HERE ARE JUST FIVE GOOD REASONS

Our one-stop shop, our large resource of specialists and our unmatched technical and project execution capability make us one of the world's leading refinery contractors. There are many good reasons to choose Foster Wheeler for your clean fuels project. Here are just five!

1. INVESTMENT PLANNING

We help our clients develop the right investment plan.

Investment planning is an essential part of any major development and this applies equally to clean fuels projects. Our investment planning approach considers current and future markets and legislation, process unit configuration, offsites, utilities, infrastructure, constructability and project implementation strategies, all based on real data and real EPC experience. We use linear programming to review scenarios and plan the investment phases in line with key market drivers including crude availability and product markets, as well as current and future legislation.

2. TECHNOLOGY EXPERTISE

We help you select the right technology for your current and future needs.

We have detailed knowledge of a huge range of licensor and open-art technologies. We maintain close relationships with all major licensors and catalyst suppliers, while retaining our strict objectivity in finding the best solution for each client. We are also experienced in integrating biofuels into clean fuels projects and incorporating biofuels-derived blending components, and we are working on new technology solutions with clients and technology providers.

3. FLEXIBILITY & CONTINUITY

We apply our EPC expertise to our study and consultancy work, and we apply our consultancy expertise to our FEED and EPC execution.

We are flexible. Whatever the scale of your project, we can help. We are expert at concept and feasibility studies including full master-planning and configuration optimization. Our studies deliver solutions that are practical, constructable and based on real cost data and real EPC experience. We have a long and illustrious FEED and EPC track record, including some of the largest and most complex projects anywhere in the world, and we can design and build the solution you select.

4. COMPLEXITY

Technical and logistics challenges are our speciality.

If a project is particularly complex, most clients know to call Foster Wheeler. With our unparalleled experience in the engineering and construction of new refineries, major refinery upgrades, revamps and turnarounds, we can anticipate and overcome the challenges presented by even the most complicated upgrades and new unit/equipment installations. We can deliver projects to meet your schedule and cost targets, to world-class HSE standards and with minimum impact on existing facilities.

5. THE HYDROGEN BALANCE

We deliver the whole clean fuels solution to optimize your refinery operation.

Hydrogen availability is a constant concern for refineries and can become a critical bottleneck. The addition of clean fuels units will invariably increase hydrogen demand. We analyse the refinery hydrogen balance and recommend the minimum investment option to meet your hydrogen needs.

Should a new plant be required, we can provide leading hydrogen generation technology using our Terrace Wall™ steam reformers.

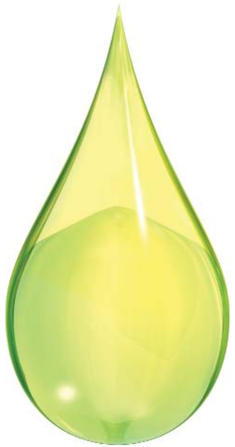
FOSTER WHEELER

REFINERIES & CLEAN FUELS

contact us at:
refining@fwc.com www.fwc.com

LEADERS IN REFINING

Refineries & Clean Fuels
Refining
Refinery Consultancy
Hydrogen
FCC
SYDEC℠ Delayed Coking
Carbon Capture & Storage



FOSTER WHEELER

WHY CHOOSE FOSTER WHEELER?

We have an unrivalled track record in executing clean fuels projects. We understand the legislative issues. We have an in-depth knowledge and experience of a huge range of technologies, licensed and open-art, and help you select the right solution. We'll design and build your chosen solution, safely and cost-effectively. We can fast-track projects, whether new build or revamps, so that you don't need to invest before you have to.

Our clients can benefit from the learning we've gained in developing and executing clean fuels projects around the world. Our track record speaks for itself.

WE ADD VALUE FROM CONCEPT TO COMMISSIONING

- Investment planning
- Technology evaluation & selection
- Optimization & integration studies
- Concept & feasibility studies
- Front-end engineering & design (FEED)
- Project management
- Engineering, procurement, construction (EPC) & commissioning
- Energy efficiency & minimization
- Hydrogen balance

OVER 70 HYDROCRACKERS AND OVER 150 HYDROTREATERS IN THE LAST 20 YEARS.

FROM LICENSOR EVALUATION THROUGH TO FULL EPC, REVAMP TO GRASSROOTS NEW BUILD.

A PROVEN CLEAN FUELS TRACK RECORD.

PROJECT HIGHLIGHTS

PETRO RABIGH, SAUDI ARABIA
Refining/Petrochemical Complex

We undertook the feasibility study and overall FEED for Saudi Aramco and Sumitomo Chemical to upgrade the existing refinery to produce ethylene and propylene petrochemical plant feedstocks for the associated world-scale ethylene complex, based around a 1.3 mtpa ethane cracker to produce polyethylene and mono-ethylene glycol.

We were also the EPC contractor for the very significant utilities and offsites facilities required to support one of the largest integrated complexes ever to be built at one time. The facility is able to process 166,000 bpsd of atmospheric residue and 38,000 bpsd of heavy gas oil from the existing refinery to manufacture a range of different products, including polypropylene and propylene oxide, in addition to lower sulfur diesel and higher quality gasoline products.

The Petro Rabigh facility included key clean fuels elements:

- revamp of existing diesel hydrotreater to increase capacity and produce lower sulfur diesel
- new 120,000 bpsd VGO hydrotreater producing 300ppm low sulfur vacuum gasoil
- new hydrogen plant to meet demand for the new and revamped hydrotreaters
- additional amine treating, sour water stripping and sulfur recovery units to handle the increased H_2S produced from the new refinery plants
- modifications to diesel and fuel oil process units, and installation of new gasoline blending systems, to meet higher quality refinery product specifications
- project design to meet World Bank standards for environmental emissions
- integrated water, steam and power plant designed with limestone-gypsum flue gas desulfurization
- flue gas desulfurization of the existing fired heaters was developed in the FEED, but later removed following changes in fuel availability that allowed a switch to treated LPG from sulfurous fuel oil

NEW ZEALAND REFINING CO
Future Fuels

FEED and EPCm for New Zealand's 110,000 bpsd refinery in Whangarei, including the installation of units for hydro-desulfurization and benzene reduction. A key execution strategy was the use of pre-assembled modules for the piperacks and a main process module. Modules were fabricated, assembled and tested in Thailand before shipping to site.

BANGCHAK PETROLEUM, THAILAND
Fuel Oil Upgrading

FEED, project management, technical consultancy and procurement for the Product Quality Improvement Project, to upgrade fuel oil to produce clean transportation fuels. We delivered a number of studies for our client, including overall refinery utilities, risk assessment, cogeneration and environmental. Units included gas oil deep hydro-desulfurization, a 25,000 bpsd hydrocracker, vacuum distillation, fuel gas treatment and a sour water stripper. We also provided our leading hydrogen production technology, and designed and supplied a Terrace Wall™ reformer and three fired heaters for the vacuum distillation and hydrocracker units. This project transformed the hydroskimming refinery into a complex high-conversion refinery.

HELLENIC PETROLEUM, GREECE
Low Sulfur Fuels

We have a 25-year relationship with this client, which includes detailed engineering and construction management for upgrading of the FCC and CCR at the Aspropyrgos refinery, FEED and basic engineering for the upgrade of the Elefsina refinery to eliminate heavy fuel oil, and EPCm and commissioning management for a major upgrade of the Thessaloniki refinery to produce low sulfur fuels.

ECOPETROL, COLOMBIA
Barrancabermeja Refinery Upgrade

FEED and owner's project management consultant for major upgrade with several objectives: to achieve deep conversion for processing domestic high sulfur heavy crudes, to increase production of distillates, to eliminate fuel oil production, and to produce clean fuel. New units include a Foster Wheeler SYDEC™ delayed coker, plus a hydrocracker and coker naphtha hydrotreater, a hydrogen production unit, sour water strippers, amine regeneration, a sulfur recovery unit with tail gas treating, offsites and utilities, and major modifications to several of the existing atmospheric and vacuum crude distillation units. Also, detail engineering and construction management of early works.

IOCL PARADIP, INDIA
Grassroots Refinery

FEED and managing project management consultant for new 15 mtpa refinery, designed to process heavy, sour crudes to produce a range of refined products, including distillates to Euro IV specification.

EPC contractor for a number of the key refinery process units, including atmospheric and vacuum distillation, naphtha hydrotreating, catalytic reforming, sulfur recovery and tail gas treatment, flue gas desulfurization, alkylation and sulfuric acid regeneration, and butane isomerization. We also provided our own leading SYDEC™ delayed coking technology.

SARAS, ITALY
FCC Gasoline Desulphurization

Detailed design, EPCm and project management of new FCC gasoline desulfurization unit, based on licensor PDP, to achieve 180 m^3/h naphtha capacity. We engineered the unit for several feedstock qualities, including isopentane, to meet 10 ppm sulfur content of the treated product. The project meets IPPC and BAT requirements and targets the very best industry standards for reliable operation.

IRAQ MINISTRY OF OIL, NASSIRIYA
Grassroots Refinery

Feasibility study and FEED for 300,000 bpsd refinery to produce a range of products both for domestic use and for export. The refinery will be designed to meet predominantly Euro IV product specifications, and products will include LPG, three grades of gasoline, Jet A-1, kerosene, light gas oil, heavy diesel oil, fuel oil, asphalt and sulfur.

The refinery is planned to be totally self-sufficient in utilities except for the provision of raw water and dry gas. Excess power will be exported to the national grid once all internal demands are met.

NSRP, VIETNAM
Grassroots Refinery/Petchems

FEED for the 200,000 bpd Nghi Son Refinery and Petrochemical project, designed to process Kuwaiti crude, and comprising a fuels refinery based on residue hydrodesulfurization feeding a residue catalytic cracker integrated with petrochemical production. The complex includes 30 process units, many of which are licensed technology.

The petrochemical plant includes aromatics units to produce paraxylene and benzene for domestic and export markets. The propylene from the residue cracker is used to produce polypropylene and the configuration also includes an indirect alkylation unit to convert some of the C4 olefins into gasoline.

Refined products will be produced to meet Vietnamese fuel quality specifications. The refinery is designed to meet the highest environmental standards. All the fuel oil produced will be consumed in the refinery for its own energy needs and includes flue gas desulfurization on the main utility boilers.

TÜPRAŞ, TURKEY
Gasoline Specification Improvement

Detailed engineering for grassroots clean fuels project to improve fuel quality and reduce its sulfur content. Our scope included a catalytic cracker gasoline desulfurization unit, designed to produce a blend of two streams, and a reformate benzene reduction unit, which integrates reactive hydrogenation with a splitter column. We also provided oxygenates storage and handling systems, and offsites, utilities and interconnections.