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Khark Island: Iran's Principal Oil Export Terminal

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This paper was prepared by [Redacted]
Office of Global Issues. [Redacted]

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Comments and queries are welcome and may be
directed to the Chief, Strategic Facilities Branch,
Strategic Resources Division, OGI, [Redacted]

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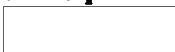
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Khark Island: Iran's Principal Oil Export Terminal



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Preface

Information available as of 7 June 1984 was used in this report.

The oil facilities on Khark Island are the most vital in Iran's oil system, and their continued operation is essential to Iran's economic well-being and ability to finance the war effort with Iraq. In recent months, Iraq has escalated its threats to attack and destroy Khark Island's oil facilities and has regularly attacked tankers engaged in Khark crude trade. If Iraq were to succeed in shutting down Khark export operations, Iran's remaining export capability in the southern Persian Gulf would be only about one-fourth its current rate—a level sufficiently low that Tehran would probably pursue earnestly the disruption of oil exports from Arab oil-exporting countries in the Gulf.



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Khark Island's oil facilities are extensive. Its export capacity of some 9-10 million barrels per day makes it the largest single oil export terminal in the Persian Gulf. Only about one-eighth of this capacity is used, giving the terminal major flexibility in coping with possible Iraqi attacks. Moreover, the unusual gravity flow oil delivery system to the island from oilfields ashore and from the tank farms to tankers reduces the risk of extended shutdown periods. The island is also well defended, which has helped negate the effectiveness of previous Iraqi bombing attacks. Knowing these qualities of Khark Island and its important oil facilities assists in understanding the impact of potential Iraqi attacks on this major oil installation.



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Khark Island and Iran's Major Producing Oilfields



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Khark Island: Iran's Principal Oil Export Terminal



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Khark Island Terminal

Khark Island Terminal is Iran's principal crude oil export facility. The terminal, operated by the National Iranian Oil Company (NIOC), is situated 42 kilometers off Iran's coast on an island, which is 44 km southwest of the coastal town of Ganaveh and 60 km northeast of Bushehr. The island is irregular in shape, approximately 8 km long in a north-south direction and 3 km wide. Although the facilities at Khark handle about 90 percent of all crude exported from Iran, loading terminals at Sirri and Lavan Islands can each export about 200,000 barrels per day (b/d). Lavan is currently producing and exporting near capacity and Sirri is exporting at about 100,000 b/d.

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The major petroleum export facilities at Khark Island include a 10-berth oil-loading jetty, a four-berth sea island, 41 operational crude oil storage tanks with a capacity of 24.5 million barrels, and a conventional buoy-mooring system. The combined crude export capacity of the Khark Island terminal facilities is about 9-10 million b/d, although pipelines from the mainland can only deliver 6.3 million b/d to the terminal. In 1983 exports from Khark averaged about 1.6 million b/d, although levels as high as 6 million b/d were achieved during 1977.

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Iraqi attacks against ships calling at Khark have altered normal approach procedures and created a waiting area near Sirri and Lavan Islands in the southern Gulf as well as outside the Gulf's entrance. At the discretion of a ship's captain, a tanker proceeds up the Gulf after Iran gives it clearance to call at Khark. Once a tanker arrives at Khark, tugs help it berth and loading commences. Loading is limited to crude oil—no bunker fuel—and can be completed in 24 to 48 hours. A tanker can make the 400-nautical-mile trip from Khark to the Strait of Hormuz in 24 to 30 hours.



Khark Development History

Khark was selected in 1957 as Iran's deepwater loading port because it provides shelter from storms, which arise mainly in the northwest, and because it has deep water close inshore on the southeast. There have been five principal construction phases in Khark's development:

	Years	Project Description
Phase I: Initial construction	1959-60	Construction of first subsea pipeline from mainland to Khark Island. Construction of twelve 272,000-barrel-capacity tanks. Construction of trestle, small boat harbor, and south jetty berths 1 to 4.
Phase II: Pipeline and storage expansion	1964-65	Construction of additional sub-sea pipelines. Construction of twelve 500,000-barrel-capacity tanks. Construction of jetty berths 5 and 6 and north jetty berths south 7 to 10.
Phase III: Major tank construction	1969-74	Construction of twelve 1-million-barrel-capacity crude tanks in three phases.
Phase IV: Sea Island	1970-71	Construction of a two-berth sea island and subsea loading lines.
Phase V: Sea Island expansion	1973-74	Construction of additional two-berth sea island and subsea loading lines. (S NF NC)

The Link to Oilfields

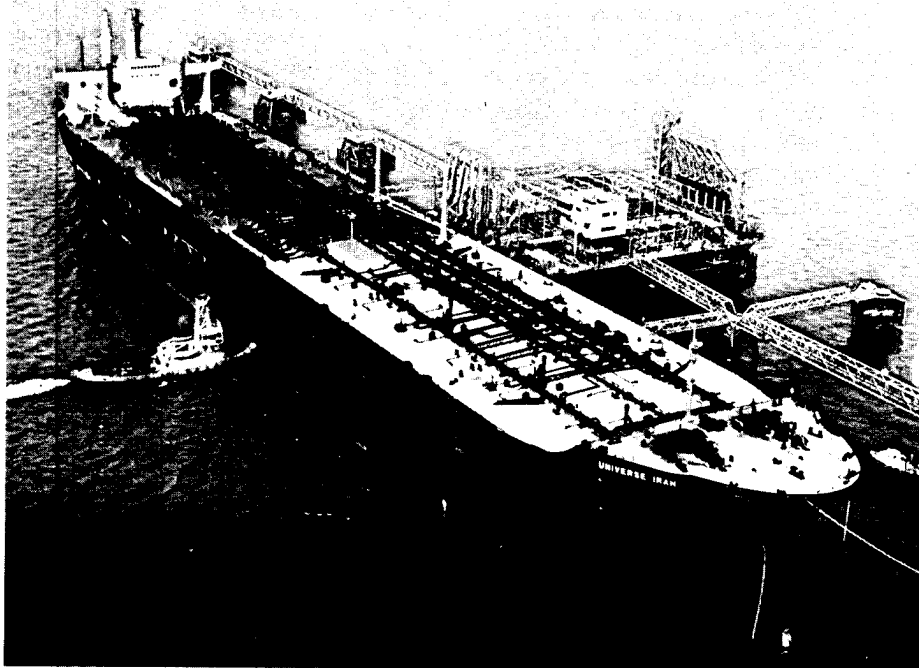
Oil flows to Khark through two trunkline systems that meet at Ganaveh on the Iranian coast. The first trunkline system leads from Gachsaran to Ganaveh and came into operation in 1960. This 30-inch pipeline system has since been looped, raising its capacity

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Tanker berthing at Sea Island.

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to 1.4 million b/d. On its route to the coast, this trunkline picks up the crude from Bibi Hakimeh and Binak oilfields. [redacted]

The Khark Island Terminal is linked to these trunkline systems and all of Iran's onshore oilfields through six submarine pipelines from the Ganaveh manifold station. There are two 30-inch and one 42-inch light crude lines, and two 30-inch and one 52-inch heavy crude line. The last pumping booster station before Khark is the Gurreh booster station, approximately 40 km upstream from Ganaveh. Even without Gurreh's pumps operating, some 2.7 million b/d could flow into Khark's storage tanks from the onshore fields, according to our analysis. [redacted]

Principal Export Facilities

Sea Island. The four-berth sea island—the terminal's largest export capacity facility—is located about 2 km off the west side of the island. The sea island can

25X1 The second trunkline system begins with a 42-inch-diameter pipeline leading from Agha Jari to Ganaveh that was built in 1965. It is 170 km long and initially had a throughput capacity of almost a million barrels per day without pumping, at least double the capacity of any previous long-distance crude oil gravity delivery line at that time. Today, this trunkline consists of two pipelines of similar size, with a capacity of 2.7 million b/d. Along its route, it draws from a number of oilfields, including Marun, Karenj, Abu ol Faris, and Pazanan. In 1972 a pipeline from Ahvaz to Ganaveh was completed. It has two sections with diameters of 42 and 48 inches, is 250 km in length, and has a throughput capacity of 2.1 million b/d. [redacted]

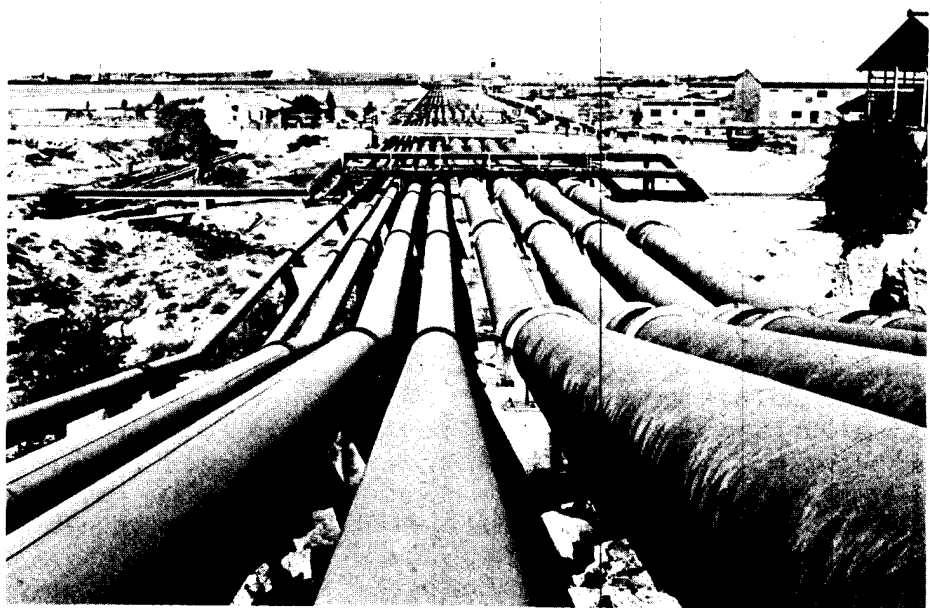
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Pipelines from storage tanks to tankers. [redacted]



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handle the largest tankers available. It can load oil at rates up to 225,000 barrels per hour (bph) at a single berth and has an overall export capacity of about 5.5 million b/d using normal operating procedures.

[redacted]

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The entire complex is approximately 1,100 meters long and 12 meters wide, extending to 90 meters wide at the two loading platforms. It consists of 23 independent structures, all interconnected by walkways. There are 11 mooring dolphins to secure and align tankers, 10 breasting dolphins to absorb the impact of berthing tankers, and two loading platforms, each serving two berths. [redacted]

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Crude oil is delivered to each loading platform on the sea terminal by two 56-inch submarine pipelines. Normally, one line is dedicated for light crude service and the other for heavy crude service. Bunker fuel is also delivered to the sea island by two 20-inch submarine pipelines terminating at Loading Platform One. [redacted]

Ten-Berth Jetty. The 10-berth jetty—the primary loading area before construction of the sea island—is located on the east side of the island and is connected

to the island by a trestle. Ships up to 250,000 deadweight tons (dwt) can be loaded here. Using articulated loading arms, loading rates up to 112,500 bph to one berth can be achieved while up to 450,000 bph can be delivered to all 10 berths simultaneously. The jetty's operating capacity is about 3.6 million b/d under normal procedures. Each berth can deliver light crude, heavy crude, bunker, or diesel oil. [redacted]

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Tank Farm. The tank farm consists of 36 tanks that feed the jetty and sea island and is located in the south central part of the island. Of these tanks, four were severely damaged by Iraqi air attacks early in the war. The remaining 32 have a combined capacity of 19 million barrels—about two weeks' storage capacity at early 1984 export rates. The tanks are located at elevations of roughly 60 to 65 meters above sea level. Because of their elevation, crude oil loading operations are accomplished solely by gravity flow.

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Of the 32 crude storage tanks, 13 are for light crude storage, and 19 are for heavy crude storage. All have floating roofs, which help minimize evaporative losses and prevent the creation of a space on the top of the tank in which explosive vapors would accumulate. Crude is delivered from the tank farm to the jetty in four 48-inch lines and one 36-inch line, and to the sea island in two 78-inch lines. [redacted]

Production Units. There are two production units on Khark Island. One is located north of the Khark Terminal tank farm and is operated by the NIOC as part of the Khark field. The second, operated by IPAC, is located east of the IPAC tank farm and is part of the Daryush field. [redacted]

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Airport. At the north end of the island is an airport operated by the NIOC. The runway is 1,525 meters long and 46 meters wide. No commercial service is available. [redacted]

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Other Khark Oil Facilities

Daryush Terminal. Formerly operated by the Iran Pan American Company (IPAC), Daryush is the other crude oil export facility on Khark Island. The Daryush Terminal tank farm lies south of the larger Khark tank farm. It has nine crude oil storage tanks with approximately 5.5 million barrels of storage. Daryush Terminal normally receives its oil from the offshore Daryush, Ardeshir, and Fereidoon oilfields, which are not now operating. Like Khark Terminal, the Daryush tanks are located at an elevation of approximately 60 meters and, therefore, no pumps are needed to load tankers. [redacted]

Navy Base and Defenses

The Iranian Navy maintains a small base and port facility on the east side of the island approximately 2 km north of the trestle jetty. The harbor consists of a small breakwater artificial harbor capable of handling six to eight small vessels. [redacted]

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Iran has one operational HAWK surface-to-air missile site and nine 2-gun radar-guided, 35-mm Oerlikon, anti-aircraft gun batteries on Khark Island. Iran has about six operational F-4 fighter aircraft at Bushehr airbase. [redacted]

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Crude oil is exported via a single conventional buoy mooring (CBM) system located approximately 2 km south of the jetty in more than 20 meters of water. Loading is via a single 36-inch submarine pipeline. Loading rates of 37,000 bph can be achieved. About 300,000 b/d could be loaded through this terminal. [redacted]

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Khemco Terminal. Khemco Terminal, operated by the Khark Chemical Co., is located at the southern end of the island between the Daryush terminal tank farm and the shoreline. The terminal has a single jetty berth with one main and eight mooring dolphins located in 13 meters of water. The terminal exports crushed sulphur and LPG (propane and butane). The LPG storage is underground. [redacted]

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