

The Role of Engineering in the Development of Oil Refining Projects



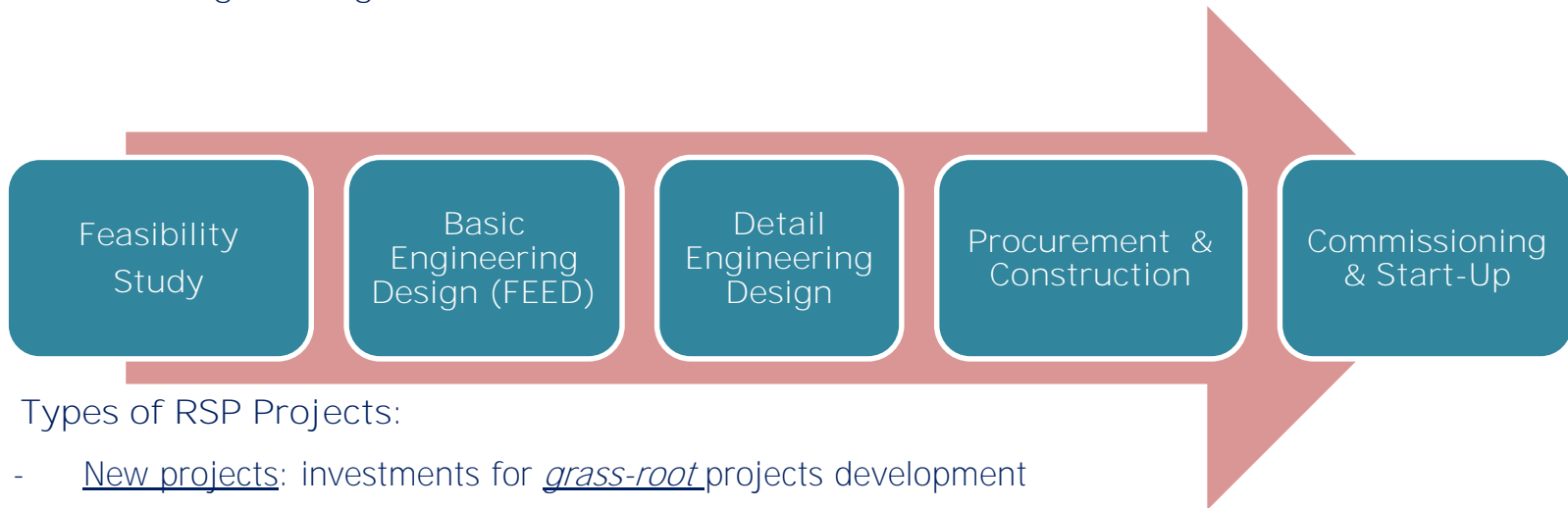
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1. Oil Refining and Storage Plants (RSPs)

- Target: development of Refining and Storage Plants (RSPs) capable to produce and deliver oil products in competitive and beneficiary prices
- Technical Aspects: design, construction and operation of process and mechanical facilities for the production and transportation of oil products (process units, storage tanks, truck loadings, interconnection pipelines, etc.)
- Market Considerations: establishment of economies of scale, security of supply, consideration of oil prices and adjustment of production/commercial policies according to the demand/supply needs of energy market
- Main Requirements for RSPs realization:
 - Application of high standards and best practices for Safety and Quality
 - Compliance with Environmental regulations and laws
 - Successful Engineering Design for cost-effective and timely construction
 - Minimization of design, construction and operation Risks
 - Flexibility in operation
 - Provision for new technologies and innovations

2. The Frame of Engineering Services for RSP Projects

➤ Chain of Engineering:



➤ Types of RSP Projects:

- New projects: investments for grass-root projects development
- Revamping : retrofit of aged or energy/cost consuming facilities and units
- Expansion: addition of new units for increase in capacity and efficiency of existing plants
- Integration: extent of production to new products, increase of performance, flexibility and diversification
- Cost of Engineering Services: corresponds to 6-15% of a RSP investment cost. The lower value corresponds to grass-root storage facilities, while the higher value to revamps of refinery units.

➤ The Nature of Projects: multidisciplinary and long term projects of high complexity

3. Engineering Services for RSP Projects

- Project and Engineering Management
- Quality Management
- HSE Management
- Permitting and Environmental Impacts Studies
- Feasibility and Techno-Economical Studies
- Front-End-Engineering-Design (FEED)
- Project Risk Analysis
- Process Simulation and Design
- Qualitative/Quantitative Risk Assessments
- Civil and Structural Engineering
- Geological, Geotechnical and Seismic Design
- Topographical and Surveying studies
- Site Development Engineering
- Design of Mechanical Equipment
- Piping Design and Stress Analysis
- Electrical Engineering
- Instrumentation and Control (I&C)
- SCADA and Telecommunication
- Surge Protection and Grounding
- Cathodic Protection and Anti-Corrosion design
- Safety and HAZOP / HAZID / SIL studies
- Material Requisitions and Data Sheets
- Erection Requisitions
- Technical Specifications
- Project Cost estimation (CAPEX-OPEX)
- ITB packages preparation
- Procurement and Inspection
- Construction Supervision
- Pre-commissioning and Start-Up

4. Factors for Engineering Success

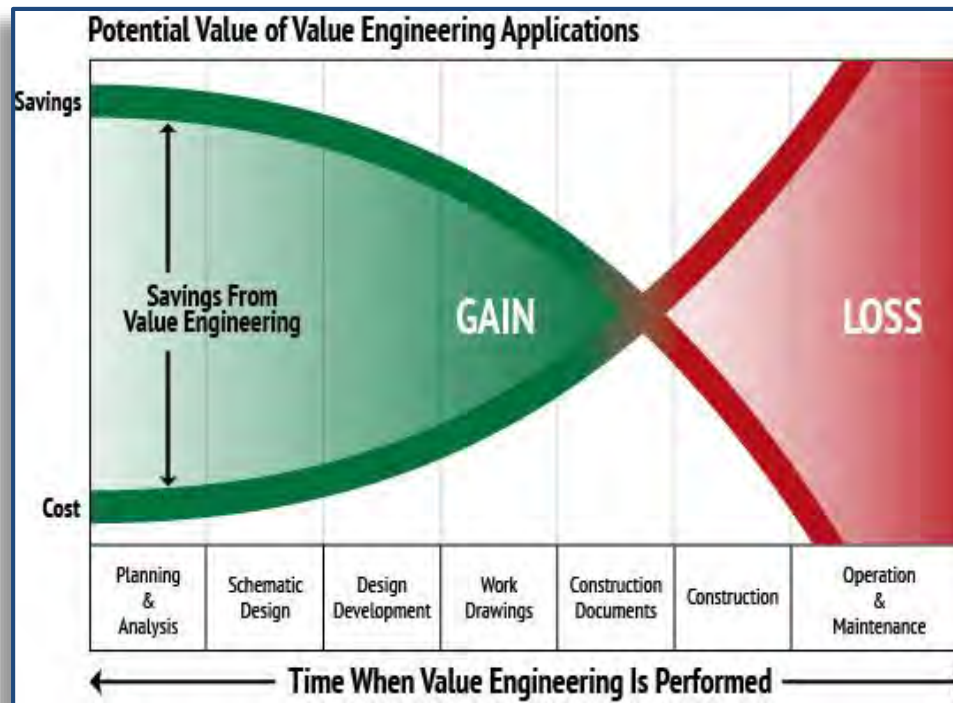
- Safety considerations from the Design phase allows:
 - Alignment of design to high safety standards **to achieve** *zero accident* technical solutions
 - **Prevention of design likely to cause** failures and damages to plant equipment
 - Introduction of industrial control technologies to increase plant reliability and emergency performance
 - Minimization of product loss, shutdowns, restoration and insurance costs

Safety Efficient Design Ensures Human & Environment Protection and Plant Integrity

- Permitting: project permits and licenses are critical for the project to be *legally compliant for construction*. Permitting, being a complex and time consuming process, requires organization, consistent follow-up and knowledge of legislation and public authorities
- Time and Quality: Optimum time and quality management in the engineering phase *prevents delays and cost increase* in the overall project execution
- Long Lead Items (LLI): the evaluation/procurement of LLI, running in parallel during the early phase of design and prior to construction can drive to *on time completion* of project execution plan
- Low Cost Engineering: the engineering design outcome is cornerstone for successful RSP projects development. Low cost and/or limited time engineering *increases the uncertainty* for provision of poor quality services, redesign effects and multiple **project's** time/cost deviations.

4. Factors for Engineering **Success (cont'd)**

- Value Engineering: enables compliance to investment and budgetary constraints, cost-effective solutions, optimization of operation philosophy and flexibility, *reduced procurement and construction cost*
- Risk Management: the understanding and proper handling of the RSP project risks enables *accurate estimation of project costs and contingencies*, reduces the design changes, prevents planning and progress deviations and prefigures the remedial actions.



5. Technological Challenges in Oil Refining Projects

- Energy Efficiency, Optimization and cost saving opportunities in oil refining. The increased energy performance can drastically support the high competitiveness of refining processes.
- Safety Life-Cycle approaches starting from the design phase, continuing in the construction/commissioning and maintained in the operation and of the plants.
- Environmental Regulations policies, meeting the new requirements defined by the local and/or European Laws, like Low-Sulfur contents in Marine Fuels from 2020.
- **Materials'** Technology and selection for the special aggressive conditions in refinery processes (hydrogen attack, corrosiveness).
- Digitalization & Information Systems to be applied in the plants design and operation, e.g. Top Management Information, Asset Management, Predictive Maintenance, Advanced Control and Training, etc.
- Application of updated European and International Codes & Standards in the design, operation and maintenance of refineries.
- The Knowledge Management policy of the companies and the operators, as a main issue to deal with all processes of a plants.

6. The Contribution of ASPROFOS

➤ ASPROFOS Engineering S.A. :

- The Leading, and largest engineering consultancy company in Greece
- Member of the Hellenic Petroleum (HEL.PE.) Group of Companies
- **With over 34 years' experience in projects of Oil and Gas**

➤ Provides:

- Integrated consulting / engineering services from the very concept to the final start-up activities
- Project Management services for large scale projects
- Extensive know-how in all phases of highly complexity projects
- Highly skilled and experienced personnel
- Cost effective solutions with appropriate value engineering considerations
- An established extensive list of Oil and Gas project references
- One-stop-shop services, from acquiring permits to final start-up

7. Main References, Registrations of ASPROFOS

Main References of Asprofos

- Modernization and revamping of HEL.PE. refining and storage facilities
- Execution of refining and storage facilities investments of HEL.PE. subsidiaries in Balkan Countries
- Execution of refinery projects in Balkan: Serbia (NIS), Croatia (INA, VITOL)
- Projects in Oil & Gas sector in Cyprus, Jordan(JPRC), Sri Lanka (CPC)
- Management, design, construction supervision and development of Natural Gas pipelines and LNG facilities in Greece
- Engineering, Permitting, Environmental and Social Impact Studies for the of TAP (Trans Adriatic Pipeline)

12million man-hours technical services in:

- Grass-Root process units
- Main revamp projects
- High & medium pressure N.G. pipelines

Main Registrations of Asprofos

Kuwait National Petroleum Company (KNPC)

Kuwait Oil Company (KOC)

Abu Dhabi Company for Onshore Petroleum Operations (ADCO)

Egyptian General Petroleum Corporation (EGPC)

SABIC – Petrochemicals Saudi Arabia

MOL Hungary

Qatar Petroleum

TUPRAS

8. Conclusions

- The proper establishment and execution of the Engineering increases the efficiency of the investment and provides added value
- The prompt involvement of an Experienced Engineering Company minimizes the risks of the project
- Refineries & Storage Facilities Operators must invest on highly-skilled & Tech Engineering to keep their facilities up-to date and to deal with the challenges of the market

ASPROFOS is a reliable partner in providing Engineering & Consultancy
in
Oil & Gas sector of SE Europe

**Thank you very much
for your attention !**



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