

Projects

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I. OIL FIELD MULTIPHASE FLOW AND GATHERING PROJECTS

Horizontal/Directional Completion of Existing Wells

Production multiphase flow technology for reservoir inflow performance into drainhole, flow performance of total system inflow, drainhole, turning section and vertical well. Increase production rate and reserves by artificial lift designs, pumping and gas lift options. Evaluations of extended laterals, drilling faults, and other increased recovery options. Software technology development program for increasing reserves and lower producing costs.

Ras Budran (Egypt)

Optimization of Gas Lift System. Installation of EnSys-Yocum production models. Location of injection valves. Determine compression facilities requirements.

Ras Fanar (Egypt)

Design and development of field facilities including submersible pumping.

Techno-Economic Studies of Several Offshore Concessions

Wells and facilities costing, financial analysis and evaluation of Magawish, Amal, North Durag and Hurgada, Proposals and presentations.

Plum Ditch, Niobrara/Codell Formation

Fracturing, horizontal wells, reservoir and facilities performance.

Vermillion Block 97 (Gulf of Mexico)

Production alternatives, economic analysis offshore flow system.

Altamont - Bluebell Field, Uinta Basin

Technical and financial analysis for purchase of 40 wells and gathering systems.

Hamaca Field, (Venezuela)

Reviewed and made conceptual pipeline and separator design recommendations for 190,000 bpd Hamaca field for high viscosity heavy crude oil..

Duri Field, (Indonesia)

De-gasser and facilities design for a high viscosity heavy foamy crude oil..

Cabimas Field (Venezuela)

Evaluated multiphase dual boost pump/compressor versus single phase trunklines

Cabimas Field (Venezuela)

Provided detailed optimized design of facilities in a low pressure field (30psig well head pressure)

Evaluated multiphase dual boost pump/compressor versus single phase trunkline system with conventional pumps and compressors.

Erskine Field (North Sea)

Delivered a multiphase PVT Meter Correction Program for Venturi meters. A retrograde condensation system.

Prudhoe Bay (Alaska)

Installed a PVT Meter Correction Meter in the Data Acquisition and Control Program of a partial separation multiphase meter.

BHP Liverpool (North Sea)

Closing proposal to install a PVT Meter Correction Program for Venturi meters and to provide software services for flow allocation in a wet gas condensate field.

Forties Field, North Sea (BP)

Multiphase flow designs, fixed platforms compared with subsea completions for alternatives of natural depletion, water injection and gas lift field development. Unique solutions to avoid slug flow risers. Solutions for wax deposits, sand removal, well work overs. Preparation engineering proposal for construction. Testing of 46 deviated wells and gathering systems. Computer simulation accurate to +/- 1-2% in wells and +/- 5% in gathering systems.

Four North Sea Fields

Multiphase pipeline system connecting four small fields with combined separation, storage and terminal facilities.

Prudhoe Bay, Alaska (ARCO)

Detailed plan and designs for large diameter three phase flow trunklines connecting multiwell clusters to gas/oil separators. Economic design and avoidance of slug flow and cease flow restraints. Preparation of project proposal and specifications for construction. Extensive testing to develop accurate three phase simulation and performance models.

Kansas Oil Resources

Acquisition studies for purchase by investment group. Reserves, financial analysis, development program, Management Information System, selection and installation.

Chase Manhattan

Comprehensive study of future oil production potential under the impact of new technologies. Also to Financial Analysts Club. Recommended investment policies.

Multiphase Lines, Risers and Downcomers, North Sea

Detailed computer based design study, analysis of flow regimes, slug size and frequencies, sizing of gas/oil separators, cease flow, and inoperable flow ranges. Recommended gas injection of risers to provide steady flow over range of operation. Preparation of detailed proposal for construction.

Gordian (Pullman Kellogg)

Developed a comprehensive business plan for production and exploration organization. Presentations.

North Sea Marginal and Small Reservoirs

Comprehensive study of the technical and economic potential of a large number of fields. Seminar presented in London to 45 company representatives, investment groups, government.

Avoidance of Slug Flow In Riser Systems

Empirical data from extensive testing showing the inefficiency of slug flow performance. Several technical procedures to avoid slug flow and increase capacity.

Paris Field

Detail design wet multiphase gathering system. Materials and equipment requirements, project proposal. Review with construction. Implementation.

North Qatif Field (Saudi Arabia)

Detailed design including a blending station for multiphase production (onshore and inshore) specifications.

Pazanan Field

Design of multiphase gathering system. Preparation of project proposal, construction drawings.

Safaniya Field

Planning and development of field and trunkline facilities. Preparation of design proposals. Review with construction and construction implementation. Testing and analysis of operations for optimization.

Berry Field (Saudi Arabia)

Planning and design of 36" offshore trunkline gathering production from offshore platforms

Ghawar Field

Testing program on 90 multiphase flowlines and wells. Development of calculation and design procedures for multiphase flow operations..

Testing and Development of Computer Simulation and Performance Models Ten Iranian Fields

A comprehensive three year engineering field production research and development study of 367 multiphase well and flowlines and trunklines. Creation of accurate, empirically based calculation methods based on sound theory and efficient computer mathematical algorithms.

Feridoon (Arabian Gulf)

Design of 60 mile 24" multiphase trunkline gathering production system from four 6 well platforms. Cost comparison with offshore separation, storage and shipping terminal.

Marun Field

Optimization of 124 well gathering system including gas/oil separator pressure levels. Plan and facilities requirements.

II. GAS FIELDS AND PIPELINE PROJECTS

Buchan Field (North Sea)

Gas lifting, facilities design, optimization, construction

Medina (New York)

Gas production development to supply Buffalo, New York gas grid. Design of gas/condensate pipeline gathering system. Production and well facilities to increase gas reserves.

Clinton Sands (Ohio)

Gas pipeline design for 23 wells. Field condensate plant.

Gach Saran (Iran)

Gas/Condensate Gathering System. Process system design, project proposals, supervision of construction. Design optimization of line sizing, routing, condensate treatment plants, compression stations, slug catchers, flaring, gas scrubbing, condensate and stabilization plants.

Sarkan Gas Field (Iran)

Development plans analysis of technical problems, gas/condensate two phase system, hydrates.

Pars offshore Gas Field (Iran)

Process design and preparation of Project Proposal for Construction. High pressure technology, line size, pigging requirements, holdup, slug catchers, flaring, gas scrubbing, condensate and stabilization plants.

Naft - E - Safid Gas/Condensate System

Design of 24" line at 2000 psig flowing gas and liquid condensate over hilly terrain. Location of gas/condensate separation station. After construction, comprehensive separation station. After construction, comprehensive field testing that increased empirical data base of the EnSys-Yocum Gas/Condensate Computer Model. (Most accurate gas/condensate design computer model.)

Das Island (Abu Dhabi)

Gas/Condensate offshore pipeline (18 miles) design and capacity testing. Guaranteed gas flow capacity for sales contracts. Field design of long gas transmission system.

Osage Gas Field

Gas pipeline design and liquids handling

Peak Sharing Analysis

Major gas transmission system including gas storage and liquid injection to meet winter-time peak capacities. (USA)

Ras Budran (Egypt) Gas Lift

Analyses of operations by computer model. Revisions to system design. Implementation of project.

III. MAIN TRANSMISSION PIPELINE PROJECTS

Uthmaniya - Abqaiq - Ras Tanura Pipeline System

Planning, optimization and design of pipeline, pump station, power supply and tankage to meet flow capacity requirements. Project proposals, construction and supervision and contractor detailed engineering for several increments of expansion. Overall cost optimization model to balance pipeline system, tankage and terminal facilities.

Safaniya-Ras Tanura Pipeline System

Planning and design, optimum pipe size wall thickness profile, location of pump stations. Looping programs to increase capacity. Hydraulic computer model for capacity performance. Power supply for pumping station. Surge control systems radio relay/control valve to tankage. Development of project proposal and construction specifications. Supervision and review of detailed engineering and contractors.

Karun River to Qatar Water Supply

Preliminary studies and costs on proposed project.

Persian Gulf Water Pipeline (to Ghawar)

Planning and design of intake plant, water purification, pumping, power supply and high pressure pipeline system. Corrosion, plugging, solution to operating problems.

Syrian 22" Pipeline System

Assist in proposal for cleaning and pipe thickness inspection employing intelligent pigs. Hydraulic studies to sleeve and repair line to increase capacity.

Naharkativa (Assam) to Calcutta

Planning and design studies for oil supply pipeline from Assam fields (India).

Tapline (Abqaiq to Sidon)

Add crude oil burning gas combustion turbine driven pumps installation and performance along line. Avoid rupture critical maximum allowable operating pressure point by design and installation of surge control systems.

IV. WATER, GAS INJECTION AND ENHANCED OIL RECOVERY PROJECTS

Permian Basin Forhman Mascho Field (Texas)

Combined water and carbon dioxide injection facilities and well requirements, reservoir and production performance economics.

Mill Gillette Field (Wyoming)

Planning, design, materials and equipment selection and procurement and construction of water flood. Management of operations. Raised financing and acquisition purchase.

Minden Dome Heavy Oil In Situ Combustion (Louisiana)

Field testing, reservoir analysis, in situ combustion/water injection pattern flood, facilities, process design and installation.

Peru Reservoir (Kansas)

Designed a process for producing deep formation gas and injecting in a hallow light oil formation to create miscible flooding with oil recovery improvement.

Improved Oil Recovery North Sea (London)

Technoeconomic and screening studies were carried out for a large number of small and marginal reservoirs. EOR and other alternatives were then recommended, including polymer/water floods, carbon dioxide, nitrogen injection, chemical flooding and steam injection, as well as oil recovery improvement technologies including downhole pumping, gas lifting and hydraulic fracturing. Involved a seminar to 45 representative North Sea participants.

Kuwait Foundation for the Advancement of Science (KFAS)

Development of a large Enhanced Oil Recovery Program described with the results presented in a Seminar and published by the Academic Press (1980) as a section of “Alternative Energy Sources”, pg 1 –98

- . Descriptions of the EOR processes and review of experimental and operational flooding and injection programs, polymer/ water, steam, air, nitrogen injection, carbon dioxide and chemical floods.
- . Design of well and facility requirements for various typical reservoirs, economic evaluation and determine the price of oil at which the project would be economical.

Application of Nitrogen Injection in Venezuelan Reservoirs

A large EOR program has started including the review of the successful nitrogen injection programs worldwide, and including both miscible and immiscible flooding. The starting analysis is directed at reservoirs currently being injected with gas and condensate and replacing the hydrocarbons with nitrogen so that the gas may be sold into the world markets. Later stages will involve the design of facilities and well pattern systems required, cost estimation and determination of economics.

Shaw Creek and Blue Stem Field (Kansas)

Design, materials and equipment purchase, construction proposal and implementation of water floods. Testing and commissioning. Performance studies.

Kuwait Foundation Advancement of Science (KFAS)

Seminar on alternative energy resources. Prepared section on enhanced oil recovery processes, polymer, carbon dioxide chemical floods, gas, nitrogen, steam injection and other processes. Description of facilities requirements, capital and operating costs and financial analysis.

Design of well and facility requirements for various typical reservoirs, economic evaluation and determining the price of oil at which the project would be economical. The seminar proceedings were published by the Academic Press (1980) as a section (p1-98) of “Alternative Energy Sources” authored by J. Mehassah, 1982.

Ramshir Gas/Condensate Injection

Design of compression, high pressure pipeline and injection and preparation of project proposal.

Ghawar Water Injection

Overall plan supply wells, lines, pumping stations, injection lines and wells. Computer model development to aid in optimization of total system costs to provide control of operations.

Gach Saran and Kharj Water Injection

Design of intake and water purification plant facilities requirements.

Abqaiq Gas Injection Plant

Analysis of plant operations, recommendations on compression incrementation and type drivers.

V. TRAINING COURSES AND SEMINARS

Gas Oil Separation, high viscosity crude de-gassing, facilities design and GOSPSIM Software Training

Provided to Texaco and CALTEX engineers in the U.S.A. and Indonesia

Enhanced and Improved Oil and Gas Recovery

Seminars in Kuwait and London

Publications

Description of processes, facilities, costs, applications.

Advances in Horizontal/Directional Drilling

The development of the technology with emphasis on production technology required to improve economics and increase reserves. (Training course)

Planning, Design and Optimization in the Oil and Gas Production, Pipeline and Process Industries

Training courses two or three weeks given 15 times to several hundred engineers and managers in ARAMCO, BP, NIOC, OSCO, SUCO and other organizations. Manuals and computer documentation provided

Future of Oil and Gas, given to public interest groups during invasion of Kuwait, 1990-91.

Estimates of worldwide reserves and production economics for new technology options and enhanced and oil and gas recovery

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