REFINERIES

CAPABILITIES PRESENTATION
ENGINEERING AND CONSULTING SERVICES
**BHP staff and its Associates** have provided clients with over 25 years of engineering design experience in the oil refining sector for various types of systems from small topping units to large complex refinery operations. BHP is a full service organization of engineering personnel and consultants with the capability to provide the complete project package for any project including civil, structural, mechanical, electrical, instrumentation, and environmental disciplines.

Oil refineries exist to process crude oil into marketable fuels. The refinery can consist of a single process unit or numerous process units, depending upon the unique characteristics of the crude oil and fuel specifications. BHP has designs available for small topping units of 6,000 BPD to modular typical refining units of 35,000 BPD and can supply designs for virtually every type of process unit needed to create a large refinery complex.

The engineering for refineries starts with the development of the Front End Loading (FEL) package or Front End Engineering Development (FEED) package which provides the basis for appropriations cost estimates and feasibility studies. BHP staff work with refinery owners to point out options for value engineering and work on the scheduling and planning of projects for optimum execution both in the design and construction phases.

**BHP’s engineers and designers** are multi-disciplined and they function as a team with our experienced project managers. BHP technology includes state-of-the-art project control systems to identify and plan the most effective means of project execution. BHP’s capabilities include involves stress analysis or 3D computer aided rendering and modeling and BHP maintains the latest available software and systems to perform the required engineering and design. As a compliment to the structural and mechanical design of the
units, our staff of control system specialists can apply the latest versions of distributed control systems, signal transmission, data collection and information processing. Our Control Systems designers have experience with all major types of distributed control systems and programmable logic controllers, as well as fiber optic and network design.

In addition to the basic crude refining process, BHP has engineering design experience in the following refinery processing units:

- FCC Units
- Catalytic Reforming
- Hydrocracking
- Asphalt
- Isomerization
- Crude Unit
- Desalter
- Hydrotreater
- Cat Reformer
- Olefins
- Flare Systems
- Cogen Boilers
- Offsite Utilities

- Alkylation Units
- Cokers
- Distillate
- Residual Fuel
- Benzene Extraction
- Vacuum Units
- Naphta Units
- Claus Sulfur Unit
- Depropanizer
- Hydrogen Plant
- DCS Systems
- Wet Gas Scrubber
- Waste Water Treatment

To compliment the basic engineering design capabilities, BHP has a demonstrated experience in the ability to provide EPC services for any of the processes which we design:

**Project Management:** Excellence is the foundation of our project management track record and contributes significantly to our high level of repeat business. We have a reputation for providing excellence in project management, as an integral part of our EPC project execution, or working with our clients as their project management consultant.

**Procurement:** With our network of procurement and our local knowledge, we have the expertise, negotiating power and flexibility to match the supply of materials and services to our clients’ cost, schedule, quality, local content and export credit needs.

**Construction and Commissioning:** There is a continuing focus on construction and commissioning from day one of our projects. Our construction
management personnel are highly experienced and culturally aware professionals with a can do mentality, who expect the same world-class standards on their construction sites, wherever they are in the world. With our experience, we have the expertise to develop the optimum construction strategy.

**Plant operations and maintenance:** Our experienced personnel provide the provision of management, operations, maintenance, staff development and training services. Our team’s expertise ranges from operating an entire facility to a specialist consultant.

**Turnarounds:** BHP has an excellent reputation for delivering successful turnarounds. We are able to manage an entire operation or work as part of an integrated team or alliance. We always strive to deliver the shortest possible safe turnaround. Our extensive experience in planning and implementing these difficult operations allows our clients to meet rigorous schedules and budgets while never compromising safety. Our ability to respond rapidly and manage unforeseen work during the turnaround itself has enabled challenging schedules to be met. Below is a listing of some of the more recent major turnaround activity for which BHP provided the planning:

- West Plant Turnaround - 1988 - Total Project Cost $8.0 Million Champlin Refining Company - Corpus Christi, TX (140,000 Man-hours)
- #2 FCCU Turnaround - 1989 - Total Project Cost $6.0 Million Champlin Refining Company - Corpus Christi, TX (100,000 Man-hours)
- EP II - Crude-Vacuum Turnaround - 1990 - Total Project Cost $10.0 Million Citgo Refining Company - Corpus Christi, TX (150,000 Man-hours)
- West Plant Turnaround - 1990 - Total Project Cost $7.0 Million Valero Refining - Corpus Christi, TX (60,000 Man-hours)
- East Plant - FCCU - H.F. Alky Units - 1991 - Total Project Cost $5.0 Million Valero Refining - Corpus Christi, TX (71,000 Man-hours)
- EDC - OHC-VCM Plant - 1992 - Total Project Cost $7.5 Million Occidental Chemical Corp. - Ingleside, TX (84,000 Man-hours)
- Quintana Plant - Hydrocracker Unit - 1993 - Total Project Cost $2.5 Million Valero Refining - Corpus Christi, TX (43,000 Man-hours)
- West Plant Turnaround - 1993 - Total Project Cost $4.5 Million Valero Refining - Corpus Christi, TX (68,000 Man-hours)
- EDC - OHC-VCM Plant - 1994 - Total Project Cost $2.0 Million Occidental Chemical Corp. - Ingleside, TX (20,000 Man-hours)
- West Plant Turnaround - 1994 - Total Project Cost $8.0 Million Valero Refining - Corpus Christi, TX (80,000 Man-hours)
- West Plant Turnaround - 1996 - Total Project Cost $3.0 Million Valero Refining - Corpus Christi, TX (40,000 Man-hours)
- Quintana Plant HC Unit Fire - 1997 - Total Project Cost $3.5 Million Valero Refining - Corpus Christi, TX
- West Plant #4 Crude Unit Fire - 1997 - Total Project Cost $3.0 Million Valero Refining - Corpus Christi, TX
- East Plant II - Crude-Vacuum Fire - 1995 - Total Project Cost $15.0 Million Citgo Refining Company - Corpus Christi, TX
- East Plant - FCCU - H.F. Alky Units - 1995 - Total Project Cost $5.0 Million Valero Refining - Corpus Christi, TX (70,000 Man-hours)
- Quintana Plant - Hydrocracker Unit - 1995 - Total Project Cost $2.5 Million Valero Refining - Corpus Christi, TX (42,000 Man-hours)
- East Plant - FCCU - H.F. Alky Units - 1997 - Total Project Cost $8.0 Million Valero Refining - Corpus Christi, TX (90,000 Man-hours)
- West Plant Turnaround - 1998 - Total Project Cost $9.0 Million Valero Refining - Corpus Christi, TX (75,000 Man-hours)
- WP Gas Oil HDS Unit Fire/Revamp - 1999 - Total Project Cost $650 Thousand Valero Refining - Corpus Christi, TX
- Quintana Plant - 1999 - Total Project Cost $3.5 Million Valero Refining - Corpus Christi, TX (38,000 Man-hours)
- #2 Naphtha HDS - Unit Rebuild after Fire - Total Project Cost $10.0 Million Valero Refining - Corpus Christi, TX
- Gas Oil HDS Unit Revamp - Total Project Cost $8.0 Million Valero Refining - Corpus Christi, TX
- FCCU Revamp AB & Wet Compressor - Total Project Cost $3.0 Million Valero Refining - Corpus Christi, TX
- Bob West Compressor Station - Total Project Cost $10.0 Million Coastal Oil & Company - Starr County, TX
- Co-Gen Auxiliary Burners - Total Project Cost $300 Thousand Valero Refining - Corpus Christi, TX
- Asphalt Blending/Storage/Loading Facilities - Total Project Cost $1.8 Million Valero Refining - Corpus Christi, TX
PROJECT EXPERIENCE:

- **Clean Fuels – Diamond Shamrock Refining**  Project Value - $65MM

- **Niger Delta 100MMBD Refining “FEED” - Nigeria** - Project Value - $1.3 B
Central Control Systems – KOCH Refining - Project Value - $35 MM

- Flare Gas Recovery – CITGO Refining - Project Value $27 MM

- Low Sulfur Diesel Facilities “FEED” - Coastal Refining - Project Value - $65 MM

- St. Eustatus Refining Relocation – Caribbean Islands - Project Value - $50 MM
- Heavy Aromatics – CITGO Refining - Project Value - $12 MM

Asphalt Modernization Project Trigeant Refining - Project Value - $10 MM
• Butadiene Saturation – Southwestern Refining - Project Value - $15 MM

• Asphalt Blending/Loading KOCH Refining - Project Value - $15 MM

• Boiler Feed Water R.O. Plant – KOCH Refining - Project Value - $9 MM
- **Belco Fuel Gas Scrubber – Valero Refining** - Project Value - $12 MM

- **FCCU Revamp – CITGO Refining** - Project Value - $10 MM

- **Refinery Flare System Revamp – KOCH Refining** - Project Value - $10 MM
• **#1 Crude Unit Revamp – CITGO Refining** - Project Value - $5 MM

• **BTX Unit - 8600 BPD Revamp – Coastal Refining** - Project Value - $5 MM

• **Sludge Concentration Unit – Coastal Refining** - Project Value - $5 MM

• **Vacuum Bottom Storage Facility – Valero Refining** - Project Value - $4 MM
• Zero Penetration Asphalt Storage and Loading - Holly Refining - Project Value - $4 MM
• Asphalt Blending/Loading Facilities – Trifinery Refinery - Project Value - $ 3.5 MM

• Asphalt Tank Heating– Coastal Refining - Project Value - $ 2 MM

Additional Capabilities

As a supplement to the Refinery Capabilities, other types of Engineering Projects and Services are within the scope of BHP’s areas of expertise. The Brochure on Water and Wastewater outlines the many capabilities in these areas. The Brochure on General Engineering Services offers a comprehensive view of the many other types of industry, municipal, and governmental groups which are served and outlines the full discipline capabilities of our talented and experienced staff of engineering professionals and scientists. You are invited to view our website at www.bhpeng.com.