

WORLDWIDE PLANT SOLUTIONS



AMMONIA

METHANOL

HYDROGEN

Services

[Detailed Plant Simulations](#)

[Detailed Plant Evaluations](#)

[Plant Debottleneck Studies](#)

[Plant Optimization](#)

[CO₂ Removal System Optimization](#)

Corporate Overview

BD Energy Systems, LLC – a world leader in plant revamps and modernizations based out of Houston, Texas, USA – works together with Mr. Steve Parrish of Parrish Process Services to generate detailed overall plant Heat and Material Balances and to bring in-depth experience on evaluating equipment performance in Ammonia, Methanol, or Hydrogen plants. This integration of services enhances BD Energy Systems' capabilities in providing the best recommendations during process and feasibility studies undertaken on existing plants, leading to plant debottlenecking and optimization. Our proven records on such revamps indicate the ROI for efficiency and capacity increases in plants is less than 2 years. BD Energy Systems will be pleased to provide references for the projects executed.

BD Energy Systems has executed more than 90 successful projects on Ammonia, Methanol, and Hydrogen plants of various designs. The range of projects covers steam methane reformers, secondary reformers, boilers, burner replacements, selective catalytic reduction (SCR) systems, selective non-catalytic reduction (SNCR) systems, combustion air preheater systems, and many more.

Our Company's strength comes from each individual who has domestic and international experience of 30+ years in the industry, specializing in furnace designs, plant technologies, plant processes, plant operations, construction, and technical field services that include commissioning, start-up, and operator training services.

With every project undertaken, BD Energy Systems uses its experience to ensure timely and accurate success of the project.



Plant Evaluation

The reasons for requesting an evaluation are varied from efficiency improvement, capacity increases, to repairs and maintenance, below are the key reasons for an evaluation:

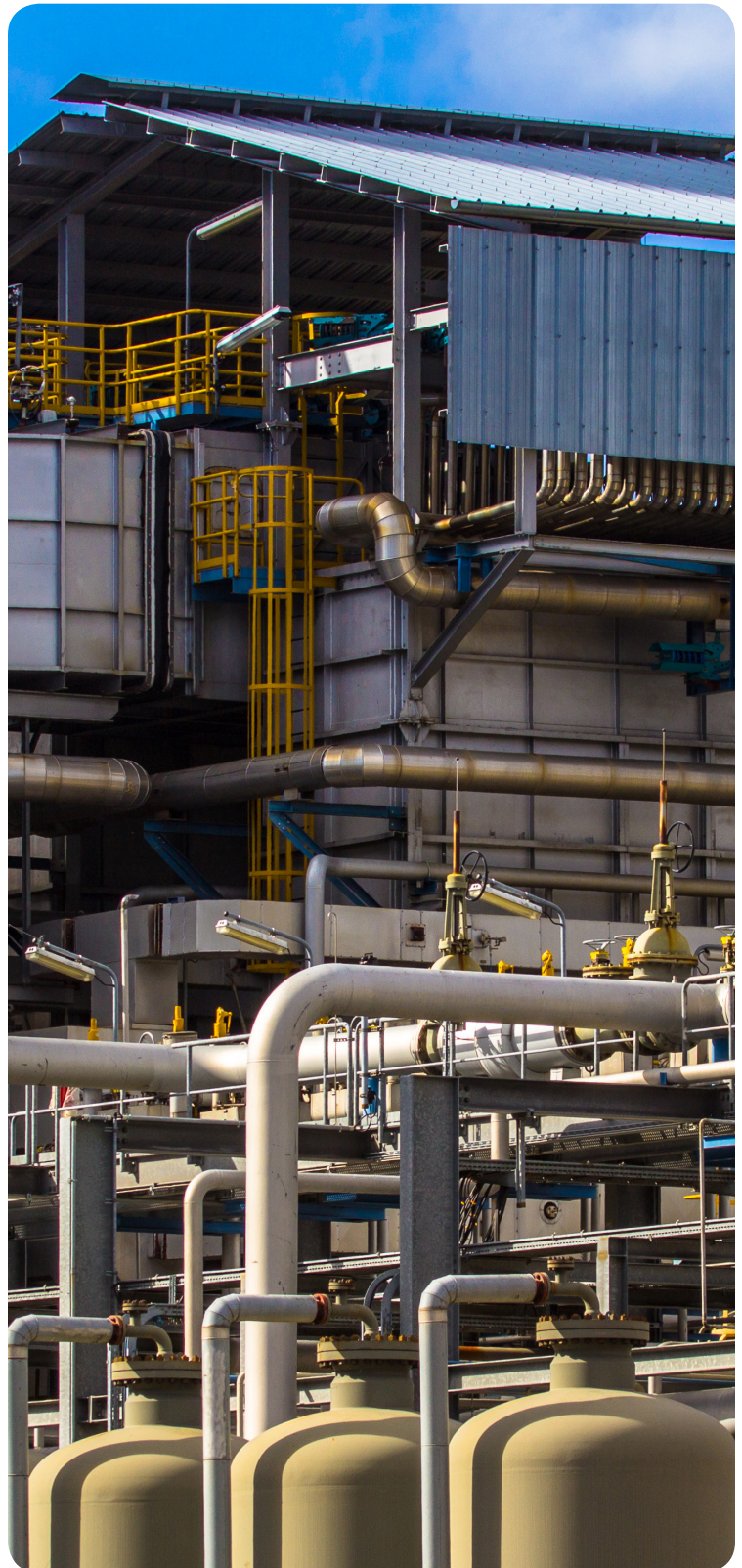
- Debottlenecking
- Improved Efficiency
- Turnaround Preparation
- Development of PFD Information

Troubleshooting

- Catalysts
- Furnaces
- Compressors
- Turbines
- Heat Exchangers
- Steam System
- CO₂ Removal
- Refrigeration
- Pressure Loss
- Leaks
- Instrumentation

Modeling of Plant Under Altered Conditions

- Higher Rates
- Different Feedstock
- Summer vs. Winter Performance
- Evaluation of Proposed Projects
- Relief Valve Studies
- Cooling Water Improvement



Study Methodology

A study begins with detailed data collection at the plant site. Time is spent collecting equipment specifications for the plant including:

- Catalyst loadings and ages
- Furnace design
- Compressors including performance curves
- Turbines
- Pumps
- Heat exchangers
- Coils
- Burners
- Vessels
- Packing

On the day of the performance test all control room and field instrumentation is recorded.

An infrared temperature gun is used to read process and cooling water temperatures and a portable oxygen analyzer is used to record O₂ levels where available in the furnace and flue gas ducting. Plant support is required for a full set of laboratory analyses as well as a detailed pressure survey using a test gauge.

The data collected is analyzed using proprietary software specifically written for the ammonia, methanol, and hydrogen industry. An overall material balance is calculated and this is used to define all plant streams and to develop a computer model of the plant performance. This simulation then becomes the basis for selection and optimization of a retrofit program or study of the plant under alternate conditions.

The plant simulation software takes into account all important aspects of plant performance and includes kinetic modeling of catalyst reactors, heat exchanger and coil performance, pressure drop at different plant rates, and compressor and turbine efficiencies. Steam balances are made for each new case and this is used to find the impact on fuel gas firing. The software is flexible enough to accommodate any type of syngas and hydrogen plant design.



Study Results

As part of the study a baseline performance report is issued for the plant. This report includes discussion of:

- The material balance
- Detailed energy use calculation
- Furnace performance including coils
- Catalyst performance
- Detailed steam balance
- Turbine calculations and comparison to design efficiency
- Compressor performance and comparison to vendor curves
- Heat exchanger performance calculations
- Cooling water balance
- CO₂ removal system performance
- Any instrumentation problems
- Flow schematics with stream assignments
- Detailed listing of all plant streams including composition, flow rate, and physical properties.

Using this information a computer model of the plant can be built. This model can then be used to simulate the plant in a wide variety of situations including specific projects for energy savings or debottlenecking, alternate feedstocks, the plant balance at a target production rate, impact of catalyst bed replacement, benefit of cooling tower retrofit, or any other situation desired. A number of retrofit designs have been adopted into ammonia, methanol, and hydrogen plants with a high degree of success.



Study Benefits

A syngas plant evaluation identifies problem areas within a plant that can be addressed for improved performance. It forms the basis from which energy savings and capacity increase projects can be studied and designed. A plant evaluation provides a baseline of the plant against which future performance can be checked and is also an excellent resource for plant engineers to use in their work. Relief valve studies and updated PFD's can be made from plant evaluations. The joining of Parrish Process Services with BD Energy Systems brings to the study their expertise in the primary reformer, convection section, SCR, SNCR, and air preheat. BD Energy can also provide full engineering, supply, and construction support for any projects selected as a result of this plant evaluation.

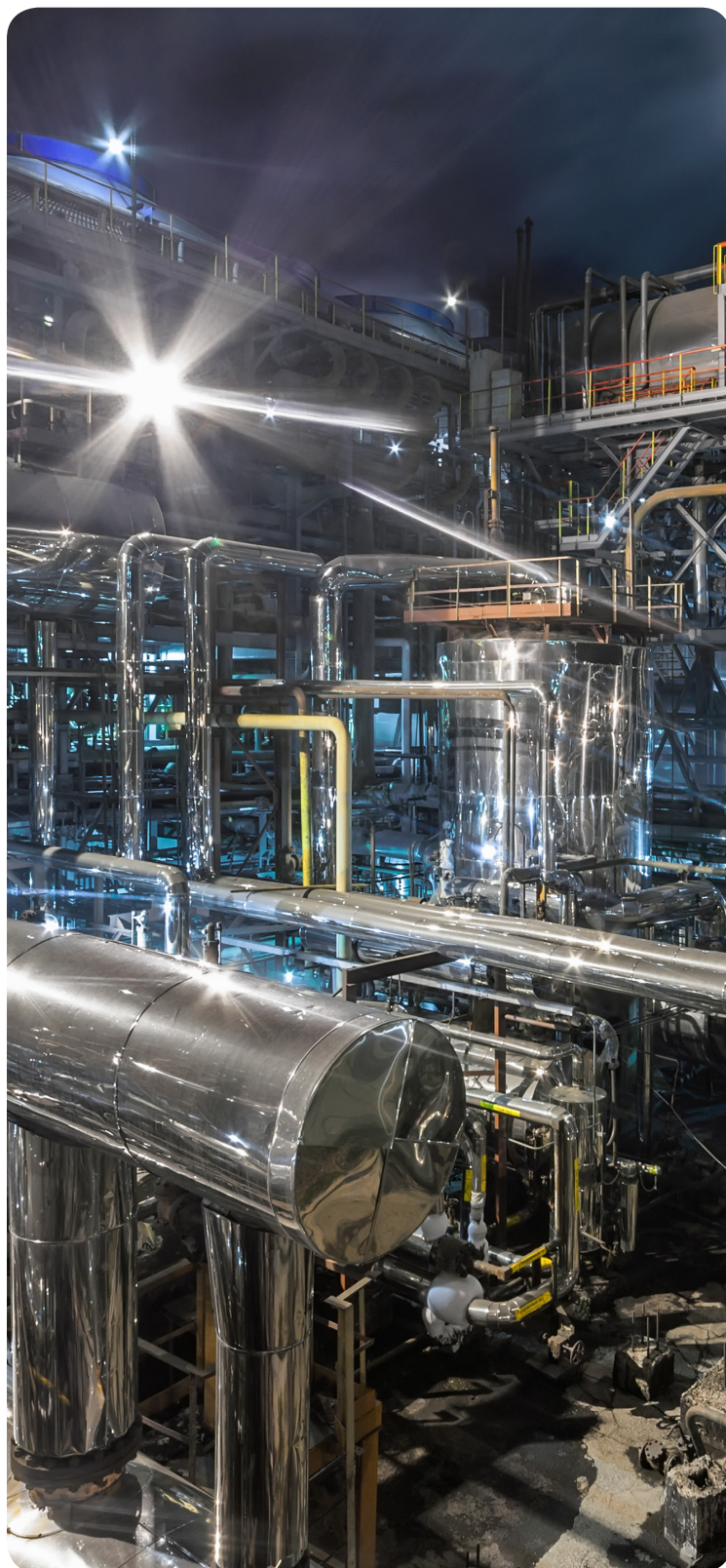


Experience

Steve Parrish received a B.S. in Chemical Engineering from the University of Colorado in 1981. From 1981 to 1982 he worked as a process engineer in the Allied Chemical Helena, Arkansas ammonia plant. From 1982 to 1988 he was the process engineer for Allied Chemical/Arcadian Corporation in their Geismar, Louisiana Kellogg ammonia plant. In 1988 he joined BASF catalysts and was responsible for half of the US ammonia plants until 1990.

Parrish Process Services has been evaluating syngas and hydrogen plants since 1990. Plant studies have been conducted in 47 different plants in 8 countries for clients including:

- Agrico
- Agrium
- CF Industries
- Cherokee Nitrogen
- Coffeyville Resources
- Cytec Industries
- Dakota Gasification
- DuPont
- El Dorado Chemical
- Engro Fertilizer
- Enron
- Koch Nitrogen
- Monsanto
- Mosaic
- Oman Chemicals and Pharmaceuticals
- PCS Nitrogen
- Reliant Energy
- Rentech Nitrogen
- Syncrude
- Triad Nitrogen
- Unocal
- Wycon Chemical

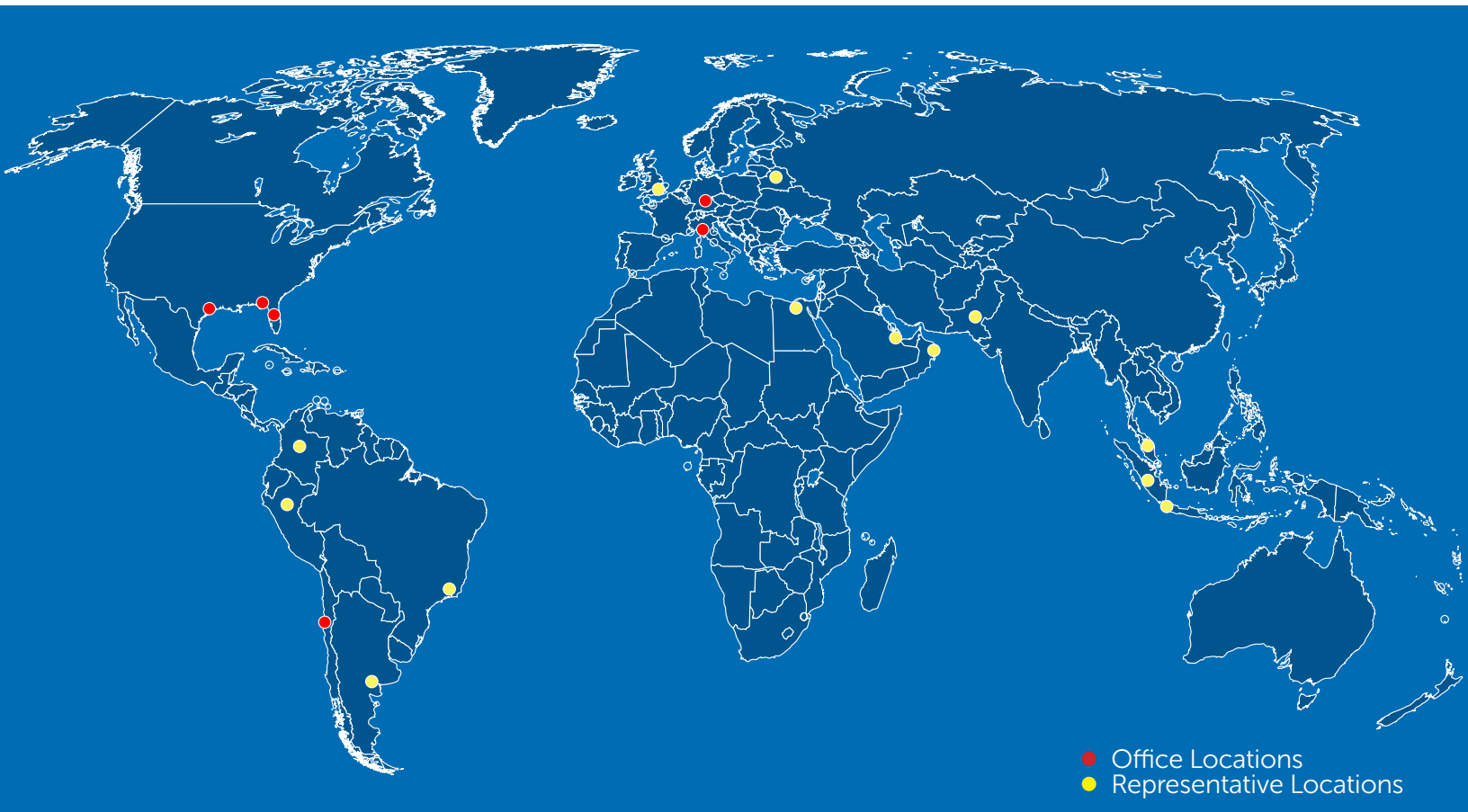




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