

Selected Projects & References

NexoSolutions engineers and scientists have during the years worked on several projects. These projects vary in process type, complexity, scope, targets and impacts. A list of selected projects is indicated below. Plant names were omitted due to confidentiality agreements in place and liability limitations. Further details can be disclosed only upon specific request.

Selected Projects: Refinery

Amine Units

- Amine Coker (American). Amine plant with excess suspended solids causing plant foaming. Hydrocarbons contamination also effecting SRU reaction ratios. Evaluated process and installed equipment. Designed new inlet separation system. Enhanced suspended solids filtration systems using existing equipment. The plant has not have incident since its implementation.
- Amine Recovery (Americas). Amine losses were substantial into treated LPG severely affecting caustic treatment units for mercaptan removal. Tested LPG stream and designed specializes system for total amine recovery. 98% of amine is currently recovered.
- DEA-MDEA conversion (Americas). Plant transitioned from DEA to MDEA as the amine solvent. The plant was evaluates mechanical to verify capability to functioning with MDEA. Modifications were recommended in several areas. Plant transition to MDEA was uneventful.
- Amine system equalization (Americas). Refinery sour gas required to be equalized for better and more stable feed into amine plants. Conceptual design and basic engineering was performed including a gas conditioning stage to remove gas phase contaminants.

Sour Water Stripper Units (SWS)

- SWS Solids deposition (Americas). Sour water stopper with high fouling episodes in the bottom of the stripper column. Verified all process and equipment. Made recommendations with operations and chemical vendors to alleviate deposition.
- SWS Hydrocarbon contamination (Americas). Acid gas from stripper with significant hydrocarbon contamination hindering SRU processing leading to emissions at flair. Provided new hydrocarbon separator design along with chemical demulsification additives.
- SWS capacity increase (Americas). Refinery with sous water capacity limited. Performed systems evaluation and modeling for capacity increase. Provided process engineering solution and equipment to increase throughput by 25%.
- Two Stage SWS pH (Americas). Low plant performance due to incorrect pH control in the feed water. Excess solids in feed water causing fouling in second stage. Performed plant evaluation and designed new pH adjustment protocols along with suspended solids separation design.

TGTU: Tail Gas Treating Units

- Quench water filtration optimization (Americas). Refinery with deficient Tail Gas quench water contamination removal system leading to lower quench tower efficiency and SO₂ breakthrough. New system design is place allows the pant to perform at capacity.
- Amine Filtration Optimization (Americas). Tail gas with low H₂S efficiency. Evaluated plant and equipment. Determined to be excessive amine solutions suspended solids and incorrect processing parameters. Designed new separation system and adjusted process conditions.
- Amine Filtration engineering (Americas). Designed and fabricated new separation systems for Tail Gas units for lean amine and rich amine circuits. Systems are performing as simulated.

Hydrogenation & Hydrocaracker Units

- Feed Filtration System Design (Americas). High temperature application. (Americas). Designed new feed conditioning system. Stream with high solidus content and high operational temperatures. System combined with antifouling additives for heat exchanger protection.
- Energy minimization (Americas). Excessive heat exchanges fouling leading to higher pre-heating of feed and higher energy costs. Designed system for heat exchanges protection focused to minimized suspended solids. Plant currently using minimal additional energy.
- Catalyst Bed Protection (America). Front end engineering and design for new filtration system for hydrocracking catalyst best protection.

FCC Units

- Naphtha carryover from overhead separator (Americas). Overhead sour water contaminated with naphtha leading to flair burning of sour gas, emissions and hydrocarbon losses. System separators were assessed and tested. Implemented solutions recovered of the 99% gasoline.
- High solids emissions from FCC flue gas (Americas). Emissions tested over time span and contamination characterized. Cyclonic systems were evaluated and engineering solutions was developed. New separation systems designed and specified.

Alkylation Units

- High acid consumption (Americas): unit experiments high acid consumption. Plant analyzed and focus was on contamination control. Consumptions decreased.
- Inlet separation (Americas): all inlet separation systems and process was reviewed, tested for performance and contamination characterization. Process significantly improved.

Reformer Units

- Deficient hydrochloric acid scavenging beds (Americas): systems and process was reviewed, tested for performance and contamination characterization. Bed protection was improved by process management enhancement. New system was designed for scavenger bed protection.

Custody Transfers

- Salt bed protection (Americas): bed for butane, hexane drying experiencing excessive salt consumption and low efficiency. The process was investigated, tested and an engineered solution was designed.
- Water content in Diesel and Gasoline products (Americas). Products did not meet water content specifications. Streams and separation systems in place were tested and evaluated. Separation process design was created and implemented. Currently water is in specifications.

Fuel Gas Systems

- Amine Salts Filtration (Americas). Refinery Fuel Gas system displayed extensive formation of solids ammonium salts. Assessment of the Fuel gas system and testing provided possible causes for salts formation. Engineering program was developed to avoid ammonium salts formation.
- Burner Tips corrosion (Europe). Plant with severe low NO_x burner failures. Plant assessment and fuel gas contamination characterization lead to the development of a fuel gas conditioning system. Los NO_x burner reliability was extended 100 fold.

Water Reuse and Recovery

- Water recovery (Americas). Plant utilized deficient water recovery system for stripped sour water. Evaluation and testing of the stream provided information to develop e customized solution. Plant currently operates correctly.
- Wash water recovery. Engineering company designed a Desalter wash water recovery system. System designs were evaluated and determined to be highly deficient and ineffective. Changes were incorporated and equipment modified. Plants was commissioning at design flow.

Merox & Oximer (Mercaptan Removal) Units

- Merox (Americas). Plant not meeting sulfur specification (copper strip) in treated LPG. Process and equipment installed was evaluated and determined to be DMDS contamination. Developed engineering procedure for contaminant minimization. LPG is currently at specifications.
- Amine Carry over in LPG (Americas). Plant experience rapid caustic solution degradation. Performed process assessment and determined to be amine carryover. Developed system for amine recovery and plant protection. System currently recovers 99% of carried over recovery.

Desalter Units

- Wash water conditioning (Americas). Plant with significant corrosion in overhead crude unit. Evaluated desalting and designed new wash water condition solution involving equipment and additive. Corrosion rated lowered 50%.

Aromatics Units

- Solvent Filtration Design (Americas). Designed aromatics solvent extraction filtration system.

Hydrogen Plants

- PSA H₂ Plant: (Americas). Plant instabilities caused by to Alumina bed flooding and saturation. System and process was evaluated and tested. Separation system was designed and fabricated for Alumina bed protection. PSA plant operating with full Alumina bed performance.

Sulphur Plants

- Demister Design (Asia). Demister for catalyst bed protection causing significant carry-over. Evaluated plant and designed new demister with enhanced efficiency specially designed for sulfur plants. Catalyst bed lifetime extended and SO_x emissions minimized.

Selected Projects: Gas Plants

Amine Units

- Amine Inlet Separation (DCP Tolar). Inlet separation causing foaming, Filtration systems causing foaming.
- Amine Inlet Separation (DCP Fullerton). Inlet separation causing foaming
- Amine total filtration inlet separation (RAKGAS). Amine plants cant start-up due to foaming.
- Amine Activator (Petrobras Bolivia). Loss in activation of amine plant
- System reengineering (RAK)
- New FT design
- Murphy Oil

Dehydration Units

- ALNG MoISieve protection
- Dew gas point plant (2X). New systems design CFS
- HyTech CFS SuperDemister

Compressor Systems

- Compressor protection
- Compressor discharge

Selected Projects: E&P Upstream

Canadian Oil Sands

- Slop Treatment Systems
- Oil Recovery Filters for Produces Water
- Produced Water Heat Exchanger Fouling
- Froth Extraction Optimization
- Secondary Extraction Demulsification

Off Shore

- Platform for residual H₂S
- FPSO separation systems design
- Petrobras oil/water separation

On Shore

- Petroleum Extraction (Oil Fields)
- Upgraders
- Injection water

Selected Projects: Midstream

Pipeline

- Pipeline Fouling and Corrosion
- Metering Systems Protection (Citi Gates and Point of Deliver). Particle Removal Comgas

Selected Projects: Chemical & Petrochemical

Polymer Plants

- Opacity Specification (Blue Star). Product out of specification unable to sale. Filtration system was designed to meet specifications
- Product Specification (Momentive). Reactors unload low due to slow filtration. Needed to add reactor. Designed robust filtration system to enhance filtration speed
- Leaf filter Optimization (BASF)

Specialty Chemical Plants

- Coatings Filtration
- Automotive Parts failure minimization



Styrene and Ethylene Plants

- Sour Water Feed Conditioning Design
- Fuel Gas
- Ethylene Cracker Feed

Selected Projects: Power Generation

Cogeneration

- Turbine Steam Water filtration (Americas)
- Plant Inlet Fuel Filtration (Americas)

Aeolic Energy

- Wind Mill Park (Europe)

Selected Projects: Mining

- Mining Solvent Recovery (Americas)
- Water Production (Americas)

Selected Projects: Food & Beverage

- Beer Process Fabrications (Americas). Evaluated
- Eatable Oil Fabrication (Americas)

Selected Projects: Pharmaceutical

- Ion Exchange Purification (USA). Design ion exchange system and procedure protocol for material purification in research and development laboratories
- Automatic Separation Process (USA). Developed automatic systems for molecular separations using automated separation equipment

List of References

NexoSolutions has performed projects, technology development, engineering, on-site testing, troubleshooting and technical training sessions for a number of companies. Below is a list of selected customers. Additional information and details are available upon request.

- Petrobras, Brazil
- ENAP, Chile
- Wet Chemical, Bolivia
- DCP Midstream, USA
- Citgo, USA
- Oil Sands Leadership Initiative, Canada
- Sulphur Experts, Canada
- Pentair, USA
- General Electric, USA
- Shell, USA
- Pemex, Mexico
- RakGas, UAE
- Alon Energy, USA
- Blue Star, Brazil
- Momentive, Brazil
- Modelo, Mexico
- TGS, Argentina
- BASF, USA
- ConocoPhillips, USA
- Questar Energy, USA
- Nobel Energy, USA
- Wynnewood Energy, USA
- Suncor, Canada
- Enbridge, Canada
- PDVESA, Venezuela
- EcoPetrol, Colombia
- Braskem, Brazil
- Ecostream, Finland
- ConocoPhillips, USA
- Eli Lilly, USA
- Eastman Kodak Company, USA
- Gascat, Brazil
- Tradicom, Argentina
- Alpco, Mexico

Corporate Leadership

David B. Engel, Ph.D.

Nexo Solutions, Managing Director & Senior Engineer

David has over 20 years of industrial experience in several large corporations and in a number of areas ranging from chemical synthesis, pharmaceutical drug discovery, corrosion resistant materials, sensors, light-to-energy conversion, membranes, nanotechnology, security technology, conducting materials, filtration and separation technologies, analytical methods, chemical additives, combinatorial chemistry and high throughput testing.

David is the inventor in over 21 United States Invention Patents (and 10 patent applications) on various technology subjects. David has also developed new businesses and performed on-site plant work for Eastman Kodak, Pentair, General Electric and Sulphur Experts into Latin America, US, Canada, Europe and the Middle East. David presented numerous seminars and technical training courses on a variety of subject around the world. Most recently David has specialized in chemical and mechanical separation technologies and systems comprising of new technology development, systems design and engineering, system and process optimization, reliability and throughput increase with minimized use of natural resources and energy. David is the Co-Founder and Senior Consultant at Filtration Experts (Sulphur Experts Division) and Founder and Managing Director of Nexo Solutions (www.NexoSolutions.com).

Education & Awards

- Indiana University, 2002 – Ph.D. (Organic Chemistry)
- USACH, 1994 – Bachelor of Science (Industrial Chemistry)
- General Electric, 2004 – Project Management and Six-Sigma Certified
- ✓ GE Technology Award, 2005 – Technology and Innovation Award
- ✓ GE Performance Award, 2003 – Yearly Technical Performance Award
- ✓ Indiana University TERA Award, 1998 – Academic Excellency

Experience

- ❖ Conceptual design, simulation, specification and review of separation technologies
- ❖ Extensive performance testing, optimization and troubleshooting processes plants and units using separation systems projects in Canada, the United States, Europe and the Middle East
- ❖ Project management of projects associated with chemical technology and separation technology development. Systems construction and installation and start-up
- ❖ Separation systems optimization and design modifications;
- ❖ Development of filtration and separation modelling algorithms
- ❖ Engineering input to environmental resource utilization for major chemical, petrochemical and Oil and Gas processing plants
- ❖ Presentation of technical seminars on process chemistry, chemical additives and separation technologies, the United States, Canada and Latin America
- ❖ Involvement in the development of new extractive separation technologies for the removal of dispersed contaminants and solvent recovery

Professional Associations

American Chemical Society, American Filtration & Separations Society and GPA Houston