

## Engineering Projects

Sr. No.	Project	Overview of Scope of Work
1	Basic Engineering Package for Crude Distillation Unit (CDU), Vacuum Distillation Unit (VDU) and SG Plant for a facility in the Middle East - KBC, UK	Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Column Hydraulics, Heat Exchanger Design in HTRI, Control Logic & Interlock Philosophy, Control Valve Hydraulics & Process Data Sheet, Line Sizing, Pressure Profile, Material Selection, Piping Class, Corrosion Allowance, Relief Valve. Identification & Process Data Sheet, Line List, Instrument Process Data Sheet.
2	Development of Basic Engineering Package of Propylene Recovery Unit (PRU) - Essar Refinery, India	Process Simulation Model of PRU in Aspen Plus (2004.1), Heat & Mass Balance, Process Flow Diagrams, Piping & Instrumentation Diagrams, Heating & Cooling Curves for Heat Exchangers, Column Sizing & Process Data Sheet for Columns.
3	Development of Basic Engineering Package for Condensate Recovery Unit - Oil and Natural Gas Corporation, India	Process Simulation Model in Hysys (2004.2), Heat & Mass Balance, Heat Exchanger Sizing.
4	Pump & Control Valve Hydraulics for DHT, Sour Crude & Vacuum Unit - Commonwealth Engineering, USA	P&ID review, Selection, Sizing and specifications of Control valves, Safety valves & Flow elements. Completed 60 Pump / Control Valve hydraulics in 10 days.
5	Detail engineering of delayed Coker unit- Commonwealth Engineering, USA	P&ID review, Selection, Sizing and specifications of Control valves, pump hydraulics, line list, equipment list, tie-in point, design of air coolers and heat exchangers, simulation support for detail engineering of delayed coker unit of an American refinery.
6	Revamp Study and Commissioning of Olefins Complex at IVOL, USA	Owner's Engineers for Revamp of Olefins Complex at IVOL, USA (onsite and offsite engineering support for revamping an Ethylene facility closed down for 15 years) Debottlenecking Simulation Engineering modifications of existing units Engineering of new units PSM PSV analysis Corrosion and inspection monitoring Construction supervision Operating Manuals new SOPs modification of existing SOPs Commissioning manuals Digitisation of P&ID(SP-PID conversion) Pre-commissioning and commissioning support Startup support Operations Excellence
7	DMIN-DI Water Unit Revamp Study at SABIC PETROKEMIA	Hydraulic Adequacy Check and Debottlenecking of DMIN Water Unit and RCA Troubleshooting of DI Water Unit
8	To Rate/Check the Existing Refineries (Nixon & Mermantau Refineries) for New Capacities – Lazarus Energy, USA	Simulation of two refineries in Aspen Plus (2004.1) for different capacities, Heat & Mass Balance, Equipment Adequacy checks viz., Furnaces, Columns, Pumps, Heat Exchangers (Air Cooled and Shell & Tube) & Vessels, Process Data Sheets for new equipments, Relief Valve & Flare Header Sizing, HAZOP, Process Flow Diagram (Mark up), Piping & Instrumentation Diagram (Mark up), Adequacy check of Package Units, assisting client in all Techno-Economic Activities.

9	Design of Anhydrous Ammonia Storage & Injection System – SA Kentz, Saudi Arabia	Design Basis, Process Description, Process Flow Diagram, Line Sizing, Piping & Instrumentation Diagram, Process Data Sheet for Ammonia Vessel, Instrument Process Data Schedule, Control & Interlock Philosophy, Safety Valve Sizing & Datasheet.
10	Cooling Tower Revamp Study	Project includes process study to evaluate LAB 1 Cooling Tower Revamp requirements at Farabi Petrochemicals plant in KSA.
11	Extended Basic Engineering for Propane Dehydrogenation (PDH) – Udhe India	Process Simulation Model in Aspen Plus (2006), Process Flow Diagrams, Line Sizing, Pump & Control Valve Hydraulics, Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheet, Heat Exchanger Design, Control Logic & Interlock Philosophy, Relief Load Analysis.
12	VC5+ stream Cracking Project - Eleme Petrochemicals Company, Nigeria	Process Design, Piping & Instrumentation Diagram, Fuel Oil Storage tank design, Adequacy check of control valve, pressure drop /hydraulics verification, Stress analysis of critical piping, ISBL piping support design drawing, Equipment construction drawing for tank, Civil foundation drawing.
13	Propane Dehydrogenation to Propylene ( PDH ) for Egypt client ( for Uhde )	Basic engineering
14	Propylene Splitter Unit for Essar Oil	Process Design Package
15	Poly Ethylene Plant for LyondellBasell	Basic Engineering
16	C4 Isomerisation Unit for China	Basic Engineering
17	Loss Identification Study and reduction of losses, for HPCL	Detailed study to reduce hydrocarbon losses
18	GRM Improvement Study for MRPL	Detailed study of many areas, including operation, crude procurement, energy optimization, Fuel and Loss etc
19	AGU Field Oil & Gas Company, Nigeria	Process simulation model, Heat & Mass Balance, Configuration of gas-oil-water separation system, Pressure sensitivity study on separation, Multiple cases for wellhead flows, Selection of most feasible option, Stabilizer requirement.
20	Basic & Detail Engineering of Ammonia Flare - PPL, India	Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Flare Design, Dispersion Modeling, Line Sizing, Pressure Profile, Material Selection, Piping Class, Corrosion Allowance, Relief Valve.
21	Thermal Design of Fired Heaters- Uhde India	Thermal design of seven fired heaters for an Indian Refinery. Job involved conceptualization and development of seven fired heaters for Naphtha hydrotreater and Continuous catalytic reforming unit. Developed API-560 datasheets for vertical cylindrical, Arbor and box type heaters. Also developed API-560 datasheets for ID/FD fans and air preheater.
22	Thermal Design of Heat exchangers for an Indian refinery- Chemtex India	Job involved thermal design and support to mechanical/fabrication team for 11 heat exchangers in SRU unit of an Indian refinery.
23	Thermal Design of Heat exchangers for an Indian refinery- Chemtex India	Job involved thermal design and support to mechanical/fabrication team for 3 heat exchangers in offsites facilities of an Indian refinery.

24	Basic engineering for Allyl acetate and allyl alcohol plant. Detail engineering of allyl alcohol plant-Pidilite Industries, India	Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Column Hydraulics, Heat Exchanger Design in HTRI, Control Logic & Interlock Philosophy, Control Valve Hydraulics & Process Data Sheet, Line Sizing, Pressure Profile, Material Selection, Piping Class, Corrosion Allowance, Relief Valve. Identification & Process Data Sheet, Line List, Instrument Process Data Sheet, mechanical datasheets, checking of fabrication drawings, preparation of plot plan and equipment layout, piping engg activities like stress analysis, isometric drawings, piping layout, BOM & BOQ for pipes, valves and fittings.civil and structural engineering activities like MTO for civil work and structural work, HAZOP study.
25	Debottlenecking study, thermal and mechanical design for PE plant first stage condenser - Eleme Petrochemicals Company, Nigeria	Job involved root cause analysis of condenser under performance, evaluation of new options, finalization of option with thermal and mechanical design of condenser.
26	AutoCAD conversion of ethylene plant P&IDs- Eleme Petrochemicals Company, Nigeria	AutoCAD conversion of 150 P&IDs for ethylene plant.
27	Detailed Engineering for Filtration Unit Dr. M for Indorama PTE Limited, Indonesia	Detailed Engineering consisting Process, Mechanical Electrical, Instrumentation & Civil disciplines: Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Control Logic & Interlock Philosophy, Control Valve Hydraulics & Process Data Sheet, Line Sizing, Pressure Profile, Material Selection, Piping Class, Line List, Instrument Process Data Sheet, mechanical datasheets, checking of fabrication drawings, preparation of plot plan and equipment layout, piping engg activities like stress analysis, isometric drawings, piping layout, BOM & BOQ for pipes, valves and fittings.civil and structural engineering activities like MTO for civil work and structural work.
28	FEED package for LNG storage tank & BOG handling system consisting BOG compressors, degasification & re-gasification and the associated heat exchangers for Indian Oil Tanking Limited	Process design philosophy, PFD's & PID's, process data sheet for critical equipment, basic process description, PSV sizing reports, heat and mass balance, conceptual study for flat bottom tank v/iso containers, utility summary and electrical load data, preliminary plot plan.
29	FEED for ethylene storage spheres & BOG re-liquefaction system for Westlake Vinyls, Calvert city, USA	Design Basis, Process Description, PFD, P & ID's, Mass & Energy balance, Equipment list, Material Selection Diagram, Process data sheet for equipment & instruments, Process specification for package items, Utility summary & electrical load data, Preliminary plot plan.
30	FEED for Pygas Hydrotreating Unit for Saudi Chevron Phillips, KSA	PFD's & PID's, SLD & UFD, Technical requisitions for all equipment, piping system hydraulic study calculation & recommendations, Revised drawings for all disciplines, Report on adequacy check of control valves List of long delivery equipment & tie in points.
31	Equipment re-rating project for Lyondell Basell - R Stamping Project	Design report of the equipment using PVElite software, sketches for changes to be incorporated in the system, quote from R - stamp provider.

32	Thermal design, Mechanical Design for Internal Heating Coils and Mechanical design review for support structure for CITEC India Limited	Thermal calculations of the coil (excel sheet/pdf), Mechanical design of the coil, Coil support drawings for both the vessels along with BOM and weld details.
33	HTRI Calculations for Llyods steel	Complete HTRI calculations for regeneration cooler, software output in pdf format.
34	Detailed Engineering of Gasoline Recovery System for ELEME Petrochemical Limited	Detailed Engineering consisting Process, Mechanical Electrical, Instrumentation & Civil disciplines: Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Control Logic & Interlock Philosophy, Control Valve Hydraulics & Process Data Sheet, Line Sizing, Pressure Profile, Material Selection, Piping Class, Line List, Instrument Process Data Sheet, mechanical datasheets, checking of fabrication drawings, preparation of plot plan and equipment layout, piping engg activities like stress analysis, isometric drawings, piping layout, BOM & BOQ for pipes, valves and fittings. civil and structural engineering activities like MTO for civil work and structural work
35	Thermal Design of Heat Exchanger for Kentz Qatar	Thermal design of the heat exchanger - Slop cooler.
36	Fabrication Drawing and Design of Liquid Distributor for CM Purifier and Civil and Stuctural Drawing for ELEME Petrochemical Company Limited	Design of Liquid Distributor, Mechanical Design and Calculation, GA Drawing, Fabrication Drawing and Calculation, Civil and Structural Drawing
37	Complete Process Development Package for Universal Hydro lubes	PDP Design Philosophy, HMB, PFD, PID, Equipment List, Process Data sheet, Electrical Area classification, Instrument list, PSV List, Preliminary flare load summary with flare header sizing, flow element, piping material specification, cause & effect diagram, catalyst and chemical consumption summary etc.
38	Design validation & Energy Audit for Medisafe, Indonesia	Design Validation for Facility Expansion and Addtion of New Unit & Energy Audit
39	BCO Valve mitigation study for Lyondell Basell, USA	Using mechanical data, calculation of MAWP and MAWV values for 17 storage tanks (API 650), A PPM files with evaluation and mitigation for 17 storage tanks relief system
40	Process Development Package for LyB C4 isomerization Technology for Henguyan Petrochemical Group & Jihao Chemical Company, Huayou Petrochemical Company & Lijin Petrochemical Company, China	PDP philosophy, PFD's & PID's, Heat & Mass balance MSD's, Electrical area classification, Piping line list & Piping specification Preliminary flare load summary, Supervisory operating manual HAZOP study & report, Process description & control philosophy Overall plot plan, PSV process data sheet & PSV list
41	Detailed Engineering, Project Management & Procurement Assistance services for Fluorine Recovery unit, Paradip Phosphates limited, Orissa	Detailed Engineering consisting Process, Mechanical Electrical, Instrumentation & Civil disciplines: Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Control Logic & Interlock Philosophy, Control Valve Hydraulics & Process Data Sheet, Line Sizing, Pressure Profile, Material Selection, Piping Class, Line List, Instrument Process Data Sheet, mechanical datasheets, checking of fabrication drawings, preparation of plot plan and equipment layout, piping engg activities like stress analysis, isometric drawings, piping layout, BOM & BOQ for pipes, valves and fittings. Civil and structural engineering activities like MTO for civil work and structural work, Project Management, Procurement Assistance, Inspection & expediting

42	Debottleneck study for westlake Vinyls, Calvert City USA	Debottlenecking studies, equipment sizing check, simulation, refrigeration circuit check, equipment adequacy check for VCM units for westlake Vinyls, USA
43	Basic Engineering Design for Fuel Additives and Alkylation Units for Jubail Expansion Projects for Farabi Petrochemicals	Project scope includes Design basis, design of equipments and process data sheets, heat and mass balance, PFDs, PIDs, PSV sizing, MSDs, flare load summary, utility summary, process description, chemical summary, process control philosophy, effluent summary, equipment list, cause and effect diagram, line list, HAZOP study, piping engineering and cross disciplinary engineering including mechanical, electrical and instrument engineering, procurement assistance
44	Adequacy Check of existing steam and BFW system of GCU at Gail (India)	Project scope includes line adequacy and piping hydraulics checking of Gas Cracker Unit related to points like : DM water tank wrt vent nozzle size, BFW feed line to deaerator, hydraulics of steam system piping- common SVH generation header from furnaces, PRDS interconnecting piping including in-line instruments such as vent valves, flow orifice and associated PSVs, HP BFW feed line to PRDS.
45	Design and Engineering services for Electric Overhead Travelling (EOT) crane for Ma'aden Phosphate plant	Project includes carrying out engineering and design for installing additional EOT crane at Maaden Phosphate. Deliverables include As-built drawings, Plot plan/layout, GA layout, MR package, datasheets, structural details, electrical load list, cable schedule, updating of SLD of MCC earthing layout, instrumentation specification etc.
46	Process Development and Basic Engineering for Deepak Phenolics Ltd, Dahej	Process Development and Basic Engineering for Acetophenone recovery from by-product tar stream of Phenol Plant. Scope includes process development of Acetophenone recovery, includes lab experiment and developing process scheme using empirical data simulation model, scale-up and Basic Engineering for 2700 MTPA Acetophenone from by-product tar stream of phenol plant of agreed composition. It is to be ensured that the design of the equipments shall deliver similar product quality at variable capacity and feed composition for an alternate case. Deliverables for the alternate case shall be limited to PFD and stream summary.
47	Detailed Engineering of Standalone Backwash System of DOX unit in Olefins Plant for ELEME Petrochemicals Company Nigeria	Project includes detailed engineering activities with deliverables like process datasheets and process sketch, effluent summary, hazardous area classification, HAZOP, PFD, P&ID, utility consumption, MDS, material requisition plot plan, equipment layout, tie-ins, piping MTO, electrical and instrumentation load list, civil pipe support design and detail drawing, MTO, TBE and cost estimation.
48	Hydraulic Study for NPN Unit and Flare System at increased load operating Study .	Project on Utility and Support Infrastructure Hydraulic Study for NPN Unit and Flare System at increased load operating Study .
49	Engineering and supply of skid mounted pilot plant	Project involves Engineering of a skid mounted pilot plant for Paraffin and Derivatives Complex Project and Farabi. Also, scope includes supply of this skid mounted pilot plant – CIF Dammam, KSA.
50	Hydraulic Analysis for Capacity Expansion	Project involves a. Hydraulic Analysis of LPG Loading system, Simulation of lpg loading system including pumps and loading bays,, pipeline sizes finalisation, pump selection and process data sheets.



51	LAO Purification Plant Engineering	Project involves lab to commercial scale LAO purification plant basic and detailed engineering. Also integration of this unit into the existing complex.
52	Hot Oil Pump and Network Analysis	Scope includes developing a hydraulic network model using AFT Fathom software for the complete hot oil network. Carrying out sensitivity analysis to identify minimum pump discharge pressure for the following scenarios: a) modifying control valves without booster pump and no change in line sizes b) modifying control valves with booster pump and no change in line sizes Highlighting the constraints in the existing Hot Oil pump and propose the necessary modifications for the following scenarios to reduce the discharge head of the Hot oil pump: a) Impeller trimming to as minimum as possible diameter by consulting with vendor b) Replacing existing pumps with new pumps with reduced head c) Pump vendor interactions for pump modifications 5. Developing a report with table indicating inadequacies and 2 line specifications for modification to pump(s) and control valve(s) required
53	Fuel Additive Pilot Plant OSBL Detail Engineering	The Scope of work for this project includes developing a DEP of the Pilot Plant OSBL Section with typical multi-disciplinary deliverables like PFD, P&ID, line list, IPDS, adequacy reports for tie-ins, HAZOP, piping layouts, piping isometrics, piping BOQ, IDS, electrical cable schedule, electrical BOQ, earthing layouts, foundation and structure drawings, TBE, VR, MR, FFQ etc
54	LAO Treatment Skid Fabrication for FCR	Project involves supply of LAO treatment skid fabrication for Linear Alpha Olefin (LAO)treatment system. Also includes fabrication of equipment with skid structure. Modular construction to facilitate transportation, 3 N2 treaters, 1 Chloride guard, 1 preheater (welded plate type), associated pipings, instruments, isolation valves, PRVs, CVs, cable trays, junction boxes for connectivity of instruments to DCS.
55	Benzene Column Pinch Study	Project includes for process study to develop a pinch scheme for the Benzene Column.
56	Engineering Package for AGOL Project	Project includes Detailed Engineering for the following: 1. 12" LPG transfer line. 2. Proposed 300NB LPG Export pipeline 3. Proposed SGR pipeline and siding 4. Phase IC Expansion 5. Pre-commissioning and Commissioning
57	Process Design Package for LPG mounded bullets of the Loading Gantry	Project involves following scope: a) Preparation of Design Philosophy b) Development of Process Flow Diagrams (PFD) c) Development of Material Selection Diagrams (MSD) d) Development of Piping & Instrumentation Diagrams (P&IDs) e) Equipment List f) Heat balances g) Equipment Sizing for equipment such as Air coolers, Heat Exchangers h) Line sizing & Pump Hydraulics i) Preparation of Line List

		<ul style="list-style-type: none"> <li>j) Preparation of Instrument Process Data Sheet</li> <li>k) Process Description and control philosophy</li> <li>l) PSV Process Data sheets</li> <li>m) Process design calculations</li> <li>n) HAZOP</li> </ul>
58	Design and Supervision of Standby PRDS System installation	Project involves Consultancy services for design and supervision for installation of 3 nos. PRDS system at GAIL Pata.
59	Detailed Engineering of 2TPD TPD Unhydrogenated Styrenic Copolymer Plant	Project involves Detailed Engineering of 2 TPD unhydrogenated Styrenic Block Copolymer Plant with typical deliverables like process datasheets and process sketch, effluent summary, hazardous area classification, HAZOP, PFD, P&ID, utility consumption, MDS, material requisition plot plan, equipment layout, tie-ins, piping MTO, electrical and instrumentation load list, civil pipe support design and detail drawing, MTO, TBE and cost estimation.
60	Engineering of Checkered Plate near Causic Cyclones	Project involves engineering of the checkered plates under primary and secondary cyclones. The deliverables include fabrication drawing of checkered plate, trench support detailing, drain pipe support detailing, structural assessment report for overall stability, drain pipe isometrics, existing lighting layout modification, BOQ.
61	MultiZone Technology Demonstration Project MultiZone	Project involves development of Process Design package (PDP) for SABIC Multizone plant. This is to be a demonstration plant to be erected in KSA. The work involves, extending concept package development to process design. It also involves cost estimation to +/- 20%.

## Simulation and Modelling Projects

Sr. No.	Project	Overview/Deliverables
62	Development of Process model for CDU-VDU & Saturated Gas Plant	Adequacy check & Rating of the equipments in CDU, VDU & SGP
63	Development of Kinetic Model for Hydrogenation Reaction in a Oleochemical Facility in Malaysia	First principal kinetic model developed for predicting the hydrogenation extent of Methyl Esters in the hydrogenators
64	Development of Process model for Ethylene Complex by Stone-Webster with Naphtha & LPG as Feedstock	Ethylene from Naphtha & LPG; Stone & Webster
65	Development of Ionic Model for CDU Overhead	CDU Overhead Ionic Model to predict corrosion & determine optimum dosing of anti-corrosion additives
66	Development of Dynamic Model for OTS of BPA Manufacturing Facility for KSA	Special Equipment modeling in OmegaLand for Yokogawa
67	Development of Hydraulic Model for Cooling Water Network for a Petrochemical Major in Qatar	CW Network hydraulics & adequacy check for identification & mitigation of maldistribution
68	Development of Strategic Business Model for Petrochemical Major in Europe	MINLP model for making yearly budgetary decision for product scheduling & profit maximization
69	Development of Global Distribution Network Optimizer Tool for FMCG Major	Supply Chain Management tool for optimizing global production & distribution of products & intermediates
70	Development of Process model for Ethylene Complex by BF Goodrich with Propane as Feedstock	Ethylene from Propane; BF Goodrich
71	Development of Process model for Ethylene Complex by MW Kellogg with Ethane as Feedstock	Ethylene from Ethane; MW Kellogg
72	Development of Process model for Ethylene Complex by MW Kellogg with NGL as Feedstock	Ethylene from NGL; MW Kellogg
73	Development of Process model for Ethylene Complex by Stone-Webster with Ethane as Feedstock	Ethylene from Ethane; Stone & Webster
74	Development of Process model for Ethylene Complex by ABB Lummus with Ethane & Propane as Feedstock	Ethylene from Ethane & Propane; ABB Lummus
75	Development of Process model for Ethylene Complex by Technip with Ethane as Feedstock	Ethylene from Ethane; Technip
76	Development of Process model for Ethylene Complex by Technip with Ethane as Feedstock	Ethylene from Ethane; Technip
77	Development of Process model for Ethylene Complex by Technip with Ethane as Feedstock	Ethylene from Ethane; Technip



78	Development of Vent dispersion for Tasnee, KSA	Development of Dispersion Model and Recommendation on Stack Height
79	Ionic Modelling for Dorf Ketal, India	Deliverables in the form of report predicting process parameters like Hydrocarbon/Water dew point, Dew Point pH, NH <sub>4</sub> Cl deposition temperature, Amine salt deposition temperature
80	Simulation & Feasibility Study Sasol Alcohol Gate 3 Project, S.A	Simulation output for new and existing units, Electrical Equipment Specs and Data sheets, Instrument index, Power Source and Sub Station Requirements, Electrical Single Line Diagrams, Electrical Single Line Diagrams, Process Safety – hazard analysis utilizing a “Checklist” approach, Process Simplification - PFD s are reviewed after process simplification work is completed, Plant Capacity, Turndown, Overdesign etc.
81	Development of fully functional sacramento plant & PFD updation for P & G Chemicals	Model consisting physical refining of oil process (PROP), methyl ester making, methyl ester fractionation, alcohol making, alcohol fractionation, MeOH System, Glycerin, and Light Cut Fatty Acid using ASPEN Simulation Workbook enabling the model to run in ASPEN Plus ver 7.3, Aspen modeling files for each of the seven cases, Consolidated Equipment performance report with key parameter results (e.g. Columns – Pressure drop, Flooding & Downcomer Backup; Heat exchanger – Heat duty, etc.), Demand supply gap analysis for available Utility, Financial analysis based on raw material, products and cost information, User manual in pdf (soft copy only), Updated and reviewed PFDs
82	CFD analysis for POSM-I R310 Epoxidizer for Lyondell Basell	A technical report containing the model results and findings for modified compartment and Native model files
83	Development of fully functional oleochemicals plant for P & G Chemicals in Malaysia	Model consisting methyl ester making, methyl ester fractionation, alcohol making, alcohol fractionation, using ASPEN Plus enabling the model to run in ASPEN Plus ver 2004.1, Aspen modeling files for five feedstock cases, Consolidated Equipment performance report with key parameter results (e.g. Columns – Pressure drop, Flooding & Downcomer Backup; Heat exchanger – Heat duty, etc.), Demand supply gap analysis for available Utility, Financial analysis based on raw material, products and cost information, User manual in pdf (soft copy only),
84	Development of Oil Economic Optimizer for profit maximization of an oleochemicals plant for P & G Chemicals in Malaysia	Detailed MINLP programme which predicts operating philosophy and critical operating parameters and product distribution strategy for profit maximization taking into account operational, material availability, financial & market related constraints. 90% of the total time required to carry out this activity was reduced.
85	Hydraulic Analysis of cross country crude oil transportation system for Kentz, Qatar	Hydraulic analysis & surge analysis for cross country pipeline.
86	Dispersion analysis of ethylene oxide for Galaxy Surfactants, India	Header sizing and heavy gas dispersion analysis using "Screen 3" software
87	Root cause analysis for vibration problem in Acetic Acid plant for ICONS Engineering, India	Qualitative analysis of 2 phase flow in the acetic acid manufacturing unit for the prediction of possible cause of vibration problem, suggestion of mitigation measures and CFD analysis of mitigation measures.
88	Dynamic Simulation of Ammonia Plant	30 MTPD Ammonia Plant dynamic simulation turkey project. Project involves 1. Dynamic simulation of tank vapor(TV) compressors. 2. Dynamic simulation for synthesis gas compressor. 3. Dynamic simulation for ammonia refrigeration compressor.

89	CFD analysis for ETP Tanks for a Refining Complex	Project involved CFD analysis to be done for 3 ETP Tanks: 1. Equalisation tank 2. Off spec treated effluent tank 3. Off spec COC/PW tank. CFD analysis to be done for these tanks to ensure the arrangement provided in tanks are sufficient for good mixing.
90	Development of Simulation and HMB for NPN Unit for Farabi Petrochemicals	Project includes development of Simulation and Heat and Mass Balance for NPN Unit for Farabi Petrochemicals
91	Simulation and Model Development for Process units in the Hysys	Project involves simulation model development for 4 process units in the BPCL Mumbai Refinery - CDU, FCC, NHT and CCR.
92	VCM Modeling and expansion study	Project involves VCM Modeling - Phase I & Cost Estimate. VCM Expansion Study From 3.1 MMPPD to 7.9 MMPPD VCM. Phase-1: Increase the VCM production rate to 1.365 billion lbs. per year (based on 8,400 plant online hours), which equates to 3.9 MMPPD of VCM production. Phase-I of the project will be to develop the simulation model for 3.9 MMPPD VCM production and to perform the adequacy check of existing equipment for processing the 3.9 MMPPD VCM production. Following major items are included under Phase-I. -External vaporizers on existing furnaces #1, #2, and #3. -A new quench tower for the existing furnace #3. #-Additional Refrigeration to the Absorber/Stripper
93	Simulation and Adequacy check	Project includes the following scope: -develop the simulation tools (Hysys and OLGA) with engineering functionalities in order to identify the potential bottlenecks in the pipelines, plant piping, control valves, equipment to the best possible extent. -determine the bottlenecks in each fluid profile case, such as (i) pipeline size, (ii) pump capacity, (iii) control valve size, (iv) equipment capacity etc. -leverage existing OLGA (pipeline simulation software) and HYSYS (equipment process simulation software) simulation models that are used for remote monitoring -Current injection water network and power fluid network models are developed in AFT Fathom/Impulse software and same will be built in Hysys with respective pipeline information -Development of OLGA model from Individual wellpad production header up to Wellpad Pig Launcher -Incorporating the additional functionalities in existing Hysys simulation model for capacity estimation -OLGA and HSYS training for 5 days for CIL personnel Deliverables include: 1 OLGA hydraulic simulation report in PDF format 2 HYSYS simulation report on identifying fluid change related bottlenecks at MPT 3 5 day training on OLGA & HYSYS for CIL personnel 4 Native files of Hysys and OLGA models developed as part of study

## Continuous Operational Support

Sr. No.	Project	Overview
94	Petrochemical facility in Malaysia	Production maximization, Furnace run length improvement, High load tests, Specific energy consumption reduction.
95	Ethylene plant in Kentucky, USA	Production maximization, capacity utilization, furnace yield improvement.
96	Ethylene plant in Louisiana, USA	Specific energy consumption reduction.
97	Ethylene plant in the Middle East	Furnace yield improvement, Furnace run length improvement, CGC efficiency monitoring and improvement, Heat exchangers fouling monitoring, Ethylene loss reduction in tail gas and C2 splitter bottom.
98	Ethylene plant in Louisiana, USA	Specific energy consumption reduction, Q.W exchangers fouling monitoring, CGC fouling evaluation, chilling train performance improvement, acetylene reactor yield improvement and green oil reduction, C2 splitter bottom loss reduction.
99	Long chain alcohols plant in Louisiana, USA	Production maximization, capacity utilization, Quality monitoring and improvement, transition tanks loss reduction, minimising changeovers (scheduling).
100	Coal Gasification facility in S. Africa	Identify problems in ash locks and keep the problem event database evergreen, Identify problems in coal-locks. Create a problem event database for coal locks, Track wear out of grate and its impact on stability of GG, Identify jacket leak signatures and forecast possible leaks, Track heat transfer related metrics, Monitor heat transfer coefficients and flag poor performance in waste heat boilers and fin fan coolers, Yield monitoring at Gasifier level through Aspen model and statistical correlations and tracking impact of CO & Master set points on yield, determine optimal Steam/O2 setting, Reconciliation of CO2 analyzer with Aspen model.
101	VCM+EDC facility in Belgium	Reduce variable cost, specific energy minimization (including recovery, generation and consumption of energy), chemical additives reduction, reactors optimization.
102	Ethylene plant in Nigeria	Reduce caustic and DMDS consumption, reduce specific energy consumption, maximize production, and improve yields.
103	Butadiene facility in Houston, Texas, USA	Monitor and suggest ways to minimise fouling, improve plant runlength, reduce specific energy consumption, improve product purity, increase production and reduce solvent consumption.
104	Butadiene facility in France	Monitor and suggest ways to minimize fouling, improve plant runlength, reduce specific energy consumption, improve product purity, increase production and reduce solvent consumption.
105	LAB facility in USA	Reduce specific energy consumption; reduce LAB slippage in W-18 column, benzene loss reduction, steam ejector performance monitoring and improvement, capacity evaluation, debottlenecking, benzene/paraffin splitter optimisation.
106	Study of energy loss in furnaces due to excess O2 content in flue gas and high stack temperature.	Fuel gas consumption in furnaces has an impact on the operating economies of furnaces. Excess fuel gas firing not only results in loss of fuel gas but also results in excess soot formation, thereby reducing run length of furnaces. Studied High Load Fuel Gas Consumption, Fuel gas header pressure variation and Furnace Fuel Gas Firing Imbalance.
107	Energy Visualization and monitoring tool	Complex processes like coal gasification require a well-defined and easy to use energy monitoring mechanism. The project was to develop such a tool that can be utilized by senior management as well as engineers to compare the energy consumption figures in all the major equipments and provide suggestions for diagnosis.

108	Pinch Study for an ethylene facility in USA & Malaysia	Pinch analysis of ethylene plant to identify energy saving opportunities and debottlenecking Propylene Refrigeration (PR) system. Main recommendations included installation of new exchangers to recover heat from the 3rd, 4th and 5th stage discharge streams of CGC (preheat ethane feed); use of Quench Water as reboiling medium in Deethaniser & secondary Deethaniser, preheat Caustic Tower feed and C2H2 reactor feed; use of C2 splitter overhead vapor for preheating ethane feed and use of ERC vapors for preheating Deethaniser feed.
109	Energy Audit for Ethylene Plant, Tasnee, KSA	Energy Audit for Ethylene plant.
110	Environmental Monitoring Tool for Ras Laffan Olefin Company	Estimation of flaring volume from all the sources, Facilitation of periodic reporting of Flaring and Emission as per regulatory authority guidelines, Creating an up-to-date database of plant emission data, Optimum programming to improve model execution , Dynamic flow equations for actual pressure & temperature, Reporting of flaring as per regulatory authority
111	Pellet coating time reduction for CIPLA	Report consisting laboratory trials undertaken, detailed comparison between laboratory scale and commercial scale plant runs and recommendations for optimizing the process with a view to minimize the coating time.
112	HDPE Plant: Study of Reaction cooling system & Ethylene let down system for Lyondell Basell Matagorda, USA	Hysys 2006.5 files, HTRI & HTFS model files, HTRI & HTFS detailed output files, summary report of the study, process data sheets for the modified equipment, PFDs, PIDs for the recommended system, markups on equipment layout.
113	IPOG services for Petrochemical plant at SABIC,Petrokemya	The objective of the service will be: a. Identification of the most significant KPIs for overall Plant performance improvement b. Baseline Generation on these KPIs c. Continuous Proactive Improvement of mutually set targets with regards to Run length of furnaces, Reliability (asset availability), Operational Stability, Throughput, Yield, Specific consumption (chemical), Energy Intensity and any other KPIs that are defined and specified by Petrokemya d. Generation of dashboard and other communication platforms for facilitating process engineers at Petrokemya e. Technical Support to carry out concept level work on Root Cause Analysis (to avoid reoccurrence of the any pervious failures), Reliability improvement, Conceptual/Feasibility studies, Review of SOP's and Debottlenecking For this document has assumed that olefins III is a typical back-end propane cracker as indicated by Petrokemya.
114	IPOG services for Westlake Geismar for VCM plant	Continuous support for troubleshooting and sustained process performance improvement of Westlake VCM plants.
115	IPOG/Technical Services for Oil&Gas plants for Cairn, Rajasthan	Project includes operations guidance for capacity maximization, produced water optimization, support equipment reliability improvement, monitoring corrosion issues, trunk line hydraulics. Includes daily reports supplemented by RCA reports and periodic reports.
116	IPOG/Operations Excellence Program for Delayed Coker Unit	Project includes a Digitlization approach for Coker real time AI/ML based analytics to improve plant reliability and operating margins. Involves sharing monthly reports in form of interactive dashboards.

## Equipment Reliability & Performance Improvement Projects

Sr.No.	Project	Overview
117	Furnace run length & throughput optimization	The objective of the study was to maximize the throughput of naphtha on annual basis. It is suggested to run at the highest feed flow possible [as limited by downstream]. Though the number of decokes increase with increase in feed flow, the extra cost incurred for the increased number of decokes is negligible compared to the profit earned from extra naphtha processed.
118	Dephlegmator's & Expander performance evaluation and optimization	The report projects the contribution of cold duty by each of the cold stream to Dephlegmator 1 and Dephlegmator 2 for chilling of hydrocarbon vapor to recover ethylene. The primary reason for the shift in delta-T across Dephegmator 2 process side was due to inefficiency in expander first stage. The other cold streams utilized for heat removal in Dephlegmator 1 & Dephlegmator 2 are also not able to deliver the required duty as expander inefficiency has cascading effect on these streams. Improving expander performance was the key and recommendations were provided for the same.
119	Evaluation of Demethanizer tower performance & Optimization	The report on Demethanizer tower performance is based on performance monitoring of the tower on daily basis. It was observed that increase in plant 3 load above 25% of design and unstable column parameters were the main causes for higher overhead C2 losses from the tower. Optimum column operations as given in the form of recommendations can lead to reduction in C2 losses from the column.
120	Increased Extra High pressure steam Temperature and Turbine Power	A temperature drop of 20°C as heat loss during transmission as against a design drop of 6°C observed in superheated steam temperature at furnace outlet and when it reaches steam turbine inlet. Estimated the gain in CGC Turbine power as a result of reduced insulation losses.
121	5 CGC compressor performance review, new limits setting	Optimization Opportunity Identified: CGC condensation stage load maximization, dictated by the ECV opening and max allowable condensate flow was suggested on 28th Nov 2006. CGC GV opening was maintained at around 82% and ECV opening was maximized (up to 99%). Implemented since 3rd Dec 2006. Net result a Power increase of 1.8 MW was utilized to increase throughput.
122	Expander inlet temperature Optimization trial	Test run done to estimate the optimum expander inlet temperature to maximize the Ethylene yield gain.
123	Complete Process Development Package for Universal Hydro Lubes.	PDP Design Philosophy, HMB, PFD, PID, Equipment List, Process Data sheet, Electrical Area classification, Instrument list, PSV List, Preliminary flare load summary with flare header sizing, flow element, piping material specification, cause & effect diagram, catalyst and chemical consumption summary etc.
124	Design validation & Energy Audit for Medisafe, Indonesia.	Design Validation for Facility Expansion and Addition of New Unit & Energy Audit
125	BCO Valve mitigation study for Lyondell Basell, USA	Using mechanical data, calculation of MAWP and MAWV values for 17 storage tanks (API 650), A PPM files with evaluation and mitigation for 17 storage tanks relief system
126	Petrochemical facility in Malaysia	Production maximization, Furnace run length improvement, High load tests, Specific energy consumption reduction.
127	Ethylene plant in Kentucky, USA	Production maximization, capacity utilization, furnace yield improvement.



128	Process Development Package for LyB C4 isomerization Technology for Henguyan Petrochemical Group & Jihao Chemical Company, Huayou Petrochemical Company & Lijin Petrochemical Company, China	PDP philosophy, PFD's & PID's, Heat & Mass balance MSD's, Electrical area classification, Piping line list & Piping specification Preliminary flare load summary, Supervisory operating manual HAZOP study & report, Process description & control philosophy Overall plot plan, PSV process data sheet & PSV list
129	Detailed Engineering, Project Management & Procurement Assistance services for Fluorine Recovery unit, Paradip Phosphates limited, Orissa	Detailed Engineering consisting Process, Mechanical Electrical, Instrumentation & Civil disciplines: Piping & Instrumentation Diagrams, Equipment Design & Process Data Sheets, Control Logic & Interlock Philosophy, Control Valve Hydraulics & Process Data Sheet, Line Sizing, Pressure Profile, Material Selection, Piping Class, Line List, Instrument Process Data Sheet, mechanical datasheets, checking of fabrication drawings, preparation of plot plan and equipment layout, piping engg activities like stress analysis, isometric drawings, piping layout, BOM & BOQ for pipes, valves and fittings. Civil and structural engineering activities like MTO for civil work and structural work, Project Management, Procurement Assistance, Inspection & expediting
130	Debottleneck study for westlake Vinyls, Calvert City USA	Debottlenecking studies, equipment sizing check, simulation, refrigeration circuit check, equipment adequacy check for VCM units for Westlake Vinyls, USA
131	Ethylene plant in Louisiana, USA	Specific energy consumption reduction.
132	Ethylene plant in the Middle East	Furnace yield improvement, Furnace run length improvement, CGC efficiency monitoring and improvement, Heat exchangers fouling monitoring, Ethylene loss reduction in tail gas and C2 splitter bottom.
133	Ethylene plant in Louisiana, USA	Specific energy consumption reduction, Q.W exchangers fouling monitoring, CGC fouling evaluation, chilling train performance improvement, acetylene reactor yield improvement and green oil reduction, C2 splitter bottom loss reduction.
134	Long chain alcohols plant in Louisiana, USA	Production maximization, capacity utilization, Quality monitoring and improvement, transition tanks loss reduction, minimizing changeovers (scheduling).
135	Coal Gasification facility in S. Africa	Identify problems in ash locks and keep the problem event database evergreen, Identify problems in coal-locks. Create a problem event database for coal locks, Track wear out of grate and its impact on stability of GG, Identify jacket leak signatures and forecast possible leaks, Track heat transfer related metrics, Monitor heat transfer coefficients and flag poor performance in waste heat boilers and fin fan coolers, Yield monitoring at Gasifier level through Aspen model and statistical correlations and tracking impact of CO & Master set points on yield, determine optimal Steam/O2 setting, Reconciliation of CO2 analyzer with Aspen model.
136	VCM+EDC facility in Belgium	Reduce variable cost, specific energy minimization (including recovery, generation and consumption of energy), chemical additives reduction, reactors optimization.
137	Ethylene plant in Nigeria	Reduce caustic and DMDS consumption, reduce specific energy consumption, maximise production, and improve yields.
138	Process Optimization of Spice Processing lines for Amalgamated Plantations	Project involves process and energy optimisation of 3 spice processing lines - tuber, seeds and chillies. Deliverables include PFD for ginger/turmeric line, Heat and mass balance, energy optimisation of seeds and chilly lines wrt tray dryer operations, provide recommendations for optimisation wrt capacities and overall effectiveness of the process.



139	DFA Plant Heat Load Analysis	<p>DFA Plant head load analysis requires following activities to be done:</p> <ol style="list-style-type: none"> <li>(1) Analysis of plant operating data for various scenarios during CPP running as well as coal fired heater operation</li> <li>(2) Quick excel calculations will be done for verification of exchanger duties based on hot oil flow and temperature</li> <li>(3) Develop hydraulic network in AFT Fathom software</li> <li>(4) Analyze the network for different operations (CPP and Coal heater) and identify causes for the inefficiencies in the network</li> <li>(6) HTRI model/rating of heat exchangers (7 Nos.) in thermic fluid circuit</li> </ol>
140	EDC Cooling Tower Study	<p>Project involves developing a hydraulic model using Pipe-FLO software and analysis of Cooling tower water network. The analysis shall address flow distribution across all major equipments for the operating case, identification of starved exchangers, suggestions to overcome mal-distribution of flow, modifications required to improve overall CW flow capacity.</p>
141	VCM Column Moisture Problem	<p>Project involves Root Cause Analysis for High Moisture issue in the VCM Column. The Column will be simulated to validate the design and identify if there are any gaps in the same. The goal of the project is to reduce the moisture levels in the column from the existing 30 ppm to below 15 ppm.</p>
142	Technical Consultancy Services for Process Engineering activities	<p>Project involves Technical Consultancy Services over a period of 2 years for the following services:</p> <p>The scope of work will be on job-to-job basis, generally covering all or some of the activities as mentioned below:</p> <ol style="list-style-type: none"> <li>1) Process simulation and design including hydraulics checks, where new schemes have to be developed or for validating existing design.</li> <li>2) Study of the projects conceptualized by BPCL or third parties (like Energy audit recommendations by M/s EIL/PCRA) to check feasibility &amp; alternate schemes and provide most feasible solution for the intended purpose of the project, followed by BDEP.</li> <li>3) Refinery-wide troubleshooting studies and BDEP.</li> <li>4) De-bottlenecking / Revamp / Max cap studies, followed by PDP / BDEP.</li> <li>5) Energy optimization, Pinch studies followed by BDEP.</li> <li>6) RCA (Root Cause Analysis) studies for shut-downs, disturbances.</li> <li>7) Process Hazard Analysis, including Hazop, FMEA, LOPA, QRA, SIL etc.</li> <li>8) Adequacy checks for all Relief devices, mitigation.</li> <li>9) Flare load analysis.</li> <li>10) Utility network analysis for steam, cooling water, Hydrogen, Fire water etc.</li> <li>11) Asset reliability improvement - for critical equipment like Furnaces management, heat-exchanger- fouling management, Compressors, Columns etc.</li> <li>12) Updation of P&amp;IDs, Plot plans, Isometrics, etc.</li> <li>13) Review and approval of design / engineering documents, PFDs, P&amp;IDs generated</li> </ol>

		<p>by other bidders and subcontractors.          14) Helping in Licensor selection by reviewing design / engineering documents submitted by different licensor for new plant.          15) Commissioning assistance during implementation of the above schemes          16) Preparation of cost estimation for the project, if required shall be with order of magnitude of +/- 10% for technical bid package and +/- 30% for DFR type of works.          17) Providing Support on Computational fluid dynamics to solve and analyze problems which involves fluid flow.</p>
143	Surge Analysis of Pipelines	Project involves Surge analysis of 105 kms long 6" and 4" pipelines of Naphtha and Propylene from RIL Dahej to Baroda.

## Relief System Engineering & Risk Analysis Projects

Sr. No.	Project	Overview
144	Relief Device Study as per OSHA guidelines for Valero refineries at Texas City, Aruba, Mckee & Paulsboro	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Flare network building and its analysis, Mitigation of all concerns of Relief device.
145	Relief Device Study as per OSHA guidelines for ConocoPhillips refineries at Borger, Ferndale, Los Angeles & Santa Maria, Trainer	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Mitigation of all concerns of Relief device.
146	Relief Device Study as per OSHA guidelines for Marathon refineries at Canton, Texas City, Garyville, Detroit, St Paul, Michigan and Robinson	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Flare network building and its analysis, Revalidation of the study, Mitigation of all concerns of Relief device.
147	Relief Device Study as per OSHA guidelines for Exxon refineries at Beaumont, Falwey, Joliet, Singapore	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing. Flare network building and its analysis. AIV Study
148	Relief Device Study as per OSHA guidelines for Sunoco refineries at Eagle Point, Neal, Toledo, Tulsa, RasTanura	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Flare network building and its analysis, Mitigation of all concerns of Relief device, HIPPS Study.
149	Relief Device Study as per OSHA guidelines for Frontier refinery at El Dorado Crude section	PSV Study after Revamping
150	Relief Device Study as per OSHA guidelines for Shell Dear Park (Singapore)	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
151	Relief Device Study as per OSHA guidelines for Chevron Pascagoula refinery	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
152	Relief Device Study as per OSHA guidelines for Suncor refineries	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
153	Relief Device Study as per OSHA guidelines for Koch Industries	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
154	Relief Device Study as per OSHA guidelines for Saudi Aramco refineries at KSA	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
155	Relief Device Study as per OSHA guidelines for Exxon Mobil Chemical (Singapore)	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
156	Relief Device Study as per OSHA guidelines for Sinclair	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.

157	Relief Device Study as per OSHA guidelines for Petronas refineries Malaysia	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Flare network building and its analysis.
158	Relief Device Study as per OSHA guidelines for Hess Corp	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
159	Relief Device Study as per OSHA guidelines for Tessenderlo, Belgium	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
160	Relief Device Study as per OSHA guidelines for NARL, Canada	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Mitigation of all concerns of Relief device.
161	Relief Device Study as per OSHA guidelines for Flint Hill	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing
162	Relief Device Study as per OSHA guidelines for TCO Kazakistan	Mitigation of all concerns of Relief device.
163	Relief Device Study as per OSHA guidelines for Sasol Alcohol	Mitigation of all concerns of Relief device.
164	Relief Device Study as per OSHA guidelines for FMC bayport	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing. Mitigation of all concerns of Relief device
165	Relief Device Study as per OSHA guidelines for Westlake Vinyl	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
166	Relief Device Study as per OSHA guidelines for SABIC KEMVA	Mitigation of all concerns of Relief device.
167	Relief Device Study as per OSHA guidelines for Tesoro	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing.
168	Relief Device Study as per OSHA guidelines for BP Carson	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing
169	Relief Device Study as per OSHA guidelines for HPCL Visak	Revalidation of the study
170	Relief Valve design verification for the expanded facility for Westlake Vinyls, Calvert City, USA	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing. Mitigation of all concerns of Relief device
171	Relief Valve design verification for the expanded facility for Westlake Vinyls, LP Geismer, Louisiana, USA	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing. Mitigation of all concerns of Relief device
172	Relief Device Study for Lyondell Basell Houston Refinery: Sites: Morris, Channelview, Tuscula, Matagorda, La Porte (VAM/Acetic Acid/Flare), Bayport chemicals, Bayport polymers, Corpus Christia	Overpressure scenario identification, Relief device sizing, Required relief rate calculation, Identification of global scenarios and its sizing, Mitigation of all concerns of Relief device.

173	Flare study (4 Nos.) for Lyondell Basell, USA	Flare header network analysis, study for combining individual flares and providing mitigation options.
174	Remote operation Isolation valve study for Muench Muenster site, Germany for Lyondell Basell, Germany	Remote Operation isolation valve study.
175	Flare header network study for ethylene unit at calvert city for Westlake Vinyls, USA	Flare network model, adequacy check and sizing of flare header network for expansion case, identification of global overpressure scenarios, evaluation of vapor disposal system performance, flare tip analysis, knockout drum adequacy,
176	Sizing of the emergency vent nozzle of reactors and vessels on which safety relief devices (rupture discs and pressure safety valve are installed) for Lubrizol India Private Limited	Calculation/design basis for the given estimation, verification of rupture discs already installed on existing emergency vents, Compilation of report that included all input data, assumption, process parameters etc taken into consideration for the adequacy check, summary of the calculations and final outcome.

## Digitalization Projects

Sr.No.	Project	Overview
177	KPI's and dashboards for IPA plant using Aspen IP21	Project involves Aspen IP21 tags updating. KPI's and dashboards for IPA plant and addition of new tags for existing system (including LIMS communication )
178	Ip21 Implementation services at Farabi Petrochemicals, Yanbu	<p>Project involves the following scope of work:</p> <ul style="list-style-type: none"> <li>• Installation and Configuration of InfoPlus.21 (25000 Points/Tags) in clustered environment</li> <li>• InfoPlus.21 Integration &amp; Configuration with SAP for read and write Communication (two-way) upto 10 transactions</li> <li>• InfoPlus.21 Integration &amp; Configuration with LIMS System</li> <li>• Installation and Configuration of AspenONE Process Explorer Server in clustered environment</li> <li>• Development &amp; Deployment of 100 No's Process Graphics.</li> <li>• Development &amp; Deployment of 20 No's Reports (excel based)</li> <li>• Development &amp; Deployment of 20 No's KPI Dashboards.</li> </ul>
179	Development of customized "Process Analytics Digital applications" for Ethylene plant, USA	<p>Project involved development of Process Analytics Digital application &amp; customization for all major equipment of Ethylene plant.</p> <p>The Process Analytics Application runs in "real-time" at client facility and is "open-loop advisory" in nature.</p>
180	Development of customized "Process Analytics Digital applications" for NGL Plant	<p>Project involved development of Process Analytics Digital application &amp; customization for all major equipment of Ethylene plant.</p> <p>The Process Analytics Application runs in "real-time" at client facility and is "open-loop advisory" to Operations in nature.</p>