GAS PROCESSING

FLOWNEX®

SIMULATION ENVIRONMENT

Flownex® SE determines pressure drop [flow] and heat transfer [temperature] for the connected components of a complete system in steady state and transient, e.g. pumps or compressors, pipes, valves, tanks and heat exchangers.

TYPICAL USES:

ANALYSIS

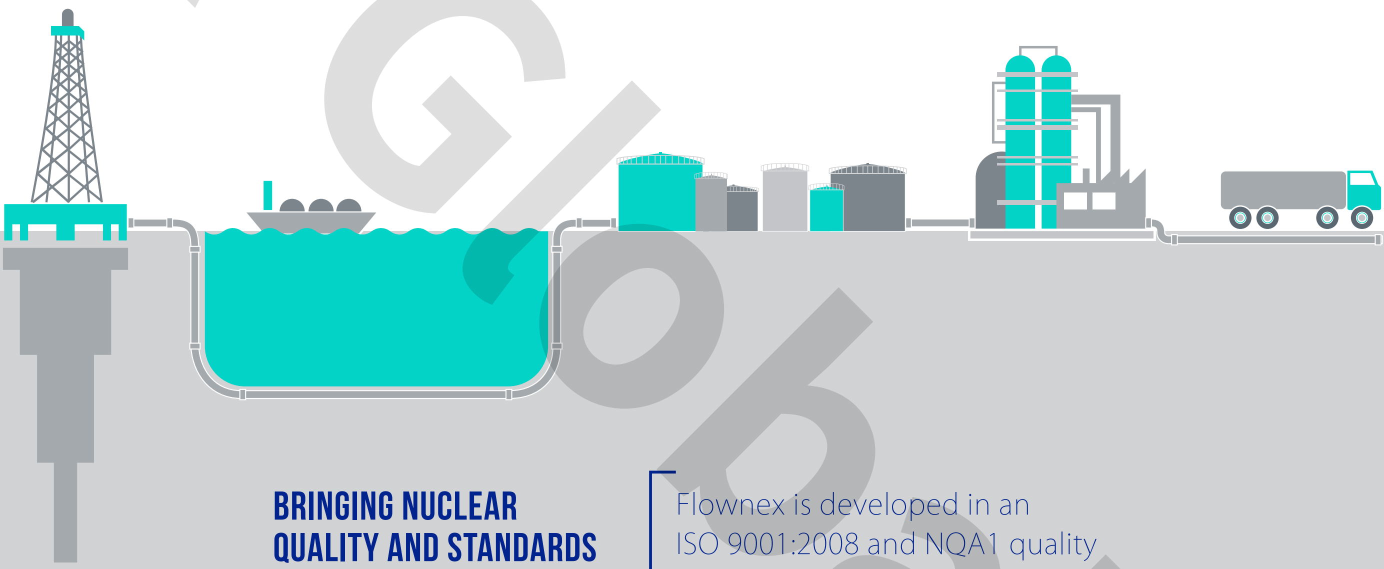
- Simulation.
- Performance assessment.
- Modification assessment.
- Fault root cause assessment.

DESIGN

- System sizing.
- Component sizing.
- Determining operating ranges.
- Flow, temperature, pressure, power consumption, etc.
- Testing of control philosophy.

TRAINING

- System behavior examination.
- Performing basic flow and heat transfer calculations.
- Thermohydraulic principles and properties referencing.



BRINGING NUCLEAR QUALITY AND STANDARDS TO SYSTEM SIMULATION

Flownex is developed in an ISO 9001:2008 and NQA1 quality assurance system environment.

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NATURAL GAS, LNG, AIR PRODUCTS, & GENERAL INDUSTRIAL GASES.

PIPE SYSTEMS

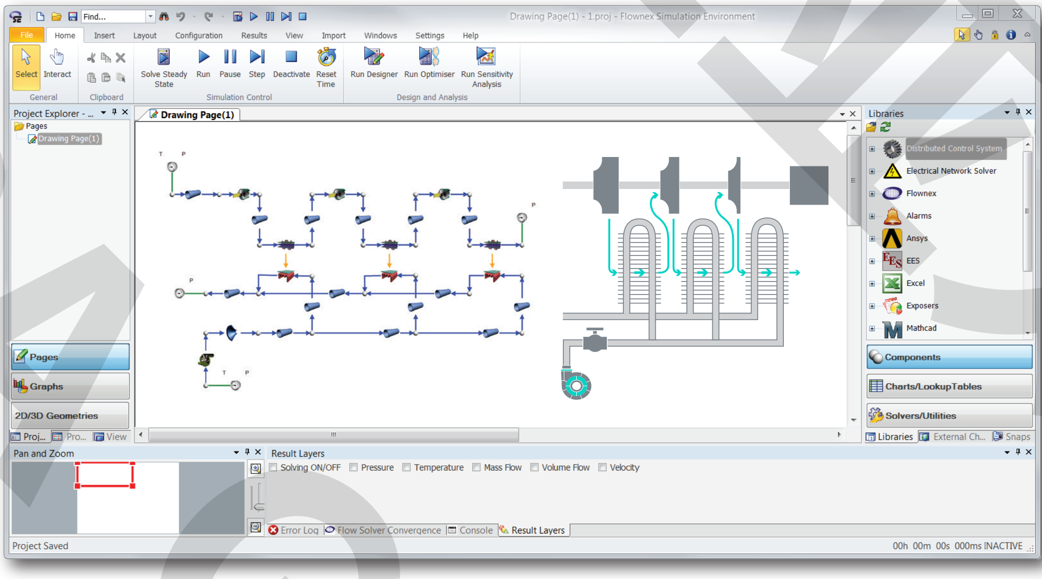
- Sizing of control valves and orifices.
- Design of gas distribution systems.
- Flow balancing in branching networks.
- Analysis of transient events like surge analysis.
- Control philosophy development and testing using the built-in PLC function block diagrams.
- Calculation of pressure drop for gases or liquids.
- Sizing of pressure safety valves.
- Simulation of a valve failure event.
- Calculation of heating or cooling requirements for various processes.
- Heat loss/pickup calculations.
- Insulation sizing.

DRILLING MUD PUMPING SYSTEMS FOR GAS WELLS

Calculation of Non-Newtonian fluid pressure drop.

Balancing of flow in branching pipe networks.

Assessment of pressure pulse transients.

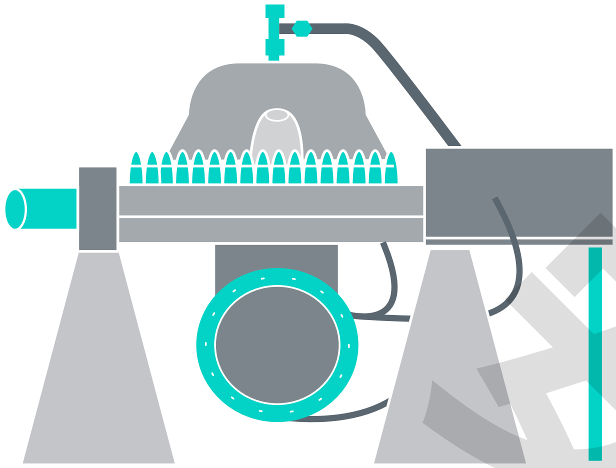


HEAT EXCHANGERS

- Calculation of heat transfer and pressure drop for various geometries: finned tube, shell and tube, tube-in-tube, plate heat exchangers.
- Calculating the heating or cooling requirement for various processes: evaporation, condensation or temperature control.
- Calculation of natural circulation evaporators' recirculation rate.
- Calculation of boiling pressure drop and temperatures.
- Simulation of transient behavior for start-up, shutdown or process upset conditions.
- Calculation of metal temperature change rates during transients.

FLARES & BURNERS

- Calculation of gas consumption rates.
- Pressure-, temperature- and composition-dependent combustion modeling.
- Calculation of conjugate heat transfer (convective, conductive and radiative heat transfer).
- Calculation of heat-up or cool-down times.
- Natural or forced draft stack sizing.
- Fan sizing.
- System integration: simulation of flare control and interaction with the main pipe system.

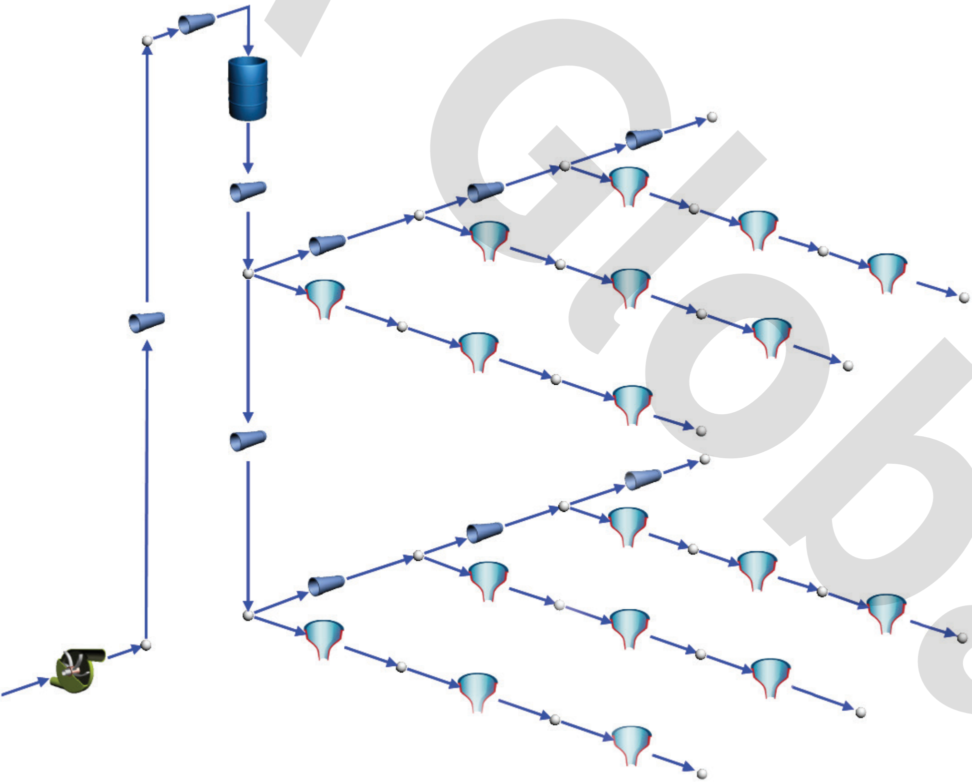


TURBOMACHINERY

- Sizing of compressors and turbines.
- Sizing of intercoolers and aftercoolers.
- Simulation of compressor surge and surge protection measures.
- Control philosophy development and testing using the built-in PLC function block diagrams.
- Energy optimization.
- Evaluation of off-design or process upset conditions.
- Analysis of accident scenarios like turbine loss-of-load, check valve failure or loss of compressor intercooling.
- Matching of turbine-driven compressors.

INTEGRATED SYSTEMS ANALYSIS

- Liquefied natural gas (LNG) storage and handling.
- Interaction between pipeline flow/pressure and the pump/turbine set including its control.
- Cryogenic system thermalfluid analysis using two-phase flow tanks, pressure drop, heat transfer, incondensable gas mixtures etc.
- Simulation of refrigeration systems for cryogenic cooling during natural gas liquefaction.
- Natural gas liquefaction.
- Design of gas venting and inventory control systems.
- Simulation of gas turbine driven pipeline booster pumps.
- Simulation or system integration of gas turbine driven compressors for natural gas liquefaction.
- Pipe system pressure control design.



FIRE PROTECTION SYSTEMS

- Pump, pipe and tank sizing.
- Sizing of nozzles and orifices.
- Flow balancing.
- Instrumentation selection & control philosophy.

> I am not aware of any other tool with which I could have obtained the required results in such a short time span. Part of the success must undoubtedly be attributed to the prompt and high level support provided by Flownex® International almost daily in answering all my questions and offering suggestions throughout this very technically challenging simulation. The support fee has been paid for with this one project!

Hannes van der Walt
Senior Thermal & Process Engineer
Gasco

FLOWNEX® LICENSE HOLDERS

sasol reaching new frontiers

Weatherford®

GASCO

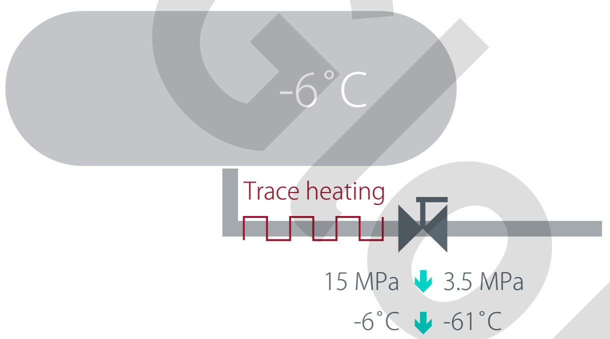
gas oil engineering

USING FLOWNEX® THE GAS INDUSTRY CAN: SIMULATE, PREDICT, OPTIMIZE OUTPUT & REALIZE SIGNIFICANT SAVINGS

GAS TURBINE START-UP
PRESSURE & EXPANSION CONTROL

CASE STUDY

CHALLENGE: Pressure regulators are to be employed at a gas-fired power station to reduce upstream gas pressures from a maximum of 15 MPa to approximately 3.5 MPa. Due to the Joule-Thomson effect, the resulting gas temperature drops could be in the region of 55°C. The dew-point temperature of the hydrocarbons (gas) flowing through is -15°C and the minimum ambient temperature of the area is -6°C, thus the regulators could potentially be subjected to gas at -61°C at start-up. According to the valve manufacturer, temperatures as low as -20°C can be tolerated for some time, provided that condensation does not occur.



Unheated, no pipe wall mass: | **-61˚C < -20˚C** Valve range exceeded

Heated, with pipe wall mass: | **-10˚C > -20˚C** Within valve range

SOLUTION: Operation of the pressure regulators during the start-up of the turbines at a gas-fired power station was studied and simulated in Flownex®. The major advantage of using Flownex® is that the capacitance of the pipe material and the full Joule-Thomson effect could be simulated. The simulations established that the regulator internals would be exposed to extremely cold gas for an extended period of time. The model was also able to determine if the proposed trace heating and insulation system would be sufficient to prevent the valve internals from cooling below their minimum temperature limit of -20°C, with a reasonable safety factor taken into account.