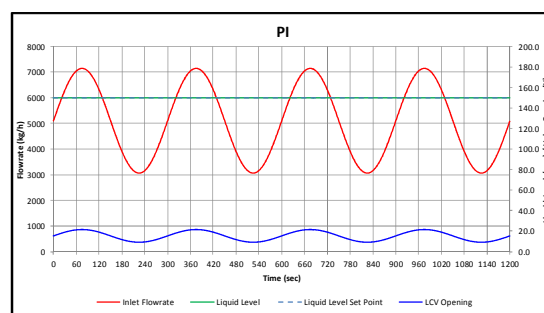
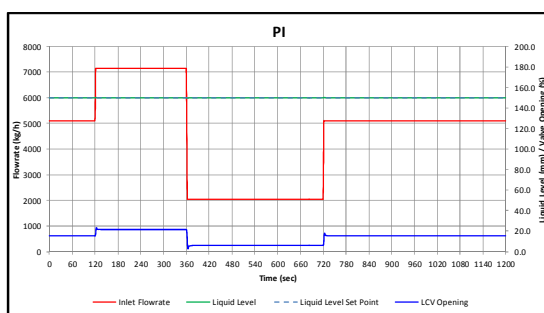


Dynamic Simulation – Controller Tuning

Challenge To determine the tuning parameters of a liquid level controller on a two phase gas-liquid separator.

Assessment The performance of a two phase separator is greatly impacted by the level of the liquid in the system. The ability of a level control valve to maintain a specified liquid level is a function of the liquid level controller tuning parameters, which determine the way the controller responds to a disturbance and the time required to stabilize the system.



The tuning parameters of a liquid level controller can be determined using a closed loop tuning method devised by Ziegler-Nichols which adjusts the controller proportional band (controller gain) until the stability limit is reached (i.e. the process variable oscillates with a constant amplitude) and based on the ultimate gain calculates the optimal tuning parameters.

The ultimate gain of a liquid level controller is determined by modelling the two phase separator and associated instrumentation in Aspen HYSYS Dynamics™ and adjusting the controller tuning parameters until the stability limit is reached. Once the stability limit controller tuning parameters have been identified (ultimate gain) and the optimal controller parameters have been calculated using the Ziegler-Nichols equations, the performance of the two phase separator liquid level controller is assessed using the Aspen HYSYS Dynamics™ model by simulating a disturbance in the system and verifying the robustness of the controller.

Results This type of assessment has been used to assist in optimising operation of numerous liquid level controllers during commissioning and early production. This optimisation has minimised the number of trips experienced by the facility as a result of poor controller response to disturbances.

Similar assessments can be complete for both temperature, pressure and interface liquid level controllers to determine the optimal controller tuning using the Ziegler-Nichols closed loop method, or alternative methods including Ziegler-Nichols open loop method or Internal Model Control (IMC) method.

