Under the sea, caverns for oil

Beneath the seabed west of Singapore, hundreds of laborers are working around the clock to carve out a network of tunnels and cavers that will eventually provide an enormous, secure storage space for oil.

So far, they have build 2.1 kilometers, or 1.3 miles, of tunnels at a depth of about 120 meters, or 400 feet, below the Banyan Basin off Jurong Island, a mostly artificial land – reclamation zone that is hoe to much of the petrochemical industry of Singapore. They are starting on the first of five caverns planned scheduled for completion in 2014.

As one of the world's largest bunkering ports and oil trading centers, on one of the world's busiest shipping lanes, Singapore has benefited from steadily rising demand for oil storage facilities, thanks to booming trade and economic growth in Asia. But it is reaching its physical limits, leading it to create new spaces, like the Jurong caves, to continue to expand its storage business.

Manoher Khiatani, the chief executive of JTC, the Jurong town corporation charged with the project, said underground storage was more secure and more space – efficient than surface tanks. Building an equivalent storage volume above ground world require about 60 hectares, or 148 acres, of land, which is scarce in Singapore. "We are a small city – state and we have to look at creative ways to optimize our land resources," Mr. Khiatani said during an interview.

Singapore's oil storage capacity is now about 20 million cubic meters, or 700 million cubic feet, of which about 8 million cubic meters is held by independent oil terminal operator and the rest owned by refiners, said Kelvin Wong, a program director at the Singapore Economic Development Board.

The Jurong Rock Caverns project was conceived in 2001 and construction started in 2007. At a cost of 950 million Singapore dollars, or $743 million, the first phase will offer storage of 1.47 million cubic meters, or about nine million barrels, of liquid crude oil, condensate and products like naphtha. A possible second phase, with six additional caverns, could add an additional 1.32 million cubic meters at an as – yet unspecified cost.

East rock cavern is drilled and blasted with explosives, them lined in cement using a high – pressure spray "shotcrete" process. The caverns, containing storage galleries 20 meters wide by 27 meters high and 340 meters long, are surrounded by a lattice of water – filled tunnels and boreholes – a "water curtain" – to prevent oil seepage by hydrostatic pressure.

Mr. Khiatani said potential users had already signed letters of intent to lease 30 percent of the first – stage capacity, but he declined to identify the companies.

In addition to the rock caverns, JTC has also recently concluded a technical feasibility study to build a "very large floating structure" for oil, based on similar fuel – storage platforms in Japan.

"We're now talking to one or two players to see whether they would be interested, because we're not building this for ourselves but for the industry," said Heah Soon Poh, JTC's director responsible for chemical industry operations.

The floating storage barge, with barge, with a capacity of 300,000 cubic meters, would probably be anchored near one of the smaller islands off Singapore, like Pulau Sebarok, which is now being used by

Singapore petroleum. Mr. Head said a decision on building it would be made sometimes this year; if it went ahead, construction would start next year and would probably take two years.

Malaysia, meanwhile, has also recently announced plans to expand its capacity. Last month, Prime Minister Najib Razak announced oil and natural gas projects worth 20 billion ringgit, or $6.6 billion. The plans included a 5 billion ringgit, independent, deepwater crude oil and product terminal in Pengerang, in southeast Johor state, near Singapore, with a storage capacity of five million cubic meters, one of the largest in Asia, to be completed in 2017.

The Malaysian unit of Dialog Group, an international oil and gas services provider based in Dublin that is leading the project, says it hopes to start work in April, once it receives approval from the environment department of the Ministry of Natural Resources.

The planned underwater facilities will be capable of handling ultralarge crude carriers. A first phase of the three – stage project, offering 1.3 million cubic meters of storage, could be completed by 2013.

“There will be incremental demand for storage in this region for both petroleum products as well as crude for the next decade,” Emir Mavani, a senior Malaysian economic planning official said in an e-mail.

“Asia’s appetite for crude oil is continuing to grow,” he said, with average daily demand projected to rise year – on – year by 420,000 barrels, for years to come. “This region will drive nearly 50 percent of global petroleum product growth from 2010 to 2020.”

With Singapore now hitting the limits of its ability to expand its storage capacity, he said, the construction of other facilities in the region could be complementary rather than competitive.

“Malaysia can complement Singapore and create a co – hub similar to that of Amsterdam – Rotterdam – Antwerp,” Mr. Emir said, noting that the South Johor area was ideally positioned to do so by virtue of its proximity, land availability, and deepwater facilities.

Mr. Khiatani agreed, conceding that Singapore could not possibly meet the growing needs of the whole region. “If some of the companies here can also expand their storage capacity in Malaysia, it will by very complementary,” he said.

Excerpted from Sonia Kolesnikov – The New York Times