

KBR

Refining Services and Experience



Refinery Studies
Feasibility & LP



Project Development
Concept to Commissioning



Refinery FEED & EPC
Grassroots & Revamps



Growth Areas
Clean Fuels & Tight Oils

A Legacy Built on Execution Excellence



Helping Global Refiners Meet Market Demands While Operating Efficiently

With over 90 years of know-how, KBR helps refiners around the world increase value, lower costs and improve the profitability of their operations. KBR's experience spans the entire range of refinery configurations and technology solutions, including crude and vacuum distillation, naphtha processing, hydrotreating, hydrocracking, hydroprocessing, FCC, delayed coking, solvent deasphalting and sulfur management. KBR's scope of services range from standalone studies to Engineering, Procurement, Construction (EPC) to commissioning and start-up services. With our talent, resources and experience across the energy business, KBR can respond quickly and effectively to meet your project requirements.

Why KBR

- Committed to Zero Harm to people, environment and property through a sustained culture where we make safe decisions, governed by personal values.
- A full lifecycle of refining solutions, optimum configuration, from early process and engineering studies; technology evaluation and selection, basic engineering and FEED; full EPC; and to commissioning, start-up and training.
- Expertise in all major technologies including client owned, all project sizes including mega projects, world-wide execution from studies to full EPC scope gives KBR a breadth and depth of refining experience including best practices.
- Combined strength in refining, olefins, petrochemicals, gas processing and LNG/GTL provides a comprehensive understanding of the hydrocarbons value chain.
- Strong senior team of refining experts who work as one team partnered with our customer to provide open communication and ease of successful project delivery.
- Experience in recent refining growth areas including clean fuels, heavy/high TAN crude conversion, bitumen upgrades and condensate refineries/tight oils where we continually remain engaged.

ZERO HARM – 24/7: Courage to Care

At KBR, Zero Harm means a culture in which we make safety conscious decisions that are governed by personal values. We make a personal choice to work safely and to look out for each other in a true interdependent culture. A Zero Harm culture embraces the courage to care through intervention and engagement in safety related conversations with our peers.

All incidents are intolerable, and there is a desire and commitment to make sure we do everything in our power to avoid any situation that could put our employees, subcontractors or customers at risk of being hurt. At KBR, we are striving to create a culture in which everyone truly realizes that an injury incident is not a statistic but rather a person who was negatively affected by a shortcoming within our organizational system, to which we all contribute.

Zero Harm

Genuine belief that zero is achievable and a mindset intolerant of incidents



ZERO HARM
courage to care

24/7

All-day every-day approach to safety

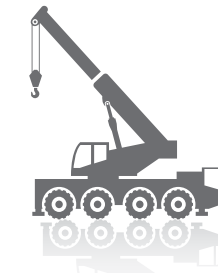
Courage to Care

The genuine willingness to intervene



80+

COUNTRIES
WHERE WE HAVE
ACTIVE PROJECTS



40+

GLOBAL OFFICE
LOCATIONS



34,000

EMPLOYEES





A leader in refining since 1924 when MW Kellogg brought one of the first cracking technologies to global markets

From grassroots feasibility studies to refinery revamps and process unit debottlenecking, KBR brings the keen insights of an experienced technology-based EPC contractor to perform the best conceptual refinery configuration and FEED preparation. Our portfolio of projects includes full front-end designs covering conceptual and feasibility studies, project cost estimates, lump-sum EPC bid books preparation and other PMC services. KBR's recent refinery projects include world-scale, single trains with some of the largest process units ever built.

KBR'S GRASSROOTS REFINERY DESIGNS (LAST 10 YEARS) – NEARLY 2 MILLION BPSD

- YASREF Refinery, Saudi Arabia (400 KBPSD)
- SONAREF Heavy Crude Refinery, Angola (200 KBPSD)
- ENOC Condensate Refinery, UAE (210 KBPSD)
- PETROSA Refinery, South Africa (360 KBPSD)
- JAZAN Refinery & IGCC, Saudi Arabia (400 KBPSD / 4 GW Power Generation)
- MOTIVA Refinery, USA (325 KBPSD)
- MBINI Refinery, Equatorial Guinea (20 KBPSD)
- PETROMONAGAS Heavy Oil Upgrader, Venezuela (150 KBPSD)



70+

GRASSROOTS
REFINERIES



50+

FEED AND EPC PROJECTS IN
LAST 10 YEARS



40+

REFINERY PLANNING
STUDIES IN LAST
10 YEARS

Global Engineering Services

KBR's leadership in the refining markets is vast and extensive. Over the past 75 years, KBR has successfully executed over 1,000+ projects worldwide, from grassroots plants and expansions to upgrades and revamps of existing units. This experience gives KBR the perspective and know-how to plan, schedule and execute projects that deliver the greatest value to our customers.



KBR FEED

KBR has successfully completed numerous FEEDs for some of the world's most challenging projects, providing a well-planned project with a well-defined scope and execution plan set up for safety, budget, schedule and quality success. KBR has the proven work methods that define the minimum engineering required, a vast database of project pricing and go-by projects, relationships with all major licensors, and a global organization to facilitate accurate funding, best possible total installed cost estimates and EPC bid packages resulting in minimal overall cost.

KBR EPC

KBR is a global leader in EPC services for the hydrocarbon industry, providing solutions that span the entire hydrocarbons value chain – from wellhead to the production of refined products to specialty chemicals and fertilizers. In addition to refining experience, KBR's vast portfolio of projects include onshore and offshore oil and gas production facilities including platforms, floating production and subsea facilities, Liquefied Natural Gas (LNG) and Gas-to-Liquids (GTL). Whether a grassroots facility, or plant expansion, KBR has a history of delivering high-performing, world-class refinery projects.

Refinery Growth Areas

Clean Fuels

KBR's high level of technical competence is reflected in the execution of over 35 Clean Fuels FEL projects, since year 2000 for units of virtually every type and size. Our experience covers both pre-treat and post-treat options for low sulfur gasoline, licensed and open-art technologies for ULSD, as well as benzene reduction compliance.

Tight Oil Processing

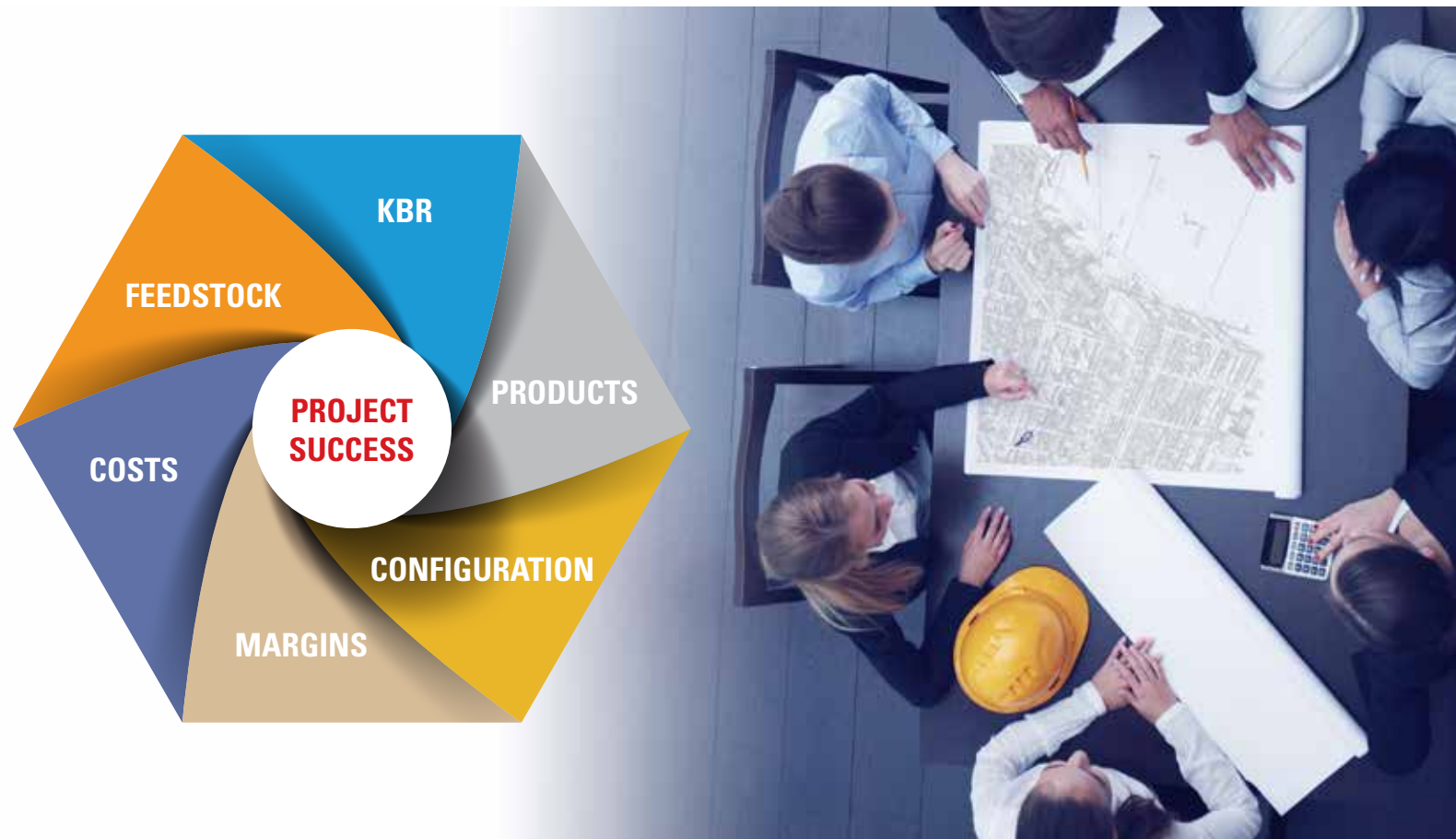
KBR's LP and engineering specialists assist customers with process adjustments and practical unit modifications to remove process unit capacity bottlenecks and help achieve tight oil processing objectives with minimal capital investment.

Bitumen and Heavy Oil Upgrading

KBR is a leading provider of a suite of bottom-of-the barrel processing technologies such as ROSE® and VCC™ Veba Combi Cracking. KBR's experience includes residue upgrading technologies, both proprietary as well as open-art.

Refining and Petrochemicals

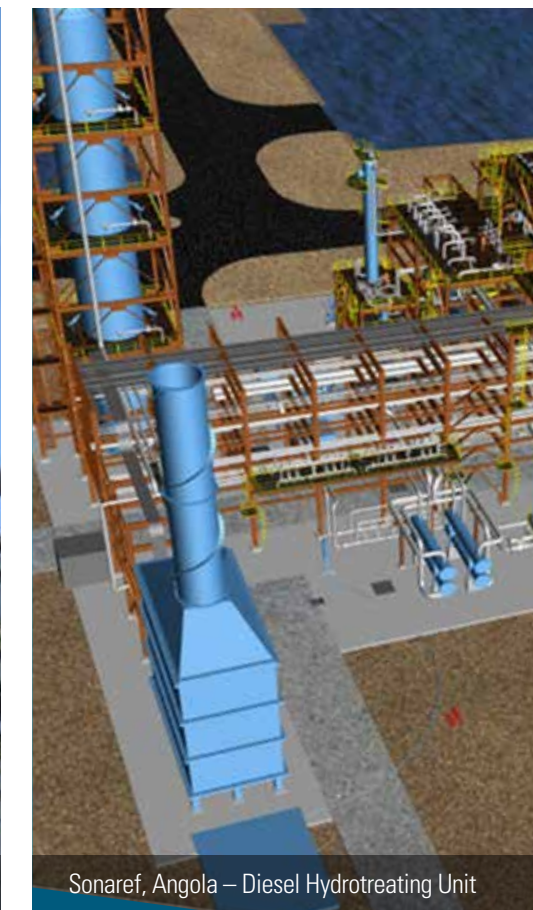
KBR's suite of technologies in refining, olefins, petrochemicals, chemicals and polymer technologies provides a comprehensive knowledge of the hydrocarbon value chain for optimal integration of petrochemicals into a crude refining facility.



YASREF, Saudi Arabia – Vacuum Distillation Unit



BP-Husky Toledo – CCR Reformer



Sonaref, Angola – Diesel Hydrotreating Unit

Refining Consulting Services

KBR's refining services include:

- Project Development
- Process and Engineering Studies
- Linear Programming (LP) Studies
- Technology Evaluation
- Basic Engineering, FEED
- Engineering, Procurement and Construction
- Commissioning and Start-up
- Training
- Clean Fuels: Gasoline and ultra low-sulfur diesel (ULSD)
- Tight Oils and Condensate Refineries: Projects and studies
- Heavy Oil / High Tan Crude Conversion: Revamps and grassroots
- Bitumen Upgrading: Canada and Venezuela

Our experts have knowledge and experience with refining emerging growth areas including:

Front-End Engineering Services

At KBR, refinery project execution evolves through several Front-End-Loading (FEL) stages and decision gates. Execution development includes a Conceptual Phase (FEL-1), a Feasibility Phase (FEL-2), and a Definition Phase (FEL-3) or FEED. These are followed by Engineering, Procurement and Construction (EPC), commissioning and start-up. KBR follows the FEL process that customers use for project development or uses its own adapted to customer needs.

Refinery LP Modeling for Configuration Development and Studies

From grassroots feasibility studies to refinery revamps and process unit debottlenecking, KBR will use the power and versatility of Linear Programming (LP) applications to establish the most advantageous basis for project economics and offer customers the best prospects for attaining project sanction and funding.

KBR's Leading Refining Team/Subject Matter Experts

- Senior refining professionals working as "One Team" with our customers, creating customized, integrated solutions
- In-house expertise in olefins, petrochemicals, gas processing and specialty chemicals
- Minimal initial need for third-party data or input

Extensive EPC Experience

Engineering

KBR routinely delivers inventive engineering solutions whatever the challenge. KBR's geographical reach, technical skills, standardized work processes, and disciplined execution approach create safe, project designs and deliver cost effective engineering services around the world.

Procurement

Leveraging international market knowledge and supplier relations, KBR's procurement offices provide timely identification of low-cost equipment and material sources for customers. KBR's Integrated Project Management System (IPMS) can manage materials and equipment from design to installation while KBR's Logistics department will coordinate all freight forwarding and shipping to the port of import. Altogether, KBR's proven procurement strategies substantially reduce supply chain costs and cost of ownership.

Construction

KBR can perform as a single-source contractor on any size brownfield or greenfield capital project and can quickly mobilize a complete construction operation anywhere in the world, providing direct hire labor, construction, and subcontract management.

KBR Recent EPC Projects

<ul style="list-style-type: none"> ● Shell Chemicals Gasoil Hydrotreater AL, US 	<ul style="list-style-type: none"> ● ExxonMobil Low Sulfur Mogas Revamps Multiple Sites, US 	<ul style="list-style-type: none"> ● ExxonMobil Low Sulfur Mogas Chalmette, LA, US 	<ul style="list-style-type: none"> ● ExxonMobil Diesel Hydrotreater Joliet, IL, US 	<ul style="list-style-type: none"> ● Petro-Canada Sulfur in Gasoline (SIG) Edmonton, Canada 	<ul style="list-style-type: none"> ● Pearl Gas to Liquids (GTL) Qatar 	<ul style="list-style-type: none"> ● BP-Husky CCR Toledo, Ohio, US 	<ul style="list-style-type: none"> ● Monroe Energy SCANfining Unit Relocation Trainer, PA, US 	<ul style="list-style-type: none"> ● BP Gasoline HDT Whiting, IN, US 	<ul style="list-style-type: none"> ● BP-Husky Feedstock Optimization Toledo, Ohio, US
2004	2006	2007	2012	2013	Ongoing				

Our Breadth and Depth of Refining Experience

Since the 1920s, we have assisted our customers in developing, designing and constructing refineries that efficiently convert each barrel of crude into valuable products, improving margins and increasing profitability.



YASREF Refinery

Major accomplishments worldwide since 2005 include:

- Nearly 2 MM BPSD of refining capacity
- Grassroots, expansions, refinery upgrades and new unit additions
- Refinery capacities ranging from 20,000 to 400,000 BPSD
- Crude API gravities from 20 to 40 API
- Full conversion, partial conversion and topping refineries, including a small modularized topping refinery
- Refinery feedstocks from whole crudes to condensates and tight oils
- World scale facilities:
 - Largest single train crude unit (400,000 BPSD)
 - Largest Hydrocracker (124,000 BPSD)
 - Largest Diesel Hydrotreater (177,000 BPSD)
 - Largest IGCC complex (4 GW power generation)
 - Largest Refinery Sulfur Recovery Unit (1260 MTD)
 - Other units among the largest in the industry include a CCR (85,000 BPSD) and coker (114,000 BPSD)

Refinery Project	Capacity, KBPSD	Crude Type	Conversion	LP Modeling	Conceptual Study	Feasibility Study	FEED Design	Utilities, Offsites & Infrastructure	Petrochemicals	Additional Roles
YASREF, Yanbu, Saudi Arabia	400	Heavy	Full	●		●	●	●	●	PMC
BP-Husky, Toledo, Ohio	115	Heavy	Full		●	●	●	●		EPC _M
Sonaref Refinery, Angola	200	x-Heavy	Full	●	●	●	●	●		PMC
Saudi Aramco, Jazan, Saudi Arabia (incl. IGCC)	400	Medium	Full	●		●	●	●	●	PMC
PetroSA, South Africa	360	Heavy	Full	●	●	●	PF	●	●	PD
ENOC, Dubai (Condensate Refinery)	210	Light	Topping	●	●	●	●	●		PD
Mbini, Equatorial Guinea	20	Light	Topping	●	●	●	PF	●		PD
PetroCanada, Edmonton	86	Bitumen	Full	●	●	●	●	●		EPC
Motiva, Port Arthur	325	Heavy	Full	●	●	●	PF	●		
Husky, Lima, Ohio	150	Heavy	Full		●	●	●	●		DE

PF: Pre-FEED PD: Project Development DE: Detailed Engineering

KBR Delivers Leading Edge Refining Technologies for Diverse Refining Needs

KBR's portfolio of refining technologies enables refiners to process a wide variety of crudes, including heavy opportunity crudes to meet ever-changing market demands. KBR's licensed technology is found in more than half of the world's FCC units, a majority of residue upgrading units, and 150+ hydroprocessing units.

KBR's technology offerings include those wholly owned by KBR and those offered in alliance with our partners:

- Fluid Catalytic Cracking (FCC)**
Flexible FCC technologies to meet refiners' desired production goals
- MAXOFIN™**
Keeping pace with rising demand for propylene
- MAXDIESEL FCC™**
Maximize refinery profitability with increased distillates production
- K-SAAT™**
A safer, low cost alternative for high quality Alkylate production
- Residuum Oil Supercritical Extraction (ROSE®)**
Recover high value products from Residues using up to 60% less energy
- Veba Combi-Cracking (VCC™) Technology**
Achieve 95% conversion on a wide range of feedstocks
- DISTILL-Max™ (Dividing Wall Column)**
Increase profitability with efficient distillation
- MAX-ISOM™ Isomerization Technology**
Technology Innovation for producing high octane gasoline at low cost
- Shell Global Solutions' Hydrotreating**
Delivering low-sulfur transportation fuels that meet the most stringent product specifications
- Shell Global Solutions' Hydrocracking**
Creating high-value clean products meeting world demands
- Neste Oil NExOCTANE™**
Improves operational flexibility and achieves high process selectivity
- Neste Oil NExETHERS™**
Refinery's total ether production in a single unit
- Neste Oil NExTAME™ and NExTAEET™**
Maximize to achieve heavier ether output at a reduced cost, using low maintenance equipment

Open-art technology designs:

- Crude and Vacuum Distillation
- Delayed Coking
- Visbreaking
- Sour Water and Amine Treating



ROSE® Unit, Navajo Refinery, Artesia, New Mexico



FCC® Unit, Ferndale Refinery, Ferndale, Washington

**KBR SmartSPENDSM and
Value Improving Practices**

With KBR's SmartSPEND work process, customers and KBR jointly evaluate additions to a predefined, minimized design and execution strategy called the SmartSPEND base. This drives critical decisions early in the project to realize maximum benefit. Also, KBR's value Improving Practices (VIP) improve above that attained through good engineering.

Refinery Utilities, Offsites and Infrastructure

KBR designs optimally integrated utility systems with production processes for reliable utility supply offsite systems and infrastructure

Logistics and Storage Optimization

KBR's event-based applications will analyze critical delivery operations against risk, unforeseen events, and overall project schedule

Environmental Assessment and Support

KBR delivers all the services and expertise required for the complete implementation of environmental control projects of any size

Vibration and Noise Analysis Services

KBR's experts will use complex computerized methods to screen new facilities for vibration analysis or perform integrity checks and management in existing assets

Advanced Engineering Services

KBR's specialty services can help refiners make the right decisions for the sustainability and operability of their assets

Automation and Process Technologies

KBR offers a suite of Plant Automation and Process Technologies (APT) to assess, manage, implement and provide long term support for solutions and systems to ensure top tier performance of customer assets.

Key services offered:

- Operator Training Simulators (OTS)
- Remote Performance Monitoring and Analysis (RPM)
- Advanced Process Control (APC)
- Operations Management Systems (OMS)
- Advanced Simulation Services (Dynamic Studies, CFD, Heat Integration, Transient Analysis, Logistics and Material Movement, and Liquid Transient Analysis)
- Refinery Reliability Improvement (steam, fuel systems, flare, etc.)

Reliability & Operations Support – RAM Modeling

KBR helps customers mitigate risks by using RAM to development and design a new system or identify potential for improvement in an existing system



Please visit www.kbr.com for more information



About KBR, Inc.

KBR is a global provider of differentiated professional services and technologies across the asset and program life cycle within the Hydrocarbons and Government Services Sectors. KBR employs approximately 34,000 people worldwide (including our joint ventures), with customers in more than 80 countries, and operations in 40 countries, across three synergistic global businesses:

Government Services, serving government customers globally, including capabilities that cover the full life-cycle of defense, space, aviation and other government programs and missions from research and development, through systems engineering, test and evaluation, program management, to operations, maintenance, and field logistics

Technology & Consulting, including proprietary technology focused on the monetization of hydrocarbons (especially natural gas and natural gas liquids) in ethylene and petrochemicals; ammonia, nitric acid and fertilizers; oil refining; gasification; oil and gas consulting; integrity management; naval architecture and proprietary hulls; and downstream consulting

Engineering & Construction, including onshore oil and gas; LNG (liquefaction and regasification)/GTL; oil refining; petrochemicals; chemicals; fertilizers; differentiated EPC; maintenance services (Brown & Root Industrial Services); offshore oil and gas (shallow-water, deep-water, subsea); floating solutions (FPU, FPSO, FLNG & FSRU); and program management

KBR is proud to work with its customers across the globe to provide technology, value-added services, integrated EPC delivery and long term operations and maintenance services to ensure consistent delivery with predictable results.

At KBR, We Deliver.

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KBR
We Deliver