



SYDECSM DELAYED COKING

Maximize profit from the bottom of the barrel



SYDEC DELAYED COKING

- the key benefits

Foster Wheeler offers SYDECSM (Selective Yield Delayed Coking) under license

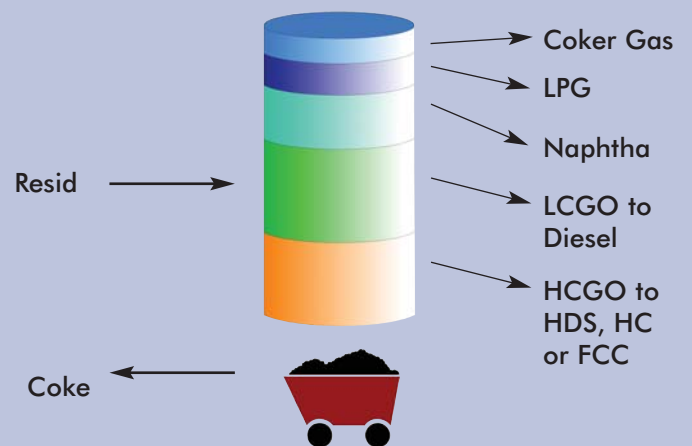
In today's market, refiners need to improve profitability by maximizing the production of transportation fuels with residue upgrading technology that is commercially proven with strong economic impact, provides feedstock and product flexibility, and is highly reliable with long periods between turnarounds.

Foster Wheeler's SYDEC delayed coking technology is the leader in residue upgrading for zero fuel oil production.

- Improved profitability by maximizing production of transportation fuels
- Yield selectivity to maximize distillate production
- Options for calcinable grade coke production
- Feedstock flexibility to process residue, pitch, or partially converted material
- Extended run-lengths between spalling and turnarounds for more on stream time and lower maintenance costs
- Designed to maximize operator safety with better layout, improved egress, sophisticated interlocks and slide valve unheading

Guaranteed performance and proven safety with SYDEC

Typical yield from a barrel of coker feedstock

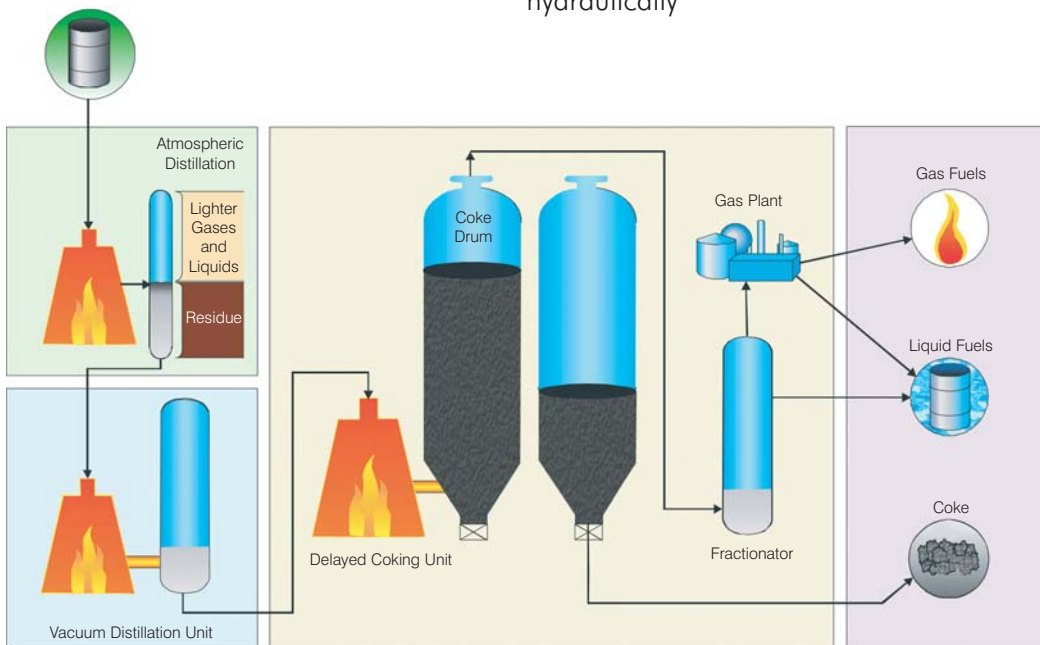


THE SYDEC PROCESS

Delayed coking is a cyclic process that thermally cracks vacuum residue or other residue feedstocks into gas, light products and petroleum coke.

Key process steps:

- heat feedstock to about 930°F (500°C) in coker furnace
- transfer the hot residue to coke drum before it has formed coke
- fill the drum and allow the heavy tars to convert
- switch the drums on timed cycle (12 to 24 hours)
- decoke the full drum hydraulically
- recover the cut coke, crush and prepare for shipment
- recycle water to eliminate waste
- fractionate cracked products into gas, coker naphtha, light coker gasoil and heavy coker gasoil
- further process fractionated products in downstream units





FOSTER - taking

Our coking capability for new plants and revamps

- Feasibility, planning and economic studies
- Process design packages
- EPC
- Commissioning, start-up and operations assistance
- Comprehensive training and knowledge transfer with KnowledgeWeb™
- Design and supply of coker heaters
- Capacity increases/revamps:
 - coke drum replacement
 - safety improvement
- API fitness-for-service evaluation
- Fatigue life evaluation on coke drums
- Ongoing licensor support services

BEST TECHNOLOGY VALUE

Foster Wheeler has designed and engineered more delayed cokers world-wide than any other technology provider or engineering contractor.

- Over 4 million bpsd installed
- Over 33 revamps designed in the last 10 years
- Almost 40 new units designed in the last 5 years
- Most accurate yield and product quality prediction with 50+ years of operating data, proprietary models and pilot plant research
- Designs for extended coke drum life while reducing cycle times for profitable operations
- State-of-the-art unit operations and full coker automation on our most recently constructed units
- Comprehensive operator training with our proprietary KnowledgeWeb system designed to reduce errors
- Dedicated operations support for commissioning and start-up
- Proven designs for long run length coker heaters, including sloped-wall, double-fired designs for very heavy feeds

SEAMLESS EPC EXECUTION

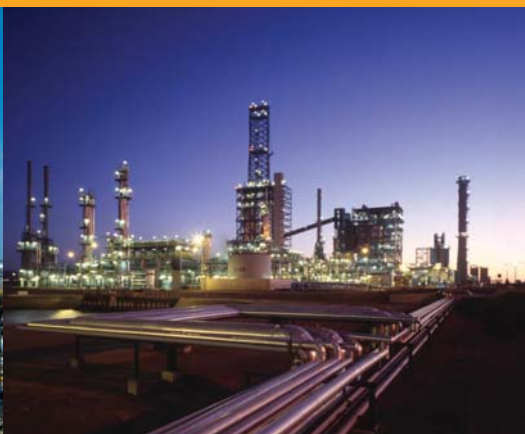
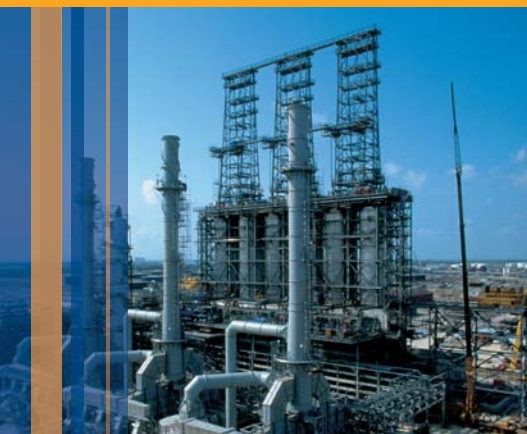
As a world-class EPC contractor with a long track record of executing successful major projects and revamps, our clients benefit from our experience of meeting aggressive cost and schedule targets.

Coker units are complex, and we always recommend Foster Wheeler detailed engineering and critical procurement to realize the full operational benefits of our well-designed, well-constructed delayed coking unit.

WHEELER technology further



PROJECT



VALERO

Texas City Refinery, USA

EPC in less than 28 months, under budget, from process design to 'oil in'. Designed to process 45,000 bpsd in four drums.

REPSOL/PETRONOR

Cartagena and Somorrostro, Spain

Our relationship with Repsol started in 1966 and recently included the license, process design package and EPCm for a 53,000 bpsd delayed coker unit, and 90,000 bpsd vacuum distillation unit at Cartagena, and license process design package and EPCm for a 35,500 bpsd delayed coking unit at Somorrostro.

ENAP BIOBIO

Talcahuano, Chile

We designed, supplied and built a new 12,000 bpsd delayed coking plant at this innovative PetroPower™ combined coker/cogeneration facility.

SINCOR

Jose, Venezuela

EPCm for debottlenecking and shutdown. One of four Orinoco upgraders; we provided delayed coking technology for three.

TUPRAS

Izmit, Turkey

License, basic design and heater supply for 52,000 bpsd grassroots delayed coker enabling the refinery to reduce fuel oil production and increase diesel production.

MOL

Százhalombatta, Hungary

We have worked with MOL for more than 15 years. Our recent revamp of the original SYDEC unit increased capacity by 27% to 26,400 bpsd.

BP

Castellón, Spain

FEED and EPC for new 20,000 bpsd coker and design, engineering, procurement and supply of 43.5 MW double-fired Terrace-Wall™ heater.

CNOOC

Huizhou, China

License package, FEED and heater for a 77,000 bpsd anode coker with the world's largest coke drums in operation (32 feet or 9.78 metres diameter).

highlights



PETRON CORPORATION

Bataan, Philippines

Part of Petron's Refinery Master Plan-2 Project, detailed engineering and procurement services for a 37,500 bpsd delayed coker unit including engineering and material supply of two double-fired Terrace-Wall coker heaters.

ENERCON

ENAP's Aconcagua Refinery, Chile

Feasibility study, basic design and EPC of a 20,000 bpsd coking facility, including amine regeneration unit, sour water stripping and coke handling facilities.

INDIAN OIL CORPORATION

Gujarat and Paradip, India

License and basic engineering for new 3.7 mtpa delayed coking units.

TOTAL

Port Arthur, Texas, USA

License, basic design and Terrace-Wall heater supply for a grassroots 50,000 bpsd delayed coking unit allowing Total to process heavier crudes.

CONFIDENTIAL CLIENT USA

License, basic design and Terrace-Wall heater supply for 15,000 bpsd delayed coking unit. The unit includes the world's only pass coker heater.

BP

Whiting Refinery, USA

License, process design package, EPCm and KnowledgeWeb for a 102,000 bpsd delayed coker unit. The unit is fully automated and constructed on a modular basis.

YPF

La Plata, Argentina

Engineering, equipment supply and assistance with construction and start-up for a delayed coker heater for the new delayed coking unit at YPF's Complejo Industrial La Plata.

SAUDI ARAMCO/TOTAL

Jubail Export Refinery, Saudi Arabia

Process design package for a new 103,000 bpsd delayed coker, part of the Jubail Export Refinery, a grassroots full-conversion refinery designed to process Arabian heavy crude.

The heater -

The fired heater is the heart of the delayed coker, and we can offer:

- Terrace-Wall double-fired, sloped wall type
- Single-fired cabin- or box-type with horizontal tubes and bridge wall

The heater is an integral part of our coking technology. It incorporates key design features which are pivotal to our cokers' excellent performance and reliability ensuring economic operation with extended run lengths and durations between turnarounds of up to seven years.

Our in-house team provides full process, thermal and mechanical design to our stringent specifications and standards, leaving no critical details open to misinterpretation by a third-party designer.

The key advantages of Foster Wheeler's Terrace-Wall delayed coker heaters:

- Sloped walls provide an extremely uniform heat flux from top to bottom of the radiant coil
- The burners firing up the sloped walls stabilize the coker off-gas fuel and spread the flame evenly along the length of the tube and up the wall
- Grade access permits 360-degree viewing access and easier burner maintenance
- Completely isolated cells allow individual pass firing controls for on-line spalling, pigging and turndown abilities, which result in cost savings from increased run length
- Unique 3-pass heaters for smaller capacity units

the heart of the process



The SYDEC evolution

Although our coking technology is well-proven, we are always looking for ways to make the SYDEC technology even safer, more reliable and more profitable for our clients.

Key features of the SYDEC process to improve reliability, operability and efficiency:

- Terrace-Wall double-fired heater
- Advanced coke drum design
- Fractionator zone sprays and fines removal
- Low pressure, ultra-low recycle
- On-line spalling/pigging
- Run lengths of five years or more between turnarounds

Safety in design:

- Slide valve unheading system
- Sophisticated extensive safety interlocks
- Improved deck layout and better safety egress
- Full coker automation available
- Coke drum life monitoring program

Environmentally friendly process:

- Low-sulfur fuel gas production
- Enclosed coke transport and storage
- Enclosed blowdown recovery systems
- Unique clean coke handling systems
- Waste by-product processing
- Water minimization
- Improved heat integration

Due to the stringent environmental regulations at ENAP's Aconcagua refinery in Chile, the petroleum coke produced is milled in a coke crusher and conveyed in belts installed in a closed gallery and driven into a domed storage facility.



Turning vision into reality

Did you know?

- Commercial coking first started in 1929
- Since 1994, almost all residue upgrading in the USA has been based on delayed coking
- Foster Wheeler cokers have the flexibility to produce fuel-grade coke or more valuable anode or needle coke depending on feedstock
- We can integrate delayed coking with
 - solvent deasphalting to increase residue conversion
 - circulating fluidized-bed technology to produce electricity and/or steam
 - gasification to produce electricity, steam and hydrogen
 - other hydroprocessing technologies
- 24 grassroots SYDEC units have successfully started operation since 1955



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LEADERS IN REFINING

