

MANDERSTAM EXPERIENCE IN PIPELINES

RELEVANT EXPERIENCE OF THE MANDERSTAM GROUP

A record of our experience in the fields of pipeline technology, and water and energy distribution

The field of pipeline technology, water, and energy distribution has assumed increasing importance over the last few decades and is now one of the prime revenue industries of the world.

Manderstam have been in the forefront of this field from the beginning and have pioneered innovations in pipeline technology which are likely to have far-reaching effects.

Our engineers specialising in the fields of pipeline technology, and water/energy distribution are internationally recognised and have many years of experience.

Manderstam expertise covers all aspects of water/energy distribution from well-head to end user destination. Where underground activities are involved. Manderstam works with established specialists in the area of sub-surface oil field operations and development.

QATAR

Client: QATAR GENERAL PETROLEUM CORPORATION (OFFSHORE DIVISION)

We have since 1978 designed and assisted in the operation of refineries, NGL plants and oil and gas distribution and loading systems for the Qatar General Petroleum Corporation. Our role as consultants required total project control from feasibility studies through project/budget plan-preparation and detailed design to procurement and site construction, supervision and operation:

Project: Enhanced Oil Recovery (EOR)

Design of an integrated EOR system of high-pressure water injection wells. The water pumping system was designed as a ring main some 150km in length with computer controlled injection pumps at 72 points.

Project: 3 New Petroleum Storage Tanks - UMM SAID TANK FARM

Complete design and specification of 3 new crude oil tanks of 42,450m³. Capacity to BP standard 163 and BS 2654. Work included additional building and computer simulation to determine draw down capacity and flow problems in pipe networks.

Project: Crude Oil Loading Pumps, Tank Farm and Pipelines

Investigation and resolution of a shortfall in the performance of Qatar's principal crude oil loading pumps at UMM SAID. Investigations required intensive field investigations, computer modelling of suction manifold options, tank farm configurations and surge analysis of delivery pipelines.

Project: Petroleum Products Pipelines and Loading Facilities

Design of all petroleum products pipelines 8", 6" and 4"NB between NODCO REFINERY and UMM SAID LOADING JETTY. Design of all pumps for low vapour pressure/high temperature conditions taking cognizance of potential cavitation under certain operating scenarios.

Project: New Fire Water Tank, Test Pump and Ring Main - NGL Plant

Complete design, procurement, commissioning of 450m³ capacity fire water tank, test pump and hydrant, deluge systems and design of all automatic detection/activation systems.

Project: Fire Fighting Systems

Our work involves the total design, specification, supervision of procurement and construction for the replacement and new fire fighting systems for all QGPC onshore plants, and storage

facilities. The systems include, pumping stations, ring mains and hydrants, automatic detection, alarms, BCF extinguishing, deluges, telemetry and central control station.

Project: Gas Distribution System

Responsible for all engineering design aspects from the preparation of process flow sheets, P & ID's specifications, engineering drawings, quantifying materials through to tender document preparation and subsequent site supervision of a gas distribution system which included:

- 48km of 24" diam. pipe
- 6km of 30" diam. pipe
- Gas treatment station handling 500 MMSCFD of associated and non-associated gas.
- Gas treatment station handling 140 MMSCFD of gas from two sources.
- Intermediate separation and monitoring facilities.
- Cathodic protection systems (impressed current).
- Line break valve stations complete with mini-telemetry systems powered by solar panels.

Project: Khuff Gas Lines

These projects were for the design of high pressure (5,150 psig) natural gas piping networks. The systems originate at the gas wellhead and include the production manifold, with inhibitor and glycol injection facilities, the overland piping distribution network and gas metering. Our responsibilities included all design aspects and construction supervision, including the necessary safety systems.

Project: LTX Units

Our work involved the technical/economic evaluation of designs by competitive bidders for four low temperature gas plants for the recovery of liquids from associated gas.

Project: Control Room

The total design, specification and supervision of construction of control room facilities to meet the latest standards.

Project: NGL Stripping Plant

The design, layout and specification of a new booster compressor and gas turbine for an NGL plant. The work includes all the necessary ancillaries such as LP separator, exchanger, surge control etc. for this 360 million standard cubic feet per day compressor.

Project: Oil Separation/Gas Gathering System

Preparation of process and instrumentation diagrams for all onshore crude oil/gas separation facilities incorporating new plant and equipment.

Project: Vent and Flare Replacement

This project involved the replacement of all the existing flares and relief valves. Manderstam scope of work included the design, specification, tender preparation and site supervision.

Project: Three New Power Stations

Responsible for all engineering design aspects from the preparation of process flow sheets, P & ID's specifications, engineering drawings, quantifying materials through to tender documents, site supervision for the gas and oil supply systems including gas treatment, to three new power stations:

- Plant design capacities : 2 No. 50 MMSCFD
: 1 No. 100 MMSCFD
- Pipeline lengths : 6" diam. 31Km
: 10" diam. 40Km

Project: Khuff Gas Well-head Design

Design and specification of gas coolers for four well-head treatment plants

Project: Natural Gas Dehydration

Design and specification of dehydration units.

Project: Oil/Gas Pipeline

Design and specification of 0KG27 flowline.

Project: Associated Gas Pipeline

Design and specification of 20 inch pipeline.

Project: Well-head Emergency Shut-down (ESD) System

Design and specification of ESD systems for four producing wells.

Project: Gas-Liquid Separation

Design and specification of three phase gas/liquid separator.

Project: Debottlenecking Gas Pipeline

Debottlenecking and flowline hook-up of sour associated gas lines.

Project: Pipeline/Separation Revamp

Revamp of 24 inch and 20 inch associated gas lines, vessel redesign.

Project: Oil/Gas Pipeline

Design and specification of DKG317 flowline.

Project: Revamp of Pipelines

Redesign and replacement of 24 inch and 20 inch associated pipelines.

Project: Design of Relief Valve System and Flares

Design and specification.

Project: Oil/Gas Pipeline

Design and specification of DKG24 flowline.

Project: Revamp of Pipework from Offshore Production Platforms

Design and specification of new plant (Psi).

Project: Revamp of Pipework from Offshore Production Platforms

Design and specification of new plant (PS2).

Project: Plant Change and Engineering Services

Design and specification for plant change items and provision of support engineering services.

Project: Oil and Gas Liquid Pipeline

Design, procurement, supervision and installation of 30km pipeline for oil and liquids.

Project: Oil Pipeline

Design of 20 inch oil pipeline

Project: Upgrading of Gas Dehydration

Design and specifications to upgrade existing dehydration unit

Project: Revamp of Pipelines

Redesign and replacement of 24 inch associated gas pipelines

Project: Oil Recovery

Recovery of hydrocarbon liquids from burn pit system.

Project: Oil Field Construction Supervision

Supervision of installation of emergency shut-down systems and new instrumentation at well-heads.

Project: Pipeline Revamp

Design and specifications to upgrade oil-gas pipeline.

Project: Revamp and Redesign to Increase Gas Pipeline Transport Capacity -Phase 1

Design and specification of new pipeline etc. supplying State Electricity Power Stations.

Project: Revamp and Redesign to Increase Gas Pipeline Transport Capacity -Phase 2

Design and specification of new pipeline etc. supplying State Electricity Power Stations.

Project: Oil Pipelines

Design and specification of new oil flowlines.

Project: Revamp and Expansion of Gas/Oil Manifold

Design and specification of manifold to oil degassing station.

SIERRA LEONE

Study and detailed design of a crude oil loading and products offloading tanker jetty for 35,000 DWT tankers.

IRELAND

Client: THE NATIONAL INSTITUTE FOR PHYSICAL PLANNING AND CONSTRUCTION RESEARCH

Studies of the effects of placing a petroleum refinery complex at a number of possible locations around the coast of Ireland. The studies included consideration of plant capacities, engineering, infrastructure construction and operational requirements, effluent specification and potential pollution problems.

Location: Killbrittain

The project involved the development with Winn Technology Limited of a flow line and telemetry cable burial machine. This was in response to the Post Office Marine's interest in the burial of telephone cables in up to 6,000 feet of seawater. The project was carried out to successful trial stages.

JAMAICA

Client: GOVERNMENT OF JAMAICA

Study of the development of an oil refinery and associated industrial complex as part the Shankland Cox Report, commissioned by the British Government.

The Report included such aspects as assessment of plant capacities, construction and operating requirements, locational inter-relationship of plants (taking into account storage/bulk transport consideration), water and power requirements, effluent specifications, site analysis and the elaboration of a development programme.

MUSCAT

Client: PETROLEUM DEVELOPMENT OMAN (PDO)

Location: Saih Nihayda - Hubara Marmul, Fahud

Design, engineering, procurement and project management of a 33 Km high pressure gas transmission pipeline and extensions to crude oil pipelines. Process evaluation of gas treatment plant and P and ID review. Commissioning of gas turbine driven oil pumping station.

BRUNEI

Client: CROWN AGENTS FOR OVERSEAS GOVERNMENT AND ADMINISTRATION

Studies for the processing of natural gas and the production of nitrogen fertilizers.

CANADA

Client: ARCTIC CANADA TRANSMISSION COMPANY

We were retained as consulting engineers to the Arctic Canada Transmission Company to carry out preliminary engineering work on the utilisation, conversion, storage and transportation of natural gas in liquid form.

ETHIOPIA

Client: ETHIOPIAN PETROLEUM SHARE COMPANY

Development of alternative systems for oil pipelines between Assab and Addis Ababa. The overall distance involved was 806 Km with a variation in elevation of 7,000 feet.

The study optimised the diameter of the pipeline, the number of pumping stations and the products handled.

FRANCE, UK, USA

Client: **FRENCH COMPANY (CONFIDENTIAL)**

We have been retained as technical experts for patent action involving advising on merits of claims by two leading LNG process licensors. This work included in-depth studies of existing plants and proposed projects as well as comprehensive, detailed patent investigations of cascade single and multi-component refrigerant systems.

GREECE

Client: **GOVERNMENT OF GREECE**

Detailed survey of the petroleum refining and petrochemical industries, with market projections, appraisal of existing manufacturing facilities, techno-economic evaluation of proposed new plants and recommendation on the planning and phasing of the expansion of these industries.

INDIA

Client: **NAGARJUNA FERTILISERS LIMITED**

Consulting engineers for the design and construction of a complex for production of 900 tons per day of ammonia and 1500 tons per day of urea and the necessary associated facilities and services.

INDONESIA

Oil Development

Following the opening-up of the country to western companies in 1966, we were engaged from 1967 on a long term consultancy to PERTAMINA the state-owned oil and gas corporation.

The initial work was a field-by-field assessment of the current situation and potential. This was followed by studies to determine the method for development and estimates of costs, subsequent involvement in the individual projects.

Client: **P N PERTAMINA**

Location: **Palembang, South Sumatra**

Design engineering of LPG gathering lines, steam and cooling water transmission lines.

Client: **PERTAMINA**

Location: Prabumulih

Design of a gas gathering system and flowline required in order to supply feedstock for an ammonia/urea complex. The pipelines involved in the gathering system were of various diameters and lengths. The main supply line was 12" diameter handling 40 million standard cubic feet per day.

Client: P N PERTAMINA

Location: Sungei Gerong, South Sumatra

Design of an 8" flowline carrying LPG a distance of 12Km to Plaju.

Client: PERTAMINA

Location East Kalimantan

Design of 41Km gas line required to supply feedstock from gas fields to Bontang ammonia/urea plant.

Client: PERTAMINA

Location: Plaju, South Sumatra

Design and construction to field gas gathering and transmission pipeline systems.

Client: PERTAMINA

Location: Bontang, Kalimantan

Design of 10" low temperature ammonia loading line including loading arms.

Design of 6Km - 36" cooling water lines having sufficient flexibility to withstand ground settlement of newly filled site.

ITALY

Client: IMPIANTI DE NORA

Feasibility studies for the establishment of an integrated petrochemical complex in Italy.

NICARAGUA

Client: ULTRAMAR BANKING CORPORATION

Regional study on an international scale for the production of petrochemicals.

NORWAY, IRAN

Client: MOSS ROSENBERG

This project involved process design for a barge-mounted LNG plant, built initially in Norway, and to be towed to a site in Iran located more than a mile off-shore. Work included review of total process design; development of P & ID's, piping specifications, and flare and drain system for the floating facility; review of energy balance and performance at non-standard conditions; supervision of piping and equipment layout.

UNITED ARAB EMIRATES

Client: AMOCO SHARJAH OIL CO
Location: Sajaa Field Development, Sharjah

As part of a consortium with Khansaheb-Gammon responsible for the installation of gas flow lines and gathering systems, well-head assembly and connections. Underground piping has shrink sleeves with individual joint wrapping. All systems hydraulically tested to 10,000 psi. Total piping 93 miles up to 30" diameter.

EGYPT

Location: Abu Qir Bay

This project involved the survey and subsequent remedial engineering to 14 Kms of gas sealine where considerable bottom movements had cause fill spans and sinkage problems. A trench was cut in rock in three places and the sealine moved over to lie in it with minimal interference to production schedules. We designed a further trench cut in the rock to lie a parallel 16" gas line for field extension.

NORWAY

Location: Bergen and California

This project involved explosive rock trenching, on-shore and off-shore in deep water, to evaluate the feasibility of a pipeline across the Norwegian Trench from the Stratfjord oilfield to Bergen. Shaped and other special charges were developed and tested in water depths of up to two thousand feet, and instrumented pipe tows conducted in conjunction with R. J. Brown Associates, the US Navy Civil Engineering Battalion, and Nobel Explosives.

YUGOSLAVIA

Detailed study of the siting of the Skopje Refinery to determine the effects of air and water pollution that might be created taking into account the local terrain and population density.

Location: Mediterranean Grass Roots Refinery

This was a proposal for the basic design and specification for 20,000 BPSD grass roots refinery

to be built in a Mediterranean country for which we undertook the basic parameters for the process plants, the offsite facilities and the crude oil and products loading and off loading systems.

UNITED KINGDOM

Client: MESA (UK) LTD

A survey of the impact of developing the Beatrice Field, the closest off-shore field to the UK. The study covered:

- (i) Method of development of the oilfield.
- (ii) Alternative methods of handling, storing and transporting the crude, e.g seabed pipeline , on-shore tankage, off-shore floating storage with dedicated shuttle tankers, total off-shore trans-shipment.
- (iii) Risk analysis.
- (iv) Economic analysis.

One major problem for the pipeline solution was the viscosity, high pour point properties of the crude oil, with the consequent inter-relationships of pumping discharge pressure, pipe wall thickness, line size etc.

Client: NYPRO LTD (UK)

Retained as Consultants in connection with the public enquiry into the Flixborough disaster where an explosion occurred on a petrochemical complex producing caprolactum from cyclohexane. Our work included research into the failure of steel pipes and vessels under pressure in fire conditions and resulted in the discovery of conditions not known before where rapid failure occurs.

Client: PAN - OCEAN SHIPPING

Providing edible oil off-loading facilities in stainless and carbon steel pipework from sea going tankers at Liverpool Dock.

Client: NORTH SEA - HAMILTON BROS OIL AND GAS

This project involved the deflooding, cutting to length and refitting 2,800 feet of 10 inch pipeline in 270 feet of water. The line was rigged, cut and bottom-towed 16 miles to a new location where it was tied in to a live satellite wellhead at one end and the production sub-sea manifold at the other. This project was managed from conception to completion including all planning, logistics, contractors' supervision and procurement.

Client: NORTH SEA - SHELL

This project involved the evaluation of methods of observing pipe burial in the North Sea immediately behind the jet sledge. Contractors' responses to Shell Exploration were evaluated and reported on and recommendations made for further action by Shell.

Client: NORTH SEA - THISTLE 'A'

This project was managed offshore for BNOG and involved the survey and report to the Thistle-Dunlin oil pipeline. Special tooling was specified and tested in Aberdeen and the operations were supervised offshore throughout the repair using the MV Seaway Swan and the MV Seaspread. Survey was carried out by the Inersub III and the repaired pipeline tested and put back on stream.

As a part of the project, we supplied the subsea co-ordination on the platform and also supervised the reinstatement of tanker loading from the SALM buoy until the pipe repair was completed.

Client: ESSO PETROLEUM CO LTD

Provision and erection of gantry, jetty fuel loading arms and pipework to storage tanks and purfleet terminal.

Client: SHELL UK EXPLORATION

Provision of slug catchers and pig traps at Bacton Terminal with modifications to pipework and platforms gantry in North Sea.

Client: BRITISH GAS CORPORATION

All above ground pipework installations for Chalgrove to Oil Warden section of the Southern Feeder Main - Sheppingley, Peters Green , Old Warden and Tydd St. Giles.

Client: BRITISH GAS CORPORATION

Bishop Auckland to Tafforth pipeline 42" diam. erection and commissioning of pig trap installations.

Client: NORTHERN IRELAND ELECTRICITY SERVICE

Kilroot Power Station - Installation of 12" heavy oil pipeline from Ballylumford to Kilroot and erection and installation of oil transfer pumphouse.

Client: NORTH ATLANTIC TREATY ORGANISATION

Brentwaters and Mildenhall Air Bases. Provision of pipework in carbon steel, aluminium and stainless steel to facilitate the high octane fuelling of aircraft.