Investigating Stability of Separator Train and MOL Export System

Separator Train Control

Problem:

- MOL export pump speed oscillations
- High maintenance - costs / time and impact on oil production
- Repeated retuning attempts – problem never really solved

Consultancy Approach:

- Represent process using HYSYS Dynamics
- Detailed elements in MATLAB/Simulink - faster development for custom elements, e.g.: Valve stiction, non-PID control
- Evaluate solutions

Separator Train Control

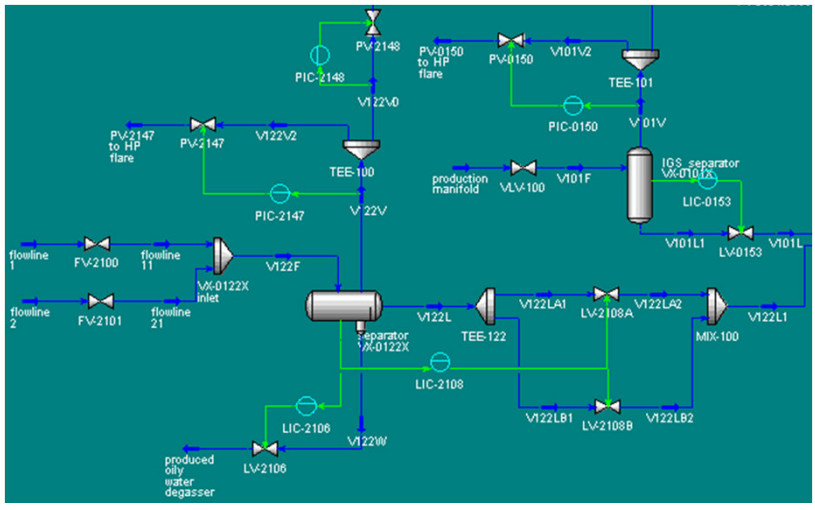
industrial systems and control

Components Modelled:

- Five main separation vessels
- Plus three scrubbers
- Two (sets of) pumps
- Two compressors
- Heat exchangers
- Control valves

Hysys Dynamic Modelling

industrial systems and control



Front–end of oil/gas/water separation process

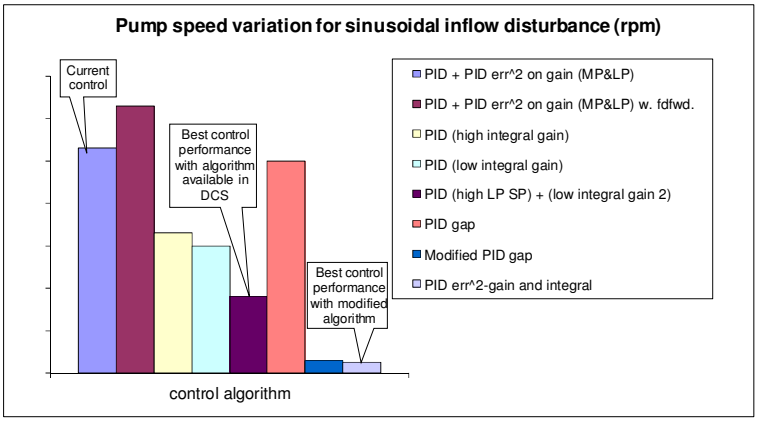
Findings on Control

industrial systems and control

- Recommended separator level SP changes to increase capacities against slugs
- Limited benefit from PID re-tuning
- Error squared could help
  - ❒ But constraints in DCS would give integral action - instability
- Modified-PID-gap level control much better
  - ❒ May need custom code in DCS

Sine Inflow Control Comparison

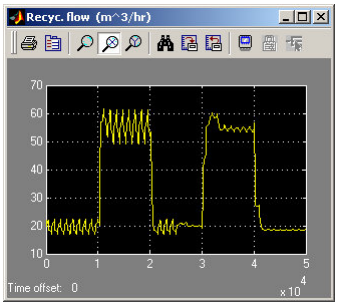
industrial systems and control



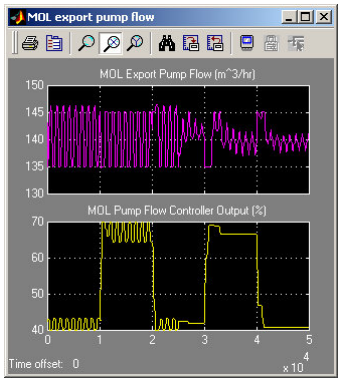
Simulated Results

industrial systems and control

MOL Pump Dynamic Flow Behaviour



- MOL pump recycle flow
  - First 7 hrs. - current control
  - Last 7 hrs. – re-designed control



- MOL pump flow control
  - First 7 hrs. - current control
  - Last 7 hrs. – re-designed control

Conclusions on Simulation

industrial systems and control

- HYSYS quick to get superficial simulation
- Difficult to get detail with non-standard elements
- Simulink much better for that
  - Also validation/comparison to log data
- Future simulation: two alternatives
  - Link HYSYS and Simulink with OPC (not at time of project)
  - Simulink only with Multiflash toolbox for chemical properties