

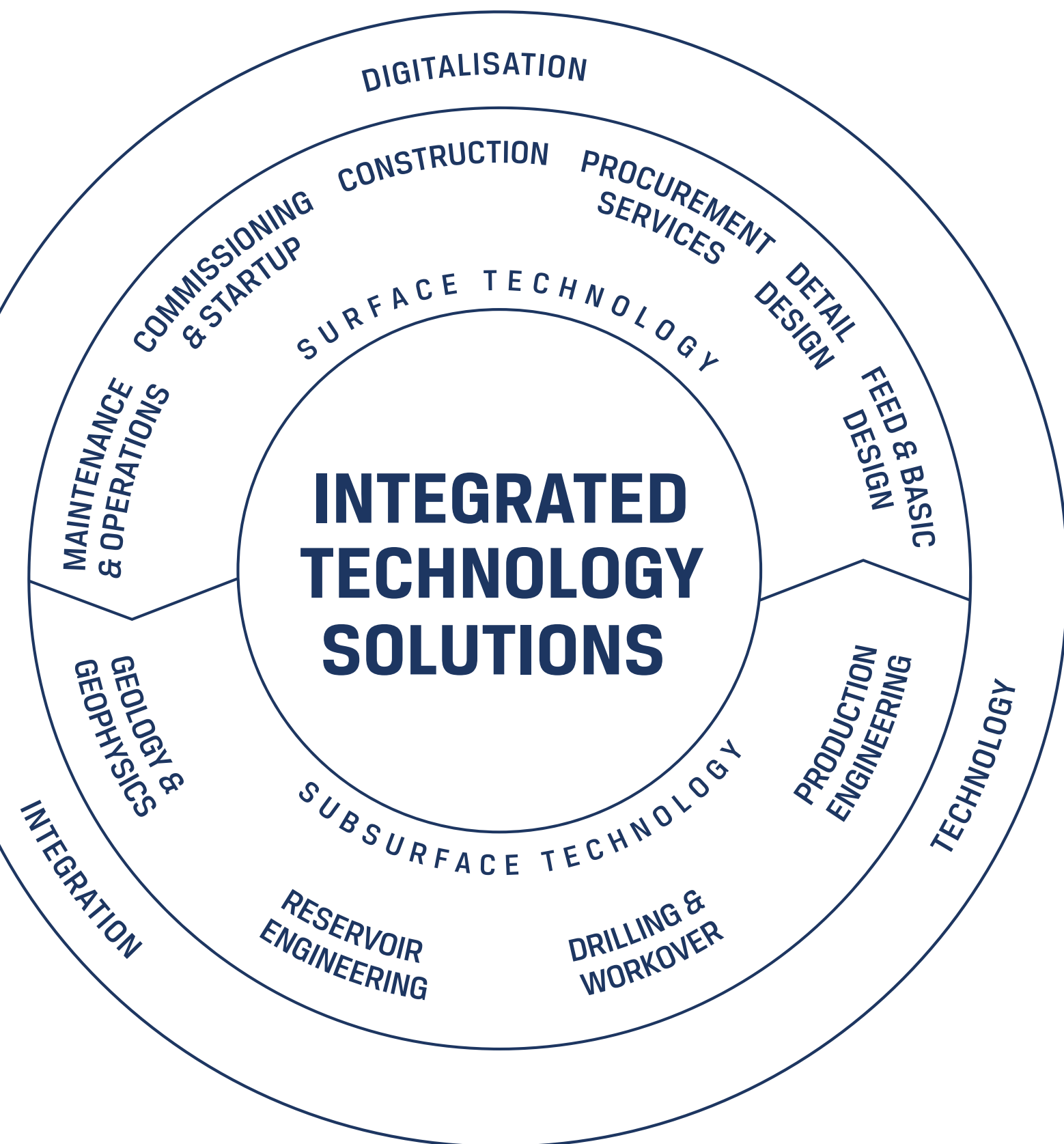
SURFACE TECHNOLOGY **REFERENCE LIST**

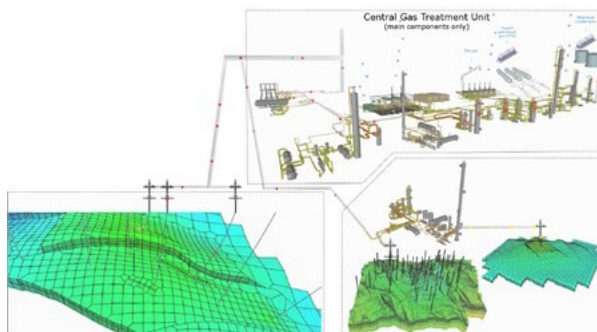
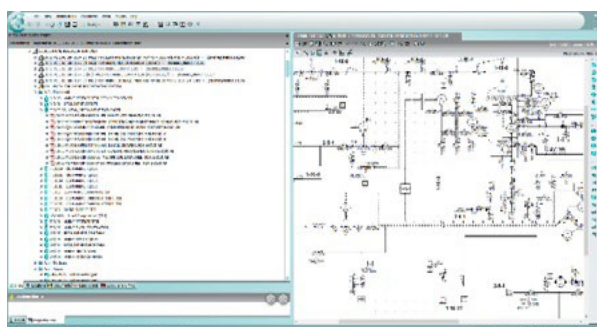
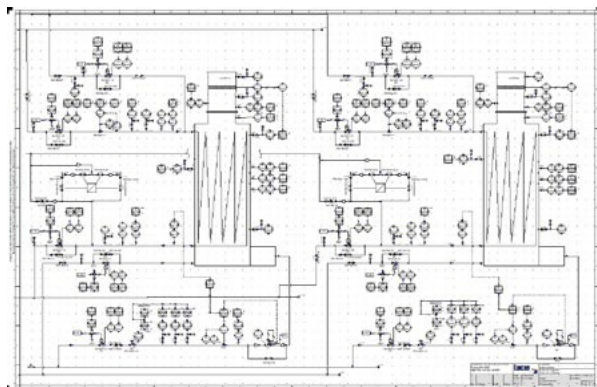
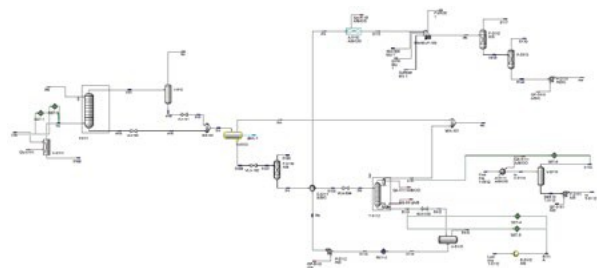
FEBRUARY 2021



ISO 9001: 2015 Quality Management System
ISO 14001 : 2015 Environmental Management System
ISO 45001 : 2018 Occupational Health and Safety Management System
ISO 50001 : 2011 Energy Management System

Certified by TÜV NORD





PROJECT:

KPO SOUR GAS PROCESSING & SUPPLY TO CHINAREVSKOYE FACILITIES

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Front End Engineering Design Project

COMMENCEMENT: April 2020

COMPLETION: October 2020

SERVICES SUMMARY:

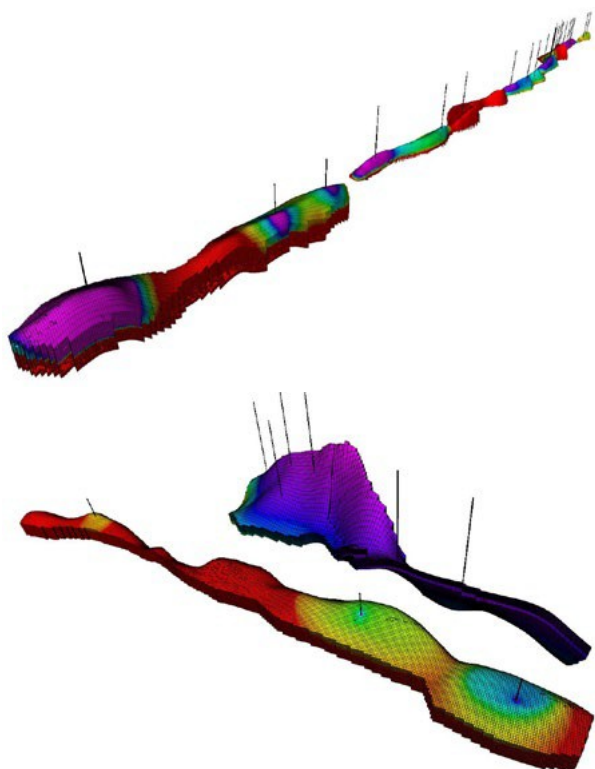
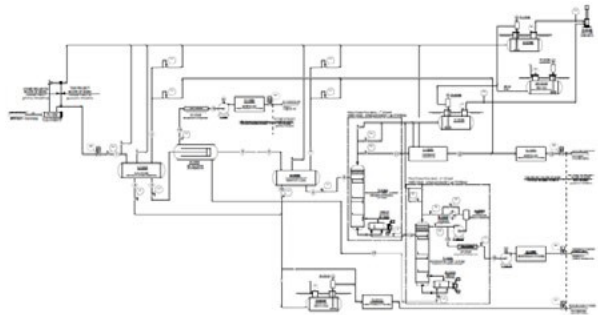
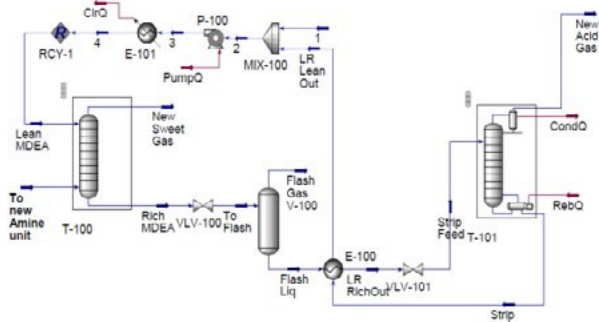
Fast Track FEED Engineering to connect the KPO PSA to the CHINAREVSKOYE facilities. (Karachaganak is a gas condensate field in northwest Kazakhstan 1.2 tcm of gas and 6.5 billion barrels of liquid condensate and crude oil. It is operated by Shell and ENI on behalf of partners Chevron, Lukoil & KMG.)

The FEED objective is to sweeten up to 3.9bcm/year of sour raw gas and sour liquid feed stock (up to 6% H₂S and 6.5% CO₂) and transfer up to 2.5 bcm/year sweetened wet gas to the CHINAREVSKOYE facility via a 110 km 28" pipeline with dual international waterway Ural river crossing. The FEED included complete Integrated Subsurface-Surface ESYS Simulation and GHG Emissions Assessment, as well as Plant Life Cycle Asset Data Management model.

The full Integrated Digitalization enables achievement of Environmental Social Corporate Governance (ESG) targets as well as future RoK Regulatory requirements for GHG Emissions reporting and compliance.

SERVICES INCLUDED:

- 1) FEED Development
- 2) New sweetening plant design
- 3) Process design engineering
- 4) Mechanical piping design engineering
- 5) Electrical design engineering
- 6) I&C design engineering
- 7) F&G design engineering
- 8) Fire suppression engineering
- 9) HYSYS Process Simulations
- 10) Process design sensitivities analysis
- 11) Gas Sweetening HYSYS Process Simulations
- 12) Liquid Sweetening Process
- 13) Gas Dehydration HYSYS Process Simulations
- 14) Acid gas compression HYSYS Process Simulations
- 15) PFD with H&M Balances
- 16) P&IDs development
- 17) Equipment Sizing
- 18) Materials Selection assessment
- 19) Pipeline Flow Assurance
- 20) Pipeline hydraulics / capacity evaluation
- 21) 100km Raw Gas Pipeline Design
- 22) Pipelines routing assessment
- 23) Engineering Survey Scope of Work
- 24) Pipeline materials specifications
- 25) Mechanical, piping, electrical, I&C specifications
- 26) General Plans and Key Plans
- 27) EIA Scope of Work
- 28) Utilities and infrastructure
- 29) SCADA control system / Process control philosophy
- 30) Pipeline control system
- 31) EPCC Tender, Administrative part
- 32) EPCC Tender, Technical part
- 33) Long Lead Process Equipment Tender Packages
- 34) Long Lead Items Tender Packages



PROJECT:

STEPNOY LEOPARD DEVELOPMENT PROJECT II

CLIENT: Nostrum Oil & Gas Coöperatief U.A.

SERVICES: Full Field Appraisal Development Project II

COMMENCEMENT: January 2019

COMPLETION: December 2020

SERVICES SUMMARY:

Multiple Full Field Development Project with full responsibility for Subsurface and Surface aspects of the project. These are 8 gas condensate and gas condensate with oil rims fields. 31 Wells needed to be tied in a 120 km gathering system and then connected with a 120 km 22" sour gas pipeline 3.3 bcm (up to 2.5 % H₂S and 5% CO₂) per year to the CHINAREVSKOYE processing facility. The project included complete Geological & Geophysical Assessment, Reservoir & Production Engineering, Drilling & Completion as well as complete Surface facility concept design, detailed design, custody transfer design, regulatory approval, and complete financial feasibility assessment for all development concepts.

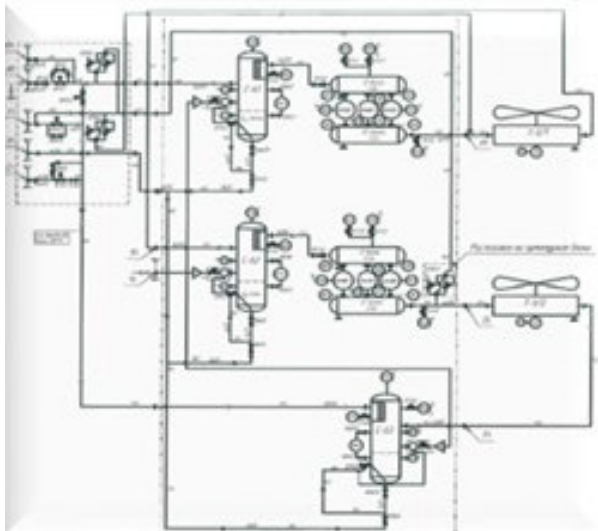
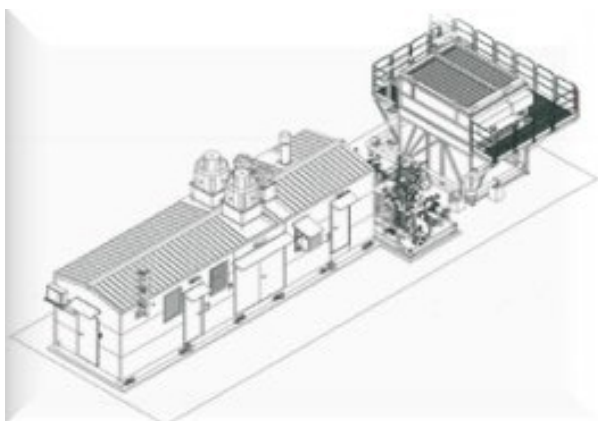
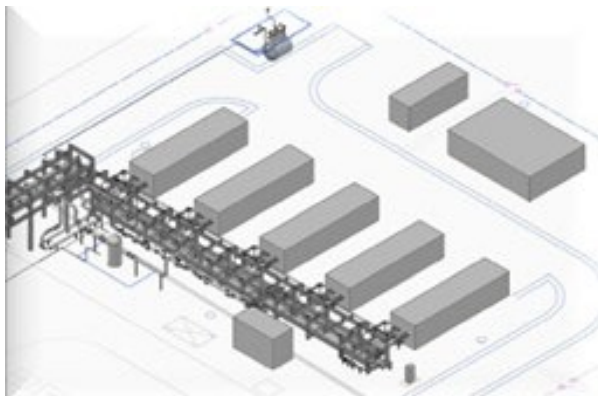
In addition to this Integrated Subsurface-Surface ESYS Simulation and GHG Emissions Assessment, as well as Plant Life Cycle Asset Data Management model was performed. The full Integrated Digitalization enables achievement of Environmental Social Corporate Governance (ESG) targets as well as future RoK Regulatory requirements for GHG Emissions reporting and compliance.

SURFACE ENGINEERING SERVICES INCLUDED:

- 1) Multiphase Development Appraisal Project
- 2) Development of Engineering Design Packages
- 3) Process design engineering
- 4) Mechanical piping design engineering
- 5) Electrical design engineering
- 6) Civil design engineering
- 7) I&C design engineering
- 8) F&G design engineering
- 9) Cathodic protection engineering
- 10) HYSYS Process Simulations
- 11) Fractionation HYSYS Process Simulations
- 12) Sulphur Recovery Unit HYSYS Process Simulations
- 13) Gas Sweetening HYSYS Process Simulations
- 14) 120km Raw Gas Pipeline Design Package
- 15) Development of Gathering System for 8 gas-condensate oil field with 120km of pipelines
- 16) Equipment Sizing
- 17) Pipelines routing assessment
- 18) Field Surveying and Routes Selection
- 19) Site Survey Supervision
- 20) Engineering Geodetic & Geological Surveying of Raw Gas Pipeline & Gathering System/Facilities
- 21) Preparation of all required documentation for obtaining Regional and State Approvals
- 22) Gathering system and surface facilities assessments
- 23) Environmental Impact Assessment

SUBSURFACE ENGINEERING SERVICES INCLUDED:

- 1) Geology & Geophysics
 - Well log & 3D seismic data QC and analyses
 - 3D seismic data re-processing (Velocity model building)
 - 3D geological modeling and HC in place volumes estimation
- 2) Reservoir Engineering
 - Reservoir engineering data QC and analyses
 - Simulation modeling and HC reserves estimation
 - Development plan elaboration
- 3) Drilling & Completion
 - Well integrity assessment of existing 120 wells. Data collection and verification.
 - Well designs & detailed drilling/ completion and well testing programs for 8 wells.
 - Preliminary procurement packages for LLI and other materials
 - Detailed plan for the mobilization/ demobilization of the drilling rig and camp
 - Complete preparation for obtaining all regulatory approvals
- 4) Production Engineering & Technology
 - Production & Operations Simulations



PROJECT:

EXTENSION OF LOW PRESSURE SYSTEM

CLIENT: ZhaikMunai LLP

SERVICES: Detail Design

COMMENCEMENT: November 2019

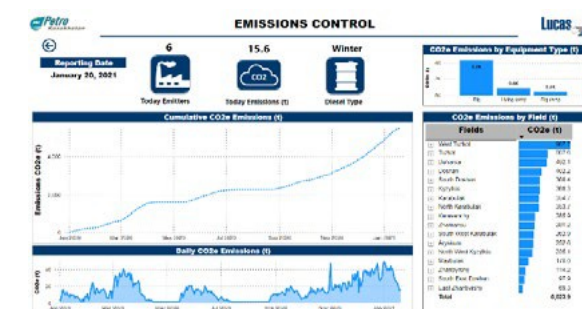
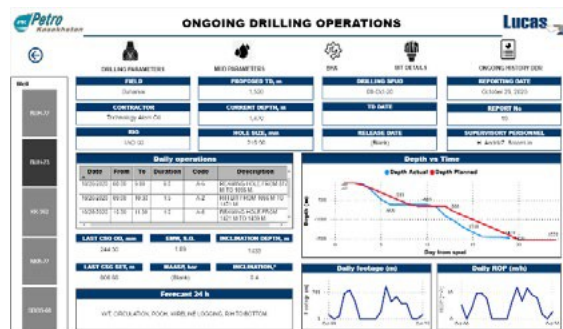
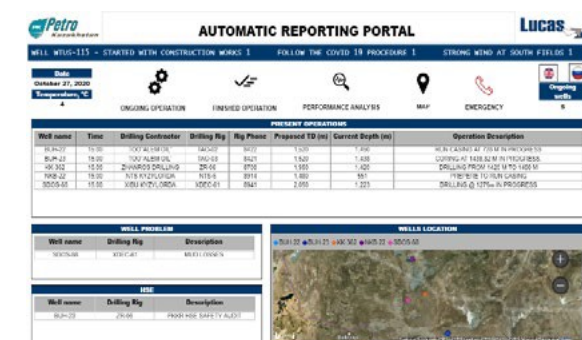
COMPLETION: February 2020

SURFACE ENGINEERING SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 2) Facility Design
- 3) Process Flow Diagram
- 4) P&IDs development
- 5) Piping 3D Modelling
- 6) Pipe rack extension
- 7) Pipeline sizing
- 8) Equipment Sizing
- 9) Debottlenecking of the existing facility
- 10) Engineering Survey Report
- 11) Input Data for EIA
- 12) Construction Project Organization
- 13) Preparation of all required documentation for obtaining Regional and State Approvals
- 14) Project Authorship

SUBSURFACE ENGINEERING SERVICES INCLUDED:

- 1) PTA data analysis & interpretation
- 2) PLT data analysis & interpretation
- 3) Production & Operations Simulations

[illegible]

PROJECT:

ESG FOCUSED INTEGRATED SUBSURFACE TO SURFACE DATA MANAGEMENT SYSTEM

CLIENT: PetroKazakhstan Kumkol Resources JSC, PetroKazakhstan Ventures Inc., Kolzhan LLP, TuzkolMunaiGas Operating LLP
SERVICE: Environmental Social Corporate Governance (ESG) Management

COMMENCEMENT: April 2020

COMPLETION: Ongoing

SERVICES SUMMARY:

Full Integrated Digitalization enabling Monitoring, Reporting, Verification, and Mitigation to achieve Environmental Social Corporate Governance (ESG) targets as well as current and future RoK Regulatory requirements for GHG Emissions reporting and compliance.

Current scope is Drilling and Work-over operations. Over 1200 wells with all related data currently have been digitalized. The all-inclusive 15 minute interval daily reporting, including CO2e Emissions, is currently covering 8 drilling rigs and 15 work-over rigs

The next Scope is Production and Operations.

SERVICES INCLUDED:

MONITORING

- Identification and digitalization of data sources, data work-flows, data measurements, and estimations
- Integration with real time plant industrial data systems
- Reservoir pore space to plant exit molecule tracking
- Satellite imagery and/or drones
- Data collection & storage (specialized data input forms, data storage, reviewing, and approval process)
- Data analysis (Data cleansing and filtering, data aggregation and calculations, data integration)

REPORTING

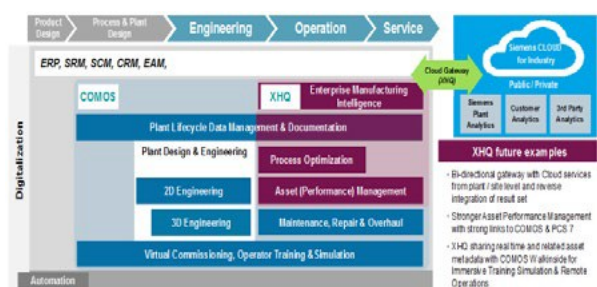
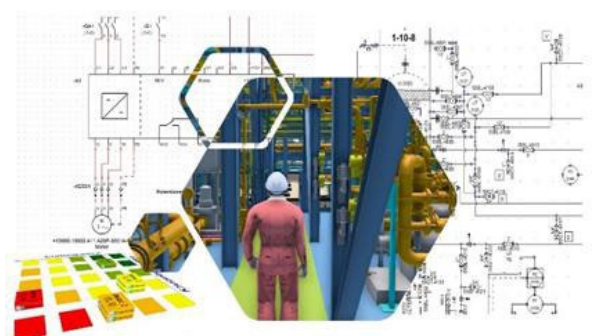
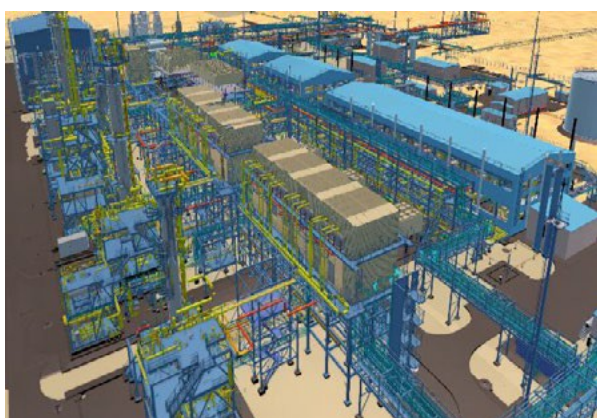
- Business Processes Orchestration (Definition of business processes, developing workflows with RACI matrices, automatization of business processes)
- Automated Reporting System (Interactive & intuitive dashboards, PDF Reports, data availability PC, tablet, phone, watch, role-based approach, real-time monitoring)
- Drilling & Workover operation
- Performance analysis (Number of drilled well per year, drilled meters per drilling rig and year, drilling days, average drilled meters per day, average ROP per drilling rig and year, analysis of well problems, operation duration analysis)
- Real time information (well status, current depth, description of current operation, drilling problems, HSE accidents)
- Hydrocarbon and GHG emission accounting methods
- Scope 1, Scope 2, Scope 3 emission categories
- Flaring, venting, fugitive emission, & stationary combustion calculations
- Total GHG (CO₂e) emission calculations and unaccounted hydrocarbon losses
- Real time plant inventory management, reconciliation & back allocation
- Internal and government reporting for sales products and total GHG emissions

VERIFICATION

- Measurement and estimation methods from base line
- Tier 1, Tier 2, Tier 3 (Top-down and Bottom-up assessments)
- Data validation and data assurance

MITIGATION

- Methods for reduction of emissions and abatement projects
- Setting emissions reduction targets and emissions reduction levels
- Upgrading equipment (e.g. compressors, valves, etc.)
- Adjust operational practice (e.g. casing venting)
- Avoid incomplete combustion (e.g. flare, heaters, etc.)



PROJECT:

INTEGRATED DIGITALIZATION & LIFE CYCLE ASSET MANAGEMENT SYSTEM

CLIENT: ZhaikMunai LLP

SERVICES: Integrated Digitalization

COMMENCEMENT: January 2019

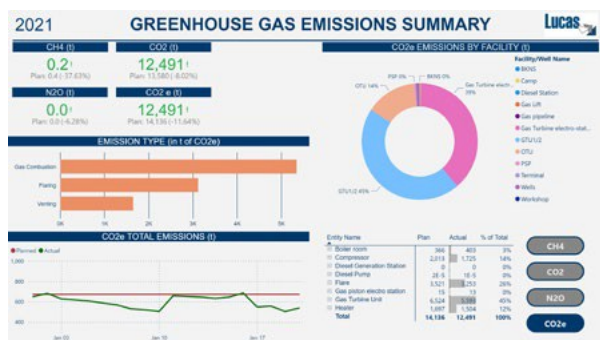
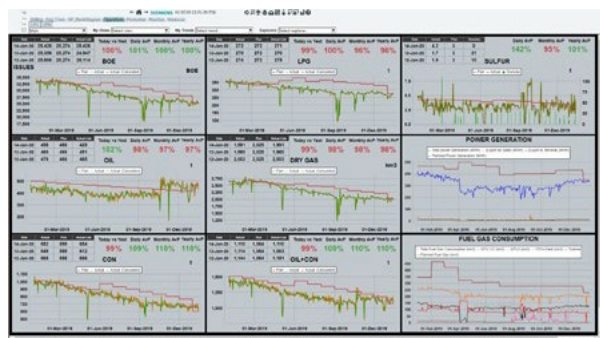
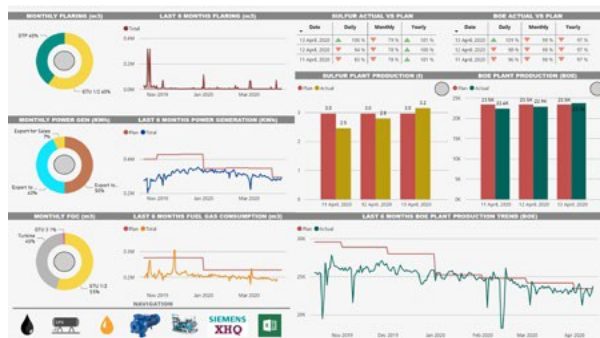
COMPLETION: ongoing

SERVICES SUMMARY:

Full Integrated Digitalization enabling Monitoring, Reporting, Verification, and Mitigation to achieve Environmental Social Corporate Governance (ESG) targets as well as current and future RoK Regulatory requirements for GHG Emissions reporting and compliance. Integrated asset-wide numerical model from the reservoir to the backend of the processing facility. Full Document Management System (DMS) Integration, Project Quality Management Integration, Facility Maintenance Integration. Forecasting of plant product specifications based on reservoir development scenarios. Assessment of Scope 1 and Scope 2 emissions resulting from plant operations.

SURFACE SERVICES INCLUDED:

- 1) Project Quality Management
 - Overall Project Management
 - Document revision system
 - Automatic reviewing and approval procedures
- 2) Document Management System (DMS)
 - Document Planning & Development
 - Automatic numbering procedures
 - Automated document distribution
 - Import, integration, and view of external documents
- 3) Maintenance, Repair, Overhaul (MRO)
 - Maintenance program/strategy (daily, weekly, monthly, yearly planning)
 - Shift management
 - Assign work packages/schedule work & resources
 - Spare parts and stock management
 - Reporting and feedback
 - Risk Assessment
 - Strategy library
- 4) 3D Virtual Reality – COMOS Walkinside
 - 3D Model Visualization
 - 3D Integration
 - Start-up Procedures & Scenarios
 - Personnel virtual trainings
 - SCADA Interface
- 5) Intelligent P&IDs and E&I diagrams
- 6) Monitoring
 - Identification and digitalization of data sources, data work-flows, data measurements, and estimations
 - Integration with real time plant industrial data systems
 - Reservoir pore space to plant exit molecule tracking
 - Satellite imagery
 - Data collection, storage & analysis
- 7) Reporting
 - Hydrocarbon and GHG emission accounting methods
 - Scope 1, Scope 2, Scope 3 emission categories
 - Flaring, venting, fugitive emission, & stationary combustion calculations
 - Total GHG (CO₂e) emission calculations and unaccounted hydrocarbon losses
 - Real time plant inventory management, reconciliation & back allocation
 - Internal government reporting for sales products and total GHG emissions
- 8) Verification
 - Measurement and estimation methods from base line
 - Tier 1, Tier 2, Tier 3 (Top-down and Bottom-up assessments)
 - Data validation and data assurance
- 9) Mitigation
 - Methods for reduction of emissions and abatement projects
 - Setting emissions reduction targets and emissions reduction levers
 - Adjust operational practice (e.g. casing venting)



PROJECT:

FULL ASSET DIGITALIZATION

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Integrated Digitalization & Environmental Social Corporate Governance (ESG) Management

COMMENCEMENT: April 2018

COMPLETION: ongoing

SERVICES INCLUDED:

Life Cycle Asset Management System, Business Processes Integration, Data Management, Automated Reports Generation, Data Analysis and Analytics

SERVICES SUMMARY:

Full Integrated Digitalization enabling Monitoring, Reporting, Verification, and Mitigation to achieve Environmental Social Corporate Governance (ESG) targets as well as current and future RoK Regulatory requirements for GHG Emissions reporting and compliance. Integrated asset-wide numerical model from the reservoir to the backend of the processing facility. Full Document Management System (DMS) Integration, Project Quality Management Integration, Facility Maintenance Integration. Forecasting of plant product specifications based on reservoir development scenarios. Assessment of Scope 1 and Scope 2 emissions resulting from plant operations.

1) Data Collection & Storage

- Data collection from field instruments
- Data collection from manual inputs, reports
- Automatic reviewing and approval process
- One single data source

2) Data Analysis

- Data cleansing and filtering (pre-processing)
- Data aggregation and calculations
- BOE calculation
- Units conversion
- Sales products
- Oil storage inventory
- Condensate storage inventory
- LPG storage inventory
- Sulfur storage inventory
- Generated & consumed energy
- GHG emissions
- Reservoir contributions
- ML & AI methods
- Integration of existing software with DOF

3) Business Processes Orchestration

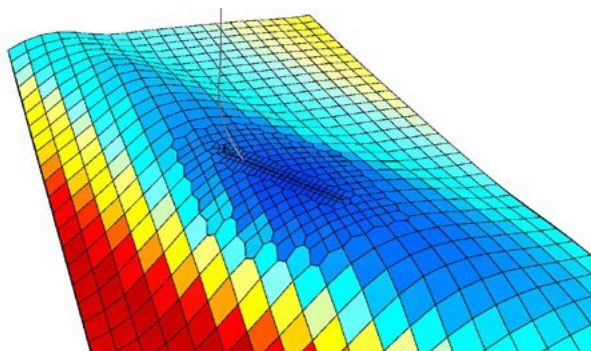
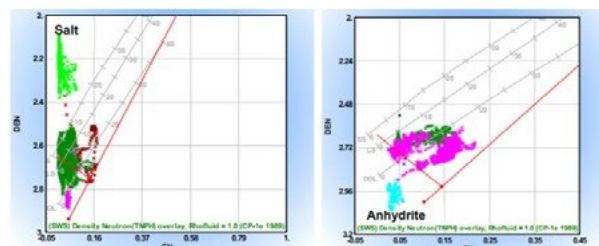
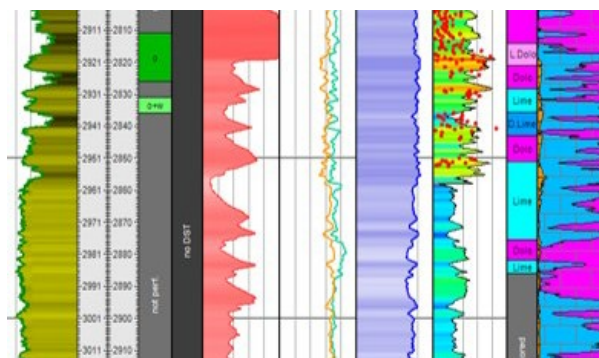
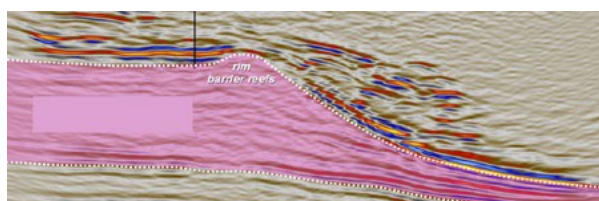
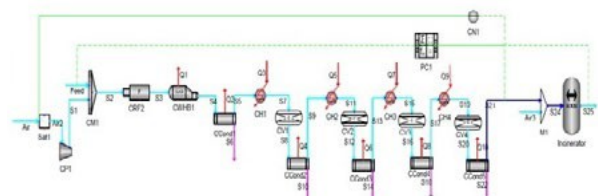
- Definition of business processes
- Developing workflows with RACI matrices
- Automatization of business processes

4) Automated Reporting System

- Interactive & intuitive dashboards
- PDF Reports (government)
- Data availability (SharePoint, PC, tablet, phone, watch)
- Role-based approach
- Real-time monitoring

5) Automated Reporting Portals

- Facility Operations
- Wells Production
- Well Testing
- Well Interventions
- Drilling & Workover
- Engineering & Construction
- GHG Emissions Control
- Budget & Cost Control
- Government Reporting System



STEPNOY LEOPARD DEVELOPMENT FEASIBILITY STUDY I

SERVICES: Full Field Appraisal Development Feasibility Study

COMPLETION: December 2018

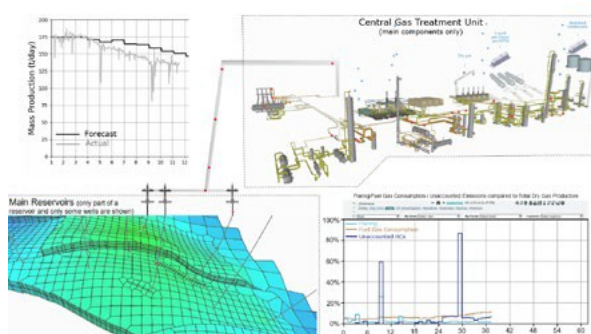
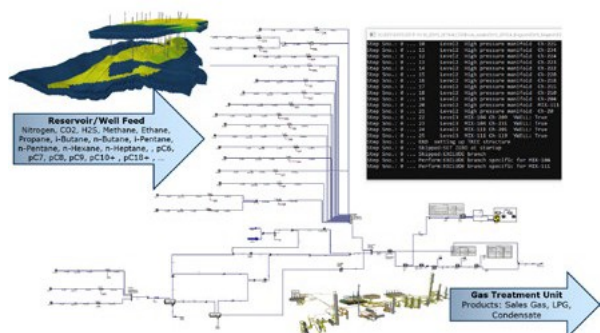
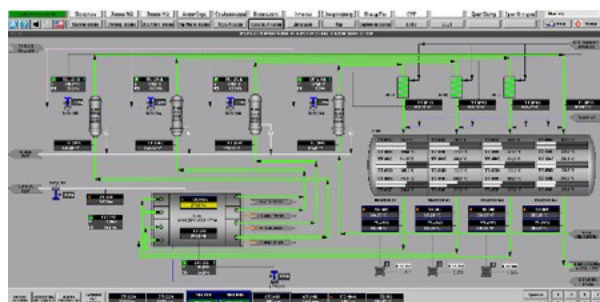
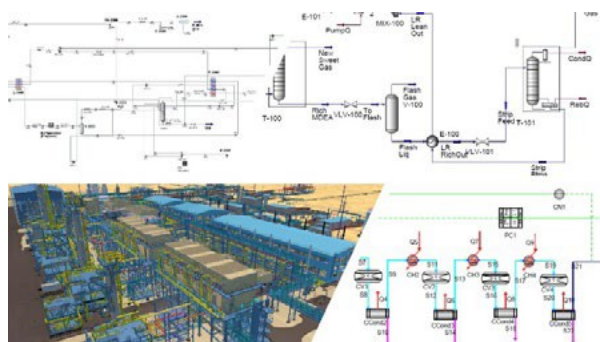
Multiple Full Field Development Project with full responsibility for Subsurface and Surface aspects of the project. These are 8 sour conditions (up to 2.5 % H₂S and 5% CO₂) gas condensate and gas condensate with oil rims fields to be tied in to the CHINAREVSKOYE processing facility.

The feasibility study concluded full field development plan of 31 Wells to be tied in a 120 km gathering system and then connected with a 120 km 22" sour gas pipeline 3.3 bcm per year to the CHINAREVSKOYE processing facility.

SURFACE ENGINEERING SERVICES INCLUDED:

- SUBSURFACE ENGINEERING SERVICES INCLUDED:

- 9 / 64



PROJECT:

GAS & OIL TREATMENT PLANT - PROCESS OPTIMIZATION

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Process Simulation Assessments

COMMENCEMENT: June 2015

COMPLETION: Ongoing

SERVICES SUMMARY:

CHINAREVSKOYE is a very complex sour conditions 1.5% H₂S onshore field in Western Kazakhstan. The field consists of 17 reservoirs in heavily layered carbonate rock from depths of 2500m to 5000m. The carbonate rock matrix is very tight, and in most reservoirs, hydrocarbons can only be produced through the presence of a natural fracture system. The reservoir fluid composition is changing with depth and pressure, so that every possible phase (gas, condensate, and oil) is present.

The objectives of the process optimization services are: Maximize sales product recovery, increase overall energy efficiency of gas processing, minimize fuel gas consumption and GHG emissions of sweetened 4.5 Msm³/ day gas design capacity Gas Treatment Unit Complex. Integrated analysis of plant performance, product quality & energy consumption based on changing well stream feeds using ESYS.

Optimization of the process to minimize flaring during regular operation.
Optimization of 1,500 tons/day condensate stabilization unit to achieve better C₅+ recovery and reduced energy consumption.

Conversion of Sulfur Recovery Unit (SRU) from direct oxidation to Claus-Process. SRU has a design capacity of 35 tons/day elemental Sulfur. Optimization of Amine Unit to decrease amine solvent flow rate and energy consumption to achieve better H₂S absorption. Optimization of gas dehydration units to achieve better C₃ recovery.

- 1) Gas Treatment Unit Complex HYSYS model development
- 2) Oil Treatment Unit Complex HYSYS model development
- 3) Maintaining live HYSYS models for existing process facilities per production / operation data
- 4) Existing process facilities sensitivity analysis
- 5) Troubleshooting of existing process facilities with problems resolving
- 6) Equipment sizing
- 7) Existing equipment rating and efficiency verification for different production flow rates
- 8) Operation envelope assessment
- 9) Simulations for estimating products yields
- 10) Generic model development for gas lift implementation in oil production wells
- 11) Flow assurance analysis
- 12) Well HYSYS Generic Model Development
- 13) Process Plants Optimization
- 14) Continuous Client Support
- 15) Integrated Subsurface-Surface ESYS Simulation
 - Connection of reservoir and facility simulation into one numerical tool
 - Link the reservoir simulation models of Ardatovskii, Biyski, Frasnian & Tournaisian reservoirs to the process simulation models of the gas treatment units GTU 1-2, GTU 3 and the oil treatment complex UPN
 - Revision of sour conditions gas condensate and oil fluid description to conform to reservoir and surface simulation needs
 - Full compositional, equation-of-state numerical modeling from the reservoir to the backend of the processing facility
 - High-resolution compositional simulation of the well drainage area
 - Integrated subsurface-surface modeling of complex physical and chemical processes, and their impact on operational and investment decisions
 - Forecasting of plant products and product quality and assessment the impact of reservoir development strategies
- 16) GHG Emissions calculations & forecasts
 - Assessment of Scope 1 and Scope 2 emissions resulting from plant operations
 - Evaluation of reservoir development strategies and plant operations to develop emission mitigation strategies
 - Bottom-up accounting of unaccounted hydrocarbons (e.g. fugitive emissions)



PROJECT:

POWER STATION AT WEST TUZKOL OIL FIELD

CLIENT: TuzkolMunaiGaz Operating LLP / Kolzhan LLP, Kazakhstan

SERVICES: Detail Design – Process Part & In-House Support

COMMENCEMENT: February 2018

COMPLETION: July 2018 (design) /December 2019 (support)

SERVICES INCLUDED:

- 1) Inlet Data Analyzes Report
- 2) Development of Process part of design
- 3) HYSYS Process Simulations, Process calculations and sizing
- 4) Development of Process Flow Diagrams, Piping & Instrumentation Diagram,
- 5) Preparation of Technical Tender Specifications for the main Process Equipment Packages
- 6) Preparation of Explanatory Notes, Design Basis Memorandum
- 7) In-House Personal Engineering Support
- 8) Development of Instrumentation & Control and Fire & Gas project parts
- 9) Planning and scheduling support
- 10) Cost estimates
- 11) Procurement support with Technical and commercial Bid Evaluations
- 12) Review of Vendor documentation
- 13) FAT of gas turbine
- 14) Construction SoW and Tender development support
- 15) Project Authorship
- 16) Commissioning and Start-up support



PROJECT:

GAS TREATMENT UNIT COMPLEX CONTROL VALVES & PUMPS ASSESSMENT FOR FACILITY MINIMUM FLOW

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Process Assessment

COMMENCEMENT: November 2018

COMPLETION: January 2019

SERVICES INCLUDED:

- 1) Assessment of pumps operability at facility minimum flow rates
- 2) Assessment of control valves operability at facility minimum flow rates



PROJECT:

CHINAREVSKOYE GTU-1/2 – PIPING SYSTEM UPGRADING

CLIENT: ZhaikMunai LLP, Kazakhstan

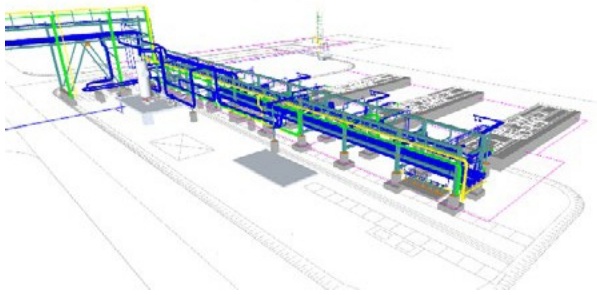
SERVICES: Detail Design

COMMENCEMENT: November 2017

COMPLETION: March 2018

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C).
- 2) Facility Design
- 3) Process Flow Diagram
- 4) P&IDs development
- 5) Tie-in points for installation during shutdown
- 6) Piping 3D Modelling
- 7) Technical Tender Specifications
- 8) Equipment Sizing
- 9) Preparation of all required documentation for obtaining Regional and State Approvals
- 10) HAZOP/HAZID Session



PROJECT:

CHINAREVSKOYE FIELD LOW PRESSURE GAS SYSTEM CONSTRUCTION

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: October 2016

COMPLETION: Core Project in 2017, Scope Change - Feb 2018

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 2) Facility Design
- 3) Process Flow Diagram
- 4) P&IDs development
- 5) Tie-in points for installation during shutdown
- 6) Piping 3D Modelling
- 7) Technical Tender Specifications
- 8) Equipment Sizing
- 9) 10kV OH Line Design
- 10) Preparation of all required documentation for obtaining Regional and State Approvals
- 11) Ecological Study - Environmental Impact Assessment
- 12) Engineering Survey
- 13) Upgrading of Detail Design due to Scope Changes

PROJECT:

C-103 & C-104 COMPRESSED GAS COOLING PROCESS UPGRADING

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: February 2017

COMPLETION: May 2017

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C).
- 2) Materials Selection
- 3) Piping 3D Modelling
- 4) Technical Tender Specifications
- 5) Construction Project Organization
- 6) Ecological Study - Environmental Impact Assessment



PROJECT:

OIL PIPELINE CONSTRUCTION FOR CONNECTION TO KTO PIPELINE SYSTEM

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: April 2016

COMPLETION: December 2016

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C).
- 2) Facility Design
- 3) Oil Pipeline Design c/w optical cables
- 4) Commercial Metering w. Tie-in to KTO Pipeline
- 5) Process Flow Diagram and P&IDs development
- 6) Piping 3D Modelling
- 7) Equipment Sizing
- 8) Cathodic protection
- 9) Road design
- 10) 10kV OH Lines Design
- 11) Preparation of all required documentation for obtaining Regional and State Approvals
- 12) Ecological Study - Environmental Impact Assessment
- 13) Engineering Survey

PROJECT:

GTU-1/2 MANIFOLD UPGRADING AND CONNECTION TO GTU-3

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: June 2016

COMPLETION: August 2016

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 2) Process Flow Diagrams
- 3) P&IDs development
- 4) Pipeline Hydraulics
- 5) Cathodic protection
- 6) Ecological Study



PROJECT:

N-E TOURNAISIAN RESERVOIR, GAS-LIFT SYSTEM DEVELOPMENT, PHASE 2

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: June 2016

COMPLETION: September 2016

SERVICES INCLUDED:

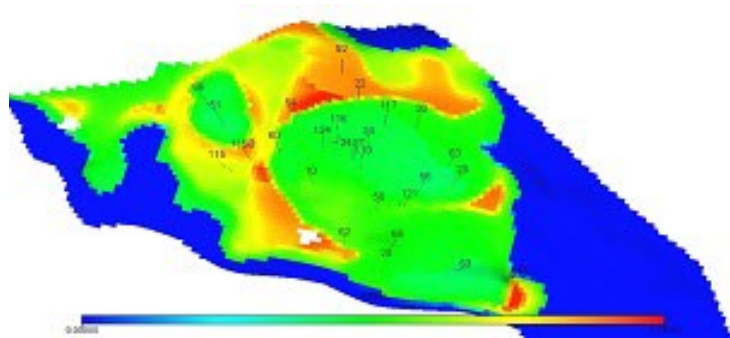
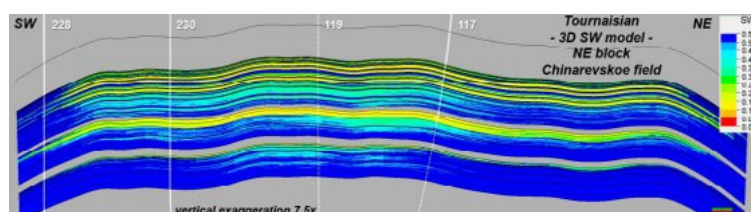
Development of Phase 2 of gas lift system in CHINAREVSKOYE field.

SURFACE ENGINEERING SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C).
- 2) Heat and Material Balance
- 3) Process Flow Diagrams
- 4) P&IDs development
- 5) Pipeline Hydraulics
- 6) Piping 3D Modelling
- 7) Cathodic protection
- 8) Ecological Study – Environmental Impact Assessment
- 9) Engineering Survey

SUBSURFACE ENGINEERING SERVICES INCLUDED:

- 1) 3D geological model updating (structural and petrophysical)
- 2) OOIP calculation
- 3) PTA data analysis & interpretation
- 4) PLT data analysis & interpretation
- 5) 3D simulation model building
- 6) Building commingled well production models
- 7) Pressure & production history matching
- 8) Elaboration of field development scenarios reflecting different development options and operating conditions in the field
- 9) Production & Operations Simulations
- 10) Artificial lift selection, design, and optimization
- 11) (Re-)completion selection
- 12) Economic and risk analysis





PROJECT:

GTU-1/2 MODERNIZATION PHASE II

CLIENT: ZhaikMunai LLP, Kazakhstan

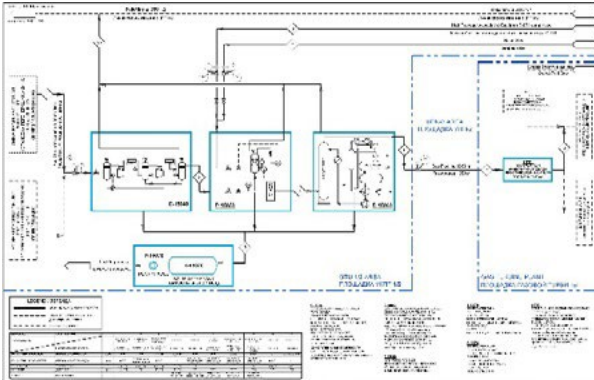
SERVICES: Detail Design

COMMENCEMENT: January 2016

COMPLETION: May 2016

SERVICES INCLUDED:

- 1) Detail Design and project adaption for all disciplines:
 - Process
 - Mechanical
 - Civil
 - Electrical
 - Instrumentation
 - Fire and Gas detection
 - Fire Suppression
- 2) Project adaption with preparation of all required documentation for obtaining Regional and State Approvals
- 3) Ecological Study - Environmental Impact Assessment



PROJECT:

SOUR GAS UTILIZATION AS FUEL GAS FOR AEG 26 MW TURBINE

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Project for Approval and Detail Design

COMMENCEMENT: December 2015

COMPLETION: May 2016

SERVICES INCLUDED:

- 1) Project for Approvals with Explanatory Notes, Development of all required supporting documentation for obtaining Regional and State Approvals
- 2) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 3) Heat and Material Balance
- 4) Process Flow Diagrams
- 5) P&IDs development
- 6) Materials Selection for Acid Gas
- 7) Piping 3D Modelling
- 8) Equipment Sizing
- 9) Technical Tender Specifications
- 10) Cathodic protection
- 11) Ecological Study - Environmental Impact Assessment
- 12) Engineering Survey



PROJECT:

FUEL GAS SUPPLY SYSTEM FOR AEG GAS TURBINE 26 MW

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: February 2015

COMPLETION: June 2015

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 2) Heat and Material Balance
- 3) Process Flow Diagrams
- 4) P&IDs development
- 5) Pipeline Hydraulics
- 6) Piping 3D Modelling
- 7) Equipment Sizing
- 8) Cathodic protection
- 9) Explanatory Notes
- 10) Ecological Study - Environmental Impact Assessment (OOC)
- 11) Engineering Survey



PROJECT:

GTU-3 INLET MANIFOLD & GAS-CONDENSATE CONNECTION PIPELINES

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: February 2015

COMPLETION: June 2015

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 2) Heat and Material Balance
- 3) Process Flow Diagrams and P&IDs development
- 4) Pipeline Hydraulics
- 5) Piping 3D Modelling
- 6) Piping Stress Analyzes
- 7) Equipment Sizing
- 8) Cathodic protection
- 9) All disciplines documentation development (process, mechanical / piping, civil, electrical, I&C)



PROJECT:

PUMP STATION TO TRANSFER OIL TO CPF KUMKOL SOUTH PHASE 2

CLIENT: VSP International LLP, Kazakhstan

SERVICES: Detail Design & Project for Approvals & Authorship Supervision

COMMENCEMENT: March 2015

COMPLETION: July 2015

SERVICES INCLUDED:

1) Detail Design for all disciplines:

- Process
- Mechanical
- Civil
- Electrical
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise

3) Authorship Supervision

PROJECT:

GTP INLET MANIFOLDS AND LP GAS-CONDENSATE GATHERING & TREATMENT SYSTEM

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Project for Approvals

COMMENCEMENT: August 2014

COMPLETION: March 2015

SERVICES INCLUDED:

- 1) Project for Approvals with Explanatory Notes, Development of all required supporting documentation for Regional and State Approvals
- 2) All disciplines documentation development (process, mechanical / piping, civil, electrical, I&C)
- 3) Heat and Material Balance
- 4) Process Flow Diagrams
- 5) P&IDs development
- 6) Equipment Sizing
- 7) Technical Tender Specification & Requisitions
- 8) Ecological Study - Environmental Impact Assessment (OBOC)
- 9) Engineering Survey
- 10) Technical Bid Evaluations and Vendor Document Reviewing



PROJECT:

CHINAREVSKOYE WEST MANIFOLD

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Project for Approvals

COMMENCEMENT: August 2014

COMPLETION: February 2015

SERVICES INCLUDED:

- 1) Project for Approvals with Explanatory Notes, Development of all required supporting documentation for Regional and State Approvals
- 2) All disciplines documentation development (process, mechanical / piping, civil, electrical, I&C)
- 3) Heat and Material Balance
- 4) Process Flow Diagrams
- 5) P&IDs development
- 6) Equipment Sizing
- 7) Technical Tender Specification & Requisitions
- 8) Engineering Survey
- 9) Ecological Study - Environmental Impact Assessment (OBOC)
- 10) Technical Bid Evaluations and Vendor Document Reviewing



PROJECT:

KONYS-BEKTAS SURFACE FACILITIES PERFORMANCE ANALYSES

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Study

COMMENCEMENT: June 2014

COMPLETION: August 2014

SERVICES INCLUDED:

- 1) Data Acquisition.
- 2) As Built Process Flow Diagrams development
- 3) Process Description and Facilities overview
- 4) Equipment List preparation
- 5) Operations Problems Identification
- 6) Problem Analyses and Problems solutions / opportunities identification
- 7) Facilities sizing calculations
- 8) Future projects/facility scenarios analyses
- 9) Proposals/Recommendations for facilities optimization, debottlenecking, and improvement
- 10) Cost Estimation for proposed Upgrades



PROJECT:

N-E TOURNAISIAN RESERVOIR GAS-LIFT COMPRESSOR FACILITY & GAS LIFT DISTRIBUTIVE SYSTEM CONSTRUCTION

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design & Project for Approvals

COMMENCEMENT: December 2013

COMPLETION: December 2014

SERVICES INCLUDED:

The project was based on complete Reservoir & Production Engineering Assessment, Completion Assessment as well as complete Surface facility concept design, and financial feasibility assessment for all development concepts.

- 1) Analyze performance and efficiency of the applied Artificial Lift System (ALS), using System (Nodal) Analyses
- 2) Perform sensitivities analyses for reservoir pressures decline, water cut incremental, tubing size changing
- 3) Estimate/forecast future Auto Gas-Lift source gas availability
- 4) Review the existing ALS based on qualitative multi-criteria ranking model (ALS Matrix Selection)
- 5) Identify and evaluate solution for pressure maintenance in Gas Condensate Reservoir to ensure Auto Gas-Lift functional operation
- 6) Perform Fluid Flow Assurance (Scaling, Paraffin, Hydrates
- 7) Perform Risk Analyses of applied ALS
- 8) Consider and evaluate alternative ALS methods implementation (Conventional Gas Lift, ESP, SRP, PCP)
- 9) Perform techno-economical evaluation of alternative ALS methods implementation
- 10) Compare (both technically and economically) applicable alternative ALS method with Auto Gas-Lift method, which require pressure maintenance with gas re-injection into reservoir
- 11) propose the "Low Cost and High Benefit" ALS method for future applications
- 12) Perform Preliminary ALS Design for proposed ALS Method
- 13) Specify down hole well completion components per typical well
- 14) Define Surface Facilities Development requirements for proposed/ selected method application
- 15) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C).
- 16) Heat and Material Balance.
- 17) Process Flow Diagrams and P&IDs development.
- 18) Pipeline Hydraulics
- 19) Piping 3D Modelling
- 20) Piping Stress Analyzes
- 21) Equipment Sizing.
- 22) Cathodic protection.
- 23) Technical Tender Specification for Gas-Lift Compressors.
- 24) Technical Tender Specification & Requisitions.
- 25) Project for Approvals with Explanatory Notes, Development of all required supporting documentation for Regional and State Approvals
- 26) Ecological Study - Environmental Impact Assessment (OBOC)
- 27) Engineering Survey
- 28) Approvals obtaining



PROJECT:

N-E TOURNAISIAN - RESERVOIR PRESSURE MAINTENANCE SYSTEM (RPMS), PHASE 2 - DETAIL DESIGN

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: October 2013

COMPLETION: September 2014

SERVICES INCLUDED:

- 1) Detail Design for all disciplines (process, mechanical / piping, civil, electrical, I&C)
- 2) Heat and Material Balance
- 3) Process Flow Diagrams and P&IDs development
- 4) Pipeline Hydraulics
- 5) Piping 3D Modelling
- 6) Equipment Sizing
- 7) Technical Tender Specification & Requisitions
- 8) Explanatory Notes
- 9) Ecological Study - Environmental Impact Assessment (OOC)
- 10) Development of all required supporting documentation for Regional and State Approvals
- 11) Engineering Survey
- 12) Approvals obtaining



PROJECT:

WEST TUZKOL INDUSTRIAL DEVELOPMENT

CLIENT: Kolzhan LLP, Kazakhstan

SERVICES: Detail Design & Project for Approvals

COMMENCEMENT: February 2014

COMPLETION: July 2014

SERVICES INCLUDED:

1) Design for all disciplines:

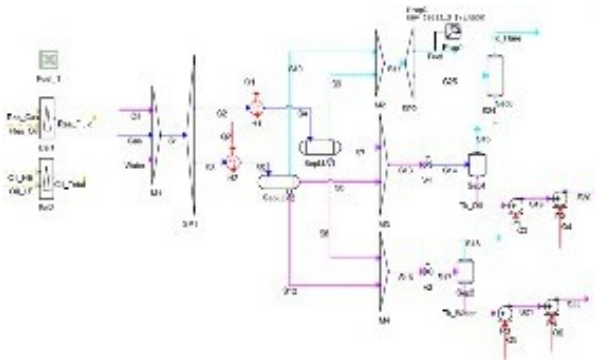
- Process
- Mechanical
- Civil
- Electrical
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise
- Expertise of energy conservation and energy efficiency

3) Project included:

- Wells – more than 400
- Access roads
- Flow lines – more than 200km
- Satellites - 25
- WDM - 11
- FWKO - 2
- Field Camp Extension
- Power Station – 25 MW
- HV line 35kV & 6 kV
- Fire and Gas Detection and Fire Suppression
- Control System
- Telecommunication System



PROJECT:

**WEST TUZKOL DEVELOPMENT AT PILOT OPERATION
2nd STAGE**

CLIENT: Kolzhan LLP, Kazakhstan

SERVICES: Detail Design & Project for Approvals & Authorship Supervision

COMMENCEMENT: August 2013

COMPLETION: July 2014

SERVICES INCLUDED:

1) Detail Design for all disciplines:

- Process
- Mechanical
- Civil
- Electrical,
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise

3) Authorship Supervision

PROJECT:

**SOUTH-WEST KARABULAK FILED DEVELOPMENT
AT PRODUCTION TESTING 2nd STAGE**

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Detail Design & Project for Approvals & Authorship Supervision

COMMENCEMENT: August 2013

COMPLETION: July 2014

SERVICES INCLUDED:

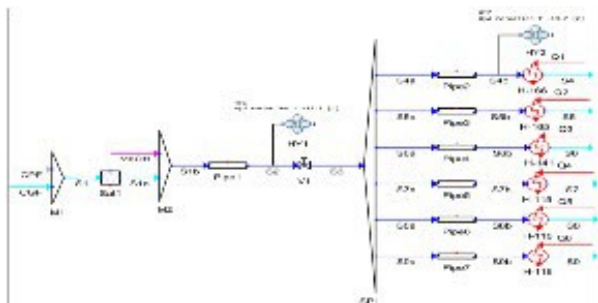
1) Detail Design for all disciplines:

- Process
- Mechanical
- Civil
- Electrical
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise

3) Authorship Supervision



PROJECT:

PIPELINE FROM GS-2 AT KYZYLKIYA O/F TO GS-1 AT SOUTH-EAST KYZYLKIYA

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Detail Design & Project for Approvals & Authorship Supervision

COMMENCEMENT: April 2013

COMPLETION: July 2014

SERVICES INCLUDED:

1) Detail Design for all disciplines:

- Process
- Mechanical
- Civil
- Electrical
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise

3) Authorship Supervision

PROJECT:

DESIGN OF PRODUCING WELLS CONVERSION TO GAS LIFT OPERATION METHOD ARYSKUM O/F

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Detail Design & Project for Approvals & Authorship Supervision

COMMENCEMENT: April 2013

COMPLETION: February 2014

SERVICES INCLUDED:

1) Detail Design for all disciplines:

- Process
- Mechanical
- Civil
- Electrical
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise

3) Authorship Supervision



PROJECT:

N-E TOURNAISIAN - RESERVOIR PRESSURE MAINTENANCE SYSTEM (RPMS), PHASE 2 - DETAIL DESIGN

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Detail Design

COMMENCEMENT: October 2013

COMPLETION: September 2014

SERVICES INCLUDED:

1) Detail Design for all disciplines:

- Process
- Mechanical
- Civil
- Electrical
- Cathodic Protection
- Instrumentation
- Fire and Gas detection

2) Regulatory Authorities and State Expertise :

- Environmental Assessment
- Conclusion of Emergency Department
- Conclusion of SES
- Conclusion of Ecology Department
- Safety Declaration
- Conclusion of State Expertise

3) Support for land allotment documentation (plan of the pipeline route drawings etc.)

4) Support for approvals such as:

- Cross-section of the Kazakhstan – China oil pipeline
- Cross-section of the KazGerMunai gas pipeline
- Cross-section of the KazGerMunai HV 110kV overhead line etc...

5) Support for Topographic and Geologic Survey

6) Support for Procurement

7) Technical analysis of all vendor proposals

8) Technical bid evaluation

9) Support for Construction

10) Authorship Supervision

11) Support for Commissioning

12) Support for Start-up



PROJECT:

N-E TOURNAISIAN - RESERVOIR PRESSURE MAINTENANCE SYSTEM (RPMS), PHASE 2 BASIC DESIGN

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Basic Design

COMMENCEMENT: June 2013

COMPLETION: August 2013

SURFACE ENGINEERING SERVICES INCLUDED:

- 1) Basic Design of two Options for RPMS Project Phase 2 Development. Option 1 is based on utilization of existing water sources: formation water from UPN-1 and artesian water from southern aquifer and upgrading of Water Gathering & Treatment - South Plant with New Field WDM and injection pumps at four injection well sites. Option 2 included construction of new Water Gathering & Treatment - North Plant and utilization of water from northern aquifer as injection water source with -1 and artesian water from southern aquifer and upgrading of Water Gathering & Treatment - South Plant with New Field WDM and injection pumps at four injection well sites.
- 2) Process and project development for both Options of RPMS Project Phase 2 Development
- 3) Development of the Design Basis Memorandums.
- 4) Development of Process Flow Diagrams
- 5) Development of the Piping and Instrumentation Diagrams
- 6) Facilities layout for the water injection plant.
- 7) Preliminary routing of new water transfer and distribution lines.
- 8) Development of the technical specifications for major equipment procurement.
- 9) Project cost estimate for both Options
- 10) Preparation of Technical Specification for major equipment

SUBSURFACE ENGINEERING SERVICES INCLUDED:

- 1) Data acquisition, review, analysis, and validation
- 2) The geological model updating (structural and petrophysical)
- 3) Fluid Model creation for oil reservoirs and for gas condensate reservoir
- 4) PLT and PTA data analysis & interpretation
- 5) OOIP calculation based on new 3D model
- 6) 3D simulation model building based on new 3D geological model
- 7) Well inflow modeled as commingled production from three oil and one gas-condensate reservoir
- 8) Calibration of reservoir simulation model to match the pressure and production history matching of the il reservoirs and for gas condensate reservoir.
- 9) Establishing a basic scenario, which served for comparison of all the other field development cases
- 10) Working out prediction scenarios that reflected different development options and operating conditions in the field
- 11) Economic and risk evaluation



PROJECT:

CHINAREVSKOYE FIELD GATHERING SYSTEM RE-DEVELOPMENT

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Feasibility Study

COMMENCEMENT: June 2013

COMPLETION: August 2013

SERVICES INCLUDED:

- 1) Studying of ZhaikMunai existing gathering system, review, and consolidation of overall input data
- 2) Assessment of current operating conditions in crude oil/gas-condensate gathering systems
- 3) Evaluation of available PVT fluid data for wells
- 4) Preparation of corrected modeled fluid compositions for wells without available PVT analyzes to meet required flow rates
- 5) Developing strategy for gathering system upgrading
- 6) Preparing hydraulic model of new gathering system and evaluating system performances
- 7) Developing process solution for fluid gathering in the west field area
- 8) Analyzing and proposing location of West Manifold Facility
- 9) West Manifold Facility equipment sizing
- 10) Transfer lines hydraulic calculations
- 11) Analyzes of future field development, concept of collecting centers
- 12) Development of Process Flow Diagrams
- 13) Proposing process solution for handling of Biyski high water cut wells
- 14) Proposed solution for new wells in central field area
- 15) Project cost estimation



PROJECT:

NW KONYS INTEGRATED OIL FIELD DEVELOPMENT PLAN
Integration of Subsurface Reservoir Technology and
Surface Technology Solutions

CLIENT: Galaz and Company LLP/ LG International

SERVICES: Conceptual Surface Engineering solutions matched
to the production profile of the oil field. Gas Utilization
by reinjection to the reservoir plus reservoir pressure
maintenance by water injection.

Preparation of EPCC Tender Package including the
Long Lead Item equipment tender packages.

COMMENCEMENT: July 2012

COMPLETION: December 2012

SERVICES INCLUDED:

- 1) Development of Project Execution Plan
- 2) Development of Design Basis Memorandum
- 3) Process study and modeling and Process Flow Diagram development
- 4) Heat and Material balance
- 5) Conceptual Piping and Instrumentation Diagram Development for oil collection,
Central Treating, oil export by truck loading and water injection
- 6) Flowline and Equipment sizing
- 7) Preparation of equipment technical specifications for tender and procurement
- 8) Development of Explanatory Notes for Regional and State Approval.
- 9) Project Cost Estimate for base solution
- 10) Alternative studies for oil processing variants.



PROJECT:

**CHINAREVSKOYE RESERVOIR PRESSURE
MAINTENANCE FACILITY – EPCC**

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Engineering, Detailed Design, Regulatory and State Approvals, Procurement, Logistics Management for Major Equipment, Construction, Technological Testing of the Facilities and State Act of Commission

COMMENCEMENT: January 2010

COMPLETION: July 2011

SERVICES AND FACILITIES INCLUDED:

- 1) Project Management
- 2) Engineering
- 3) Construction
- 4) Commissioning
- 5) Detailed Design
- 6) Inlet Header c / w Pig Receiver assemblies,
- 7) Two Cartridge Filter Sets F-6810/A/B,
- 8) three Water Injection Pump Sets
- 9) Two 1000 m3 Water tanks
- 10) Fire Detection System
- 11) Water Distribution Manifold for 4 (four) injection wells 53, 115, 118 and 121
- 12) Pig Launchers assemblies for 4 (four) injection wells 53, 115, 118 and 121
- 13) Chemical Injection Package CI-6850
- 14) Nitrogen Generator Package GN-6830 with receiver
- 15) Diesel Generator Package Set c / w Day Tank and Enclosure
- 16) Pipe Rack and Cable Trays as required for interconnection of Equipment
- 17) Low Voltage MCC
- 18) Transformer Substation 6/0.4 kV
- 19) PLC Control System with Uninterruptible power supply
- 20) Control Room (container 12 m x 2.4 m)



PROJECT:

OPERATIONS AND MAINTENANCE OF KOMSOMOLSKOE OILFIELD – O&M

CLIENT: OMV Petrom Group on behalf of KomMunai LLP, Kazakhstan

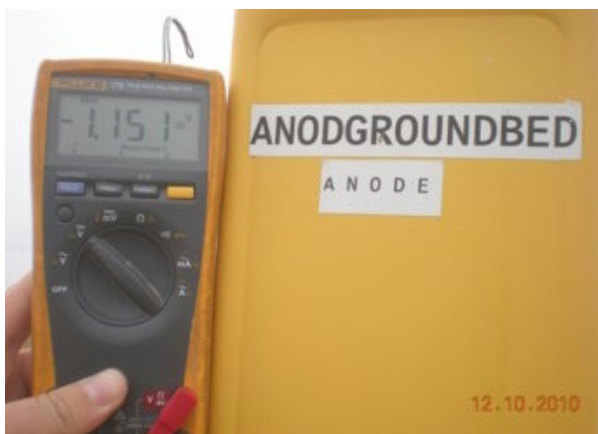
SERVICES: Operations and Maintenance Support Services for the Central Production Facility at Komsomolskoe and the ORF at Karakuduk

COMMENCEMENT: November 2009

COMPLETION: February 2011

SERVICES INCLUDED:

- 1) Provision of Lead Operations and Maintenance Supervisor for works coordination with KomMunai
- 2) HSE Coordinator to ensure compliance with OMV Petrom HSE requirements
- 3) Provision of Specialized Personnel required for the Operations and Maintenance of the following equipment;
 - Low Pressure Screw Compressors (2)
 - High Pressure Reciprocating Compressors 3 stage-320 Barg discharge pressure Sour Service
 - Amine based gas sweetening plant
 - Fuel gas treatment and operation and maintenance
- 4) Provision of Specialized Personnel required for the Operations and Maintenance of the 4 by 2.5 Mw PAES Gas Turbine driven power generation equipment
- 5) Specialized personnel in Mechanical Rotating equipment, Electrical and Instrumentation for the Oil Receiving Facility at Karakuduk
- 6) Small projects construction support team
- 7) Roustabout maintenance personnel
- 8) Emergency Response Support in the form of personnel, equipment, and machinery
- 9) Provision of all test equipment and specialty tools as required for the execution of the contract.
- 10) On the job training of the KomMunai Operations and Maintenance staff



PROJECT:

PIPELINE SURVEILLANCE FOR THE KOMSOMOLSKOE GATHERING SYSTEM AND FOR THE EXPORT OIL PIPELINE – O&M

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Pipeline and Gathering System right of way surveillance for Komsomolskoe Oil Export Pipeline (81km), SOR Kaydak Crossing and Komsomolskoe Oil Gather, Water and Gas Injection Systems

COMMENCEMENT: November 2009

COMPLETION: February 2011

SERVICES INCLUDED:

1) Provision of all equipment and machinery necessary for the pipeline surveillance program to be execute on dry land, wetland and water submerged territory:

- Amphibian Vehicle
- Boat and motor
- Hover Craft – 2 person
- Hover Craft – 10 persons
- 4 wheel drive Hilux vehicles
- Specialty tools

2) Emergency Response Support in the form of equipment and personnel

3) Weekly survey of the SOR Kaydak – 16 km water crossing

4) Weekly survey of the Pipeline Right of Way –dry land portion

5) Weekly survey of the Gathering System –dry land and wet land Right of Ways

6) Monthly checking of the Cathodic Protection System for the Export Pipeline, Gathering System and CPF Facilities

7) Execution of the required pigging program for the Export oil Pipeline and oil flowlines

8) Export Oil Pipeline Block valve station inspection (3) and verification of safety system performance

9) Oil Gathering System safety system performance verification

10) Gas Injection System safety system performance verification

11) Full compliance with OMV Petrom HSE requirements



PROJECT:

KOMSOMOLSKOE PERMANENT CAMP - EPCC

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Project Management,
Engineering, Detailed Design,
Regulatory Approvals,
Procurement and Logistics
Management for Major
Equipment, Construction and
State Acts of Commission

COMMENCEMENT: October 2009

COMPLETION: October 2010

SERVICES AND FACILITIES INCLUDED:

- 1) 70 person 2 story accommodation block including VIP Rooms.
- 2) Multipurpose building which combined the kitchen, dining, and recreational facilities into a single building.
- 3) Office block
- 4) Medical Clinic per OMV International Criteria
- 5) Fire Post per Republic of Kazakhstan Criteria
- 6) Multipurpose warehouse and maintenance building.
- 7) Potable and Technical Water Supply and Storage.
- 8) Sewage water treatment and disposal.
- 9) Inter camp roads
- 10) Site lighting and electrical safety system



PROJECT:

KOMSOMOLSKOE OIL FIELD DEVELOPMENT – EPCC

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Engineering, detailed design, Regulatory Approvals, Procurement, Logistics Management for major equipment, Construction, technological testing of the facilities and State Act of Commission

COMMENCEMENT: August 2007

FIRST OIL: August 2009

COMPLETION: December 2009

SERVICES SUMMARY:

KomMunai LLP a member of the OMV Petrom Group, has developed a remote greenfield oil and associated gas field in the Mangystau Region of Kazakhstan.

PM Lucas was initially engaged to provide a feasibility engineering study and FEED study and was then single sourced for a Fast Track turnkey EPCC project. First Oil was delivered on time and on budget in less than 2 years.

During the feasibility study and FEED study, concepts and options for design utilizing new and surplus process equipment in the world-wide market were evaluated. To reduce project time and costs a new modularized gas treatment plant was selected from Alberta, Canada. The shop modularized gas treatment plant engineering, design, fabrication, inspection, packing, and shipping via land, sea and air was managed by PM Lucas.

SERVICES AND FACILITIES INCLUDED:

- 1) Oil Gathering piping network
(trunks, flowlines, pigging facilities, distribution manifolds, various process equipment)
- 2) Central Processing Facility for oil water and gas separation.
- 3) Two stages of water separation
- 4) Three stages of gas separation
- 5) Two stages of fluids heating with gas and diesel fuel systems.
- 6) Crude oil desalting facility.
- 7) Water injection piping distribution network operating at 150 Barg.
- 8) Gas Injection piping distribution network operating at 320 Barg
- 9) Amine plant for H₂S removal from the utility gas stream
- 10) Two Sour gas Compression trains consisting of screw compressors for low pressure gas recovery and 3 stage reciprocal compressors for injection.
- 11) Full gas recovery and utilization
- 12) Export Oil Storage 2 by 2000m³
- 13) Export Oil Shipping Pumps
- 14) Export Metering System for pipeline leak detection
- 15) Produced water storage 1000m³
- 16) Produced water pumping station for reinjection into the reservoir as part of the reservoir pressure maintenance
- 17) Turbine Power Generation units for a total install of 10 MW.
- 18) Diesel Driven Emergency Generator rated at 2.5 MW
- 19) Process Control PLC Control System
- 20) Safety Control PLC System
- 21) Uninterruptible Power Supply
- 22) Fire Water Deluge system for Crude Oil Tanks.
- 23) Plant wide Fire and Gas Detection system with CO₂ fire suppression for the compressor buildings and nitrogen fire suppression for the process heaters.
- 24) Emergency flaring for high pressure and low pressure gases
- 25) Site Lighting and electrical safety systems



PROJECT:

KOMSOMOLSKOE TO KARAKUDUK EXPORT OIL PIPELINE – EPCC

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Engineering, detailed design, Regulatory Approvals, Procurement, Logistics Management for major equipment, Construction, technological testing of the facilities and State Act of Commission

COMMENCEMENT: October 2007

COMPLETION: December 2008

SERVICES AND FACILITIES INCLUDED:

- 1) 81 km by 168 mm by 5.6 mm wall thickness API-5L-X-52 Grade Steel Export Oil Pipeline
- 2) 16 km of wetland/ water crossing of the SOR Kaydak
- 3) Full set of pigging facilities suitable for intelligent pigging of the pipeline
- 4) Remote controlled Emergency Block valve on either side of the SOR Kaydak complete with automatic shutdown system
- 5) Wireless Communications System for block valve stations
- 6) Solar Powered Remote Block valve sites
- 7) Supervisory Control and Data Acquisition System
- 8) Line balancing system for leak detection.



PROJECT:

SCADA FOR KOMSOMOLSKOE TO KARAKUDUK EXPORT OIL PIPELINE - EPCC

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

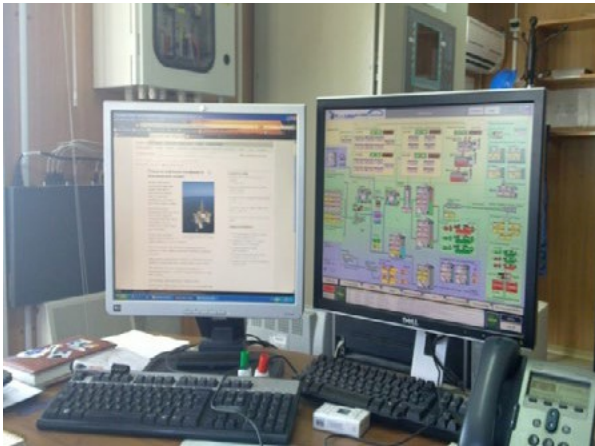
SERVICES: Project Management, Engineering, Detailed Design, Regulatory Approvals, Procurement, Installation, Commissioning and Training of Client Key Personnel

COMMENCEMENT: August 2007

COMPLETION: May 2009

SERVICES AND FACILITIES INCLUDED:

- 1) Process and Safety System PLC for monitoring of the pressure at each of the remote block valve stations and automatic closure of the valve upon loss of pressure
- 2) Wireless Communication System to the two Remote Block Valve stations located on either side of the SOR Kaydak water crossing
- 3) Satellite Communication system between Karakuduk and Komsomolskoe Oilfield.
- 4) Emerson Delta V PLC system for interfacing the process parameter monitoring of the Custody Transfer Metering Station at Karakuduk
- 5) Fiber Optic interface to KazTransOil for process parameter monitoring of the Custody Transfer metering station at Karakuduk
- 6) Satellite Communications equipment
- 7) UPS Systems for Konys and Kumkol Site
- 8) Programming of the PLCs at Konys and Kumkol
- 9) Development of the Cause and Effects Matrices for Konys and Kumkol Sites
- 10) Factory Acceptance Testing
- 11) Field Acceptance Testing
- 12) Key Client Employee Training at the manufacturing facility



PROJECT:

KARAKUDUK OIL RECEIVING FACILITY AND CONNECTION TO KAZTRANSOIL - EPCC

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Project Management, Engineering, Detailed Design, Regulatory Approvals, Procurement and Logistics Management for major Equipment, Construction and State Acts of Commission

COMMENCEMENT: April 2008

COMPLETION: July 2009

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering
- 3) Detail design for all disciplines
- 4) Preparation of Explanatory Note for Regulatory Approval and State Expertizing
- 5) Material Procurement and expediting
- 6) Construction Management
- 7) Technological testing development program, approval by regulatory and execution of the program
- 8) Act of State Commission
- 9) Inlet metering for Leak detection on the pipeline
- 10) KTO required 100 m3 oil quality storage bullets.
- 11) Oil Booster pump station
- 12) Export Oil pumping station
- 13) Oil Heaters
- 14) RoK KazInMeter Certified Custody Transfer Oil metering station.
- 15) Fire Detection System
- 16) Site Lighting and electrical safety system



PROJECT:

CHINAREVSKOYE PRESSURE MAINTENANCE - EPCM

CLIENT: ZhaikMunai LLP, Kazakhstan

SERVICES: Front End Engineering and Design of the Pressure Maintenance Facilities Required for the Reservoir

COMMENCEMENT: September 2008

COMPLETION: January 2009

SERVICES INCLUDED:

- 1) Technical Water Well System Performance investigation and inflow performance assessment and report
- 2) Injectivity performance assessment and report
- 3) Development of the Design Basis Memorandum
- 4) Development of Process model with heat and material balance
- 5) Equipment sizing
- 6) Development of the Piping and Instrumentation Diagrams
- 7) Facilities layout for the water injection plant
- 8) Detailed design of the facilities
- 9) Design of the Technical Water Gathering system design
- 10) Design of the Water Injection system design
- 11) Development of the technical specifications for major equipment procurement
- 12) Development of the Explanatory Notes for Regulatory Approval and State Expertizing Approval
- 13) Project cost estimate
- 14) Preparation of Tender Packages for the procurement of major equipment



PROJECT:

KYZAN TO KOMSOMOLSKOE SERVICE AND ACCESS ROADS PLUS KOMSOMOLSKOE WELL SITES AND WELL SITE ACCESS

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Road Maintenance Service Contract

COMMENCEMENT: August 2008

COMPLETION: August 2010

SERVICES INCLUDED:

- 1) Supply of all specialized personnel, machinery, and equipment as necessary to ensure the 100km of road from Kyzan to Komsomolskoe and the infield access road to the well sites are passable 24 hrs. per day 365 days per year.
- 2) Provide annual road maintenance plan and execution to ensure the 100km of Category IV and V access roads and infield access roads are kept at as constructed conditions.
- 3) Provide all repair materials for the servicing of the roads as required per the approved annual maintenance plan.
- 4) Provide emergency response support in the form of personnel and equipment as requested by KomMunai.
- 5) Full compliance with OMV Petrom HSE requirements.



PROJECT:

**86KM AKSHIMRAU TO KOMSOMOLSKOE
CATEGORY V ACCESS ROAD - EPCC**

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Project Management, Engineering, Detailed Design,
Regulatory Approvals, Procurement and Logistics
Management for Materials Supply, Construction and
State Acts of Commission

COMMENCEMENT: March 2007

COMPLETION: December 2007

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering and detail design of the RoK Category V access road
- 3) Regulatory approvals within Mangystau Oblast
- 4) State Expertizing of the Project
- 5) Management of Subcontractors
- 6) Materials sourcing and supply
- 7) QA/QC execution per the Normative requirements of Kazakhstan
- 8) RoK Working Commission
- 9) RoK State Commission



PROJECT:

**14KM KYZAN TO AKSHIMRAU
CATEGORY IV SERVICE ROAD - EPCC**

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Project Management, Engineering, Detailed Design,
Regulatory Approvals, Procurement and Logistics
Management for Materials Supply, Construction and
State Acts of Commission

COMMENCEMENT: March 2007

COMPLETION: July 2007

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering and detail design of the RoK Category IV service road.
- 3) Regulatory approvals within Mangystau Oblast.
- 4) State Expertizing of the Project
- 5) Management of Subcontractors
- 6) Materials sourcing and supply
- 7) QA/QC execution per the Normative requirements of Kazakhstan
- 8) RoK Working Commission
- 9) RoK State Commission



PROJECT:

KOMSOMOLSKOE OILFIELD DRILLING PADS (6) & ASSOCIATED CATEGORY V ACCESS ROADS- 14 KM - EPCC

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Project Management, Engineering, Detailed Design, Regulatory Approvals, Procurement and Logistics Management for Materials Supply, Construction and State Acts of Commission

COMMENCEMENT: March 2007

COMPLETION: December 2008

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering and detail design of the drilling pads for a 2000 HP drilling rig with associated support equipment
- 3) Engineering and detail design of the RoK Category V access road
- 4) Development of Explanatory Notes for Regulatory approvals and for State Expertizing approval within Mangystau Oblast
- 5) Project Management of Subcontractors
- 6) Materials sourcing, supply, and logistics management
- 7) QA/QC execution per the Normative requirements of Kazakhstan
- 8) RoK Working Commission
- 9) RoK State Commission

PROJECT:

ASSOCIATED GAS UTILIZATION STUDY

CLIENT: OMV Petrom Group on behalf of Tasbulat Oil Company

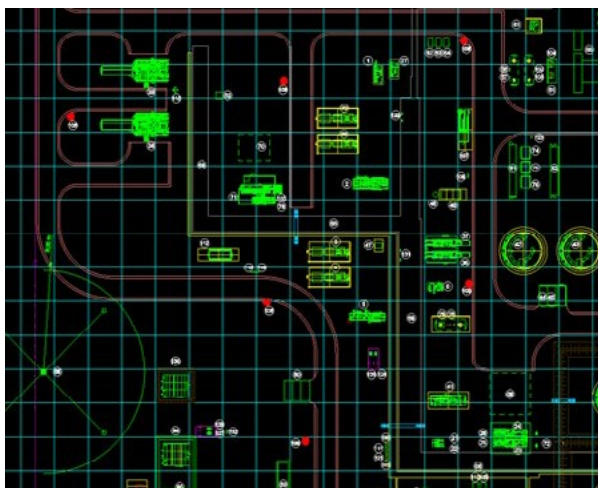
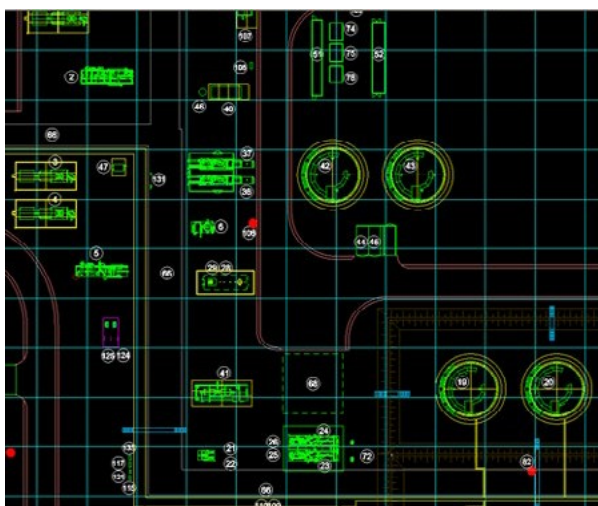
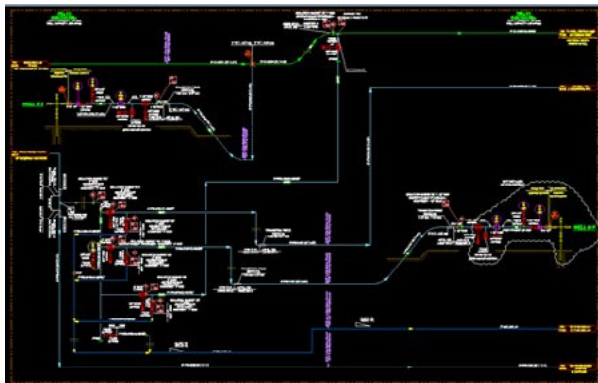
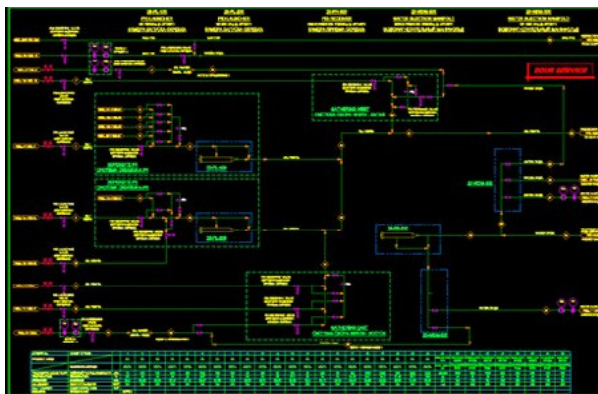
SERVICES: Engineering Conceptualization Study with Cost Estimate and Project Execution Schedule

COMMENCEMENT: June 2006

COMPLETION: October 2006

SERVICES INCLUDED:

- 1) Process modelling of the facility and development of heat and material balance
- 2) Development of main equipment sizing and equipment list
- 3) Development of conceptual cost estimate for the plant and the schedule for realization of the project



PROJECT:

KOMSOMOLSKOE OILFIELD DEVELOPMENT PROJECT FEED STUDY

CLIENT: OMV Petrom Group on behalf of KomMunai LLP

SERVICES: Front End Engineering and Design of the Komsomolskoe Oil Field Development Project

COMMENCEMENT: September 2006

COMPLETION: February 2007

SERVICES INCLUDED:

- 1) Assessment of the pre-conceptual FEED documentation and forecasted budget and development of an alternative fit for purpose solution
- 2) Development of the Design Basis Memorandum for the oil field development project
- 3) Development of the optimized oil gathering system based on the oil well drilling plan
- 4) Development of the optimized oil production facility based on 10,000 BPD of average production c/w equipment selection and cost estimate
- 5) Development of the oil export strategy from Komsomolskoe to Karakuduk and assess the hydraulic requirements of the pipeline based on oil characteristics
- 6) Assess the cost/ benefits relationship between LPG recovery from the associated gas and sales of LPG and sales of export gas versus the reinjection of gas back into the reservoir
- 7) Development of the Gas Utilization program and optimization of equipment selection based on a gas having an H₂S level of 1500 ppm at the inlet to the CPF c/w equipment selection and cost estimate
- 8) Development of the Gas Injectivity report and assessment of surface facility requirements necessary for gas reinjection
- 9) Development of the Water Injection Facilities which must consider produced water and technical water as requirements for the reservoir pressure maintenance program c/w equipment selection and cost estimate
- 10) Development of the Artificial Lift strategy for the field c/w equipment selection and cost estimate
- 11) Development of the Power Generation requirements, equipment selection c/w equipment selection and cost estimate
- 12) Development of the Utilities requirements for the Oil Field Development c/w equipment selection and cost estimate
- 13) Development of the Operations and Maintenance staffing plan and maintenance plan for the oilfield
- 14) Development of the Accommodation and associated infrastructure requirements for the sustained operation of the oil field
- 15) Preparation of the Project Execution Plan for integration into the EPCC tender package
- 16) Support KomMunai with the development of the deliverables to be included into the EPCC tender package
- 17) Development of the equipment tender packages for all major pieces of equipment and technical assessment of all tender packages as issued by Client to Vendors
- 18) Development of the design documentation as required for the commencement of Regulatory Approvals of the project
- 19) Management of the Land Allocation permitting and execution for the Client



PROJECT:

**GAS UTILIZATION PROJECT IMPLEMENTATION
DETAIL DESIGN FOR COMPRESSION STATIONS - EPCM**

CLIENT: Karazhanbasmunai LLP

SERVICES: Project Management, Engineering, Detailed Design, Procurement Support, Explanatory Notes for Regulatory Approvals, Documentation Management, Construction Supervision, State Acts of Commission

COMMENCEMENT: July 2006

COMPLETION: July 2008

SERVICES INCLUDED:

- 1) Development of the Design Basis Memorandum
- 2) Process modelling of the facilities and development of heat and material for each of the 6 compressor locations
- 3) Equipment sizing and preparation of the technical specification as required for tendering and procurement
- 4) Technical evaluation of the tenders and recommendation to Client
- 5) Development of the complete project detail design documentation as required for regulatory approvals and required for construction
- 6) Preparation of the Explanatory notes required for Regulatory Approval and Expertizing of the Projects
- 7) Construction Supervision support to the client

PROJECT:

GZU-34 PROCESS AND SAFETY SYSTEM PLC - EPCC

CLIENT: Karazhanbasmunai LLP, Kazakhstan

SERVICES: Engineering, Detailed Design, Regulatory Approvals, Procurement, Installation, Commissioning and Training of Client Key Personnel

COMMENCEMENT: March 2007

COMPLETION: June 2008

SERVICES INCLUDED:

- 1) Engineering and detail design of the Process and Safety PLC.
- 2) Preparation of Cause and Effects Matrix for the purpose of equipment tender.
- 3) Preparation of the technical specifications for the purpose of equipment tender.
- 4) Preparation of the Tender Package for the Process and Safety System.
- 5) Process and Safety System PLC supply for GZU-34
- 6) Interface design to the existing control system.
- 7) UPS System supply
- 8) Development of the Cause and Effects Matrices
- 9) Programming of the PLC
- 10) Factory Acceptance Testing
- 11) Installation management
- 12) Field Acceptance Testing
- 13) Key Client Employee Training at the manufacturing facility.



PROJECT:

ENGINEERING SUPPORT SERVICES

CLIENT: Karazhanbasmunai LLP, Kazakhstan

SERVICES: Specialized Engineering Support

COMMENCEMENT: July 2006

COMPLETION: July 2008

SERVICES INCLUDED:

- 1) Supply of two Engineering specialists at Client's office for the purpose of technical coordination between Clients Project-Construction Management team and Lucas detail engineering team
- 2) Development and execution of small projects within the Clients organization
- 3) Development of Tender Packages for 3rd party project execution and construction services



PROJECT:

HYDROGEN PEROXIDE TRUCK OFFLOADING AND STORAGE FACILITY - EPCM

CLIENT: JV Inkai LLP, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Explanatory Notes for Regulatory Approval, Construction Supervision

COMMENCEMENT: August 2008

COMPLETION: December 2008

SERVICES INCLUDED:

- 1) Project Management of Engineering
- 2) Process design with material and heat balance
- 3) Piping and Instrumentation Drawings
- 4) Detail design
- 5) Process and Safety design
- 6) Cause and Effects Matrix development
- 7) Development of Explanatory notes for regulatory approval



PROJECT:

ANHYDROUS AMMONIA TRUCK OFFLOADING AND STORAGE FACILITY - EPCM

CLIENT: JV Inkai LLP, Kazakhstan

SERVICES: Project Management, Engineering, Detail Design, Explanatory Notes for Regulatory Approval, Construction Supervision

COMMENCEMENT: August 2008

COMPLETION: December 2008

SERVICES INCLUDED:

- 1) Project Management of Engineering
- 2) Process design with material and heat balance
- 3) Piping and Instrumentation Drawings
- 4) Detail design
- 5) Process and Safety design
- 6) Cause and Effects Matrix development
- 7) Development of Explanatory notes for regulatory approval



PROJECT:

PROJECT MANAGEMENT AND CONSTRUCTION SUPPORT SERVICES

CLIENT: JV Inkai LLP, Kazakhstan

SERVICES: Consulting Services at Client Location in the Role of Project Management and Coordination and Additional Consulting Services for Construction Supervision

COMMENCEMENT: July 2007

COMPLETION: October 2008

SERVICES INCLUDED:

- 1) Supply of two Engineering specialists for the purpose of technical coordination between Clients Project-Construction Management team and Lucas detail engineering team
- 2) Development and execution of small projects within the Clients organization
- 3) Development of Tender Packages for 3rd party project execution and construction services
- 4) Project Management Services as requested by Client
- 5) Construction Management and Supervision of Client's projects



PROJECT:

KONYS TO KUMKOL EXPORT OIL PIPELINE - EPCM

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Regulatory Approvals, Procurement Support, Construction Management, Technological Testing and State Acts of Commission.

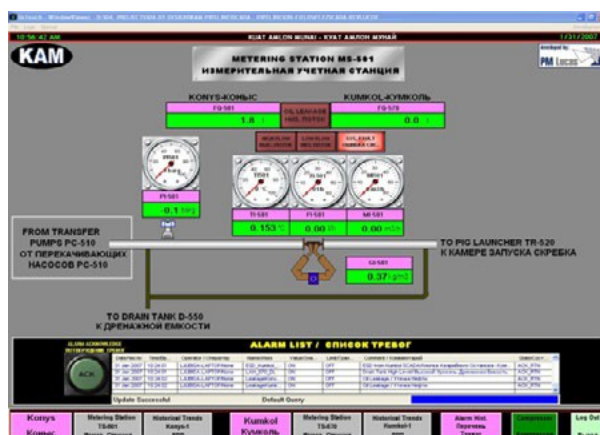
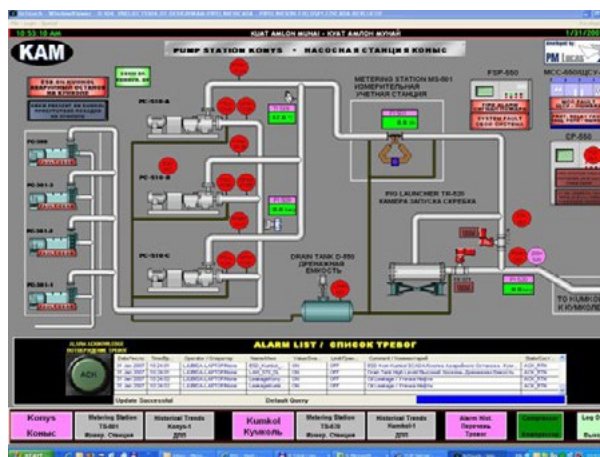
COMMENCEMENT: May 2006

COMPLETION: May 2007

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering and detail design for the project
- 3) Development of Technical Specifications and Tender packages for the Client
- 4) Technical bid evaluation of major pieces of equipment for the Client
- 5) Preparation of Explanatory Notes as required for Regulatory Approval and State Expertizing Approval
- 6) Construction Management of Client's Contractor
- 7) Technological testing program development and execution thereof
- 8) Supply of the Pumping station at the Konys site rated at 600,000 tonnes per year
- 9) Supply of the Metering Station for pipeline leak detection
- 10) 72.4 km Export pipeline - 219 mm in diameter with 5.6 mm wall thickness and Class API-5L-X-52. The pipeline is rated for 100 Barg MAWP
- 11) Supply of the Pigging facilities suitable for intelligent pigging of the pipeline
- 12) Supply of the Oil heating facilities at the Kumkol site
- 13) KTO and KazInMeter Certified custody transfer metering facility at Kumkol site
- 14) Tie-in to the KTO pipeline





PROJECT:

SCADA SYSTEM FOR KONY'S TO KUMKOL EXPORT OIL PIPELINE - EPCC

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Project Management; Engineering, Detail design, Regulatory Approvals, Procurement, Installation, Commissioning and Training of Client Key Personnel

COMMENCEMENT: May 2006

COMPLETION: May 2007

SERVICES AND SYSTEM INCLUDED:

- 1) Project Management
- 2) Engineering and detail design of the system
- 3) Process and Safety System PLC supply for the Kony's Pump Station
- 4) Process and Safety System PLC supply for the Kumkol Oil Transfer Station
- 5) Interface engineering and equipment supply for KazTransOil monitoring of the meter process parameters
- 6) Satellite Communications equipment supply
- 7) UPS Systems supply for Kony's and Kumkol Site
- 8) Development of the Cause and Effects Matrices for Kony's and Kumkol Sites
- 9) Programming of the PLCs at Kony's and Kumkol
- 10) Factory Acceptance Testing
- 11) Installation Supervision
- 12) Field Acceptance Testing
- 13) Key Client Employee Training at the manufacturing facility



PROJECT:

PROCESS OPTIMIZATION EPCM

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering Assessment of the Oil Processing Capacity of the Kony's CPF with Recommendations for Upgrading Certain Process Pieces of Equipment to Ensure 2000 m3 Oil Processing Capacity.

COMMENCEMENT: July 2006

COMPLETION: September 2006

SERVICES INCLUDED:

- 1) Updating of the Process Flow Diagram
- 2) Updating the Heat and Material Balance tables
- 3) Assessing existing equipment on site under actual operating conditions
- 4) Developing the HYSYS Model and matching to the existing process
- 5) Developing the recommendations for equipment upgrading
- 6) Developing the cost estimate for the equipment



PROJECT:

SCADA SYSTEM EXPANSION FOR THE GAS INJECTION COMPRESSOR PHASE II - EPCC

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Project Management; Engineering, Detail design, Regulatory Approvals, Procurement, Installation, Commissioning and Training of Client Key Personnel

SERVICES AND SYSTEM INCLUDED:

- 1) Process and Safety System PLC supply
- 2) Interface to existing system provided with phase 1 project
- 3) Development of the Cause and Effects Matrices for the second compressor and integration with existing equipment
- 4) Programming of the PLC
- 5) Factory Acceptance Testing
- 6) Installation supervision
- 7) Field Acceptance Testing
- 8) Key Client Employee Training at the man



PROJECT:

GAS INJECTION COMPRESSOR DESIGN PROJECT- PHASE II - EPCM

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering, detailed design, procurement support, Development of Explanatory Notes for Regulatory approval

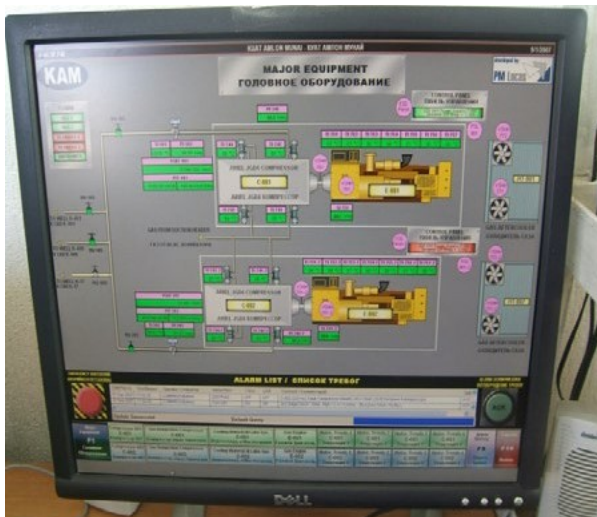
COMMENCEMENT: August 2006

COMPLETION: October 2006

SERVICES INCLUDED:

- 1) Updating of the process model and verification of support systems hydraulic capacity and utility capacity
- 2) Preparation of technical portion of the tender package for Client
- 3) Preparation of the Explanatory Notes as required for Regulatory Approval and State Expertizing
- 4) Development of detail design package as required for construction
- 5) Development of Bills of Material for all construction disciplines
- 6) Development of technical specifications for procurement of all equipment necessary for project execution





PROJECT:

PROCESS AND SAFETY CONTROL SYSTEM FOR THE PHASE-I GAS INJECTION COMPRESSOR - EPCM

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering, Detailed Design, Regulatory Approvals, Procurement, Installation, Commissioning and Training of Client Key Personnel

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering and Detailed Design of the System.
- 3) Process and Safety System PLC supply
- 4) UPS Systems supply for Konys
- 5) Development of the Cause and Effects Matrices for the compressor based on vendor and client requirements
- 6) Programming of the PLC
- 7) Factory Acceptance Testing
- 8) Installation Supervision
- 9) Field Acceptance Testing
- 10) Key Client Employee Training at site



PROJECT:

GAS UTILIZATION PROGRAM PHASE I KONYS OIL FIELD DEVELOPMENT GAS RE-INJECTION FACILITY INSTALLATION - EPCM

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering, detailed design, procurement support, development of Explanatory Notes for Regulatory approval

COMMENCEMENT: August 2005

COMPLETION: October 2006

SERVICES INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of Central Production Facility upgrade
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client
- 7) Process and Safety System development c/w cause and effects matrix
- 8) Fire deluge system expansion
- 9) Fire Detection System expansion
- 10) Development of Explanatory Notes for Regulatory Approval
- 11) Construction Supervision





PROJECT:

**ARYSKUM OIL TANK ADDITION 2 BY 2000M³
FIXED ROOF TANKS C/W SUPPORT UTILITIES
AND PROCESS TIE-IN - EPCM**

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Engineering, detailed design, procurement support,
development of Explanatory Notes for Regulatory
approval

COMMENCEMENT: March 2006

COMPLETION: September 2006

SERVICES AND SYSTEM INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of Central Production Facility upgrade.
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client.
- 7) Process and Safety System development c/w cause and effects matrix.
- 8) Fire deluge system expansion
- 9) Fire Detection System expansion
- 10) Development of Explanatory Notes for Regulatory Approval.
- 11) Construction Supervision

PROJECT:

ARYSKUM CPF PROCESS & SAFETY SYSTEM UPGRADE – EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Engineering, Detailed Design, Procurement,
Installation, Commissioning and Training of Client
Key personnel

COMMENCEMENT: May 2006

COMPLETION: August 2006

SERVICES INCLUDED:

- 1) Process and Safety System PLC expansion
- 2) Interface to existing control system.
- 3) UPS Systems
- 4) Programming of the PLC
- 5) Development of the Cause and Effects Matrices
- 6) Factory Acceptance Testing
- 7) Field Acceptance Testing
- 8) Key Client Employee Training at the manufacturing facility



PROJECT:

EXPANSION OF THE AKZHAR OIL GATHERING AND CENTRAL PRODUCTION FACILITIES - EPCM

CLIENT: Altius LLP, Kazakhstan

SERVICES: Engineering, Detailed Design, Procurement Support, Development of Explanatory Notes for Regulatory Approval and Construction Supervision

COMMENCEMENT: April 2005

COMPLETION: May 2006

SERVICES INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of gathering system upgrade
- 5) Detail design of Central Production Facility upgrade
- 6) Equipment sizing
- 7) Equipment tender assessment and recommendation to client
- 8) Process and Safety System development c/w cause and effects matrix
- 9) Development of Explanatory Notes for Regulatory Approval
- 10) Construction Supervision

PROJECT:

KYZYLKIA WATER INJECTION FACILITY (BKNS) FACILITY - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Engineering, Detailed Design, Procurement Support, Development of Explanatory Notes for Regulatory Approval and Construction Supervision

COMMENCEMENT: 2005

COMPLETION: 2006

SERVICES INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of water injection pumping facility and injection piping network
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client
- 7) Process and Safety System development c/w cause and effects matrix
- 8) Fire Detection System
- 9) Development of Explanatory Notes for Regulatory Approval
- 10) Construction Supervision



PROJECT:

SOUTH KUMKOL WATER INJECTION (BKNS) FACILITY - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Engineering, Detailed Design, Procurement Support,
Development of Explanatory Notes for Regulatory Approval
and Construction Supervision

COMMENCEMENT: 2005

COMPLETION: 2006

SERVICES INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of water injection pumping facility and injection piping network
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client
- 7) Process and Safety System development c/w cause and effects matrix
- 8) Fire Detection System
- 9) Development of Explanatory Notes for Regulatory Approval
- 10) Construction Supervision

PROJECT:

**KONYS CPF AS BUILT DOCUMENTATION DEVELOPMENT
COMPLETE WITH OPERATIONS & MAINTENANCE MANUAL
DEVELOPMENT**

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering, Detailed AutoCAD Design, Equipment Sizing
and Main Equipment List, Documentation Register Development,
Document Management System and Development of the
Operations, and Maintenance Manuals for the Central Production
Facilities

COMMENCEMENT: April 2005

COMPLETION: October 2005



PROJECT:

BEKTAS GATHERING SYSTEM - EPCM

CLIENT: Altius LLP, Kazakhstan

SERVICES: Conceptual Design

COMMENCEMENT: 2005

COMPLETION: 2005

SERVICES INCLUDED:

- 1) Engineering
- 2) Facilities design and optimization of gathering system
- 3) Cost estimate



PROJECT:

ARYSKUM 2000 M3 TANK INSTALLATION - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Detailed Design, Construction support

COMMENCEMENT: February 2005

COMPLETION: June 2005

SERVICES INCLUDED:

- 1) Process Study and Modelling
- 2) Heat and Material Balance
- 3) Piping and Instrument Diagram Development
- 4) Detailed Design of Water Injection Pumping Facility and Injection Piping Network
- 5) Equipment Sizing
- 6) Equipment Tender Assessment and Recommendation to Client
- 7) Process and Safety System Development C/W Cause and Effects Matrix
- 8) Fire Detection System
- 9) Development of Explanatory Notes for Regulatory Approval
- 10) Construction Supervision



PROJECT:

PROCESS UPGRADE – ADDITIONAL 3 PHASE SEPARATOR KONYS CENTRAL PRODUCTION FACILITY - EPCM

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering, Procurement, Construction

COMMENCEMENT: February 2004

COMPLETION: October 2004





PROJECT:

AKSHABULAK GAS TREATMENT PLANT - EPCM

CLIENT: GU KazGerMunai LLP a JV of RWE-Dea AG, Erdgas-Erdöl GmbH, IFC and PetroKazakhstan Kumkol Resources JSC

SERVICES: EPCM, Engineering, Detailed design, Explanatory notes for regulatory approval, Procurement support, Technological testing, and State Act of Commission

COMMENCEMENT: May 2004

COMPLETION: October 2005

SERVICES SUMMARY:

GU KAZGERMUNAI (KGM), a joint venture of RWE-Dea AG, Erdgas-Erdöl GmbH, IFC and PetroKazakhstan Kumkol Resources (PKKR), installed a Gas Treatment Plant (GTP) on a location adjacent to the Akshabulak Oilfield Central Oil Processing Station (COPS) in Kazakhstan. The new GTP will be a stand-alone facility and receive 300 mm Sm³/year wet gas feed stock from the COPS. The processed dry sweet gas is delivered to KazTransGas' (KTG) 12" x 125 km gas pipeline to the City of Kyzylorda.

PM Lucas was engaged to provide a feasibility engineering study, FEED study, detailed engineering design, procurement, field engineering, construction, commissioning, and start-up support.

During the feasibility study, concepts and options for design utilizing new and surplus process equipment in the world-wide market were evaluated. To reduce project time and costs, a modularized gas treatment plant was selected from Alberta, Canada using both new and surplus equipment. The shop modularized gas treatment plant engineering, design, fabrication, inspection, packing, and shipping via land and sea was managed by PM Lucas.

SERVICES AND FACILITIES INCLUDED:

- 1) Standalone new facility which take associated gas from the existing Oil Treating Facility
- 2) Low Pressure Inlet Compressor
- 3) Gas Treatment Refrigeration Plant
- 4) Sales Gas Compressor with a capacity of 150 MM Sm³/ year
- 5) 12,500 tonnes per year of LPG Recovery by Demethanizer Fractionation Tower and Debutanizer Fractionation Tower
- 6) C5+ Condensation recovery and reinjection into Crude Oil Sales
- 7) Transfer of Sales quality gas to KazTransGas for shipment to the City of Kyzylorda



PROJECT:

AKSHABULAK LPG STORAGE AND TRUCK LOADING FACILITY - EPCM

CLIENT: GU KazGerMunai LLP a JV of RWE-Dea AG, Erdgas-Erdöl GmbH, IFC and PetroKazakhstan Kumkol Resources JSC

SERVICES: Project Management, Engineering, Detailed design, Explanatory notes for regulatory approval, Procurement support, Technological testing, and State Act of Commission

COMMENCEMENT: May 2004

COMPLETION: October 2005

SERVICES SUMMARY:

LPG from the Akshabulak Gas Treatment Plant (GTP) process is pumped to the LPG storage facility located on an adjacent site to the GTP facility.

PM Lucas has designed the LPG storage tanks, tank cars loading facility, and tank car custody transfer measurement system with the following capacities: Storage capacity: 12 above ground bullets, 200 m³ each, 2400 m³ total capacity. Loading capacity: three pumps and three truck loading stations 45 m³/h unit capacity

SERVICES AND FACILITIES INCLUDED:

- 1) Project Management
- 2) Process modeling with heat and material balance
- 3) Engineering
- 4) Piping and Instrumentation Diagrams
- 5) Detail Design
- 6) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 7) Material procurement and expediting
- 8) Construction Management/ Supervision
- 9) Technological Testing
- 10) RoK State Act of Commissioning



PROJECT:

**EARLY SALES GAS PRODUCTION FACILITY –
AKSHABULAK OIL FIELD - BOOM**

CLIENT: KazGerMunai LLP, Kazakhstan

SERVICES: BOOM (Build, Own, Operate and Maintain) solution for
Gas Production Facility at Akshabulak

COMMENCEMENT: June 2004

COMPLETION: October 31st, 2004 of Construction

OPERATION: November 2004 until September 2006

SERVICES SUMMARY:

The joint Owners and Operators of the Akshabulak Oil Field were facing a large financial penalty for late completion of the planned new Akshabulak Gas Treatment Plant and late delivery of sweet gas to the new 125km pipeline to the City of Kyzylorda for the 2004 winter heating season. To compensate for the late gas delivery, the Owners approached PM Lucas to finance and develop the Early Sales Gas Production Facility project as Fast Track BOOM project funded through their OPEX budget.

PM Lucas developed a concept and detailed design for the production of 18 mm Sm³/year dry sweet gas utilizing three phase separation, membrane drying, condensate recovery, aerial cooling, and free flow from the early gas plant outlet to the City of Kyzylorda. The major plant process equipment was designed from available new and surplus equipment in Alberta, Canada, and Germany. The Canadian processequipment packages and bulk materials were procured by PM Lucas and air lifted by Antonov An-225 to Kazakhstan, custom cleared, constructed, commissioned. Start-up and operated on time and on budget.

SERVICES AND FACILITIES INCLUDED:

- 1) Project Management
- 2) Process modeling with heat and material balance
- 3) Engineering
- 4) Piping and Instrumentation Diagrams
- 5) Detail Design
- 6) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 7) Material procurement and expediting
- 8) Construction Management/ Supervision
- 9) Technological Testing
- 10) Production of specification export gas for transfer into KazTransGas Pipeline.
- 11) RoK State Act of Commissioning
- 12) Operation and Maintenance of Facility 24/7
- 13) Spare Parts Management



PROJECT:

EARLY OIL PRODUCTION FACILITY AKZHAR FIELD DEVELOPMENT - EPCM

CLIENT: Altius Holdings

SERVICES: Engineering, Procurement Support, Commissioning
Support, Construction Supervision

COMMENCEMENT: April 2004

COMPLETION: December 2005

The Main Facility (CTPF) would be designed to handle 5000 BOPD with a 20% water cut and design GOR of 4m³/m³ and would include all tankage, utilities, and water injection equipment to handle this. Provisions for installation of future required equipment necessarily for handling the flow rate of 7500 BOPD with 40% water cut will be provided. The key element of the approach is to install the CTPF in three distinct stages to match the cash flow with the drilling and overall development. The first stage would provide for the expected production from the existing wells and the 2004 drilling program together with the basic infrastructure. The second stage would provide for additional production and/or increased water cut or special additions to handle operational problems that may have arisen after the initial phase. The final phase would bring the facility to full throughput with any additional tankage and pumping or to address operational problems. The test and group lines from the North and Southeast wing will be flow lined to the main facility with suitable inlet manifolding and test separation.

The Main Facility (CTPF) is designed to handle 5000 BOPD with a 20% water cut and design GOR of 4m³/m³ and includes all tankage, utilities, and water injection equipment to handle this. Provisions for installation of future required equipment necessarily for handling the flow rate of 7500 BOPD with 40% water cut will be provided. The test and group lines from the North and Southeast wing are flow lined to the facility with suitable inlet manifolding and test separation.



PROJECT:

**OIL GATHERING SYSTEM
AKZHAR OILFIELD DEVELOPMENT - EPCM**

CLIENT: Altius Holdings

SERVICES: Engineering, Detailed Design, Procurement Support,
Development of Explanatory notes for regulatory approval
and Construction Supervision

COMMENCEMENT: February 2004

COMPLETION: October 2004

SERVICES AND FACILITIES INCLUDED:

- 1) Hydraulics study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of oil gathering system with Group Stations and Metering Stations
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client
- 7) Process and Safety System development c/w cause and effects matrix
- 8) Fire Detection System
- 9) Development of Explanatory
- 10) Notes for Regulatory Approval
- 11) Construction Supervision



PROJECT:

**OILFIELD GATHERING SYSTEM
KONYS OILFIELD DEVELOPMENT- EPCM**

CLIENT: KuatAmlonMunai LLP, Kazakhstan

SERVICES: Engineering, Detailed Design, Procurement Support,
Development of Explanatory notes for regulatory approval
and Construction Supervision

COMMENCEMENT: February 2004

COMPLETION: December 2004

SERVICES AND FACILITIES INCLUDED:

- 1) Hydraulics study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of oil gathering system with Group Stations and Metering Stations.
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client.
- 7) Process and Safety System development c/w cause and effects matrix.
- 8) Fire Detection System
- 9) Development of Explanatory
- 10) Notes for Regulatory Approval.
- 11) Construction Supervision



PROJECT:

**GAS RE-INJECTION PLANT
ARYSKUM OIL FIELD DEVELOPMENT - EPCM**

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan
SERVICES: Engineering, Detailed Design, Procurement Support,
Development of Explanatory notes for regulatory
approval and Construction Supervision

COMMENCEMENT: September 2003

COMPLETION: September 2004

SERVICES INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of gathering system upgrade.
- 5) Detail design of Compressor Facility and interface into existing facilities.
- 6) Equipment sizing
- 7) Equipment tender assessment and recommendation to client.
- 8) Process and Safety System development c/w cause and effects matrix.
- 9) Development of Explanatory Notes for Regulatory Approval.
- 10) Construction Supervision



PROJECT:

**UPGRADE OF ELECTRICAL DISTRIBUTION SYSTEM
KONYS OIL FIELD - EPCM**

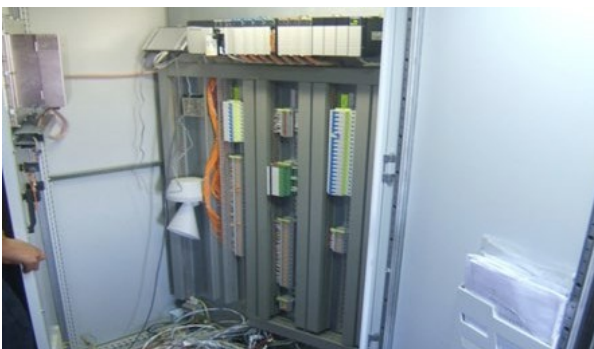
CLIENT: KuatAmlonMunai LLP, Kazakhstan
SERVICES: Engineering, Detailed Design, Procurement Support,
Development of Explanatory notes for regulatory approval
and Construction Supervision

COMMENCEMENT: April 2003

COMPLETION: November 2003

SERVICES INCLUDED:

- 1) Electrical Load Study and modelling
- 2) Single Line Diagram development
- 3) Detail design of electrical system upgrade
- 4) Detail design of Generator Building
- 5) Equipment sizing –emergency generator, distribution panel, lighting system
and electrical safety system
- 6) Equipment tender assessment and recommendation to client
- 7) Development of the Cause and Effects matrix
- 8) Development of Explanatory Notes for Regulatory Approval
- 9) Construction Supervision



PROJECT:

AKSHABULAK WATER INJECTION UNIT - BOOM

CLIENT: KazGerMunai LLP, Kazakhstan

SERVICES: BOOM (Build, Own, Operate and Maintain) solution for Water Injection Facility at Akshabulak

COMMENCEMENT: May 2003

COMPLETION: September 2003

OPERATION: October 2003 until December 2004

SERVICES INCLUDED:

- 1) Project Management
- 2) Process modeling
- 3) Engineering
- 4) Piping and Instrumentation Diagrams
- 5) Detail Design
- 6) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 7) Material procurement and expediting
- 8) Construction Management/ Supervision
- 9) Technological Testing
- 10) RoK State Act of Commissioning
- 11) Operation and Maintenance of Facility 24/7
- 12) Spare Parts Management

PROJECT:

SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM FOR THE KUMKOL TO DZHUSALY EXPORT PIPELINE AND DZHUSALY STORAGE AND RAIL CAR LOADING FACILITY - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Procurement Support, Construction Management and Technological Testing Support

COMMENCEMENT: August 2002

COMPLETION: May 2003

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering
- 3) Detail Design of the equipment and installation requirements
- 4) Development of the Cause and Effects Matrices for the Kumkol Pump Station, Ayskum Pump Station, Dzhusaly Storage Terminal, and Dzhusaly Railcar Crude oilloading facility
- 5) Development of the FAT Testing Program and execution of the FAT on behalf of the Client
- 6) Construction installation supervision of the subcontractor
- 7) Development of the Field Acceptance Program and execution of the Acceptance Program on behalf of the Client
- 8) Training of the Operations and Maintenance staff of the Client
- 9) Development of the Fibre Optic Communications system and development of the installation method statement
- 10) Construction installation supervision of the fibre optic cable and commissioning of the communications system for Voice and Data



PROJECT:

**OIL RAIL CAR LOADING FACILITY C/W RAILWAY
INFRASTRUCTURE, DZHUSALY TERMINAL - EPCM**

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design,
Procurement Support, Development of Explanatory notes
for Regulatory Approval and State Expertise approval
Construction Supervision and Technological Testing

COMMENCEMENT: October 2001

COMPLETION: June 2003

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering for the Rail Car loading gantry for 360 rail wagons per day and 6.5 million tonnes of oil per year
- 3) Detail design of the facilities required to take the oil from the storage tanks to the rail car loading facility
- 4) Detail design of the process and safety systems
- 5) Hermetically closed dome loading system for 60 railcars
- 6) Rail track infrastructure designed per the requirements of the Temir Zholy State owned rail Company
- 7) Railcar vapor management system and integral flare complete with back flash explosion protection
- 8) Construction Supervision of the Rail Loading and Rail track infrastructure

PROJECT:

**KUMKOL INITIATING PUMP STATION KUMKOL TO DZHUSALY
PIPELINE SYSTEM - EPCM**

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design,
Procurement Support, Development of Explanatory
Notes for Regulatory Approval and State Expertise
Approval, Construction Supervision and Technological Testing

YEAR: 2003

Two centrifugal series connected pumps were installed with the capacity of 1260 m³/h at differential pressure from 38 bars. The main task is to enable crude oil shipment from Kumkol Tank Farm to Dzhusalý Terminal.



PROJECT:

ARYSKUM BOOSTER PUMP STATION KUMKOL TO DZHUSALY PIPELINE SYSTEM - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Procurement Support, Development of Explanatory Notes for Regulatory Approval and State expertise approval, Construction Supervision, Technological Testing, Engineering Supp., Commissioning Supp., Construction Supp.

YEAR: 2003

Two centrifugal serial pumps were installed with the capacity of 1260 m³/h at differential pressure of 48 bars. The main task is to allow crude oil shipment from Aryskum Pump Station to the Dzhusaly Terminal.



PROJECT:

KUMKOL TO DZHUSALY PIPELINE SYSTEM - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Procurement Support, Development Of Explanatory Notes For Regulatory Approval and State Expertise Approval, Construction Supervision and Technological Testing

SERVICES INCLUDED:

- 1) Project Management
- 2) Engineering including hydraulics modeling
- 3) Heat and material balance and pour point assessment of the crude oil
- 4) Detailed design of the 176 km by 406.4 mm diameter pipeline. API-5L-X-52 Grade Steel pipe
- 5) Fully line cathodic protection by impressed current system
- 6) MAWP of 100 Barg





PROJECT:

KYZYLKIA TO ARYSKUM OIL EXPORT PIPELINE - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Procurement Support, Development Of Explanatory Notes For Regulatory Approval and State Expertise Approval, Construction Supervision and Technological Testing

COMMENCEMENT: January 2003

COMPLETION: October 2003

SERVICES INCLUDED:

- 1) Engineering including hydraulics modeling
- 2) Heat and material balance and pour point assessment of the crude oil
- 3) Detailed design of the 28 km by 168 mm diameter pipeline. API-5L-X-52 Grade Steel pipe
- 4) Fully line cathodic protection by impressed current system
- 5) Development of Explanatory Notes for Regulatory Approval
- 6) MAWP of 100 Barg
- 7) Construction Supervision



PROJECT:

ARYSKUM TOLF EXPORT OIL PIPELINE - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Project Management, Engineering, Detailed Design, Procurement Support, Development Of Explanatory Notes For Regulatory Approval and State Expertise Approval, Construction Supervision and Technological Testing

COMMENCEMENT: January 2003

COMPLETION: October 2003

SERVICES INCLUDED:

- 1) Engineering including hydraulics modeling
- 2) Heat and material balance and pour point assessment of the crude oil
- 3) Detailed design of the 22.5 km by 200 mm diameter pipeline. API-5L-X-52 Grade Steel pipe.
- 4) Fully line cathodic protection by impressed current system.
- 5) Development of Explanatory Notes for Regulatory Approval.
- 6) MAWP of 100 Barg
- 7) Construction Supervision

PROJECT:

KUMKOL OIL COLLECTOR DEBOTTLENECK - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act of Commission

COMMENCEMENT: February 2003

COMPLETION: October 2003

SERVICES INCLUDED:

- 1) Engineering hydraulics assessment of requirements
- 2) Heat and material balance
- 3) Detail design of required piping changes
- 4) Development of Explanatory notes for Regulatory approval



PROJECT:

SOUTH KUMKOL OIL COLLECTOR DEBOTTLENECK - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC, Kazakhstan

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act Of Commission

COMMENCEMENT: February 2003

COMPLETION: October 2003

SERVICES INCLUDED:

- 1) Engineering hydraulics assessment of requirements
- 2) Heat and material balance
- 3) Detail design of required piping changes
- 4) Development of Explanatory notes for Regulatory approval



PROJECT:

LPG RAIL CAR BOTTOM LOADING FACILITY – EPCM

CLIENT: PetroKazakhstan Oil Products LLP (Shymkent Refinery)

SERVICES: Engineering, Detailed Design, Procurement Support, Construction Supervision and Technological Testing

COMMENCEMENT: May 2003

COMPLETION: October 2003

The Project included upgrading of the existing LPG top loading system by providing bottom loading to railway containers. The complexity of the project is aggravated by hazardous conditions and reconstruction of the old Russian-made piping arrangement and its' modification to the ANSI standards. After upgrading, the new installation provides non-simultaneous top or bottom LPG loading at the same loading spot. The complete work, from design and equipment purchase to the first loading was completed in four months.



PROJECT:

CPF INLET MANIFOLD DEBOTTLENECKING - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support.

YEAR: 2003

Due to a great pressure drop at the Kumkol CPF incoming inlet collectors, and the resulting vibrations, fluctuations and pumps operating problems, all piping at the CPF inlet was upgraded. The most important attribute for this project is installation of a new piping arrangement in the existing system without closing of the facility.



PROJECT:

BAGA TERMINAL TANK FARM EXTENSION

SERVICES: EPCM

YEAR: 2003

The design includes conversion of four existing 3,000 m3 diesel and gasoline storage tanks to crude oil service. The conversion required capital expenditures, both on the BAGA terminal and PKOP refinery. Conceptual and detailed engineering of upgraded facility, including piping modifications on the PKOP and BAGA sites, were provided within the Project. The Project resolved heating technology of the crude oil tanks by installing both oil heater and circulation pump, as well as crude oil transportation through 1,500 m long pipeline between the Terminal and Refinery in Shymkent in both directions and flushing of the pipeline by diesel during winter period.



PROJECT:

MINI FWKO AT GS-24 - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2003

For the purpose of removing the increased quantity of produced water from the Gathering Station 24, a new water separation facility was installed, with a new 100 m3 separator installed between the existing sputnik equipped with spider valve and the existing group separator. Oil and gas return to the existing separator and the produced water is pumped to the water injection facility. The facility is designed to handle 3,500 m3/d of Oil, 8,000 m3/d of Water and 350,000 Sm3/d of gas. Eigen-value equipment: 100 m3 three phase separators, produced water transfer pumps, 400 produced water break tank, upgraded flare system, chemical injection skid packages, drain vessel, etc.



PROJECT:

MINI FWKO AT GS-04 - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2003

With the aim to remove the increased quantity of produced water from the Gathering Station 04, a new water separation facility was installed, with a new 100 m3 separator installed between the existing sputnik equipped with spider valve and the existing group separator. Oil and gas return to the existing separator and the produced water is pumped to the water injection facility. The facility is designed to handle 3,500 m3/d of Oil, 5,000 m3/d of Water and 250,000 sm3/d of gas. Eigen- value equipment: 100 m3 three phase separators, produced water transfer pumps, 400 produced water break tank, upgraded flare system, chemical injection skid packages, drain vessel, etc.



PROJECT:

SOUTH KUMKOL FREE WATER KNOCK OUT - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2003

To remove the increased quantity of produced water from the Gathering Stations, a new FWKO facility on the Central Plant Facility (CPF) oil inlet collector was installed. Produced water is pumped to the Water Injection Facility while oil is pumped to the CPF. The facility is designed to handle 6,100 m3/d of Oil, 11,000 m3/d of Water and 13,000 sm3/d of gas. Eigenvalue equipment: 200 m3 three phase separator, crude oil transfer pumps, produced water transfer pumps, 400 produced water break tank, flare system including flare stack, arrestor and flare knock out drum, chemical injection skid packages, drain vessel, etc.



PROJECT:

KAM FIELDS DEVELOPMENT - KUMKOL 28,000 TONES CRUDE OIL STORAGE (CPF TANK FARM EXPANSION) - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2003

Kumkol Central Production Facility (CPF) is the main supply source for shipment of crude oil in the new NPS 16 KAM pipeline from Kumkol to Dzhusaly. The Kumkol CPF tank farm consisted at that time of 6 large oil storage tanks feeding the KTO pipeline. All crude oil from these tanks is shipped to Shymkent. New tanks were added to increase oil storage capacity at Kumkol and allow shipment of crude oil in both the KTO and KAM pipelines at the same time without breaking normal daily operations. The main task is to allow crude oil shipments to the KAM pipeline and determine and design facilities necessary for re-cycling off-spec oil from any of these tanks to the existing onsite process separator (TDE). The initial design flow rate for the KAM pipeline is 900 m3/h. The Facility was designed for a nominal flow rate of 1260 m3/hr.



PROJECT:

KAM FIELDS DEVELOPMENT - ARYSKUM TRUCK OFF LOADING FACILITY - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2003

Aryskum TOLF is the central process facility for the KAM Oil Field. Oil from Kyzylkia oil field coming through 6" oil pipeline, oil gathered at Aryskum oil field and oil trucked off from all KAM field single wells is processed at this facility. Besides inlet manifold and truck off-loading station, the facility includes 100 m³ three phase separator, storage – settling 2 x 1,000 m³ oil tanks, flare and drain system, production heaters, glycol system for oil and fire water tank heating.



PROJECT:

ELECTRICAL SUBMERSIBLE PUMP INSTALLATION PHASE 1 & 2 - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2002-2003

The Customer, according to the business schedule, planned to apply ESP Artificial Lift System on certain numbers of main production field wells, instead of the existing artificial lift methods (PCP). This substitution is followed by a significant production increase, requiring adequate updated and modified gathering station piping arrangement.



PROJECT:

KAM FIELDS DEVELOPMENT – OIL GATHERINGS - EPCM

SERVICES: Engineering, Commissioning Support, Construction Support
YEAR: 2002

Crude oil from specific well heads is gathered through the system of flow lines from production wells to the manifolds of the gathering stations or trucked off as done at Aryskum and Maybulak Oil fields. Design includes installation of line heaters and pigging devices.



PROJECT:

WATER INJECTION SYSTEM MAYBULAK OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Engineering Support, Detailed Design,
Explanatory Notes for Regulatory, Construction Supervision and
State Act of Commission

COMMENCEMENT: January 2002

COMPLETION: November 2002

Produced water from Kyzylkia CPF is transported by trucks to Maybulak Water Injection Facility. The facility consists of 40 m³ Off Loading Break Tank, 1,000 m³ produced water storage tank and skid mounted high pressure pump station. The pump station includes booster and high pressure produced water injection pumps (capacity of 3 x 21 m³/h @ 115 bars). Make up water is provided by raw water well and submersible electrical pump. From this pumps station the water is taken by four discharge high pressure produced water flow lines to water injection wells.



PROJECT:

CPF UPGRADE FOR WATER AND ADDITIONAL GAS SEPARATION AT KYZYLKIA OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act Of Commission

COMMENCEMENT: January 2002

COMPLETION: October 2002

SERVICES INCLUDED:

- 1) Process modeling with heat and material balance
- 2) Engineering
- 3) Piping and Instrumentation Diagrams
- 4) Detail Design
- 5) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 6) Material procurement and expediting
- 7) Construction Management/ Supervision
- 8) Technological Testing
- 9) Production of specification export gas for transfer into KazTransGas Pipeline.
- 10) RoK State Act of Commissioning



PROJECT:

MINI FREE WATER KNOCKOUT AT GS-14 KUMKOL OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act Of Commission

COMMENCEMENT: January 2002

COMPLETION: October 2002

SERVICES INCLUDED:

- 1) Process modeling with heat and material balance
- 2) Engineering
- 3) Piping and Instrumentation Diagrams
- 4) Detail Design
- 5) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 6) Material procurement and expediting
- 7) Construction Management/ Supervision
- 8) Technological Testing
- 9) Production of specification export gas for transfer into KazTransGas Pipeline.
- 10) RoK State Act of Commissioning



PROJECT:

FREE WATER KNOCKOUT 2, KUMKOL OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act Of Commission

COMMENCEMENT: January 2002

COMPLETION: October 2002

SERVICES INCLUDED:

- 1) Process modeling with heat and material balance
- 2) Engineering
- 3) Piping and Instrumentation Diagrams
- 4) Detail Design
- 5) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 6) Material procurement and expediting
- 7) Construction Supervision
- 8) Technological Testing
- 9) Production of specification export gas for transfer into KazTransGas Pipeline.
- 10) RoK State Act of Commissioning



PROJECT:

WATER INJECTION SYSTEM (BKNS) KUMKOL OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act Of Commission

COMMENCEMENT: February 2001

COMPLETION: November 2001

SERVICES INCLUDED:

- 1) Process study and modelling
- 2) Heat and material balance
- 3) Piping and Instrument Diagram development
- 4) Detail design of water injection pumping facility and injection piping network.
- 5) Equipment sizing
- 6) Equipment tender assessment and recommendation to client.
- 7) Process and Safety System development c/w cause and effects matrix.
- 8) Fire Detection System
- 9) Development of Explanatory notes for Regulatory approval.
- 10) Construction Supervision



PROJECT:

EARLY OIL PRODUCTION FACILITY KYZYLKIA OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Detailed Design, Explanatory Notes for Regulatory, Construction Supervision and State Act Of Commission

COMMENCEMENT: March 2001

COMPLETION: December 2001

SERVICES INCLUDED:

- 1) Process modeling with heat and material balance
- 2) Engineering
- 3) Piping and Instrumentation Diagrams
- 4) Detail Design
- 5) Preparation of Explanatory notes for Regulatory Approvals and for State Expertise Approval
- 6) Material procurement and expediting
- 7) Construction Management/ Supervision
- 8) Technological Testing
- 9) Production of specification export gas for transfer into KazTransGas Pipeline.
- 10) RoK State Act of Commissioning



PROJECT:

FREE WATER KNOCKOUT #01 KUMKOL OIL FIELD - EPCM

CLIENT: PetroKazakhstan Kumkol Resources JSC

SERVICES: Engineering, Procurement, Construction Supervision

COMMENCEMENT: May 2001

COMPLETION: November 2001

SERVICES INCLUDED:

- 1) Civil construction supervision
- 2) Mechanical fabrication and installation construction supervision
- 3) Instrumentation and electrical installation construction supervision
- 4) QA/QC Control for all construction disciplines
- 5) Technological testing of the facility