 370 psig is going to create a great deal of lag time. As a result the overall system will have a slow response time regardless of how fast the GC is.