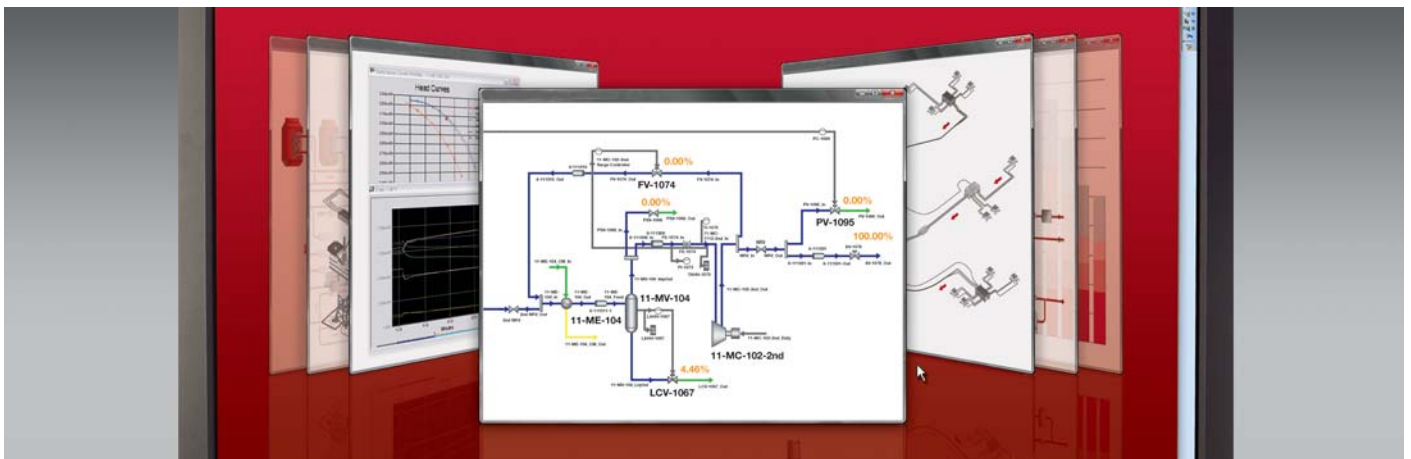




At the Forefront of Dynamic Simulation Technology

Risk reduction, rapid evaluation and cost savings from an integrated engineering approach underpinned by state-of-the-art simulation technology



What is simulation?

It is a virtual representation of existing or future plant. Changes in terms of equipment operating conditions and process control can be made to models rapidly and cost-effectively. This allows evaluation of various operating scenarios, all offline with no risk to production. A steady-state simulation will give a snapshot of a process, producing an idealised view of flow rates, pressures and temperatures. Dynamic models take into account time, leading to the evaluation of transient conditions, i.e. slugging, start-up and shutdown, which are typically when plant limitations can be reached.

Knowledge of the data requirements to populate the model, knowledge of the simulation package to build the model and astute interpretation of the model output is

crucial to delivering the optimum solution. All Xodus personnel engaged on dynamic simulation projects have design and operations support experience and are used to using the simulation as a tool to reach a 'real-world' engineering solution.

Specialist experience

With a combined total of over 100 man-years of simulation experience, Xodus personnel are dynamic simulation specialists, notably in our industry-leading experience linking HYSYS® to external applications. As well as using Aspen toolkits to link HYSYS to pipeline simulators (such as OLGA® and PROSPER GAP) and Microsoft® Excel®, Xodus develops custom links to control systems, leveraging the COM and OPC communication protocols. Xodus has also delivered an industry first by using a dynamic

simulation at the heart of an allocation system, reading in-plant data to the model then calculating and publishing allocation reports to a client's intranet.

Integrating engineering and technology

Utilising the experience of each Division within the Xodus Group provides the engineering knowledge of subsea, flow assurance and topsides, allowing us to provide world-class simulation, whilst our Integration Technology Division enables us to deliver this software via a state-of-the-art software platform.

Previous projects include:

- › Slug control study on oil train level control
- › Produced water design stage control review
- › Compressor control optimisation utilising CCC controllers

- › Rigorous hydraulic and thermodynamic blowdown analysis of onshore and offshore facilities
- › Over-pressurisation and IOPPS analysis of process facilities
- › Slug control study on reciprocating compressor control
- › Control solution for two platforms exporting oil to a common manifold
- › Development of operator training systems.

Slug control

Xodus has developed a number of slug control solutions ranging from cascade control through to non-linear error squared control and into custom designed algorithms. Our approach is to look at each system individually and through a combination of experience and modelling, determine the optimum solution for the system. Our flow assurance expertise allows accurate determination of the slugging type and slugging source, which ultimately determines the optimum solution: a change in fluid phase rates; a change in choke or riser valve position; feed forward control based on early slug detection; primary separator control; or a combination of these. The ability to link a transient pipeline simulator (i.e. OLGA) to a dynamic HYSYS model can be key to carrying out this type of analysis.

Compressor control

Compression optimisation studies by Xodus engineers range from improving control of a single electric motor driver compressor with a DCS based flow vs. dP anti-surge algorithm to rationalising three parallel trains of three stage compression with 19 CCC anti-surge and performance controllers, to designing and commissioning a load sharing speed controller for turbine driven export compressors. Sub-optimal compressor operation can lead to excessive recycle valve wear, more frequent maintenance intervals, more frequent trips (the costs of which can be exacerbated by loss of gas lift), increased fuel consumption and subsequent emissions. Xodus have a HYSYS extension (emulation) of CCC anti-surge and performance controllers that allows rigorous surge and load sharing analysis of centrifugal and reciprocating compressors.

Operator training systems

Linking HYSYS to control systems and SCADA graphics allows Xodus to provide cost effective and realistic operator training. The operator training systems we design range in complexity from simple process trainers with a few operator screens mocked up in Microsoft Excel to multiple models distributed across several PCs linked to

control interfaces. They can be used for personnel who are new to the industry or as refresher training for more experienced personnel.

Online model deployment

Xodus personnel have industry leading experience in the online deployment of dynamic simulation models covering pipeline operations manager, pipeline integrity monitoring, process monitoring/optimisation and allocation. Our online models satisfy the need to run reliably and continuously, with input data errors captured and output errors reported without crashing the model.

Business benefits of dynamic simulation

Dynamic simulation is now an established step in the engineering process to design, upgrade and de-bottleneck plant equipment. The primary benefits of simulation lie in the risk reduction through offline analysis and cost savings achievable via:

- › Ratification of a design prior to purchase of equipment – rapid evaluation of different feed GORs if a comprehensive well test programme was not carried out or if confidence is low in respect of reservoir analysis, perhaps due to analysing old fluid samples
- › Confidence in control system performance prior to installation and commissioning – avoiding mistakes in control system design that could lead to sub-optimal operation, an overrun shutdown or additional shutdown to install additional instrumentation
- › Optimisation of separator-level control experiencing slugging conditions – offline evaluation of various control strategies
- › Retuning of compressor anti-surge and performance controllers to optimise production following the introduction of additional gas to the process
- › Minimising off specification oil sent to slops tanks due to slugging or start-up conditions
- › Development of an operator training system to maximise process understanding and subsequent process uptime
- › Development of real-time pipeline models for XPLORE¹ pipeline monitoring systems.

