



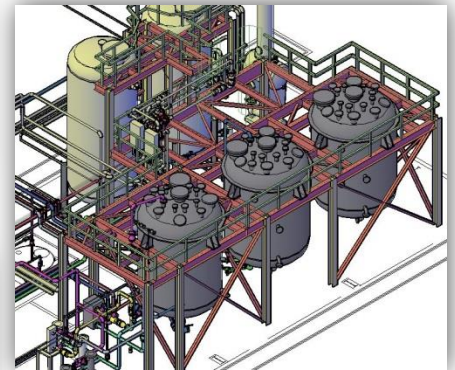
# Frazier, Barnes & Associates, LLC

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Frazier, Barnes & Associates, LLC is a Memphis, TN engineering and consulting firm providing process, industrial and mechanical engineering services for local and national process, specialty chemical, industrial, renewable, and agricultural process clients. With our focus on owner-advocacy and cost-effective energy resourcefulness, we consider not only first cost but long-term life cycle expenditure. We provide personal service enhanced by our communication skills, to allow for maximum project success!

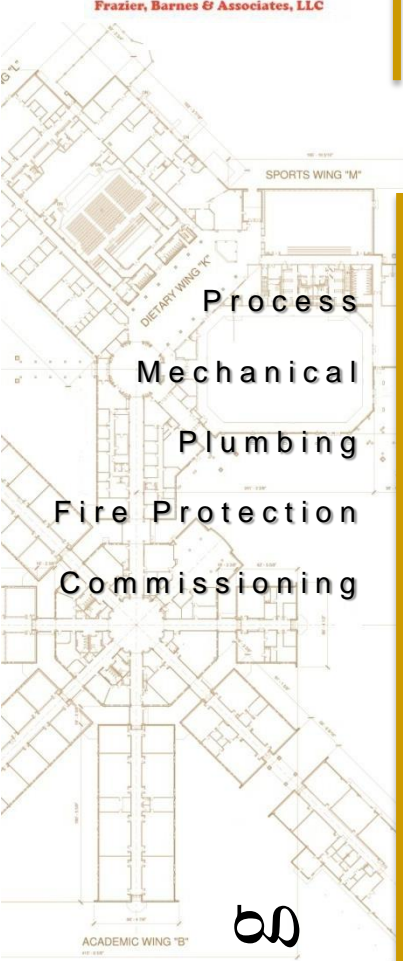
FBA engineering professionals provide engineering design services including: conceptual design, engineering construction documents, cost estimates, financial and economical analysis, industrial equipment appraisals and business enterprise valuations. We also provide construction administration, plant startup, process troubleshooting, owner training and process commissioning. We are a small firm that provides the highest quality engineering services without the unnecessary overhead cost.

**Engineering • Feasibility • Economics • Renovation • Greenfield**



Process  
Mechanical  
Plumbing  
Fire Protection  
Commissioning

Engineering

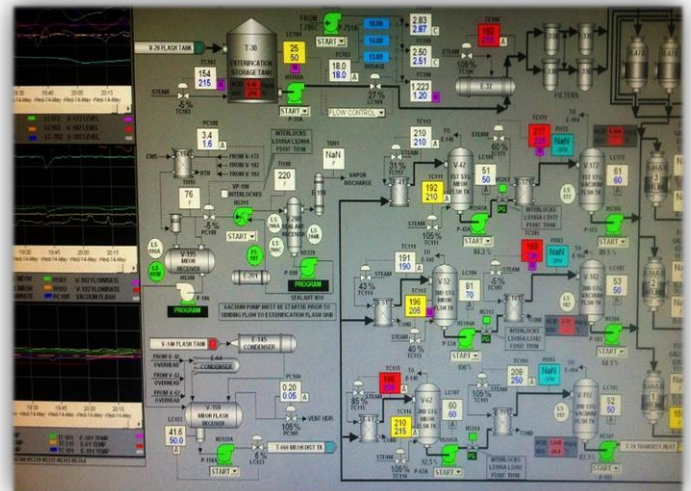


# Process Engineering

- Project development
- Design flow diagrams
- Development of process technology
- Design prototype systems for upgrade to commercial projects
- Prepare mass and energy balance
- P&ID - Design Process & Instrumentation Diagrams
- Process modeling and simulation
- Process optimization
- Process & equipment design and selection
- Specify process equipment
- Permitting criteria and data calculations
- Write RFP for equipment purchase
- Prepare process hazard analysis
- Prepare PSM -Process Safety Management
- Operations training on process, industrial and chemical facilities
- Technical and economic feasibility report
- Write business plans for new facilities and processes
- Plant and equipment troubleshooting
- Energy audit and implementation of recommendation to actual practice
- System analysis for pressure drop estimation
- Selection of process pumps, blowers, reactors, dryers and centrifuge
- Steam and process valve selection
- Design vacuum systems, vacuum pumps, ejectors
- Critical flow analysis
- Design PRV - Pressure Relief Valves, Rupture disk failure analysis
- Unsteady state flow analysis
- Two-phase flow analysis.
- Leak-rate estimation for vessels subjected to vacuum
- ChemCAD, AutoCADD 3D, mass balance software
- Develop in-process lab testing procedures

Process  
Industrial  
Mechanical  
Plumbing  
Fire Protection  
Commissioning

Engineering





# Mechanical Engineering



# Engineering

- Industrial Heating, Ventilation and Air Conditioning (HVAC) systems
- Process boiler, chiller and mechanical room design
- Central energy plant design
- Large scale industrial cooling towers and pumping systems
- Outside air & energy recovery systems
- Dust collection systems –bag house, ductwork, etc. design
- Exhaust systems (process, VAV laboratory, and industrial)
- Energy analysis, energy audit, & energy modeling
- Energy Management and Control Systems (EMCS)
- Equipment procurement
- Steam distribution and service design
- Process piping system design and supports
- Pipe stress analysis and piping supports design
- Process equipment selection and installation
- Phase demolition/reconstruction
- Construction administration and Inspection report
- Code compliance inspections report
- Hazardous area systems design
- Startup and commissioning
- Grain and material handling system design
- Feasibility reports and business plans
- Renewable energy design
- Bio-renewable energy design – Biodiesel, Biomass, Biogas & Ethanol
- Industrial plumbing and piping system design
- Industrial sanitary sewer systems
- Laboratory VAV HVAC and gas piping systems
- Acid, caustic and chemical piping system
- Process, domestic, graywater systems and storage
- Secondary containment piping systems
- Compressed air and vacuum systems
- Natural gas and propane fueling systems
- Laboratory and hazardous waste system design





## Key Engineering Projects

### Project Engineering for Upgrade to 12 Million Gallon Yr. Process Plant

Performed process engineering upgrades to increase plant capacity 50%, upgrade esterification capacity, refurbish methanol column and increase plant flexibility to operate using multiple feedstocks – \$8M project.

### Project Engineering for Specialty Feed Ingredient Process

Developed Capital Cost Estimate for a specialty feed ingredient facility. Developed project scope, major equipment lists and equipment costs, mass and energy balances and engineering package.

### Design and Engineering of New Industrial Steam Plant

Provided detailed engineering, design and construction administration of steam system for an agricultural processing plant located in the North West. Provided design, engineering and construction oversight of new 1,200 Hp steam system. Provided feasibility, financial analysis and engineering to upgrade and or construct new processing and extraction facilities.

### Start-up Services for 35,000 PPH Process Plant

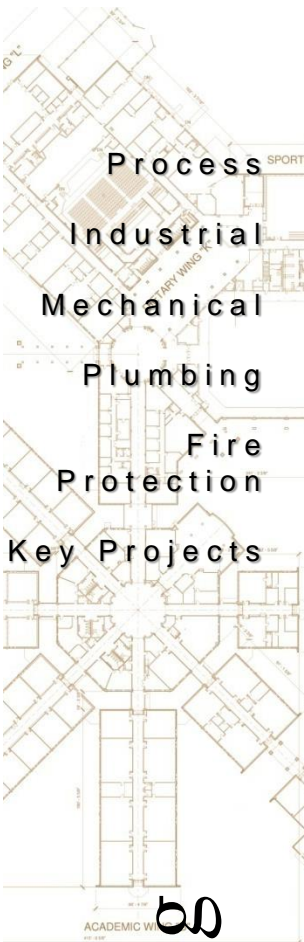
Once the technology provider left and the plant was not functioning after a year of trials, the client called in the FBA team to troubleshoot the process, glycerin and methanol distillation units. Within a month, FBA had identified the problems and the plant was able to produce in-spec products.

### Operator Training & Start-up for 85,000 PPH Process Plant

FBA provided on-site operator training and start-up assistance for process, safety, chemistry and plant operations for 100 mgy biodiesel plant. FBA provided written operating procedures for the following unit operations associated with the process facility, phosphoric refining, alcohol Neutralization, transesterification, methyl ester distillation, gums and glycerin acidulation, glycerin evaporation & neutralization, methanol recovery and distillation, acid esterification, and utilities. Training was provided for normal startup, normal shutdown, and emergency shutdown due to loss of power, loss of chillers, loss of instrument air, and loss of process heater. Provide process troubleshooting.

### Extraction and Process Plant Process Improvements

FBA provided process improvements and detailed engineering design for canola oil crush facility, install crush cooler, relocate and install methanol distillation column, and provide upgrades to process plant. Apply for government grant, provided process improvements, troubleshooting, design, engineering, to install, commission and start-up of systems and utilities.



Engineering

