



Kinetics Process Improvements, Inc.

KPI SERVICE PROFILE AMMONIA & METHANOL PLANTS

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KPI, Inc.

16000, Park Ten Pl.,
Suite#903
Houston, TX-77084
USA

Phone: (281) 773-1629
Fax: (832) 565-9360
Email: process@kpieng.com



Attachments

- I. KPI Services
- II. Specific Experience in Ammonia Plants
- III. Specific Experience in Methanol Plants
- IV. Specific Experience as "Owner's Engineers/ Project feasibilities"
- V. Design & Engineering tools
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Kinetics Process Improvements, Inc.

ATTACHMENT-I **KPI Services**

KPI is an independent consulting and engineering group based in Houston since 2006 with an expertise in Ammonia, Methanol & light olefins-based Petrochemicals facilities.

Our key services include:

- I. **Supporting new project development** with project feasibility, Technology sourcing/evaluation, Project risk assessment, review of Licensing/BEP/Off-take Agreements, Initial cost estimates, and economics, developing project scope definition for Licensors, EPC and also support during the project execution phase with critical reviews as “**Owner’s Engineers**”. Successfully performed ‘Owner’s Engineers’ role for more than six projects.
- II. **Supporting existing facilities** with cost effective and practical solutions to troubleshoot & improve the capacity, efficiency, reliability, and Carbon footprint using our independent analysis & tools. Many successful operating references with over 150 revamps studies and upgrades completed globally.
- III. **Providing comprehensive and custom training-** Ammonia, Methanol & Ethylene plants. Completed custom training for more than 600 candidates for major producers.

In the past 16 years, KPI has completed over 150 different projects globally with Ammonia and Methanol producers and project developers. The Ammonia producers included CFI, Yara, Nutrien, OCI, Dyno Nobel, SABIC, LSB, Incitec, Caribbean Nitrogen, N2000, AUM, PLNL, etc. The Methanol related producers included Methanex, Celanese, Methanol Holdings, SABIC, AMPCO, Chemanol, Natgasoline, & Syngas Energy etc.

Our **experience in Ammonia and Methanol** spans in Technology, design/engineering/operations, Critical design reviews, Risk assessment, Techno-Economic project analysis, Feasibility studies, Troubleshooting, reducing Carbon foot print, Reliability improvements & Training from small to mega plants with all the latest configurations all major licensors including KBR, Uhde/TK, Topsoe, Casale, Linde for Ammonia and Air-liquide/Lurgi, Topsoe, JM for Methanol. ***[We carried out over a dozen studies for production of Blue, Green Ammonia including their integration with existing plants to reduce CO2 footprint with and without incremental production. In addition to this, we also carried out several engineering & economic studies for the CO2 capture (from flue gas & process) with supercritical Compression for sequestration]***

We conducted customized training (~700 candidates) for all major Ammonia & Methanol producers.

We have the proven design and economic-analysis tools to carry out an independent and critical project, design and risks reviews. Our design tools include Process Simulation modeling, Reactor kinetic models, Equipment Sizing/rating, Cost Estimation, Economic modeling for project IRR/Cash-flow analysis etc.



Kinetics Process Improvements, Inc.

ATTACHMENT-II

Specific Experience in Ammonia Plants

- **Revamp study from 2425 to 3000 & 3100 stpd** including Cost estimate with preliminary engg. (Uhde/TK)
 - **Revamp study from 1750 to 1950 stpd** with cost estimate (KBR) *successfully implemented in parts*
 - **Revamp study from 1100 to 1550 stpd** – (KBR) *successfully implemented*
- Most of the Revamp Studies also included Budgetary Cost Estimates in KPI's scope*
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- Revamp Study **to integrate gH₂ & gO₂** with incremental capacity increase in existing 1800 stpd Ammonia Plant (KBR)
 - Revamp Study **to integrate gH₂ & gO₂** with incremental capacity increase in existing 2425 stpd Ammonia Plant (KBR)
 - Revamp Study **to convert two existing Ammonia Plants to gNH₃ using gH₂ & replacing with Electric drivers (1650 mtpd)-** (KBR & Topsoe)
 - Comprehensive design review of a new Ammonia Synloop & its offsites using pure H₂ & N₂ for 1630 mtpd Ammonia plant (Casale)
 - Process evaluation of KAAP converter performance to maximize/optimize Ammonia production (KBR)
 - Techno-Economic study of Green Ammonia for US location- including Electrolyzer for H₂ (1000 mtpd x 3 & 3000 mtpd)
 - Techno-Economic Study of Green Ammonia for Saudi location- using Electrolyzed H₂ & Pipeline Cryo-Nitrogen (400 mtpd & 700 mtpd)
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- Design Review of new **Ammonia plant using Petcoke + Bio-Feed** with a net zero CO₂ emissions (Casale Synloop)
 - Design Review for **conversion of existing Ammonia plant feed from gas to coal**
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- Revamp study- **aMDEA CO₂-R** system to reduce CO₂ slip from 3000 to <300 ppmv (single stg- KBR/BASF- 1200 stpd Ammonia) *(Successfully implemented with less than 100 ppmv CO₂ slippage for 1200 tpd plant)*
 - Revamp study- **aMDEA CO₂-R** system (2800 stpd to 3000 tpd, two-stage with re-absorber) (Uhde/TK & BASF)
 - Revamp study- **aMDEA CO₂-R** system to reduce high CO₂ slip (2500 tpd, two-stage system) (KBR/BASF)
 - Revamp study- **aMDEA CO₂-R** system (1750 tpd to 1950 tpd, single-stage with LP flash) *successfully implemented*
 - Conversion study- **MEA to aMDEA CO₂-R** system (500 tpd, single-stage) *successfully implemented*
 - Process study & basic engineering for the conversion of an existing single-stage **aMDEA CO₂-R** system to two-stage design (KBR/BASF)
 - Revamp study, design, engineering & supply to troubleshoot **Benfield CO₂-R** system in two different 2100 stpd plants *(Big success at a fractional cost compared to the Licensor's option)* (KBR/UOP)
 - Revamp Study and PDP of **Benfield CO₂-R** system (2100 mtpd Ammonia)- *successfully implemented & presented* (Uhde/TK & UOP)
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- Revamp study of Reformer to replace **Convection section** -process & thermal design with new specs 1200 stpd Ammonia plant (KBR)
 - Revamp study of Reformer **Radiant Re-harping**- provided new radiant coil design & preliminary specs with capacity upgrade (KBR)
 - Revamp study of Reformer **Convection section** for TMT and metallurgy upgrades with cost estimate (Uhde/TK) 2425 stpd Ammonia plant
 - Revamp study of Reformer **Radiant & Convection sections** for capacity upgrade with cost estimate (KBR) 1800 stpd Ammonia plant
 - Engineering Study + cost estimate to reduce firing and CO₂ emissions in Primary Reformer using an **electric pre-reformer (Topsoe)**
 - Engineering Study + cost estimate to reduce firing and CO₂ emissions in Primary Reformer **by re-purposing convection coils (Topsoe)**
 - Revamp study of Reforming section with addition of integrated suction chiller for 4 Ammonia plants (3 KBR, 1 Uhde/TK)
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- Revamp of Molecular Sieve systems in two plants to increase the life of Mol. Sieve – 2 yrs to 7+ years (KBR) 1800 stpd- *successfully implemented*
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- Detailed Evaluation of Technology for licensor selection from 4 Licensors for Saudi location (Uhde/Topsoe/KBR/Linde) **[as 'Owner's Engineer']**
 - Performance Audit Study with improvements for 1750 stpd Ammonia plant (KBR design)
 - Performance Audit Study with improvements for 1800 stpd Ammonia plant (KBR design)
 - Performance Audit Study with improvements for 1850 stpd Ammonia plant (KBR design)
 - Performance Audit Study with improvements for 2750 stpd Ammonia plant (KBR design)
 - Performance Audit Study with improvements of 2800 stpd Ammonia plant (Uhde/TK design)
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- Engineering study to produce Ammonia using off-gases from Methanol/CO plant with cost estimates (**Topsoe**)
 - Engineering study to produce Ammonia using off-gases from Methanol plant with cost estimates (JM)
 - Engineering study to produce Ammonia using off-gases from Ethane Cracker with cost estimates (Lummus)
 - Engineering study to produce Ammonia using off-gases from PDH with cost estimates (Lummus)
-
- Engineering Study + Cost Estimate for **CO₂ (Compression & Dehydration)** for four different NH₃ plants
 - Engineering Study + Cost Estimate for **CO₂ (Compression + Dehydration)** system (3000 tpd CO₂ x 2 trains)
 - Engineering Study + Cost Estimate for **CO₂ (Compression + Dehydration)** system (3900 tpd CO₂)
 - Engineering Study- **400 & 1200 stpd CO₂ capture from Reformer Flue gas** with Cost estimate
- [as 'Owner's Engineer']**
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- Provided **3 days of customized 'Ammonia plant training'** for >650 'Process and Plant Engineers/Operations' since 2006
 - **Three Patents for Ammonia Process Improvements & decarb** (assigned in Sept 2017, 2019, and 2021) + one pending



ATTACHMENT-III

Specific Experience in Methanol Plants

- Owner's Consultant for 5400 tpd Methanol, CO and Acetic Acid Plants - Saudi Arabia
- Revamp study to expand Methanol capacity using CO₂ injection- 2300 tpd to 2750 tpd- Saudi Arabia
- Implementation with performance review of Methanol upgrade (2300 to 2750 stpd)- Saudi Arabia
- Revamp study of 2500 tpd to 3000 tpd Methanol plant-Chile
- Revamp study 1200 to 1550 tpd Methanol plant using CO₂ injection-USA
- Led Design & Engineering of 800 tpd Ammonia converted to 1900 tpd Ammonia plant- USA
- Design rating of an Old Methanol plant relocation for new conditions & a new Reformer (USA)
- Revamp study of Methanol Reformer for Reliability & capacity upgrade (USA, Trinidad, Saudi)
- Revamp study of Methanol Reformer for feedstock conversion- Natural gas to LPG (Saudi)
- Revamp study of Methanol plant to co-produce Ammonia (Saudi, USA)
- Independent evaluation of Methanol Technologies of Licensors for a new project in Saudi location
- Small Methanol plant design development (300 tpd) with cost estimates- USA
- Audit Study with improvements in reliability and efficiency of 1500 stpd Methanol plant-USA
- Revamp study to upgrade the Methanol loop with new Steam raising converters
- Revamp study to upgrade the Methanol purification system to minimize effluent streams (USA)
- Study to produce Ammonia using off-gases from 700 tpd Methanol plant & its upgrade (Saudi)
- Engineering studies for conversion of 5 different Ammonia Plants to Methanol plants- USA
- Feasibility study of 5000 tpd Methanol plant with Acetic Acid & other derivatives- Trinidad
- Feasibility study of 5400 tpd Methanol plant- USA
- Design review of a Coal to Ammonia/Methanol study- USA
- **Pre-feasibility with process modeling of 500 mtpd green Methanol Synloop using gH₂ & CO₂ - USA**
- Sourcing & Evaluation of Methanol Rector system from China (for a US project)
- Methanol & Ammonia plant training (customized) for more than 600 Process/Operations Engineers (*Small to World-scale plants including ATR*) (USA, Saudi Arabia, Trinidad, Equatorial Guinea)



Kinetics Process Improvements, Inc.

ATTACHMENT- IV

Specific Experience as “Owner’s Engineers”/Project Feasibility- Petrochemicals, Ammonia & Methanol Plants- with Green & Blue options to Decarbonize

KPI team worked as “Owner’s Engineers” for several projects (*refer a partial list below*) and carried out a number of pre-feasibility studies of several Petrochemicals and Syngas derivatives projects (including Green & Blue Ammonia, CO₂ Capture-Compression & Dehydration) in the US, Saudi Arabia, Trinidad, & India. Our services included:

- *Early Project definition and facilitation with various licensors*
- *Analysis and Feasibility for optimum Products & Project configuration*
- *Techno-Economic Evaluation, Due diligence with Risk Assessment/mitigation*
- *Sourcing, Evaluating & Negotiating the Specialty Technology & Other Licenses*
- *Initial Capital Cost estimates*
- *Project Rate of Return Analysis using our in-house Economic models*
- *Project Scoping Definition*
- *RFQ & ITB review/recommendations of Licensors/E&Cs*
- *Facilitating technology partners & review of project Partnership arrangements*

A partial list of projects and handled are listed below:

- ✓ **From 2006 to 2010, KPI played a key role (as Owner’s Engineers) in developing a world scale Acrylic Acid/Esters project (~ 1.7 billion USD) for a Saudi company (D7 Petrochem).** KPI’s scope included sourcing, evaluating technologies, due diligence/risk assessment followed by review & negotiation of all the six license/BEP agreements (*with Dow, Topsoe & Huiy*) as well as review of Feedstock agreements (*with ARAMCO/ SATORP, SABIC & others*) including preparation of site allocation package with plot plan & environmental items for *Royal Commission*. Initial Project capital cost estimate with project returns for SIDF & other potential lenders. In the next phase, our scope included to lead all the six Basic design packages, followed by Basic design package of Propylene export terminal near Jubail (Saudi Arabia)
- ✓ Owner’s Engineers for a new Ammonia Plant of 400/700 MTPD using off-gases from Methanol/ CO plants (Saudi Arabia)
- ✓ Methanol derivatives project feasibility for Methanol producer in Trinidad- including Acet Acid, POM, DMF, Mixed Amines
- ✓ Various Petrochemicals feasibilities for Advance Petrochemicals Co- Saudi Arabia
- ✓ Acrylic Acid & Oxo project feasibility- India
- ✓ Carbon black, DMDS & LABSA feasibilities Advance Petrochemicals, Saudi Arabia
- ✓ Propane Dehydrogenation (PDH) project feasibility & design reviews- Saudi Arabia
- ✓ C3 derivatives project feasibility for Chemanol, Saudi + JV partner facilitation
- ✓ Feasibility of Natural Gas-Syngas to Ethanol for Saudi location
- ✓ Consultant for new PDH project- 650 KTA Propylene capacity (Saudi Arabia)
- ✓ Owner’s consultant to upgrade Old Methanol plant along with a new Reformer & purification section (USA)
- ✓ Pre-feasibility of Ethanol plant & derivatives via reforming of Natural gas (Saudi Arabia)
- ✓ Pre-feasibility of Ethylene Oxide & specialty derivatives (Saudi Arabia)

GREEN AMMONIA

- ✓ **Green Ammonia feasibility with Cost estimates for Chemanol (400/700 mtpd)-Saudi**
- ✓ **Green Ammonia pre-feasibility-1000 mtpd (USA)**
- ✓ **Green Ammonia pre-feasibility-3000 mtpd (USA)**

BLUE AMMONIA

- ✓ Engineering Study-CO₂ capture from Reformer Flue gas + Clean-up & Compression (with Cost estimate)- USGC location
- ✓ Engineering Study to integrate Green Electrolysis H₂ in Ammonia Plant (1800 STPD)- USA
- ✓ Engineering Study + Cost Estimate for CO₂ Compression & Dehydration & CWT system (3000 tpd CO₂ x 2 trains)- USA
- ✓ Procurement quality specs for CO₂ Compressors, motors & LO/SO system for a CCS project (3000 tpd CO₂)- USA
- ✓ Engineering Study + Cost Estimate for CO₂ (Compression & Dehydration) system (2200 tpd CO₂)- USA



Kinetics Process Improvements, Inc.

ATTACHMENT-V

Process Design, Modeling, Sizing & Engineering Tools

• Process

Our Process & Kinetic models are well tested & proven with actual performance in many Ammonia & Methanol plants

- Proven and tested Simulation models for Ammonia & Methanol plants:
 - **Complete Ammonia, Methanol Plants** of all configurations including ATR (**PROII, DESIGN II, VMG**)
 - Kinetic model for Ammonia & Methanol converter performance & catalyst estimates (**MATLAB- In-house**)
 - Rate based model for CO₂ removal systems (**Protreat** for **aMDEA, Benfield** & related solvent combinations)
 - Steam Reforming model- thermal rating and sizing (**PFR-** commercial software)
 - Glycol based dehydration system (**Protreat & VMG**)
- Rigorous **Steam System model** with built-in steam properties & macro driven modules for steam turbines, WHB etc.
- Rigorous **NH₃ Refrigeration System model** with built-in Ammonia properties & macro driven modules of Compressor/Flashes
- Rigorous **Molecular-Sieve System model** for 13X & 4A Mol Sieves-with built-in properties & macros
- Sizing & Rating of Heat Exchangers/Air-Coolers (HTFS, HTRI)
- Combustion & Efficiency estimate of Reformers & Fired Heaters (in-house)
- Ethane & Propane Refrigeration System with built-in properties & macro driven modules of Compressor/Flashes
- Estimation of Steam rates for Steam Turbines (in-house)
- Rating of Cooling Tower (in-house & CTI)
- Sizing of Packed and Trayed Columns (Simulators & of different vendors)
- The pressure drops across the Catalyst beds (in-house)
- Hydraulics of Pump/piping loops and power estimate (in-house)
- Piping network Hydraulic model (KORF, in-house)
- Flare system modeling
- Relief System design per API codes
- Control valve, Orifice & RV sizing (in-house, vendor)
- Rating of Centrifugal/Recip/Screw Compressors (in-house & of vendors)
- Sizing and rating of Two & Three phase Separators (in-house)
- Plus, many more in-house Process and Engineering design programs

• Project Economics & Cost Estimate

- Rigorous Project Economic Model for NPV & IRR estimate (in-house)
- Aspen K-Base for Cost Estimation (and in-house cost database)

• Mechanical

- AutoCAD & 3D Navisworks
- CADWorx for Plant 3D modeling
- Ceaser II for Piping Stress Analysis
- STADD for Steel Structure
- PV Elite, Code ware & COMPRESS for Static Equipment design



Kinetics Process Improvements, Inc.

ATTACHMENT-VI

KPI References (partial)

Clients Served:

- | | |
|--|---|
| • ABB Lummus Global, USA | • Modi group, India |
| • American Acryls, USA | • Chemanol, Saudi Arabia |
| • BP Gas Company, Trinidad | • N2000, Trinidad |
| • Dammam 7 Petrochemicals, Saudi Arabia | • Mustang Engineering, USA |
| • Injaz Petrochemicals, Saudi Arabia | • YPFB Fertilizers, Bolivia |
| • Hovensa Refinery, USA | • QAFCO, Qatar |
| • Ar-razi/SABIC, Saudi Arabia | • Saudi Chevron, Saudi Arabia |
| • Saudi Methanol, Saudi Arabia | • Phoenix Park Gas Processing, Trinidad |
| • Tasnee Petrochemicals, Saudi Arabia | • Syngas Corporation, USA |
| • Larsen & Tuboro, India | • Ascend Performance Materials, USA |
| • Medra Arabia, Saudi Arabia | • Texas Petrochemicals, USA |
| • SNC-LAVALIN, Canada | • Mosaic Company, USA |
| • Caribbean Nitrogen Company, Trinidad | • Advansix/Honeywell, USA |
| • Proman, Trinidad | • Celanese, USA |
| • CB&I, USA | • BASF, USA |
| • Koppers, Inc., USA | • Dow Chemicals, USA |
| • Advance Petrochemical Co, Saudi Arabia | • Yara, Australia |
| • CF Industries, Donaldsonville/Port Neal/Yazoo, USA | • Yara, Canada |
| • Methanol Holdings Company, Trinidad | • LSB Industries, USA |
| • Ejmal Petrochemicals, Saudi Arabia | • Dyno Noble, USA |
| • Nutrien, Trinidad | • IFCO/OCI, USA |
| • Methanex, Trinidad | • Natgasoline- Proman/OCI, USA |
| • Lummus, Saudi Arabia | • AMPCO Methanol, Equatorial Guinea |
| • Ibn Rushd/SABIC, Saudi Arabia | • Medra Arabia, Saudi Arabia |
| • Ibn-Zahr/SABIC, Saudi Arabia | • Eolic Green Ammonia, USA |
| • Al-Bayrouni/SABIC, Saudi Arabia | • Natgasoline, LLC, USA |
| • OCI, Netherland | |
| • PLNL, Trinidad | |

Jobs Completed:

- Lead role in the project development of Acrylic Acid/Esters including Butanol/Syngas & Utilities including technology sourcing, selection, risk assessment and negotiation of all three licensed Technology & Basic Engineering agreements (Saudi Arabia)
- Supervision, Improvements, and Management of Basic Engg for Acrylic acid/Esters including Butanols & Syngas (Saudi Arabia)
- Techno-Economic Evaluation of several Petrochemicals Projects- including Acrylic Acid/Esters, Acrylonitrile, PDH, Syngas for Oxo-alcohols, Carbon Black, Integrated Refinery & Petrochemicals (Saudi Arabia)
- Due diligence for a potential acquisition of LNG, NGL plant Licensor (USA)
- Review of Propylene Feedstock & Product off-take agreements (Saudi Arabia)
- Refinery Crude Fractionation Revamp & Energy Improvement study (USA)
- Refinery Delayed Coker gas plant Revamp study (USA)
- Process Design of a Gas Condensate Stabilizer (Aruba)
- Energy Improvement Study for a Thermal Oxidizer for Acrylic Acid plant (USA)
- Hydrogen plant simulation to support dynamic simulator for training (USA)
- Owner's Consultant for 5000 mtpd Methanol Plant +CO (ATR based) Saudi Arabia)
- PMC for a large Nitrogen generation system design and execution (Saudi Arabia)
- Feasibility study including a design review of a Coal to Ammonia/Methanol project (USA)
- Study for the conversion of an Ammonia plant feed from gas to coal (USA)
- Basic Engg to revamp single stage CO2 removal aMDEA system to two stages for an Ammonia plant (Simulated aMDEA)
- Ammonia plant training more than 500 plant Process/Operations Engineers (Trinidad, USA, Saudi)
- Methanol plant training for more than 175 plant Process/Operations Engineers (mid to Mega plants with ATR) (USA, Trinidad, SA)
- Nitric Acid Plant Training for over 30 Process/Operations Engineers (Trinidad)
- Urea Plant Training for 30 Process/Operations Engineers (Trinidad)
- Methanol Reformer training for SABIC Engineers- two weeks long covering all process/mechanical/inspection aspects (Saudi)
- Expert review of the Ammonia plant loop conversion from gas to coal feed (USA)
- Process development to produce Tar via thermal cracking of Pyrolysis Fuel Oil (USA)
- Study & Basic Engg for Methanol Plant Cooling water network to de-bottleneck production (Trinidad)
- Ammonia Plant troubleshooting study of Benfield Solution carry-over the problem to minimize production loss (Trinidad)
- Process & Startup advisory by KPI team of three Engineers for Metathesis & Polypropylene Plants start-up (Saudi Arabia)
- Consultant for the Propane Dehydrogenation Plant- 650 KTA Propylene capacity (Saudi Arabia)
- Engineering & Procurement of Column internals to troubleshoot Benfield system of two Ammonia Plants (2x2000 TPD, Trinidad)
- Propylene export & logistics (via port) expansion study including Marine loading with Cost estimate (Saudi Arabia)
- Due diligence study for a new acrylic acid & Ester's complex (India)
- Acrylic acid/Butanol plant Effluent treatment options study (Saudi Arabia)
- Pre-feasibility study of a new Oxo-Alcohol & Syngas plant with Capex & IRR sensitivity (India)
- Basic design package for Propylene transport, refrigeration, storage & export facility (Saudi Arabia)
- Tank farm basic design (Hydrocarbon and utilities storages) (Saudi Arabia)
- Review of design & operation of Molecular Sieve system to reduce pressure drop & improve sieve life
- Process design & costing of H2/CO plant using LPG feed as part of the Oxo-Alcohol unit (Saudi Arabia)
- Pre-feasibility study of Methanol Plant with Acetic Acid & other derivatives with Capex estimate (Trinidad)
- Customized Process Training of Melamine plant- for Process Engrs/Sr. Operating personnel (Eurotechnica Process)



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KPI References (partial) cont...

- Basic & Detail Engg with Supply of Internals of Molecular Sieve System for Two Ammonia Plants- 1750 TPD capacity (Trinidad)
- Process design improvement for SRU/TGTU- to meet emissions target (Bahrain)
- Feasibility Study for 5400 tpd Methanol plant (USA)
- Feasibility study for 5000 tpd Methanol with derivative plants (Trinidad)
- Basic Engg and FEED for 600 MMSCFD Gas Plant for high Ethane Recovery and Rejection (Trinidad)
- 600 MMSCFD Gas Plant for high Ethane Recovery and Rejection (Trinidad)
- Ammonia plant Seawater Cooling Tower and Cooling system revamp study & Engg study for higher capacity (Trinidad)
- License sourcing & Technology evaluation for a new Ammonia-Urea complex (Bolivia)
- Detail revamp study of two Ammonia Plants (1750 TPD)- to improve energy & capacity (Trinidad)
- Process study of Ammonia production using off-gases from Methanol & CO plants (Saudi Arabia & USA)
- Debottlenecking study of 600 MMSCFD Gas plant to significant improvement in C3 recovery (Trinidad)
- Owner's Engineers for a new Ammonia Plant of 400/700 MTPD using off-gases from Methanol & CO plants (Saudi Arabia)
- Independent design rating & review of an Old Methanol plant relocated to new conditions with a new Reformer (USA)
- Pre-feasibility of Ethanol plant & other derivatives via reforming route of Natural gas (Saudi Arabia)
- Pre-feasibility of Ethylene Oxide & specialty derivatives (Saudi Arabia)
- Basic & Detail Engineering- Gas plant revamp for additional C3 recovery (600 MMSCFD plant- Trinidad)
- Study & Basic Engg for Reformer Re-harpping to increase Ammonia production (USA)
- Troubleshooting & reliability improvements study for C4 Dehydrogenation facility (USA)
- Study & Basic Engineering for CO₂ system (aMDEA) to reduce high CO₂ slip in Ammonia Plant (USA)
- Troubleshooting and upgrading of an existing Scrubber system in Nitric Acid Plant for NO_x abatement (USA)
- Design of a new Acid Scrubber system for high-efficiency NO_x removal in Nitric Acid plant (USA)
- 600 MMSCFD Expander based gas plant upgrading study (Trinidad)
- Ammonia Plant Reformer Revamp with a new Convection Design Study (1200 stpd- Kellogg type Reformer) (USA)
- Ammonia Revamp study from 2800 stpd to 3100 stpd (USA)
- Ammonia Plant Revamp Engineering & Project Cost Estimate (3100 stpd) (USA)
- Ammonia Plant Cooling Water System upgrading study (USA)
- Two-stage aMDEA CO₂ Removal System Revamp study with cost estimates (3000 stpd) (USA)
- Audit Study of 1750 stpd Ammonia Plant (KBR design) (USA)
- Audit Study of 1850 stpd Ammonia Plant (KBR design) (USA)
- Troubleshooting Two-stage aMDEA System to reduce CO₂ slip from 3000 to <500 ppmv (2500 mtpd Ammonia plant- Nigeria)
- Revamp & upgrading of CO₂ Compressors for Urea Plant from 4600 stpd to 6000 stpd along with Cost Estimate (USA)
- Rerating of an old Primary Reformer of an Ammonia Plant with CO₂ addition (USA)
- Revamp Study of Benfield CO₂ Removal System for 2100 MTPD Ammonia Plant (Canada)
- Engineering study of large products/utilities Tanks to replace fuel gas with an inert system to reduce CO₂ emissions (Trinidad)
- Process Design Pkg of Revamped items following Benfield CO₂ Removal System for 2100 MTPD Ammonia Plant (Canada)
- Design, Sizing & Cost estimate of a new Mixed Feed convection coil for 2520 stpd Ammonia Plant Reformer (USA)
- Engineering Study for CO₂ capture from Reformer Flue gas + Clean-up & Compression to 2000 psi (USA)
- Engineering study of gH₂ addition to 2200 mtpd Ammonia plant (USA)
- Engineering Study to integrate Green Electrolysis H₂ in Ammonia Plant (1775 STPD)- USA
- Engineering Study + Cost Estimate for CO₂ (Compression & Dehydration) system (3000 tpd CO₂ x 2 trains)-USA
- Engineering Study with modeling to change MEA to aMDEA for CO₂ removal system of Ammonia Plant- USA
- Review of all major Purchase packages for CCS project (3000 tpd CO₂)-USA
- Engineering Study to reduce CO₂ emissions in Primary Reformer with an electric pre-reformer and patented schemes- Nigeria
- Audit and revamp study for 2800 stpd to 3100 tpd Ammonia plant (USA)
- Pre-FEED study for CO₂ Compression and dehydration (3900 stpd CO₂) from an Ammonia plant (USA)
- Upgrading of aMDEA CO₂ removal system for 1000 tpd Ammonia Plant (USA)
- Independent Process/Engg design review of new Ammonia Synloop with external pure H₂ & ASU N₂- 1630 mtpd (USA)
- Engineering study of gH₂ & gO₂ in 1800 stpd Ammonia plant for incremental capacity (USA)
- Engineering study of gH₂ in 2800 stpd Ammonia plant for incremental capacity and reduced CO₂ footprint (Nigeria)
- Troubleshooting study with modeling of Ammonia Synloop with new converter to resolve higher temperature issues (USA)
- Engg Study to convert two large Ammonia plant Synloops using clean H₂ and replacing steam to motor drives (Netherlands)
- Engineering study of gH₂ & gO₂ in 2425 stpd Ammonia plant for incremental capacity (USA)
- Review & evaluation of Capex reduction strategies and options of new Ammonia Synloop 1630 mtpd (USA)
- Techno-economic and pre-engineering study to improve C3 recovery for a 600 MMSCFD Turbo-expander Gas plant (Trinidad)
- Process Design Package for conversion of existing Ammonia plant to green Ammonia (Netherlands)



Kinetics Process Improvements, Inc.

ATTACHMENT-VIII
KPI Service Brochure

Link to KPI Brochure

KPI CONFIDENTIAL