

CO₂ Projects Experience

**Carbon Capture, Utilization, Sequestration
Facilities, Pump / Compressor Stations, and
Pipelines**

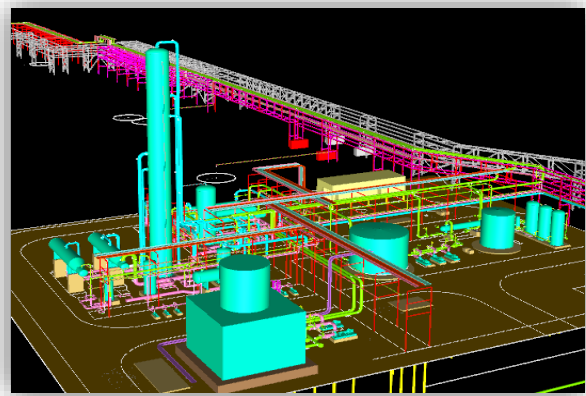
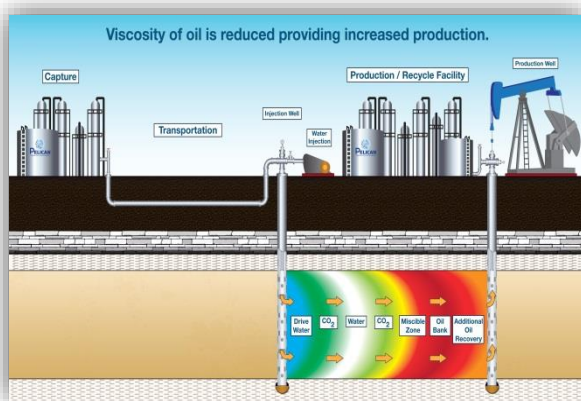




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Project Experience – Partial List

Pelican has extensive experience and expertise in the design of carbon capture, transportation, utilization, EOR (Enhanced Oil Recovery) and sequestration facilities, with over 300 executed CO₂ projects with TIC costs over \$5 billion, both in cold and warm climate regions. Our project experience also extends to Canada, South America, Asia and Europe. Pelican has been designing and executing the installation of anthropogenic CO₂ capture facilities since 2009. As part of Pelican's portfolio, our team has been executing CO₂ Enhanced Oil Recovery (EOR) projects since the late 90s, with experience extending to all the major CO₂ flooded basins in the US, which have been operating since the 1960s. A partial listing of these projects is as follows:

Carbon Capture Facilities

From Ethanol Plants

● Central Kansas – *In Operation*

- Project Description: CO₂ Capture Facility, Pipeline and Recycle Facility
- Provided Complete Mechanical, Civil / Structural, Pipeline and I&E Design Packages
- Design of a CO₂ Treatment and Capture Facility from Existing Ethanol Plant
- Design of a 14 Mile 2,220 psig Pipeline with Design Rate of 0.2MM tonnes/yr (Approx. 10 MMSCFD CO₂) to Connect Capture Facility with Oil Field
- Design of Recycle Facility Including CO₂ Injection and Production Flowline Systems and Well Hookups
- Facility Production Design Rate: 1,600 BOPD, 5,000 BWPD, 25 MMSCFD CO₂ Recycle
- Test Design Rate: 200 BOPD, 1,500 BWPD, 3.0 MMSCFD CO₂
- Incoming Working Pressure: 250 psig
- CO₂ Recycle / Well Injection Pressure: 1,800 psig

● Kansas – *In Operation*

- Project Description: CO₂ Capture Facility
- Provided Mechanical, Civil / Structural, and E/I Design Packages
- Design of a CO₂ Treatment and Capture Facility from Existing Ethanol Plant
- Blower / Reciprocating Compressor and TEG Dehydration
- 0.28 MM tonnes/year (Approx. 14 MMSCFD) Capture Rate
- 1,400 psig Compressor Discharge Pressure



🌐 *Midwest – In Detailed Design*

- Project Description: CO₂ Capture from Five (5) Ethanol Plants in Nebraska for Sequestration
- Rates Ranging from 174,000 tonnes/yr (Approx. 9.2 MMSCFD) to 497,000 tonnes/yr (Approx. 26 MMSCFD) Per Site
- Multidiscipline Engineering and Design / Drafting
- Equipment Selection and Design for All Facilities
- Blower System with Suction Scrubber
- Reciprocating Compressors and TEG Dehydration
- Inter and After Coolers
- E&I Infrastructure, Utilities, Liquid Handling, Safety and Control Systems

🌐 *USA*

- Project Description: CO₂ Capture Facility Study from Ethanol Plant Totaling 250,000 tonnes/yr (Approx. 13.5 MMSCFD)
- Liquefaction and Cryogenic Treatment Facilities
- Screw Compressor and Dehydration
- CO₂ Transport via Rail or Barge
- CO₂ Rail Terminal Inbound / Outbound
- Regassification Facilities
- Bullet Tank Storage
- Waste Water Handling
- Developed CAPEX and OPEX Estimates

🌐 *Indiana*

- Project Description: CO₂ Capture Facility Study from Ethanol Plant
- Capture Rate of 295,000 tonnes/yr (Approx. 16 MMSCFD)
- Capture from the Beer Well via the CO₂ Vent Scrubber within the Ethanol Plant
- Centrifugal Blower with Suction Scrubber
- Blower After Cooler
- 5-Stage Reciprocating Compressor and TEG Dehydration
- 2,100 psig Compressor Discharge Pressure
- Discharge CO₂ Measurement and Pig Launcher Upstream of Departing Supercritical CO₂ Pipeline
- Developed CAPEX and OPEX Estimates



Indiana

- Project Description: CO₂ Capture Facility Study from Ethanol Plant
- Capture Rate of 200,000 tonnes/yr (Approx. 11 MMSCFD)
- Capture from the Fermenters
- Suction Scrubber and Centrifugal Blower
- Compression and TEG Dehydration Facilities
- CO₂ to be Transported via ~3.5 Mile Pipeline for Sequestration
- Developed CAPEX and OPEX Estimates

Illinois

- Project Description: CO₂ Capture Facility Study from Ethanol Plant
- Capture Rate of 400,000 tonnes/yr (Approx. 21 MMSCFD)
- Capture from the Fermenters / Beer Well
- CO₂ Compressed to 2,100 psig and Dried to <30 lb/MMSCF
- CO₂ Routed an Injection via Pipeline Approximately 800 ft Long for Sequestration Onsite
- Liquids Generated During Compression / Dehydration of CO₂ Stream to be Sent Back to Ethanol Plant for Processing
- Developed CAPEX and OPEX Estimates

USA

- Project Description: CO₂ Capture Facility Study from Ethanol Plant Totaling 250,000 tonnes/yr (Approx. 13.5 MMSCFD)
- Captured CO₂ Feed Stream at 91.2 wt% on Wet Basis with Primary Contaminants of H₂O, N₂ and O₂
- CO₂ to be Dried to Product Stream Specification of <20 lb/MMSCF
- O₂ to be Controlled to <200 ppm Prior to Feeding Capture System
- CO₂ to be Compressed to 2,100 psig for Onsite Sequestration

USA – *In Detailed Design*

- Project Description: CO₂ Capture Facility Study from Ethanol Plants (Total of 173 MM gal/yr Capacity) for Sequestration
- Capture Facility with Compression Train to Capture CO₂ from Three (3) Batch Process Ethanol Plants
- Blower System with Suction Scrubber
- Blower After Cooler
- TEG System to Dehydrate Supercritical CO₂ to <30 lbs/MMSCFD
- Inter and After Coolers
- E&I Infrastructure, Utilities, Liquid Handling, Safety and Control Systems

🌐 USA

- Project Description: CO₂ Capture Facility Study from Ethanol Plant
- Capture Rate of 300,000 tonnes/yr (Approx. 16 MMSCFD)
- Evaluated Advantages and Disadvantages of Available Technologies
- Studied Requirements for Power, Nitrogen, Waste Removal and Water Disposal
- Evaluated Cleaning, Compression, Liquefaction and Storage Facilities
- Developed CAPEX and OPEX Estimates
- Identified Project Timeline from Design and Construction Standpoint

From Gas Processing / Amine Treating Facilities

🌐 West Texas

- Project Description: Capture of 9 MMSCFD with Expansion to 18 MMSCFD of CO₂ from Amine Treating Plant
- Neuman & Esser Combined Screw / Reciprocating Package (Total of 3,200 HP)
- TEG Gas Dehydration System
- CO₂ Transportation Pipeline
- Sulfa Treat H₂S Removal System
- 2,100 psig Compressor Discharge Pressure

🌐 USA

- Project Description: CO₂ Capture and Injection Facilities from Multiple Gas Processing / Amine Treating Sources from 2 Different States
- Up to 850,000 tonnes/yr (Approx. 45 MMSCFD) from Seven (7) Emitters in One State
- Up to 1.85 MM tonnes/yr (Approx. 98 MMSCFD) from Ten (10) Emitters in Another
- Phase 1: Developed CAPEX and OPEX Costs for All Capture and Injection Facilities
- Develop Required Permitting Documentation for Federal and State
- Phase 2: Detailed Engineering and Design / Drafting
- Equipment Selection and Design for All Facilities

🌐 USA

- Project Description: Capture of CO₂ from Multiple Amine Treating Sources Ranging Up to 1.4 MM tonnes/yr (Approx. 70 MMSCFD)
- Consisting of Multiple Screw / Reciprocating Compressor Options
- Dexpro Gas Dehydration System
- CO₂ Transportation Pipelines Ranging in Sizes from 4" Through 10" in Diameter
- 2,100 psig Compressor Discharge Pressure



Louisiana

- Project Description: Six (6) CO₂ Capture Facilities for Multiple Amine Gas Plants
- Provided Process Design and Equipment Sizing to Support TIC to Capture, Strip H₂S, Dehydrate, Compress and Meter CO₂ for Pipeline Injection from Seven (7) Sites
- Rates Ranging from 53,000 tonnes/yr (Approx. 2.8 MMSCFD) to 460,000 tonnes/yr (Approx. 24 MMSCFD) Per Site
- CAPEX and OPEX Estimates
- Blowers with Suction Scrubbers and After Coolers
- Reciprocating Compressors
- TEG Gas Dehydration System
- PDC Building with VFDs / Starters
- RO Water Storage Tanks

Louisiana

- Project Description: Capture of CO₂ from Multiple Amine Treating Sources Ranging Up to 0.48 MM tonnes/yr (Approx. 24 MMSCFD)
- Consisting of Multiple Blower / Reciprocating Compressor / Multi-Stage Pump Options
- TEG Gas Dehydration System
- 1,600 psig Compressor Discharge Pressure

Louisiana

- Project Description: Capture of CO₂ from Multiple Amine Treating Sources Ranging Between 0.05 MM to 0.46 MM tonnes/yr totaling 1.6 MM tonnes/yr (Approx. 85 MMSCFD)
- Consisting of Multiple Electric Blower / Engine Driven Reciprocating Compressor
- Multiple H₂S Removal Options
- TEG Gas Dehydration System
- 1,800-2,160 psig Compressor Discharge Pressure

New Mexico

- Project Description: Capture of CO₂ from Multiple Amine Treating Sources Totaling Approx. 1.1 MM tonnes/yr (60 MMSCFD)
- Full Acid Gas Injection to Class II Well
- Phase 1 – Compression to 2,400 psig Injection
- Phase 2 – Installation of CO₂ Multistage Pumps from 2,400 to 4,500 psig Injection



Post Combustion Capture Studies

Pennsylvania

- Project Description: Capture of CO₂ from Boiler Flue Gas
- 0.32MM tonnes/year (Approx. 16.7 MMSCFD) Captured; 97% Recovery from Flue Gas with 8.7% CO₂
- CAPEX (+/- 25%) and OPEX for Two Location Options and 3 Recovery Options (97%, 95%, 85%)
- Capture From Three (3) Natural Gas Fired Boilers
- Adjustment of Process Simulation to Account for Promoted Amine Solvents
- New SCR to Reduce Nox / Sox Emissions to Meet Environmental Permit Requirements
- Brownfield Site Consists of New Capture, Recovery, Liquefaction / Purification and Storage
- Truck and Rail Loading Facilities
- End User Requires Food and Beverage Grade CO₂

Texas

- Project Description: Post Combustion CO₂ Capture Facility from Refinery
- Provided Study to Capture CO₂ from Ten (10) Vented Process Heater Flue Sources
- Captured CO₂ to be Delivered from the Recovery Unit Where it is 97.9 wt. % CO₂ for Processing as Feedstock for Methanol Unit
- Rates Ranging from 30,000 tonnes/yr (Approx. 1.6 MMSCFD) to 237,000 tonnes/yr (Approx. 13 MMSCFD) with a Total Capture Rate of 826,000 tonnes/yr (Approx. 44 MMSCFD), 97.9 wt. % CO₂ and Less Than 5mol% H₂O
- CAPEX and OPEX Estimates
- Process Simulation to Account for Licensed Amine Technology
- Option to Flow Entire CO₂ to Methanol Process Area or Split and Portion up to 15 MMSCFD to Compression for Sequestration

Texas

- Project Description: Post Combustion CO₂ Capture Facility
- Provided Study to Capture CO₂ from Gas Turbine Flue Gas
- 1.39MM tonnes/yr (Approx. 74 MMSCFD) Captured, 95% Recovery from Flue Gas with 3.7% CO₂
- CAPEX and OPEX Estimates
- Capture from Two (2) Combined Cycle Gas Turbines
- New Back-Pressure Steam Turbine to Economize MP Steam Supply
- TEG Gas Dehydration System
- Single Shaft Centrifugal Compressor with 2,100 psig Discharge Pressure

🌐 Louisiana

- Project Description: Post Combustion CO₂ Capture Facility
- Provided Study to Capture CO₂ from Gas Turbine Flue Gas
- 1.44MM tonnes/yr (Approx. 76 MMSCFD) Captured, 95% Recovery from Flue Gas with 3.5% CO₂
- CAPEX and OPEX Estimates
- Capture from Three (3) Simple Cycle Gas Turbines in CHP Service
- New Steam Turbine to Economize MP Steam Supply and Excess Steam Production
- New Natural Gas Fired Steam Boiler to Increase Reliability of Steam Supply to CO₂ Capture Facility
- Single Shaft Centrifugal Compressor with 2,100 psig Discharge Pressure

🌐 Texas

- Project Description: Post Combustion CO₂ Capture Facility
- Capture from Exhaust of Three (3) Natural Gas Fired Compressors and Two (2) Natural Gas Fired Hot Oil Heaters Using an Amine Capture Process
- 24,000 tonnes/year of CO₂ Captured (Approx. 1.3 MMSCFD)
- Recovery from Exhaust Stream with 12.6% CO₂
- CO₂ Treating Utilizing Proprietary Amine Solvent
- CO₂ to be Compressed, Transported Through an Existing Pipeline and Sequestered into an Adjacent Well

🌐 USA

- Project Description: Capture of CO₂ from Multiple Sources and Development of Hub Gathering Concept
- Centralized Compression, Dehydration Facility Utilizing Centrifugal Compressors
- Total CO₂ Capture of 5.5MM tonnes/year (Approx. 280 MMSCFD) from 9 Sources Along a 9 Mile Corridor
- Scoping Document, Detailed Project Schedule, and CAPEX (+/- 20%) and OPEX for 5 Processing Options
- Adjustment of Process Simulation to Account for Promoted Amine Solvents
- CO₂ Captured from Refinery FCC, Hydrogen SMR, and Natural Gas Fired Equipment

Capture Studies from Other Sources

USA

- Project Description: CO₂ Capture from Hydrogen Plant
- Transportation for 90 Miles to Central Pad Including Metering and Pigging Facilities
- Flow Splits to Three Injection Sites for Sequestration – 5 MTPA Capacity of Current System
- Standardized Metering Systems with Analyzers
- Monitoring Well Topsides Design Including Fiber
- Designed for Future Trunkline Expansion with Pumps to Facilitate 10+ MTPA of Sequestration Capacity
- DAS / DTS Fiber System Integration and Control Building
- Safety Systems, Communications, Power Control and Utility Infrastructure
- Completed Engineering, Project Management Including Procurement, Material Expediting, Project Schedule and Cost Tracking
- PHA / HAZOP Reviews and Safety System Design

Alabama

- Project Description: CO₂ Capture from Refinery Hydrogen Plants HP1 and HP2
- Provided Study to Capture CO₂ from Pressure-Swing Absorbers (PSA)
- Tail Gas Routed to an Amine Unit Where CO₂ Would be Absorbed, with the Remaining Gases Rich in Methane and Hydrogen Routed Back to Hydrogen Plant for Fuel in the Process Heaters
- CO₂ Absorbed to be Compressed and Dehydrated Prior to Transportation via Pipeline
- Utilized Specialty Amine Solvent
- Carbon Capture Rate of 113,000 tonnes/yr (Approx. 6 MMSCFD)
- Blower / Reciprocating Compressor and TEG Dehydration
- 584 psig Compressor Discharge Pressure
- Custody Transfer Metering and Pig Launcher Upstream of Pipeline
- CAPEX and OPEX Estimates

USA

- Project Description: CO₂ Capture Facility
- Provided Study to Capture CO₂ from a Steam-Methane Reforming Hydrogen Plant
- Design of a CO₂ Capture Facility from Pressure-Swing Absorber (PSA) Utilizing Specialty Amines
- Carbon Capture Rate of 207,500 tonnes/yr (Approx. 11 MMSCFD)
- Blower / Reciprocating Compressor and TEG Dehydration
- 2,000 psig Compressor Discharge Pressure

🌐 USA

- Project Description: CO₂ Capture from Ammonia Plant
- FEED Study to Capture, Compress and Dehydrate Vented CO₂ After Amine Regeneration Process
- Centrifugal Blower and Three (3) 5-Stage Reciprocating Compressors in Parallel Operation
- Fin / Fan Interstage Discharge Coolers
- Gas Dehydration Through TEG Between 3rd and 4th Stage Compression
- CO₂ to be Compressed to 2,000 psig for High Pressure Case and 750 psig for Low Pressure Case
- Discharge CO₂ Measurement

🌐 Florida

- Project Description: CO₂ Capture from Landfill and Ethanol Plant
- CO₂ to be Transported via Truck and Pipeline, Respectively
- Landfill Gas to be Processed to Remove CO₂ and Return Methane to Existing Pipeline to Feed CAT 3520 Engines
- Purified CO₂ to be Liquefied and Stored in Bullet Tanks at the Landfill Site then Trucked for Processing
- Boil of Gas (BOG) System to be Utilized at the Bullet Tanks to Maintain Temperature
- Evaluated Technology Providers for CO₂ Capture
- Evaluated Truck Capacities and Frequency of Transportation for 18,500 tonnes/yr and Expansion to 30,000 tonnes/yr of CO₂
- Carbon Capture Rate of 125,000 tonnes/yr (Approx. 6.6 MMSCFD) from Ethanol Plant
- Metering Facilities for Custody Transfer at Truck Loading Sites
- Provided Technical and Financial Analyses of Conceptual Systems

🌐 Louisiana

- Project Description: CO₂ Capture Facility from Steel Mill Direct Reduced Iron (DRI) Process
- Provided Study to Capture CO₂ from DRI process with phased expansion from 0.8 MM to 2.8 MM tonnes/yr
- Consisting of Multiple Blower / Reciprocating Compressor Options
- TEG Gas Dehydration System
- 1,500 psig Compressor Discharge Pressure



🌐 Alabama

- Project Description: CO₂ Capture from Paper Mill
- Provided Study to Capture CO₂ from Flue Gas Off of Recovery Boiler and Power Boilers 1 & 2
- Carbon Capture Rate of 2MM tonnes/yr (Approx. 106 MMSCFD) and Captured for Thirty (30) Years
- Flue Gas from Each Source to be Pretreated Prior to Entering Amine Absorber to Eliminate Contaminants
- Evaluated Technology Providers for CO₂ Capture with Focus on Specialty Amine Solvents
- Multiple Specialty Amine Type Systems were Considered as Part of Study
- CO₂ to be Sequestered in Deep Saline Aquifers for Permanent Storage
- Project Includes a 30 Mile Pipeline to Transport CO₂ to a Class VI Well
- CAPEX and OPEX Estimates

🌐 Louisiana

- Project Description: Post Combustion Capture from Power Station
- Provided Study to Capture CO₂ from Gas Turbine Flue Gas
- Carbon Capture Rate of 3.6MM tonnes/yr (Approx. 191 MMSCFD), 95% Recovery from Flue Gas with 5.3% CO₂
- Capture from Two (2) Combined Cycle Gas Turbines
- New Natural Gas Fired Steam Boiler to Provide Regeneration Steam
- TEG Gas Dehydration System
- CAPEX and OPEX Estimates

🌐 Various Locations – Texas, Louisiana, Oklahoma, Mississippi, California, Alabama

- Project Description: CO₂ Capture Facility – Landfill Gas
- Provided Complete Project Development, Economic Comparisons and Facility Designs for All Disciplines
- Design of a CO₂ Treatment and Capture Facility from Existing Landfills – Rates Ranging from 1 MMSCFD to 6 MMSCFD Per Site
- Designed Pipelines and Determined Suitable CO₂ Dispositions Including Sequestration and Utilization Sites
- Feed Operating Pressure: Near Atmospheric
- CO₂ Discharge / Well Injection Pressure: 1,800 psig – 2,500 psig

🌐 USA

- Project Description: CO₂ Capture from Solid Oxide Fuel Cell
- Eight (8) Configuration of Energy Servers Set Up to Generate 6.5MW of Power Each for a Total of 52MW
- Provided Study to Determine Total Installed Cost to Gather, Process and Compress Captured CO₂ from the Solid Oxide Fuel Cell Installation for Sequestration
- Evaluated Beginning of Life (BOL) and Middle of Life (MOL) Operating Conditions
- Design Capture Rate of 207,500 tonnes/yr (Approx. 11 MMSCFD)
- Also Evaluated Processing Untreated Field Gas to Meet Solid Oxide Fuel Cell Natural Gas Specifications

CO₂ Transportation and Metering

🌐 USA

- Project Description: CO₂ Compressor Station
- Phase 1 Design Rate: 3.2MM tonnes/year (Approx. 170 MMSCFD) from Ammonia Processing Plant
- Future Expansion to 10MM tonnes/year (Approx. 530 MMSCFD)
- Pre-Cast Concrete Structure (Waskey Type)
- High Speed Reciprocating Compressors with Dual 7,000 HP Compressors for Initial Phase with 6-7 Compressors for Ultimate Case
- Inlet and Outlet Leak Detection Metering Skids
- Inlet Separation / Scrubber and Coalescing Unit for Removal of Upfront Liquids
- Incoming Pig Receiver and Outgoing Pig Launcher
- Produced Water Tank
- Vent and Sump Systems
- PDC and PLC / Control Buildings

🌐 Southwest Colorado

- Project Description: CO₂ Compressor Station
- Design Rate: 200 MMSCFD
- Two (2) Dresser Rand HHE frame compressors at 5,500 HP each
- Suction pressure: 550 psig with discharge pressure of 2,200 psig
- Gas Dehydration Utilizing Glycol Dehydration (DEG) System



Wyoming

- Project Description: CO₂ Compression Facility
- Provided Complete Mechanical, Civil / Structural, Pipeline and I&E Design Packages
- Multi-Discipline Expansion Project to Install Two New 30 MMSCFD (Total of 10,000 HP) Reciprocating CO₂ Compressors
- Variable Frequency Drives, PDC / MCC Building, 15MVA Transformers, Compressor Building with 20-Ton Overhead Crane, Interstage and Final Discharge Air Coolers, 2-Phase Separator, Cooling Water Tower
- 200 MMSCFD Flare Knock Out Drum and Flare
- Pipe Rack and Access Roads

Germany

- Project Description: Feasibility Study of CO₂ Rail Transport and Cold CO₂ Liquid Pipeline
- Assessed Worst-Case Scenario CO₂ Compositions
- Evaluated H₂O Impurity (30 PPMV) for Risk Solids Formation
- Completed Hydraulic Evaluation for CO₂ Railcar Unloading
- Completed Pipeline Hydraulic Calculations – Wall Thickness, Fracture Propagation and Mitigation Strategies
- Evaluated Flow Schemes and Pressure Drops in Proportion to Identified Pipeline Length Options
- Also Studied Effects of Different Insulation Types and Pipeline Burial Depths

Midwest

- Project Description: Five (5) CO₂ Metering Facilities for Multiple CO₂ Capture Plants in Nebraska
- Capture from Ethanol Plants for CO₂ Sequestration
- Rates Ranging from 174,000 tonnes/yr (Approx. 9.2 MMSCFD) to 497,000 tonnes/yr (Approx. 26 MMSCFD) Per Site
- Meter Selection and Development of Specifications
- Multidiscipline Engineering and Design / Drafting for All Meter Sites

Mississippi

- Project Description: Pipeline Design with Booster / Meter Station
- 150 MMSCFD CO₂ Station Capacity
- Utilized Two (2) Woodgroup TM24000A 75 MMSCFD Horizontal Centrifugal Pumps
- Design of CO₂ Cooling System Utilizing Water Cooling Tower and Heat Exchangers



Mississippi

- Pipeline Design with Booster / Meter Station
- Booster Station Design for 800-1000 MMSCFD CO₂ Capacity with Discharge of 2,160 psig
- Integrate NEJD and Barksdale Pipeline
- Utilized Eight (8) Woodgroup TN3500 100 MMSCFD Horizontal Centrifugal Pumps
- Utilized Suction and Discharge Wet Surface Air Coolers (WSAC)

Mississippi

- Project Description: Pipeline Design with Booster / Meter Station
- Booster Station Design for 650 MMSCFD CO₂ Capacity with discharge of 2,160 psig at 90°F
- Utilized Four (4) Woodgroup TN2500 260 MMSCFD Horizontal Centrifugal Pumps
- Utilized Wet Surface Air Coolers (WSAC)

Louisiana

- Project Description: Pipeline Design with Booster / Meter Station
- Booster Station Design for 650 MMSCFD CO₂ Capacity with discharge of 2,160 psig at 90° F
- Utilized Three (3) Woodgroup TX2500 260 MMSCFD Horizontal Centrifugal Pumps

Louisiana

- Project Description: 60-mile, 24" Pipeline for Anthropogenic CO₂ Capture from Multiple Sources of CO₂
- Pipeline Design from 300 MMSCFD to 900 MMSCFD Capacity with Operating Pressure of 1,250 psig to 2,350 psig
- Future Midline Booster Stations Included in Design

Wyoming

- Project Description: CO₂ Pipeline Scoping Report
- Provided a Feasibility Study and Scoping Report for Installation of a 90 Mile CO₂ Pipeline with Operating Pressures of 2,400 psig
- Provided Elevation Profile with Pressure Drop Calculations Utilizing HYSYS with Initial Flowrates of 32.5 MMSCFD and Future Flowrates of 70 MMSCFD



CO₂ Sequestration / Injection Facilities

Offshore USA

- Project Description: CO₂ Central Platform Facility (CPF), CO₂ Injection Well Platforms and Distribution Pipeline Systems
- Structures and Facilities for Deep Zone Monitoring Wells, Shallow Water Monitoring Wells, Passive Seismic and Soil Gas Stations
- CO₂ Pump Station for Sequestration
- Injection Rate of 10.5MM tonnes/year at 2,300 psig in Future
- Modular Steel Deck Design on Steel Piles for CPF in 5 ft. Water Depth with Provisions for Future Expansion
- Steel Monopile Deck for Injection Well Platforms
- DAS / DTS Fiber System Integration
- MCC / PDC Building
- Safety Systems, Communications, Power Control and Utility Infrastructure

North Dakota, USA

- Project Description: CO₂ Storage Facility
- Injection Flow Rate of 1.7 MM tonnes/yr (Approx. 85 MMSCFD)
- 1,950 psig Topside Injection Pressure
- 3 Mile Lateral from Main CO₂ Trunk Line
- Facilities to Produce CO₂ from Storage Reservoir and Treat to Pipeline Quality

CO₂ EOR Processing Facilities

Louisiana

- Project Description: Methane Removal and NGL Production Project
- Separating Methane and NGL from Existing Facility CO₂ Recycle Stream Designed for 200 MMSCFD
- Major Equipment Consisted of Silica Gel Dehydration and Regeneration, 2-Stage Membranes, Chiller, Stabilizer, Dewpoint Control, Dresser Rand 2 Section 20,450 HP Centrifugal Compressor, LP and MP Screw Compressors, Hot Oil Systems and NGL Storage and Truck Loading



Bulgaria

- Project Description: CO₂ EOR Project
- Provided Process Design FEED Study to Capture CO₂ from an Existing Fertilizer Plant, Treat / Dehydrate CO₂ and Deliver to Pipeline System for Transport to Existing Oil Fields
- Feasibility Study Included Study of All Compression Types Including New Shockwave Technology for CO₂ Compression
- Designed CO₂ Rate of 50 MMSCFD for Phase 1 Development and Future Expansion of 100 MMSCFD for Phase 2 Development with Inlet Pressure of 5 psig and Discharge Pressure of 2,000 psig

Alberta, Canada

- Project Description: CO₂ EOR Facility Project
- Provided Process Design Review to Capture CO₂ from an Existing Fertilizer Plant and Transport the CO₂ for Enhanced Oil Recovery at Existing Fields
- Railcar and Pipeline Options were Considered for Transportation
- Utilized Aspen HYSYS to Determine Ideal Transport Conditions for Each Case
- Feasibility Review of the Central Processing Plant with Recommended Process Changes, Material Selection and AFEs, Project Schedules and Execution Plan

Texas

- Project Description: CO₂ Recycle Pilot Facility / Pipeline Design
- Provided Complete Mechanical, Civil / Structural and I&E Design Packages
- Design of an 8" - 2,220 psig Pipeline with Design Rate of 200 MMSCFD CO₂ from Kinder Morgan Pipeline to Goldsmith, Texas
- Facility Production Design Rate: 840 BOPD, 13,660 BWP, 3 MMSCFD CO₂ Recycle
- Test Design Rate: 120 BOPD, 2,380 BWP, 0.5 MMSCFD CO₂
- Incoming Working Pressure: 70 psig
- CO₂ Recycle / Well Injection Pressure: 1,800 psig

Mississippi

- Project Description: Central Facility, Production / Injection System
- Design Rate: 2,000 BOPD, 5,000 BWP, 40 MMSCFD CO₂ Recycle
- Incoming Working Pressure: 850 psig
- CO₂ Recycle / Pipeline Injection Pressure: 3150 psig
- Utilized Dresser Rand 6HOS/2 20 MMSCFD Recycle Compressors
- Utilized Two (2) Woodgroup TJ9000 20 MMSCFD Horizontal Centrifugal Pumps



Louisiana

- Project Description: Central Facility, Production / Injection System
- Design Rate: 2,500 BOPD, 5,000 BWPD, 60 MMSCFD CO₂ Recycle
- Incoming Working Pressure: 850 psig
- CO₂ Recycle / Pipeline Injection Pressure: 3,150 psig
- Utilized Three (3) Dresser Rand 6HOS/2 20 MMSCFD Recycle Compressors
- Utilized Three (3) Woodgroup TJ9000 20 MMSCFD Horizontal Centrifugal Pumps

Louisiana

- Project Description: Central Facility, Production / Injection System
- Design Rate: 12,000 BOPD, 100,000 BWPD, 390 MMSCFD CO₂ Recycle
- Incoming Working Pressure: 400-700 psig
- CO₂ Recycle / Pipeline Injection Pressure: 1,350 psig
- Utilized Two (2) Dresser Rand 7HOS/4 60 MMSCFD Recycle Compressors
- Utilized Four (4) Dresser Rand 7HOSS/6 130 MMSCFD Recycle Compressors
- Utilized Screw Compressor for Vapor Recovery

Texas

- Project Description: Central Facility, Production / Injection System
- Design Rate: 10,000 BOPD, 40,000 BWPD, 200 MMSCFD CO₂ Recycle
- Incoming Working Pressure: 400-850 psig
- CO₂ Recycle / Pipeline Injection Pressure: 2,200 psig
- Utilized Two (2) Dresser Rand 5HOS/4 15 MMSCFD L.P. Recycle Compressors with CAT G3608 TALE Engine with SCR/OC Emission Controls
- Utilized One (1) Dresser Rand 5HOS/4 38 MMSCFD H.P. Recycle Compressors with CAT G3606 TALE Engine with SCR/OC Emission Controls
- Utilized Three (3) Dresser Rand 5HOS/6 50 MMSCFD Recycle Compressors with CAT G3608 TALE Engine with SCR/OC Emission Controls
- Utilized Combination of Centrifugal Blowers and Screw Compression for Atmospheric and Low-Pressure Vapor Recovery

Montana

- Project Description: Central Facility, Production / Injection System
- Design Rate: 15,000 BOPD, 55,000 BWPD, 260 MMSCFD CO₂ Recycle
- Incoming Working Pressure: HP: 400-700 psig, LP: 100-200 psig
- CO₂ Recycle / Pipeline Injection Pressure: 2,100 psig
- Utilized One (1) Dresser Rand Small HP 7HOSS/4 40 MMSCFD Recycle Compressor
- Utilized Two (2) Dresser Rand Large HP 7HOSS/6 80 MMSCFD Recycle Compressors
- Utilized Two (2) Dresser Rand LP 7HOSS/6 35 MMSCFD Recycle Compressors
- Utilized Screw Compressor for Vapor Recovery



Texas

- Project Description: Central Liquids Handling and Compression Facility, Production / Injection System
- Design Rate: 3,000 BOPD, 30,000 BWPD, 35 MMSCFD CO₂ Recycle
- Incoming Working Pressure: 175 psig
- CO₂ Recycle / Well Injection Pressure: 1,500 psig
- Utilized One (1) Oil-flooded Screw VRU Compressor
- Utilized One (1) Oil-flooded Screw LP Compressor
- Utilized One (1) Dexpro Unit for Dehydration with Five (5) 3-Stage Reciprocating HP Recycle Compressors 7 MMSCFD
- Utilized four (4) Horizontal Multistage Centrifugal Pumps
- Water Recycle / Well Injection Pressure: 1,050 psig

Louisiana

- Project Description: CO₂ Recycle Facility Design
- Provided Complete Mechanical, Civil / Structural, I&E Design Packages
- CO₂ Source from Truck Loading Facility
- Design of a 1,500 psig Injection System Utilizing Flex Steel Injection Materials
- Design of Recycle Facility including CO₂ Injection, Production Flowline Systems, Separation and Glycol Dehydration
- Facility Production Design Rate: 1,000 BOPD, 1,000 BWPD, 6 MMSCFD CO₂ Recycle
- Test Design Rate: 200 BOPD, 750 BWPD, 1.0 MMSCFD CO₂
- Incoming Working Pressure: 285 psig
- CO₂ Recycle / Well Injection Pressure: 1,250 psig

Utah

- Project Description: McElmo Unit Water / CO₂ Flood Upgrade FEED Study and Execution of Upgrades to Existing Facilities and Centralization of Processing Capabilities
- Additional Production Design Rate: 30 MMSCFD CO₂, 3,000 BOPD, 28,000 BWPD

CO₂ Test Site Facilities

Mississippi

- Project Description: Field / Test Site #1
- Production Design Rate: 2,523 BOPD, 24,550 BWPD, 33 MMSCFD CO₂
- Test Design Rate: 200 BOPD, 1,000 BWPD, 16 MMSCFD CO₂
- Incoming Working Pressure: 425 psig



Mississippi

- Project Description: Field / Test Site #2
- Production Design Rate: 5,000 BOPD, 50,000 BWPD, 45 MMSCFD CO₂
- Test "A" Design Rate: 200 BOPD, 1,000 BWPD, 6 MMSCFD CO₂
- Test "B" Design Rate: 200 BOPD, 1,000 BWPD, 6 MMSCFD CO₂
- Incoming Working Pressure: 425 psig

Mississippi

- Project Description: Field / Test Site #1
- Production Design Rate: 3,000 BOPD, 30,000 BWPD, 45 MMSCFD CO₂
- Test Design Rate: 300 BOPD, 1,500 BWPD, 3 MMSCFD CO₂
- Incoming Working Pressure: 400 psig

Mississippi

- Project Description: Field / Test Site #2
- Production Design Rate: 3,000 BOPD, 30,000 BWPD, 45 MMSCFD CO₂
- Test Design Rate: 300 BOPD, 1,500 BWPD, 3 MMSCFD CO₂
- Incoming Working Pressure: 400 psig

Mississippi

- Project Description: Field / Test Site #1
- Production Integrated with Martinville Central Facility
- Test Design Rate: 200 BOPD, 750 BWPD, 3 MMSCFD CO₂
- Incoming Working Pressure: 850 psig

Mississippi

- Project Description: Field / Test Site #1
- Production Design Rate: 7,000 BOPD, 20,000 BWPD, 80 MMSCFD CO₂
- Test Design Rate: 3,000 BLPD, 7 MMSCFD CO₂
- Incoming Working Pressure: 400 - 900 psig
- Including Infield Flowlines

Texas

- Project Description: Field / Test Site #1
- Production Design Rate: 800 BOPD, 8,500 BWPD, 5.8 MMSCFD CO₂
- Test Design Rate: 1,050 BLPD, 0.65 MMSCFD CO₂
- Incoming Working Pressure: 300 - 1,000 psig
- Infield Flowlines Included



Texas

- Project Description: Field / Test Site #2
- Production Design Rate: 400 BOPD, 4,000 BWPD, 2.8 MMSCFD CO₂
- Test Design Rate: 1,080 BLPD, 0.7 MMSCFD CO₂
- Incoming Working Pressure: 300 -1,000 psig
- Infield Flowlines Included

Other Relevant Projects

USA – Multiple Clients

- Project Description: Development of Standards and Specifications in CO₂ Service
- Developed Overall Design Specifications for the Following Facilities:
 - Emitter / Capture Sites
 - Injection Wellsite
 - Midline Valve Stations
 - Pipeline Systems
 - Compressor / Booster Stations
 - Central Receiving and Measurement Stations
- Developed Other Design Standards that Include but are not Limited to Piping Systems, Coolers, Manual & Automated Valves, Control Valves, Instrumentation, Metering, Process Analyzer, PDC, PLC, Control Panel, Bus Stop, UPS, SCADA, DAS / DTS System, Utility Power / Transformers, Battery Bank / Solar Array, Pig Launcher & Receiver, etc.
- Created Pipeline Compositional Specifications
- Also Created Design Standards for the Following:
 - Pipe Stress Analysis
 - Hydraulic Analysis
 - Fracture Propagation
 - Process Safety Standard
 - Dispersion Analysis
 - Cathodic Protection
 - Noise Standard
 - Identification of Equipment, Components, Devices, Lines, Valves and P&IDs