

Helping Refiners Upgrade Their Facilities to Process Heavy Crude

World Energy Interviews Dan McCarthy,
Executive Vice President, Lummus Technology, a CB&I Company

CB&I combines proven process technology with global capabilities in engineering, procurement and construction (EPC) to deliver comprehensive solutions to customers in the energy and natural resource industries. With more than 70 proprietary licensed technologies and 1,500 patents and patent applications, CB&I is uniquely positioned to take projects from conceptual design through technology licensing, engineering, construction and final commissioning. Drawing upon the global expertise and local knowledge of approximately 17,000 employees in more than 80 locations, CB&I safely and reliably executes projects worldwide.



World Energy: CB&I recently acquired Lummus Technology. What are some of the benefits of this combination?

McCarthy: Over the past decade, CB&I has been extending its capabilities across the hydrocarbon industry. By adding Lummus Technology to its offerings, CB&I has expanded its reach across the entire project life cycle, adding process technologies at the front end, expanded EPC capabilities in the middle and technical services at the back end.

From the Lummus perspective, we are pleased to be part of the CB&I organization. The acquisition offers many benefits to our customers, such as the ability to deliver projects faster through modular fabrication. This is becoming increasingly valuable as the price of oil rises. The faster we complete projects, the sooner our clients can begin earning profits. This is especially important in today's volatile markets. Building process modules in a controlled shop environment gives us more control over quality and schedule, and it allows us to support projects all over the world, regardless of climate or conditions.



World Energy: Where do you think the hydrocarbon market is heading?

McCarthy: At present, the main focus in hydrocarbons is the shift toward processing heavy crude. Generally speaking, the market has two distinct segments: upstream and downstream. For the upstream segment, investment opportunities in Alberta and Venezuela remain very strong, and we expect that additional projects will be developed in Russia, the Middle East and Mexico (pending the outcome of the political debate now in progress).

For the downstream users, we expect continued growth in projects that modify existing refineries to handle lower-cost crude oils – both on-site and support facilities – as well as the investment in additional conversion facilities to make higher yields of lighter, cleaner products. Maximizing the refiner's heavy oil conversion is the key to improving downstream users' economics.

World Energy: What other market drivers are influencing refiners' decisions to process heavy crude?

McCarthy: Primarily economic factors drive these decisions. For example, since 2004 the spread between heavy crude and West Texas Intermediate (WTI) has roughly doubled, giving refiners even more reason to invest in heavy-oil processing equipment. Refiners that employ heavy-oil upgrading technology are able to reduce the daily crude oil cost for a 300,000-barrel-per-day refinery by \$2 to \$6 million.

World Energy: How does Lummus Technology assist customers in addressing the need to process heavy crude?

McCarthy: We are able to assist clients in planning refinery options for converting to low-cost crudes using both sophisticated linear programs based on Lummus Technology data and CB&I's capital project experience. Our software can predict yields and operating conditions for a wide variety of feedstocks and product requirements.

World Energy: What kind of experience does Lummus Technology have with regard to heavy crude refineries?

McCarthy: In the major energy centers of Kuwait, Russia and Canada, almost every refinery project we currently have under way is based on processing heavy, cheaper, sour crudes.

For example, through our Chevron Lummus Global (CLG) joint venture, we provide licensed heavy-oil technology to most of the oil sands units in both Canadian and U.S. refineries. We have designed more than 100 hydroprocessing plants worldwide, with catalyst systems that give refiners maximum flexibility to respond to changes in market conditions.

World Energy: What are some of the challenges of working with heavy crudes?

McCarthy: Today we are dealing with a greater variety of crudes. Bottom-of-the-barrel processing applies not only to heavy oil but also to oil that has a high level of impurities. Providing a wide selection of solutions is vital in contending with different discounted crudes.

World Energy: What other capabilities does Lummus Technology have regarding bottom-of-the-barrel processing?

McCarthy: Lummus Technology licenses modern heavy-oil coking technology to upgrade the bottom-of-the-barrel oil to light products. Our delayed coking technology is the most frequently used technology for converting heavy oils to distillate product. One commercial example is a delayed coking unit in Canada licensed by Lummus Technology, which will be the largest grassroots-delayed coking unit in the world to upgrade oil sands bitumen.

In addition to heavy-oil upgrading, CLG is well known for its hydrocracking and base oil technologies, which are based on its proprietary catalysts. We are also pleased to combine Lummus technologies with CB&I's strengths, such as hydrogen generation and sulfur recovery. We feel we can provide a complete offering of technology and EPC solutions for our clients.

World Energy: What sets your delayed coking technology apart from others in the industry?

McCarthy: Our delayed coking technology is cost-effective and maximizes distillate yield. We have accumulated data from more than 60 commercial installations to continually update our designs, adjusting to meet more rigorous environmental and safety requirements.

On the EPC side, we now have CB&I's patented vertical plate coke drum design. By reducing the number and orientation of weld seams in the more severe zones of the coke drum, this design reduces the effects of drum deformation and extends the life of the drum. This solution provides refiners



with reduced maintenance and ownership costs at a price that is comparable to traditional drum installations.

World Energy: What are you doing to position for the future?

McCarthy: The need to capitalize on the best technologies and to constantly improve these technologies is critical across the oil and gas industry today. At Lummus, we are working internally and with our alliance partners to enhance our technologies and produce new solutions for our clients. We have research and development centers that focus on finding new solutions, and we use numerous pilot plants for developing and testing technologies.

Offering a wide range of solutions allows us to work in locations all over the world. This also gives us flexibility for the future since we are able to modify our offerings for different types of discounted crudes.

World Energy: Do you have any final remarks?

McCarthy: As light oil becomes more and more scarce, it is imperative that refiners equip their facilities to process opportunity crudes. These types of projects are being developed all over the world, and being able to process heavy crudes gives refiners more options.

CB&I has a full range of product offerings for refiners, including licensed technologies, engineering, procurement, fabrication, construction and technical services. CB&I also has experience in nearly every part of the world and is able to capitalize on local resources. Looking forward, we will continue to expand our refining capabilities to meet the needs of all our customers globally.



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