

**Enppi**

Engineering for the Petroleum and Process Industries

Gas  
& Treatment  
& Processing





# Gas Treatment & Processing





# Enppi At A Glance

**E**nppi, established in 1978 and headquartered in Cairo, Egypt, is an Engineering and EPC Main Contractor providing fully integrated engineering, procurement, construction supervision and project management services for the petroleum, petrochemicals, power and other industries, onshore and offshore.

## Shareholders

Egyptian General Petroleum Corporation (EGPC) **97%**

Petroleum Projects and Technical Consultations Co. (PETROJET) **2%**

Housing and Social Services Fund for the Petroleum Sector's Employees **1%**

## Capital

Authorized **US \$ 600 Million**  
Paid **US \$ 220 Million**

# Fields of

# Experience

- ▶ Gas Treatment And Processing
- ▶ Offshore / Onshore Oil & Gas Production
- ▶ Offshore/Onshore Pipelines
- ▶ Petrochemicals & Chemicals
- ▶ Oil Refining
- ▶ Engineering, Consultancy And HRD Services
- ▶ Utilities And Offsite Facilities



## Gas Treatment & Processing

**E**nppi executes various projects in the local and international markets, starting from studies to EPC and turn-key projects. Internationally, Enppi penetrated the markets in various regions such as; Arabian Gulf, Venezuela, Syria and Yemen.

Diverse project involvement utilizes Enppi's own integrated multi-discipline engineering resources together with state of the art design software and techniques. Various process specialized programs (Hysys, Unisim, Pro II, Flarenet, Olga, Pipe phase, Pipesim, Pipeline studio, HTRI, ...etc) and in-house developed programs together with process team specialists extensive experience and capabilities in simulation enables Enppi to support projects with static and dynamic simulation models for process units, pipelines and flare systems (reference projects utilizing Hysys dynamic simulation: West Harbor Expansion Project for PhPc and Qasr compression station for KPC. Reference projects utilizing Olga dynamic simulation: Assil & Karam gas development and PAGMI project phase I).

Enppi process division has acquired an extensive experience in the design and commissioning of gas processing facilities including fractionation, LPG, NGL's recovery plants. Deep cryogenic extraction reached calculated recovery levels up to 98% for propane, 99% for butanes, 98% for ethane and 99% for pentanes.

In the gas treatment field, Process Division has acquired extensive experience in various facilities including acid gas removal, dehydration, mercury removal, compression, gas-oil separation, fuel gas treatment, ... etc.

Further to the experience gained in the processing and treatment facilities, Enppi designed and commissioned several gas pipelines in both onshore and offshore territories.

The experience and capabilities gained from the above engineered projects support and help Enppi to offer development packages for projects that cover the entire Gas Handling and Processing value chain including but not limited to LPG & NGLs extraction.

Enppi integrated team experience / capabilities cover the following:

- Studies (upgrading, debottlenecking, environmental, safety assessment, flow assurance and surge studies,...etc)
- Pre- front-end engineering and design (Pre-FEED) studies
- Front-end engineering and design (FEED) studies
- Basic Engineering
- Detailed Engineering
- Revamping
- Rehabilitation
- Expansions
- Quantitative Risk Assessment for Gas Facilities
- Engineering, procurement and construction (EPC) Projects
- Turn-key Projects



Samples of technologies employed in different designs performed by Enppi integrated team:

- Sweetening (With capacities up to 2200 MMSCFD)
- Turbo-expanders (With capacities ranging from 300 to 700 MMSCFD)
- Absorption (With capacities up to 330 MMSCFD)
- Adsorption (With capacities up to 1300 MMSCFD)
- Refrigeration (With capacities up to 900 MMSCFD)
- Cold-Box (With capacities ranging from 300 to 900 MMSCFD)
- Deep Cryogenic extraction
  - »C2/C3 production (With capacities up to 1000 MMSCFD)
  - »Selective fractionation for propane, iso-butane, normal butane, pentane, gasoline and heavy ends recovery (With capacities up to 50,000 BPD)

Samples for the fields experienced by Enppi in gas processing, treatment, storage and transportation projects:

### **Gas Production**

Onshore production facilities (launchers, receivers, slug catchers, separators, ...etc)

Offshore platform topside facilities/structure (HIPPS, Compressors, de-sanding...etc)

Processing facilities (gas lift, gas injection, dew-pointing...)

Receiving terminals

Export terminals

Compression stations

Metering stations

Control and safety systems (PLC, DCS, ESD, HIPPS, CEMS on heaters and SCADA)





## Gas Storage and Transportation

Storage facilities (LPG, LNG, NGLs, condensate, C2/C3, Propane...etc)

Pipelines

Loading Arms and shipping terminals facilities

## Gas Processing

Gas processing and fractionation facilities, to supply ethane and propane, at the required purity, as make-up to the refrigeration cycles.

Heat transfer fluid facilities to provide reboil heat for the various fractionation columns and chilling purpose.

Gas treatment facilities (mercury removal, acid gas removal, dehydration / drying, sweetening...etc)

Gas scrubbing facilities

Sales gas conditioning facilities

LPG production facilities

Condensate recovery facilities

Condensate processing and blending facilities

C2/C3 production facilities

Gas storage and transportation facilities

Condensate storage and transportation facilities


NGL and cryogenic storage and transportation facilities

LNG facilities





Gas Treatment  
& Processing  
Experience

A nighttime photograph of an industrial facility, likely a refinery or chemical plant. The scene is dominated by a large, illuminated structure on the left, possibly a distillation column or reactor, with multiple levels of scaffolding and walkways. In the center, a large crane is positioned on a platform, its arm extending towards the right. The background shows a vast expanse of industrial buildings and structures, all illuminated by numerous lights, creating a bright, glowing effect against the dark night sky. The foreground features a road with streetlights and some greenery, suggesting an urban or industrial park setting.

We apply state of the art technology and know-how based on worldwide sources of operating companies, international engineering firms and technology licensors. We comply with international codes and standards such as ASME, ANSI, API, ASTM, IEC, etc...

## INTERNATIONAL PROJECTS

### YANBU GAS PLANT EXPANSION

#### OWNER

Saudi Aramco, KSA

#### CONTRACT TYPE

EPC Main Contractor - lump-sum turnkey.

#### SCOPE OF SERVICES

Detailed engineering, material supply, construction and commissioning & start-up.

#### PROJECT DESCRIPTION

Expand Yanbu NGL plant capacity from 390 to 585 MBOD. The scope of work includes: 195 MBOD de-ethanizer with ancillaries and propane, refrigeration system, feed to the existing de-propanizer and de-butanizer columns, construction of substation with process interface room and expansion of DCS and ESD systems.



### GAS EXTRACTION AND COMPRESSION PROJECT

#### OWNER

PDVSA, Venezuela

#### CONTRACT TYPE

Lump-sum for professional services/material supply cost plus.

#### SCOPE OF SERVICES

Basic & detailed engineering and procurement services.

#### PROJECT DESCRIPTION

Installation of a new NGL extraction plant with processing capacity 1000 MMSCFD of natural gas.



## FRACTIONATION CAPACITY INCREASE AT JOSE (ACFJ) PROJECT

### OWNER

PDVSA, Venezuela

### CONTRACT TYPE

Lump-sum for professional services/material supply cost plus.

### SCOPE OF SERVICES

Conceptual design, basic & detailed engineering, procurement services and construction supervision.

### PROJECT DESCRIPTION

Development of new facilities to process the increase of NGL capacity to 50000 SBPD in order to cover the requirements of the 1<sup>st</sup> Phase of NGL production increase. Each fractionation train will be designed to produce propane, iso-butane, n-butane, pentanes, gasoline and heavy ends.

## ETHANE RECOVERY PROJECT

### OWNER

PDVSA, Venezuela

### CONTRACT TYPE

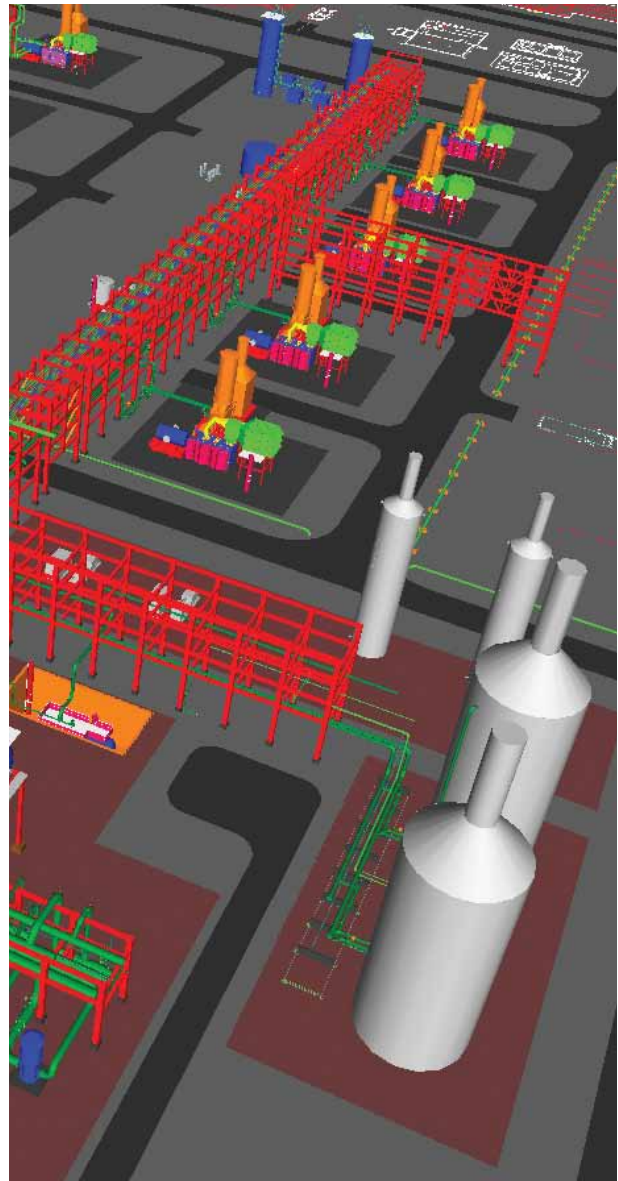
Lump-Sum For Professional Services.

### SCOPE OF SERVICES

Basic & detailed engineering for sweetening package (ISBL), detailed engineering for C2 extraction unit (ISBL) and overall project management & coordination.

### PROJECT DESCRIPTION

Installation of 2200 MMSCFD gas sweetening plant to completely remove the CO<sub>2</sub>/H<sub>2</sub>S and CO<sub>2</sub> dehydration for the natural gas upstream. The extraction facilities in Anaco and the dehydrated CO<sub>2</sub> (200 MMSCFD) will be used for well gas lift, in addition to retrofit of the San Joaquin extraction facilities Trains A&B to achieve 98% ethane recovery. The scope includes provision of molecular sieve dehydration package along with its regeneration (H<sub>2</sub>O plus CO<sub>2</sub> 200 MMSCFD – well gas lift).



## PAGMI PROJECT PHASE I & II – GAS CONDITIONING FOR DOMESTIC MARKET

### OWNER

PDVSA, Venezuela

### CONTRACT TYPE

EPCM - lump-sum for professional services, material supply cost plus and unit rates for construction works.

### SCOPE OF SERVICES

Basic engineering review, detailed engineering, procurement services for long lead equipment, construction management and overall management for phase I. Conceptual engineering and basic & detailed engineering for phase II.

### PROJECT DESCRIPTION

Treating and conditioning gas produced from the offshore area in Northeastern Venezuela to be used in the domestic market in the PDVSA CIGMA Complex, located in Güiria, Estado Sucre, Venezuela.

Phase I: Conditioning of 600 MMSCFD gas from Dragon field (mainly Methane saturated with water), molecular sieve dehydration package and all required utilities to accomplish the domestic market requirements.

Phase II shall be designed to treat 1000 MMSCFD gas and 20197 STD bpd condensate. There will be an additional dehydration module (module B) parallel to module A in PAGMI phase I, with capacity of 600 MMSCFD with different outlet water content.

## KHURSANIYAH GAS PLANT

### OWNER

Saudi Aramco, KSA

### CONTRACT TYPE

Professional services - reimbursable basis

### SCOPE OF SERVICES

Engineering services (main contractor – Bechtel)

### PROJECT DESCRIPTION

The Khursaniyah gas plant includes two gas-conditioning trains, ethane and natural gas liquids recovery units in order to process 1000 MMSCFD of natural gas, produce 550 MMSCFD sales gas, 240,000 BL/D ethane / natural gas liquids, and 1,800 metric tons / day sulfur. The complex will process natural gas from three onshore fields in the eastern province: Abu Hadriya, Fadhili, and Khursaniyah.



## CONCEPTUAL & BASIC ENGINEERING FOR PIRITAL-I PROJECT

### OWNER

PDVSA GAS S.A, Venezuela

### CONTRACT TYPE

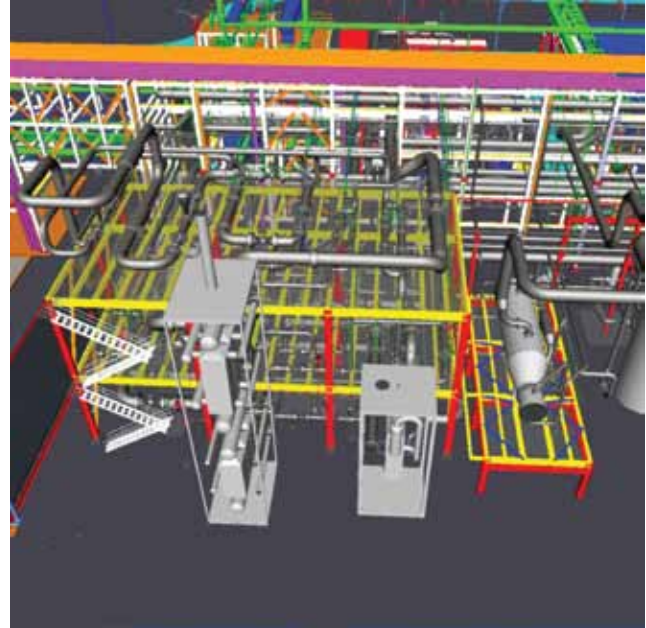
Lump-sum for professional services.

### SCOPE OF SERVICES

Conceptual design and basic engineering.

### PROJECT DESCRIPTION

Construction of new extraction plant and its utility systems, processing capacity 1000 MMSCFD of natural gas.



## DEVELOPMENT OF THE JORDANIAN GAS TRANSMISSION PIPELINE

### OWNER

Jordanian Egyptian Fajr for Natural Gas Transmission and Supply Company

### CONTRACT TYPE

EPCM - lump-sum for engineering and construction/material supply cost plus - consortium (Petrojet, Gasco and Enppi Leader).

### SCOPE OF SERVICES

Engineering, material supply, construction supervision, and commissioning & start-up assistance.

### PROJECT DESCRIPTION

Transmit Egyptian Natural Gas to Jordan through a 36"/394 km pipeline (With Throughput capacity 10 BCM/Y Gas) (From Aqaba to Syrian borders). A compression station was installed at Aqaba for gas transmission.



# LOCAL PROJECTS



## NGL PROJECT AT PORT SAID

### OWNER

United Gas Derivatives Company (UGDC)  
(BP/Eni/Gasco), Port Said

### CONTRACT TYPE

Lump-sum for professional services.

### SCOPE OF SERVICES

EPCM: basic engineering review, detailed engineering & procurement services, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

Installation of processing facilities for 1100 MMSCFD feed of natural gases produced from El-Gamil & Ha'py fields to produce propane, LPG and condensates.

## DAMEITTA NGL EXPORT FACILITIES

### OWNER

United Gas Derivatives Company (UGDC)  
(BP/Eni/Gasco), Damietta

### CONTRACT TYPE

EPC turnkey - consortium contract (Enppi and Tractebel) - lump-sum for professional services and cost plus fees for material supply and construction work.

### SCOPE OF SERVICES

FEED & detailed engineering, procurement, construction and commissioning & start-up assistance.

### PROJECT DESCRIPTION

Installation of marine export facilities - cryogenic tank capacity (30,000m<sup>3</sup>) for propane storage produced from Port Said NGL process facilities.





## WEST HARBOR EXPANSION PROJECT

### OWNER

Pharaonic Petroleum Company (PhPC), Port Said

### CONTRACT TYPE

EPC LSTK (Enppi Main Contractor).

### SCOPE OF SERVICES

Engineering, material supply, construction, commissioning & start-up and overall management.

### PROJECT DESCRIPTION

Expand West Harbor facility which is currently processing 280 MMSCFD from Ha'py and 265 MMSCFD from Taurt fields, by providing an additional HP stage Compression Train and expand the plant design capacity to 585 MMSCFD.

## MAXIMIZATION OF C2/C3 RECOVERY FROM WESTERN DESERT GAS FIELDS

### OWNER

Egyptian Natural Gas Company (GASCO), Alexandria

### CONTRACT TYPE

Lump-sum for professional services/material supply disbursable.

### SCOPE OF SERVICES

EPCM: techno-economic/feasibility study, basic & detailed engineering, procurement, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

The project aims to maximize C2 and C3 Recovery from Western Desert Gas Complex (WDGC) and Ameriya LPG plant. The recovered C2 and C3 in Ameriya LPG plant will be transferred to WDGC through a 12" pipeline, to be processed within WDGC where storage and loading facilities exist.

The project was executed in three phases:

Phase I: production of 600 MMSCFD

Phase II: increase of production to 800 MMSCFD

Phase III: increase of Production to 900 MMSCFD

## SIMIEN/SIENNA DEVELOPMENT PROJECT

### OWNER

Burullus Gas Company (BG/Petronas/EGPC), Idku

### CONTRACT TYPE

EPC lump-sum turnkey - consortium (Enppi and Petrojet, Enppi leader).

### SCOPE OF SERVICES

Basic & detailed engineering, procurement services, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

Extension to the onshore existing Scarab/Saffron facility to treat 665 MMSCFD of natural gas produced from Simian/Sienna offshore deepwater fields to feed the onshore Egyptian LNG Plant.

## SAPPHIRE DEVELOPMENT PROJECT

### OWNER

Burullus Gas Company (BG/Petronas/EGPC), Idku

### CONTRACT TYPE

EPC lump-sum turnkey - consortium (Enppi and Petrojet, Enppi leader).

### SCOPE OF SERVICES

Basic & detailed engineering, procurement services, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

Extension to the onshore existing Scarab/Saffron and Simian/Sienna facility to treat 665 MMSCFD of natural gas produced from Sapphire offshore deepwater fields to feed the onshore Egyptian LNG Plant.



## WDDM PHASE V BOOSTER COMPRESSION STATION

### OWNER

Burullus Gas Company (BG/Petronas/EGPC), Idku

### CONTRACT TYPE

EPC lump-sum turnkey - consortium (Enppi and Petrojet, Enppi leader).

### SCOPE OF SERVICES

Engineering services, material supply, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

Adding two new gas booster compression systems including waste heat recovery and other facilities required to maintain the export gas supply pressure within the fields of Simian/Sienna, Sapphire and Scarab/Saffron at Idku - Egypt.

## PHASE VII MAIN COMPRESSION ONSHORE PROJECT

### OWNER

Burullus Gas Company (BG/Petronas/EGPC), Idku

### CONTRACT TYPE

Lump-sum (FEED phase) and detailed engineering lump-sum/material supply cost plus (EP phase).

### SCOPE OF SERVICES

FEED review, basic engineering, tendering of long lead items and project management; detailed engineering and material supply at cost plus (EP scope); construction supervision (separate contract).

### PROJECT DESCRIPTION

To install 5x25% new gas turbine driven compression stations with a capacity of 500 MMSCFD each to accommodate the pressure declination from 59 barg to 28 barg, including waste heat recovery system and a new figure type slug catcher.



## WESTERN DESERT GAS COMPLEX

### OWNER

Egyptian Natural Gas Company (GASCO),  
Alexandria

### CONTRACT TYPE

Lump-sum for professional services/material supply disburseable.

### SCOPE OF SERVICES

EPCM: techno-economic/feasibility study, basic & detailed engineering, procurement, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

Treatment of 550 MMSCFD natural gas produced from Western Desert (Obaiyed, Salam & Tarek) to produce ethane & propane mixture for 300,000 t/y ethylene, commercial propane, sales gas, condensate and LPG - Dehydration Package: 2x300 MMSCFD molecular sieve two trains.



## OBAYIED PRE-COMPRESSSION PROJECT

### OWNER

Bapetco (Shell Egypt/EGPC), Western Desert

### CONTRACT TYPE

EPC turnkey – lump-sum for professional services and construction works/material supply disburseable.

### SCOPE OF SERVICES

EPC Main Contractor: detailed engineering, procurement, construction supervision, commissioning & start-up assistance and overall project management.

### PROJECT DESCRIPTION

Restore Obaiyed Gas Plant (OGP) compression capacity by 420 MMSCFD through the installation of 2x50% compression train facilities to upgrade OGP pressure from 25 to 86 barg.





## **ASSIUT/ASWAN GAS PIPELINE PROJECT**

### **OWNER**

EGAS

### **CONTRACT TYPE**

Lump-sum for professional services.

### **SCOPE OF SERVICES**

Route selection, surveying, basic & detailed engineering, procurement services, construction supervision and overall project management.

### **PROJECT DESCRIPTION**

Installation of gas transmission pipeline (500 km) from Assuit to Aswan as follows:

Phase I: Assiut/Gerga P/L 120km – 32”

Phase II: Gerga/Aswan P/L 380km – 30”

## **DAHSHOUR GAS COMPRESSION STATION PROJECT**

### **OWNER**

EGAS

### **CONTRACT TYPE**

Lump-sum for professional services.

### **SCOPE OF SERVICES**

Engineering and procurement services.

### **PROJECT DESCRIPTION**

Installation of four new gas turbine compression stations in Dahshour area, including civil, mechanical and E&I works, Station current capacity is 27.7 MMSCMD by using 3 compressors + 1 standby and the future capacity will be 40 MMSCMD by using 5 compressors + 1 standby



## AMERYA LPG RECOVERY PLANT

### OWNER

EGPC, Alexandria

### CONTRACT TYPE

Lump-sum for professional services/material supply and construction work disburseable.

### SCOPE OF SERVICES

Basic & detailed engineering, procurement services, construction supervision and commissioning & start-up assistance.

### PROJECT DESCRIPTION

Installation of LPG recovery plant with inlet gas production capacity of 300 MMSCFD producing 360 T/D of LPG. The scope includes Dehydration of 330 MMSCFD of gas by molecular sieve (one train).

## EGYPTIAN LNG PROJECT

### OWNER

Egyptian Natural Gas Company, Idku

### CONTRACT TYPE

S/C: Lump-sum for engineering services (Bechtel USA).

### SCOPE OF SERVICES

Detailed engineering for: Inlet treating unit, buildings for power generation, LNG storage, flares, marine facilities and utilities.

### PROJECT DESCRIPTION

The 1<sup>st</sup> LNG project in Egypt; two trains LNG plant with a capacity of 3.6 MMTY LNG production each, located in Idku, Beheira, Northern Coast of Egypt.



## TRANSULF LPG PLANT

### OWNER

EGPC, Ras Bakr

### CONTRACT TYPE

EPC turnkey - lump-sum for professional services/ material supply and construction works disburseable.

### SCOPE OF SERVICES

Detailed engineering, procurement services, construction supervision and commissioning & start-up assistance.

### PROJECT DESCRIPTION

Inlet gas production 130 MMSCFD - producing 960 T/D of LPG. The scope includes provision of molecular sieve dehydration package.

## SETH OFFSHORE DEVELOPMENT PROJECT

### OWNER

Belayim Petroleum Company / PETROBEL (Eni / EGPC)

### CONTRACT TYPE

EPC LSTK – Consortium (Enppi, Petrojet and Tecnomare).

### SCOPE OF SERVICES

Detailed engineering for topside facilities, Procurement Services and material supply and assistance for commissioning & Start-up.

### PROJECT DESCRIPTION

The project aims to install a new platform at water depth 83.3 m at PTB Seth gas field in Ras El barr concession west Nile Delta area ( Mediterranean Sea), with total field production flow rate of 4.5 MMSCMD.



## ROSETTA GAS FIELD DEVELOPMENT

### OWNER

Rashid Gas Company - Rashpetco (BG / Edison / EGPC),  
Rashid

### CONTRACT TYPE

Lump-sum for basic & detailed engineering, reimbursable for construction supervision and commissioning & start-up assistance.

### SCOPE OF SERVICES

Detailed engineering, procurement services, construction supervision and commissioning & start-up assistance.

### PROJECT DESCRIPTION

The project aims to install Rashid onshore gas processing facilities (275 MMSCFD FEED) including the onshore terminal with gas treatment and export; stabilization unit, condensate export facilities, dehydration & dew-pointing system, gas export facilities, chemical injection package, heating medium, oily water treatment, control system, electricity generation and distribution and utilities in addition to 30km 24" pipeline to transmit sales gas to national grid, and 23km 6" onshore condensate pipeline for gas exported to WEPCO facilities.

## RASHID-2 PLATFORM PROJECT

### OWNER

Rashid Gas Company - Rashpetco  
(BG / Edison / EGPC), Mediterranean Sea

### CONTRACT TYPE

Lump-sum for professional services.

### SCOPE OF SERVICES

Basic & detailed engineering and procurement services.

### PROJECT DESCRIPTION

Installation of four legged unmanned steel jacket platform located in Rosetta at 49 m water depth, with capacity of 275 MMSCFD, weight 450 tons through a 24" subsea pipeline to the onshore terminal for final processing, 3 (1x70 mm<sup>2</sup>) XLPE 12 / 20 KV 61km submarine cable with fiber optical bundle.







## **SEMMAN FIELD DEVELOPMENT**

### **OWNER**

Belayim Petroleum Company / PETROBEL (Eni / EGPC), Mediterranean Sea

### **CONTRACT TYPE**

Professional services reimbursable.

### **SCOPE OF SERVICES**

Basic engineering review, detailed engineering and procurement services.

### **PROJECT DESCRIPTION**

Installation of new Semman platform (tripod plus deck) and laying of new 18" sea line from Semman to existing Darfeel platform with total length 20km.

## **DENISE B DEVELOPMENT PROJECT - TNW2 - PLATFORM UPGRADE**

### **OWNER**

Belayim Petroleum Company / PETROBEL (Eni / EGPC), Mediterranean Sea

### **CONTRACT TYPE**

Lump-sum for professional services.

### **SCOPE OF SERVICES**

Basic & detailed engineering and procurement services.

### **PROJECT DESCRIPTION**

Upgrade of TNW2 existing platform to suit Denis gas field production, transmit additional capacity onshore via 61km 32" offshore pipeline and 1km 32" onshore pipeline and upgrade of El Gamil onshore facilities.

## ASSIL & KARAM GAS DEVELOPMENT PROJECT

### OWNER

Badr Eldin Petroleum Company – Bapetco (SHELL / EGPC)

### CONTRACT TYPE

Professional Services & Construction Lump-sum, Material Disbursable – EPC Turnkey.

### SCOPE OF SERVICES

Detailed engineering, material supply, construction, commissioning & start-up

### PROJECT DESCRIPTION

Installation of CO<sub>2</sub> removal plant, utility facilities to support CO<sub>2</sub> removal plant, 29km P / L, gas turbine generator, air cooler, 2 separators, flare package.



## QASR COMPRESSION STATION

### OWNER

Khalda Petroleum Company- KPC (Apache / EGPC)

### CONTRACT TYPE

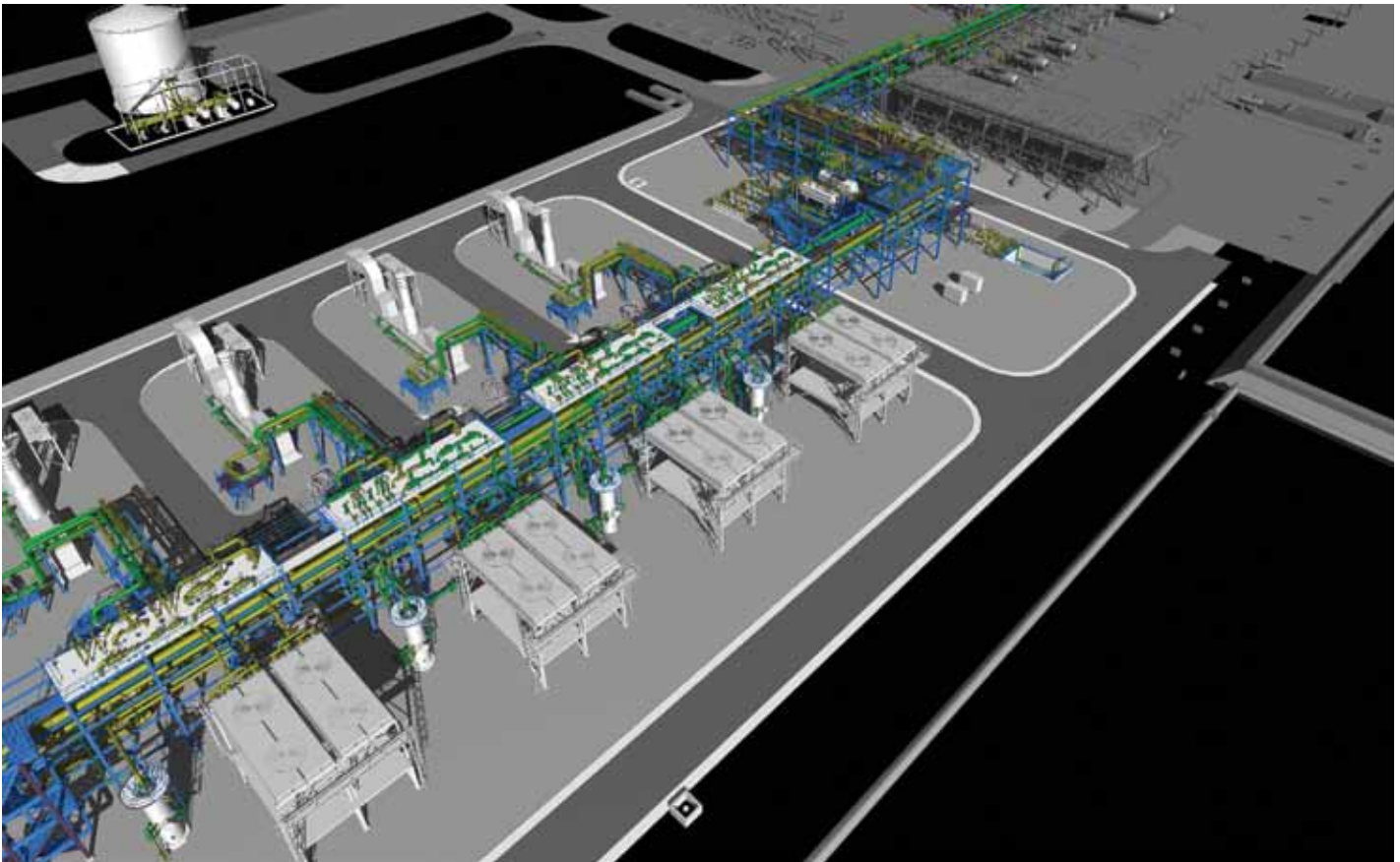
EPC LSTK.

### SCOPE OF SERVICES

Detailed engineering, Procurement, construction and Pre commissioning & commissioning.

### PROJECT DESCRIPTION

Aims to install a gas compression station (four trains), to maintain gas pressure and the condensates produced from the wells at 123 bar. The produced gas will be sent for treatment at Salam and Obayed stations. The pressure of gas produced from the wells is expected to drop from 120 bar to less than 30 bar in the coming years.





## **TAURT ONSHORE DETAILED ENGINEERING**

### **OWNER**

Gulf Of Suez Petroleum Company - Gupco (BP Egypt / EGPC), Port Said

### **CONTRACT TYPE**

Professional services reimbursable.

### **SCOPE OF SERVICES**

Detailed engineering for onshore part of Taurt gas field development project.

### **PROJECT DESCRIPTION**

The Project aims to develop Taurt field through a sub-sea production system (SPS) that consists of seven sub-sea wells tied with a manifold with well testing capability.

## **OFFSHORE NORTH SINAI FIELD DEVELOPMENT**

### **OWNER**

North Sinai Petroleum Company - NOSPCO (BP / Gasco / Perenco), North Sinai

### **CONTRACT TYPE**

Lump-sum for professional services/material supply disburseable.

### **SCOPE OF SERVICES**

Detailed engineering for offshore topside facilities and onshore gas central processing facility, overall procurement services except for pipelines and offshore structure steel, and construction supervision.

### **PROJECT DESCRIPTION**

Development of Tao offshore gas field, 60km north of Rommana producing 180 MMSCFD of gas. The development includes offshore production wells, production platform, submarine pipeline, onshore gas treatment plant and sales gas pipeline in addition to gas dehydration.



## TEMSAH-4 PLATFORM

### OWNER

Belayim Petroleum Company / PETROBEL (Eni / EGPC), Mediterranean Sea

### CONTRACT TYPE

Lump-sum for professional services.

### SCOPE OF SERVICES

Basic & detailed engineering and procurement services.

### PROJECT DESCRIPTION

Installation of a new platform: four legs, 12-slot unmanned fixed offshore production platform at 85m water depth and capacity of 10 MMSCMD gas plus 3000 BPD condensate.

## Other Areas Of Expertise

As an Engineering EPC Main Contractor, Enppi areas of expertise lie in the value chain of its role as an Engineering, procurement, project management and construction supervision contractor.

### ENGINEERING

#### PROCESS TECHNOLOGY

Enppi has considerable experience in the design of oil & gas, onshore/offshore production facilities, gas processing, oil refining, and petrochemicals in the areas of:

- Process optimization and selection
- Studies (techno-economic and technical)
- Flow assurance engineering ( steady state & dynamic )
- Debottlenecking and revamps
- License evaluation and selection
- Review of basic engineering for others
- Oil & Gas separation
- FEED, conceptual and basic & detailed engineering
- HAZOP, HAZID, QRA, Sil and other safety studies
- Performance analysis and guarantees
- Operating manuals development
- Commissioning and start-up procedures
- Field assistance for construction and start-up



## MECHANICAL ENGINEERING

Enppi has qualified specialists in all aspects of mechanical engineering. The following services are offered to support FEED and detailed design activities or independently as specialized services.

- Static equipment design, covering:
  - »Pressure vessels, heat exchangers, columns, reactors, heating and power boilers and tank design.
- Rotating equipment design, covering:
  - »Compressors, gas and steam turbines, pumps, turbo expanders, HVAC, etc..
- Material selection, covering:
  - »Material selection guides
  - »Cathodic protection
  - »Painting
- Field assistance for construction and start-up
- Solid handling designs, covering:
  - »Solids Conveying, Transport, Storage and Processing Systems in the fields of Chemical, Petrochemical, Mining and Mineral Processing Industries
  - »Cranes
- HVAC systems design and engineering works, covering:
  - »Industrial Applications such as control, switchgear, battery, laboratory, warehouses and workshop buildings.
  - »Administration buildings.

## ELECTRICAL ENGINEERING

Enppi has fully experienced team in Electrical System Design, with heavy experience in both onshore & offshore applications; covering :

- Power generation and distribution
- Electrical systems analytical studies
- Relay coordination studies
- Overhead transmission lines design
- UPS systems
- Solar power units
- Plant power distribution & cabling systems
- Lighting systems
- Lightning protection facilities
- Navigational aid systems
- Grounding systems
- Heat tracing systems
- Hazardous Area Classification, Plans & Elevations and Electrical enclosure selection criteria
- Field assistance for construction and start-up



## INSTRUMENTS & CONTROL AND TELECOMMUNICATIONS ENGINEERING

The company's competencies in Instrument & Control and Telecommunication engineering cover:

- Field instruments & Process Measurements.
- Final Control Elements: Control valve Sizing & selection, On-Off Valves, Shut Down & Blow Down Valves.
- Process Control Applications (Burner Management System, Boiler control, Compressor Control, etc....)
- Process Control Systems (DCS, PLC)
- Pneumatic, Hydraulic controls.
- Safety Instrumentes System (SIS).
- High Integrity Pressure Protection System (HIPPS).
- SCADA & Communication Systems.
- Pipeline Management System.
- Fiscal Metering Systems.
- Automatic Tank Gauging.
- Oil & Gas Wellhead control system.
- Tele-communication systems such as:
  - »Private Automatic Branch Exchange (PABX), VoIP
  - »Public Address & Alarm System (PA&A)
  - »Fiber Optic Cables / System
  - »Wireless Systems (Satellite, Microwave, VHF/UHF)
  - »Security systems (Closed Circuit Television (CCTV),
  - »Access Control System & Intrusion detection system)
  - »Video Conference.
- Field assistance for construction and start-up





## CIVIL/STRUCTURAL/ARCHITECTURAL ENGINEERING

Enppi possesses considerable design experience in different phases of Civil/Structural/Architectural works, which covers the following activities for plant facilities and other onshore structures:

- General site preparation drawings
- Road and paving drawings
- Building design (architectural / structural detailed drawings)
- Detailed drawings (steel/concrete) and MTO preparation
- Tanks and basins drawings
- Foundation drawings
- General specifications, MRQs & MRPs preparation
- Field assistance for construction and start-up

## OFFSHORE STRUCTURES

Enppi offshore structural design capabilities cover the following areas:

- Offshore fixed platforms analysis and design
- Deep & shallow foundation engineering
- Dynamic & fatigue assessments
- Earthquake Analysis
- Nonlinear Analysis
- Finite element Analysis
- Construction support engineering
- Transportation & Installation engineering
- Weight & COG engineering
- Structural Integrity Management
- Ports & Terminals engineering
- Subsea structural engineering
- Specification & Fabrication drawings
- Field assistance for construction and start-up



## PIPING ENGINEERING

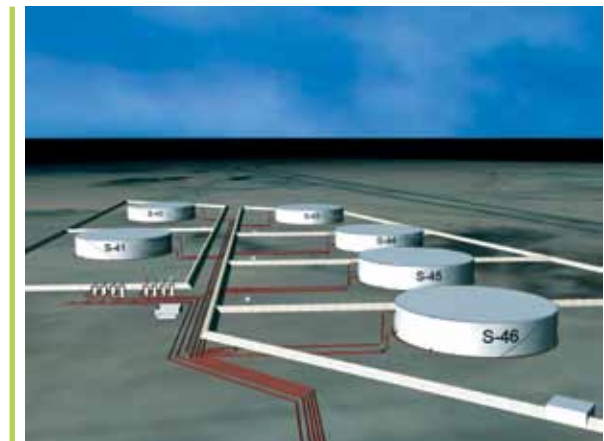
The principal documentation generated by Enppi piping engineering incorporates:

- Plot plans and equipment location plans
- Piping general arrangement drawings for the above ground piping
- Orientation drawings of Tower, vessel, tank, etc...
- Piping isometrics drawings
- Stress analysis reports for critical lines using Caesar II program
- Piping supports distribution and design
- Piping material specification and supply specification for packages
- MRQs and MRPs preparation for piping bulk and valves
- Underground Composite Drawing
- Detailed design of underground piping systems
- Update of drawings and 3D CADD model to “AS-BUILT” status
- Detailed and block plastic model building
- Field assistance for construction and start-up

## PIPELINE ENGINEERING

Enppi Pipeline Engineering is responsible for onshore/offshore pipelines engineering (FEED & Detailed Design), pre-commissioning and installation supporting; The main pipelines engineering activities cover the following:

- Pipeline design basis
- Pipeline mechanical design
- Route selection
- Planimetry and profile
- Riser/Spools Layout
- Crossing details
- Field assistance for construction and start-up
- Subsea Equipment
- Analysis reports
- Standard details
- Material requisitions and Specifications
- Bidders evaluations



## The following section gives detailed description of the various deliverables:

### For onshore & offshore pipelines:

Pipeline specifications

Material selection and wall thickness calculations

Stress analysis studies

P/L alignment drawings

Buoyancy calculations

Anchor blocks calculations

Thermal expansion calculations

Buckling calculations

Coating and wrapping

Cathodic protection

Material take-off

Material requisitions including material specifications and purchase orders preparation

### For Offshore Pipelines:

Free span analysis

Seabed irregularities analysis

Upheaval buckling analysis

Installation analysis

Trenching study

Pipeline survey, installation and trenching bid packages

Riser and spool piece design



## PROCUREMENT

Enppi's strategy in procurement is to provide quality goods and services, at the right time, at the lowest cost, produced and delivered safely. We have the experience, the tools, and the know-how for procurement services by providing integrated, reliable, and cost-efficient supply chain management services to ensure the success of projects, large and small.

We have capabilities in:

- Procurement Management
- Purchasing and contracting services
- Purchase orders expediting and subcontracts administrations.
- Supplier quality surveillance.
- Material Logistics
- Material control



Enppi's supply management services leverage today's technologies and logistics' methods to make efficient decisions which streamline the supply management process.

We have a global track record of ensuring timely and accurate material receipt through innovative expedition and quality assurance with vendors to minimize receiving delays and errors. We optimize transportation networks, operating hand-in-hand with global freight forwarders with dedicated assets. We offer the expertise, processes and tool utilization needed to facilitate frequent status updates on all material control information including material quantities required, received and issued.

## PROJECT MANAGEMENT AND CONSTRUCTION SUPERVISION

The design and execution of large scale onshore and offshore projects necessitates the strict adherence to sound management and control practices. In such projects, Enppi provides specialized management, control and quality assurance services covering:

- Contracts/subcontracts preparation and administration
- Overall project management and control
- Front-end planning and detailed project scheduling
- Engineering coordination and control
- Cost estimation and budget monitoring
- Variance control
- Identifying and solving problems hindering project execution

Enppi also provides construction management services as part of the overall project management function, covering structural, piping, mechanical and E&I supervision.

The offered construction management services include construction supervision, commissioning and start-up activities covering:

- Construction management and quality assurance/control
- Construction safety management
- Construction planning and control
- Onshore fabrication, installation and load-out supervision
- Offshore installation supervision
- Commissioning and start-up assistance





# Software Applications

The latest software programs have been widely used in Enppi to optimize the efficiency of the different disciplines' processes.

## Process Technology

Program	Deliverables
Dnv Phast	Quantitative risk assessment
Smart plant P & ID "Intergraph"	Piping & instrument diagram
Flare Net	Flare hydraulic networks
Flare Sim	Flare radiation calculation
Fri	Tower internals design
Hextran	Heat Exchanger network optimization
HTRI	Heat transfer equipment design (Heat exchangers, air coolers, heaters)
Hysys	Process simulation
Network Inplant	Network simulation
Pipeline Stodio	Gas & liquid pipeline dynamic simulation
Olga	Pipeline transient multiphase flow dynamic
Pipenet	fire water system hydraulic calculation
Pipephase	Pipeline steady state hydraulic simulation
Pipesim	Steady state multiphase flow simulator
Process Eng. Suite (Pes)	Process Simulation
Sil Core	Safety integrity level
Smart Plant P & Id	P & ID Document
Primatch	Hazop / Hazid

## Mechanical Engineering

Program	Deliverables
Cadna	Noise Models - Noise Contours
Compress	Pressure vessels design / analysis
E-Tank / ITS	Storage tanks design / analysis
Pv Elite	Pressure vessels design / analysis
Signal Ffs	Fitness for service assessment according to API 579
Solid Works Simulation	3-D modeling

## Civil / Structural / Architectural Engineering

Program	Deliverables
Afes	Analysis & design for shallow & deep information
Arch	Arch, design to produce drawings & MTO
Autodesk Revit	4D BIM software, used to design a building in 3D, interfacing with 2D drafting tools, access information from the model & allow plan & track various stages in the building's lifecycle
Etabs	Civil building analysis, design for structural & earthquake engineering
Pds 3d (Frameworks Plus)	3D modeling and steel drawings
Safe	Floor analysis & drawings
Sap 2000 V15.0.1	3D structural analysis
Staad Pro	Structural analysis

## Electrical Engineering

Program	Deliverables
ETAP 12.0.0 Electrical Transient Analyzer Program	To Perform Complete Power System Studies: <ul style="list-style-type: none"> <li>• Short Circuit Calculation</li> <li>• Load flow studies</li> <li>• Motor starting Calculation</li> <li>• Harmonics analysis</li> <li>• Transient stability studies</li> <li>• Earthing Calculation</li> <li>• Protection Relay Coordination</li> </ul>
PLS-CADD and PLS-Pole	To perform Overhead transmission line (OHL) design for power distribution and transmission.
DIALUX	Lighting System Design
SMARTPLANT® 3D CABLE MANAGEMENT INTERFACE	Intelligent Software for Cables management through 3D Modeling
PDS	For 3D Modeling of electrical equipment/lighting/cable routing
PDMS	For 3D Modeling of electrical equipment/lighting/cable routing
Micro-Station	For smart extracting of layouts from PDS modeling
AutoCAD	For drafting layouts
Electrical Load Analysis (ELA)	Used for sizing of electrical equipment such as follows:- <ul style="list-style-type: none"> <li>• Generators</li> <li>• Transformers</li> <li>• Switchgears</li> </ul>
Oracle and Electrical Cable Sizing	Used for Sizing HV/LV power cables feeding relevant users.



## Instrumentation & Control and Telecommunication Engineering

Program	Deliverables
Aveva Instrumentation	Instrumentation Engineering design
Aveva (PDMS)	3D Modelling
Aveva Cable Design	3D Modelling
Smart Plant Instrumentation (Intools)	Instrumentation Engineering design
Smart Plant 3D	3D Modelling
PDS 3D Model	3D Modelling
CONVAL	Sizing Software
INSTRUCALC	Sizing Software

## Projects Control

### Planning Division

Program	Deliverables
Primavera P6 Team member / Collaborator	Planning & Scheduling
Primavera Project Management	Planning & Scheduling Projects
Primavera Risk Analysis	Planning & Scheduling
Risky Project Professional	Quantitative Risk Analysis

### Cost Division

Program	Deliverables
The Decision Tools Suite Professional @ Risk	Cost quantitative risk assessment
Comfar Iii Expert	Feasibility Analysis

## Plant Design & Piping

Program	Deliverables
Aga, Prci	Stability
Autodesk Navisworks Simulats	Model Access / review
Autopip	Stress analysis
Aveva Area Based Automatic Drawing Production Aveva Final Designer	Automatic 2D drawing generation
Aveva Laser Model Interface	Transferring laser scanner data to 3D model
Aveva Multi Discipline Supports	Pipe support modeling
Aveva Pdms	3D equipment / pipe modeling
Aveva Review	Model access / review
Caesar II	Pipe stress analysis / calculations
Isogen	Piping isometrics extraction
Lmi	Laser scanner data review
Microstation / J	2D drawings
Offpipe	Subsea pipe lay
Orthogen	Automatic 2D drawing generation
PDMS PDS 3D	3D equipment / piping modeling
Sage Profile	Subsea seabed inequalities
Sewer Cad	Underground pipe network modeling
Smart Plant 3D	3D equipment / piping modeling
Smart Plant Review –Api Smart Plant Review-Photo Realism Smart Plant Review- Simulation &Visual Effects	Model access / review
Smart Plant Sketch	2D drawings
Smart, Plant Review	Model access / review
Vpe Workbench	P&ID Sketch

## Pipeline

Program	Deliverables
OFFPIPE (Ver. 2.07), Non-linear finite element method for offshore installation analysis for Pipelines, Risers and Cables	Modeling and structural analysis of non-linear analyses of offshore pipelines installations (including normal and davit lift).
AUTOPIPE-PLUS (Ver 8.06), stress analysis software	Finite element software program for analysis of complex pipeline/piping systems.
SAGE PROFILE (Ver 6.4)	Finite element software program for subsea pipeline seabed irregularities 2D and 3D analyses.
AGA/PRCI (Ver 3.0)	Submarine Pipeline On-bottom Stability software & Design Standard developed by American Gas Association and Pipeline Research council International.

## Procurement

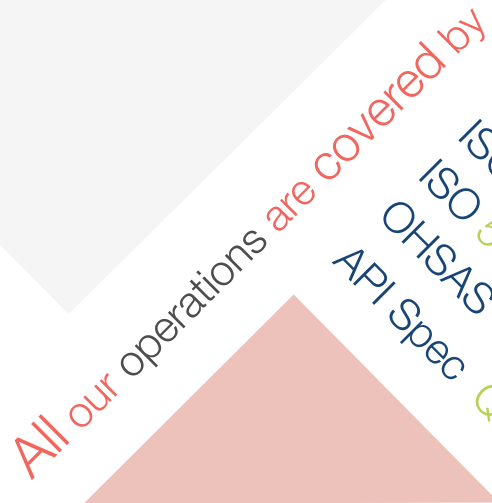
Program	Deliverables
Site Material Management System	Follow up & control of project material at site
Vendor E-registration	Vendor to register via Enppi website – Evaluate vendors via internet



## Q E H S Management Systems

In line with our commitment to continuous growth and sustainable development for the future, Enppi works in the best possible manner to balance Quality, Environment, Energy and Health & Safety (QEHS) considerations into our daily business decisions and operations.

Enppi achieved certification to the revised standard ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007 as well as the new standard ISO 50001:2011 for energy management system and API Spec Q1 for quality management system in petroleum, petrochemicals and natural gas industries



All our operations are covered by

- ISO 9001
- ISO 14001
- ISO 50001
- OHSAS 18001
- API Spec Q1

## Quality Management System -QMS-

In compliance with the needs defined by the international codes and standards and in order to achieve a competitive edge in the global oil and gas sector, Enppi moves towards expanding alliances with its customers to continually boost productivity and keep our projects on-schedule and within budget aiming to achieve customer satisfaction.

Our applied Quality Management Systems provide strict controls, monitor work, track projects and streamline procurement and materials management activity.

The acquisition of globally acknowledged certification/accreditation is a crucial step toward continual improvement for achieving customer satisfaction through providing high quality services with time commitment and at competitive cost.

It is worth mentioning that Enppi has established a quality management system certified to ISO 9001 since 1995 . Recently, in 2014, Enppi has acquired API spec Q1 certification from the American Petroleum Institute as sector specific certification for Quality Management System for oil and gas companies to become one of the leading companies in the world to be certified to these international standards.

For every project the company executes, QMS covers the following:

- Issuing Project Quality Plan.
- Developing Project KPIs.
- QMS auditing.

Enppi takes an additional responsibility in encouraging customers, suppliers and contractors to consider the QMS requirements in their activities.

Also, Enppi offers a wide range of QMS consultation and training services related to:

- ISO 9001 requirements.
- Quality management system auditing.
- API spec. Q1 requirements.
- Self-assessment.
- Documentation management.



## Environmental Management System (EMS)

As a part of Enppi's contribution towards sustainable development, Enppi has established, implemented and maintained an environmental management system as per ISO 14001: The system objectives are compliance with all applicable environmental legal and other requirements, minimizing pollution and reduction of resources. For every project the company executes, the EMS covers the following:

- Establishment and implementation of environmental policy and objectives.
- Aspects/impacts analysis.
- Identification of legal and other requirements.
- Development and implementation of environmental management programs.
- Emergency preparedness and response.
- Environmental management system auditing.

Enppi takes an additional responsibility in encouraging customers, suppliers and contractors to consider the environmental impacts of their activities, mainly through the following means:

- Organizing and conducting awareness sessions/courses.
- Requesting suppliers and contractors to declare their environmental policies and commitment to environmental protection.
- Following up supplier/contractor implementation of environmental management programs.
- Taking a leading role with customers to design environmentally friendly projects.

Enppi also has wide experience in EMS related services as awareness and training, environmental monitoring, environmental assessment, environmental management systems auditing and environmental performance evaluation.



## Health & Safety Management System (HSMS)

Enppi recognizes the importance of protecting the health and safety of its employees, customers, suppliers and contractors personnel within work premises over which it has control. Enppi implements and continually improves a health and safety management system in accordance with OHSAS 18001 to achieve improvement in the overall company health and safety performance, including prevention of injury and ill health. For every project the company executes, HSMS covers the following:

- Establishment and implementation of Health & Safety policy and objectives.
- Provision of safe working environment.
- Hazards identification.
- Risk assessment.
- Implementation of necessary control measures to ensure that risks are reduced as low as reasonably practicable.
- Identification and compliance with applicable Health & Safety legal and other requirements.
- Development and implementation of Health & Safety management programs.
- Emergency preparedness and response.
- Encouragement of customers, suppliers and contractors to consider Health & Safety requirement in their activities.
- HSMS auditing.
- Quantitative risk analysis using “PHAST Software/ Fault Tree Analysis and Event Tree Analysis”.
- Qualitative risk analysis by HAZOP review, FMEA technique.
- Perform safety audits.
- Provide training courses related to health and safety:
  - » OHSAS 18001 requirements
  - » Loss prevention
  - » HAZOP (basic and advanced)
  - » Risk analysis techniques
  - » Fire protection systems
  - » Hazardous area classification
  - » Detection and alarm systems
- Preparation of Safety case studies.

Related Services provided by Enppi can be summarized as follows:

- Design of fire protection systems.
- Review plot plans (layout with respect to safety distance and prevailing wind).



## Energy Management System (EnMS)

In terms of Enppi role as a leader in the field of projects in the region and in line with our responsibilities toward the community and in order to keep pace with global and national trends for energy conservation, Enppi has developed, implemented and maintained EnMS as per the international standard ISO 50001 and became the first company in Egypt acquiring an accredited ISO 50001 certificate.



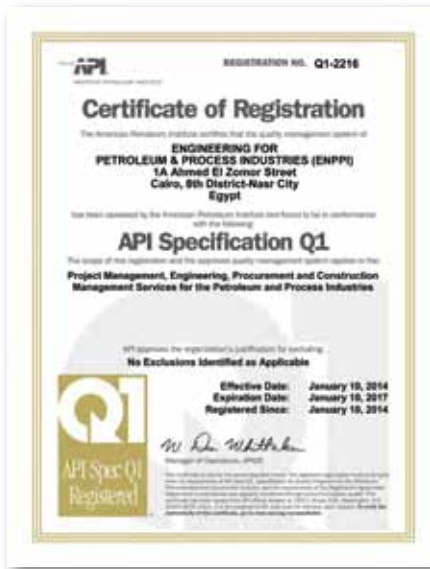
For every project the company executes, the EnMS covers the following:

- Establishment and implementation of energy policy and objectives.
- Consider energy performance improvement opportunities in the Design and Procurement activities.
- Energy use/consumption analysis.
- Identification of legal and other requirements.
- Development and implementation of energy action plan.
- Enppi takes an additional responsibility in encouraging customers, suppliers and contractors to consider the EnMS requirements in their activities.
- Energy Auditing.

Related Services provided by Enppi can be summarized as follows:

- Assist in establishing, implementing and maintaining energy management systems.
- Conduct Energy Reviews.
- Assist in issuing energy Baseline.
- Assist in Establishing Energy Objectives, Targets and Action Plans
- Assist in issuance of EnPIs for monitoring and measuring performance
- Assist in prioritizing opportunities for improvement through application of new technologies or process modifications.
- Designing and procurement for renewable energy technologies.
- Assist in establishing operational controls.
- Conducting Training Courses, Workshops and Awareness Sessions.
- Conducting Energy Management System Audits.





# Enppi



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