B.S. Mechanical Engineering New Mexico State University
Graduate Courses at Purdue University and New Mexico State University

JOHN R. WOLFLICK

With more than 40 years in the oil and gas industry, John Wolflick offers a senior level perspective in the conceptual and detail design of gas systems. His experience with Allison Division of General Motors, El Paso Natural Gas Company (EPNG), Standard Oil of Ohio (SOHIO), Atlantic Richfield Company (ARCO), and as a private consultant since September 2000 has given him a broad exposure to the business. During his 12 years with EPNG, John supervised the Compressor Station Design, Pipeline Design, and Cryogenic (LNG) Groups. During his 18 years with SOHIO and ARCO, John was the leader of five separate multi-company conceptual engineering teams for all gas production, gathering, processing, and reinjection expansions at the Prudhoe Bay oil field in Alaska. Between 1983 and 1998, gas handling capacity was increased from 2.3 BSCFD to 8.0 BSCFD in four increments. The low temperature gas processing facility was the largest of its type in the world at the time. It processed approximately 8 BSCFD of gas to recover approximately 100,000 BPD of natural gas liquids for blending with the crude oil, and 600 MMSCFD of miscible injectant for enhanced oil recovery.

John provides a rare combination of creativity, analytics, and practicality. For example, he played a large role in pioneering the application of large single shaft gas turbines to gas compression service with the startup of four General Electric Frame 6 turbines in 4500 psi gas injection service at Prudhoe Bay in 1993 and 1994. John identified the machine as a candidate for this service in 1986 and worked steadily with General Electric and Prudhoe Bay owner management to bring the project to fruition. John personally wrote detailed steady state and dynamic simulations which he used to select compressor staging, design all of the sequencing and control systems, and size all of the major piping, control valves and heat exchangers. These systems broke new ground in many areas. The machines started up in record time. All systems functioned as predicted, and the machines have continued to operate with no modifications.

Over the past 40+ years, John has developed and honed proprietary computer modeling software for design and operational analysis of gas and liquid systems. This software is used to quickly develop detailed steady state and dynamic simulations of complete systems containing centrifugal and reciprocating compressors and pumps with appropriate drivers, piping, heat exchangers, control valves, etc. The software has also been used for rigorous dynamic simulation of flare/relief systems of great complexity. These simulations have proven to be very leveraging for conceptual engineering, detail design, and trouble shooting on projects in the lower 48 United States, Alaska, Indonesia, China, Algeria, Venezuela, Dubai, India, Qatar, Australia and the North Sea. This software was used by John to generate all of the hydraulic designs for the Alaska Gas Producers Pipeline Team pipeline optimization work in 2001 through March, 2002. This entailed thousands of hydraulic designs for various combinations of pipeline diameter, working pressure, steel grade, compressor station configuration, flow rate, and thermal regime. The work was done in a rapid, cost effective manner using automated techniques for locating compressor stations combined with custom output formats for automated interfacing with cost estimating software. John has provided ongoing support to the North Slope owner companies and others on Alaska Gas Pipeline and Trans Alaska Pipeline hydraulics through 2015.

PARTIAL LIST OF DYNAMIC SIMULATION PROJECTS

1. Central Gas Facility and Central Compression Plant – Prudhoe Bay, AK
   Two RB211 driven boost compressors in series with 9 Frame 5 single shaft driven low stage gas injection compressors in series with 4 Frame 5 single shaft driven high stage gas injection compressors. Concern was effect of tripping the boosters. Simulation resulted in development of rate of change of suction pressure controller for low stage gas injection machines to prevent surge of low stage machines. Simulation was verified with field data. Very close match.
2. Frame 6 Driven Gas Injection – Prudhoe Bay, AK
   Pioneered the application of large single shaft generator drive gas turbines to gas compression service with the startup of four General Electric Frame 6 turbines in 4500 psi gas injection service at Prudhoe Bay in 1993 and 1994. This saved approximately $100 MM for the project compared to using six frame 5 two shaft units. Identified the machine as a candidate for this service in 1986 and worked steadily with General Electric and Prudhoe Bay owner management to bring the application to fruition. Wrote detailed steady state and dynamic simulations from scratch in FORTRAN which were used to select compressor staging and design all of the sequencing and control systems. These systems broke new ground in many areas. The machines started up in record time. All logic functioned as predicted and the machines have continued to operate with no modification to the logic or controls. The success of this application paved the way for use of General Electric Frame 6 and Frame 7 gas turbines in mechanical drive service for natural gas liquefaction
3. Thames Platform – North Sea
   One Mars driven 2 body tandem, 2 TB5000 driven single body trains, 2 gathering pipelines, one export pipeline, 4 fields tied in. Complete system was simulated to develop control system. Simulation and resulting control system were verified with field data. Simulation is interactive and is used for operator training.

4. Alpine LP compressor startup – Alpine Oil Field Alaska
   Constant speed motor driven compressor started across the line. Simulation was used to develop startup procedure to prevent overheating motor during acceleration. Simulation was verified with field data.
5. Central Compressor Plant High Stage Compressor Trip – Prudhoe Bay, AK
   9 Frame 5 single shaft driven low stage gas injection compressors in series with 4 Frame 5 single shaft driven high stage gas injection compressors. Two high stage compressors bodies were replaced with higher capacity machines. Simulation was used to resize surge valves to prevent surging on trip, develop starting procedure to prevent train stagnation during startup, and confirm operation of mis-matched high stage machines during normal operation and trip. Simulation was verified with field data.
6. Pt Mac HOFIM Machine – Lisburne Oil Field, AK
   High Speed Oil Free Intelligent Motor Compressor. 10,000 HP, 12600 rpm induction motor with VFD direct driving two multistage compressor bodies in 4500 psi miscible injectant service. Compressors are solid coupled to both ends of the motor for thrust balance. Magnetic bearings, dry gas seals. Active thrust control with piston on outboard end of one compressor pressured and depressured through 10 bit digital valves. Simulation covered complete system for startup, shutdown and normal operation. Four vent valves, one each on discharge and suction side of each compressor were sized using simulation to keep thrust with capability of magnetic bearing while simultaneously preventing surge during shutdown. Simulation verified on test stand and in field.
7. Northstar HP – Northstar Oil Field, AK
   Two body tandem trains driven by LM2500's in 5000 psi gas injection service. Three major failures in field due to both compressor surging on trip and overload during startup. Dynamic simulation used to resize surge control valves and modify acceleration rate during startup. Fix was successful and dynamic simulation was verified in the field.
8. Mad Dog Three Body Tandem - Deep Water Gulf of Mexico
   Three body tandem driven by gas turbine Simulation used to resize surge valves and piping for trip, and develop startup procedure.
9. Mad Dog LP Compressor Tandem - Deep Water Gulf of Mexico
   Gas turbine drive. Simulation used to resize surge valve. Simulation utilized gas turbine test stand trip data to develop data on gas turbine output power vs time after trip
10. Holstein Booster Tandem - Deep Water Gulf of Mexico
    Two body tandem driven by gas turbine. Simulation used to resize surge valves for trip.
11. Marlin LP Compressor Tandem - Deep Water Gulf of Mexico
    Gas turbine driven single body. Simulation used to size surge valve for trip, develop control system and startup procedure.
12. Thunder Horse Booster Tandem - Deep Water Gulf of Mexico
    2 body tandem, motor drive, VFD. Simulation used to resize surge valves for trip and develop startup procedure.
13. Thunder Horse Export Tandem - Deep Water Gulf of Mexico
    Single body, motor drive, VFD. Simulation used to resize surge valve for trip and develop startup procedure.
14. Generalized gas vent or flare system dynamic simulation tool
    Developed generalized tool for dynamic simulation of gas vent and flare systems. Fully compositional including kinetic energy and choking with unlimited network complexity. Includes control valves, block valves, PSVs, staging valves and logic, flare tips including variable geometry, blowdown of volumes, etc. All unit operations had been field proven in previous special purpose steady state and dynamic simulations. A colleague has been using this software do perform all flare dynamics work for BP on the North Slope of Alaska from 2005 through May 2012. The colleague retired in August, 2012 and the work was taken over by John Wolflick's son, J.D Wolflick.
15. Angola LNG – Angola, Africa
    Worked with ConocoPhillips and Bechtel early on performing dynamic simulations to prove up capability to start up and operate GE Frame 6 and Frame 7 driven refrigerant compressors. Worked on detailed sequencing and control system design with ConocoPhillips, Bechtel and Chevron. As a result of this work, three or four ConocoPhillips patents and one Compressor Controls Corporation patent include John Wolflick's name as inventor.
16. Valhall Redevelopment Project – North Sea
    Performed dynamic simulation for Mustang Engineering. This project consisted of 4 constant speed motor driven centrifugal compressors in series, compressing associated gas from about 65 psia to about 1800 psia, with a glycol contactor between stages 2 and 3 and a JT based cold separation process between stages 3 and 4. The dynamic simulation was used to size all control valves, develop startup and operating procedures, control system details, and size PSVs.
17. Zamzama Gas Plant Front End Compression – Australia
    This consists of a two body tandem train driven by a GE Frame 5C gas turbine. A dynamic model was written and used to check recycle valve sizing, design the control system, determine the need for and size hot gas bypasses to prevent trip surge, and calculate maximum discharge pressures for blocked discharge scenarios using a SIL3 fuel shutoff valve.