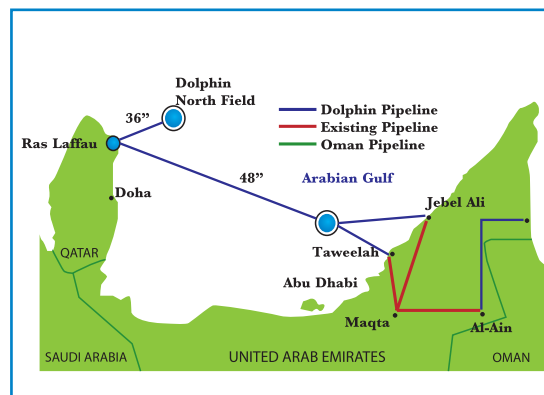


# The Dolphin Gas Project

Gas reserves and sub-sea pipeline from Qatar to the UAE

The Dolphin Gas Project, an investment of up to USD3.5 billion, involves the development of gas reserves in Qatar and transportation of the gas from offshore North Field in Ras Laffan, Qatar to a receiving facility terminal in Taweelah, United Arab Emirates (UAE) via a 48 inch diameter, 340 kilometre (km) sub-sea pipeline. Borouge delivered 10,000 metric tonnes of material over a period of a year.

This project is being developed by Dolphin Energy – a joint venture partnership between the UAE Offsets Group, TotalFinaElf and Occidental Petroleum. It involves three phases: Developing the gas reserves in the North Field in Qatar; the construction of the sub-sea pipeline to the UAE to transport the gas, and the distribution of gas to water and power plants.



Pipeline capacity, when completed, is expected to be about 3.2 billion cubic feet a day of processed natural gas.

## Protection from corrosion and withstanding deep sea pressure

The sub-sea pipelines for the project require protection from corrosion, must be long lasting and durable to withstand deep sea pressure. The coating system used for the sub-sea pipelines has to provide higher compression strength and higher creep resistance than other standard materials.

Dolphin Energy has specified a three layer polyolefin coat for the pipelines. Besides an anti-corrosion coating (HDPE and PP systems) for the external surface, an epoxy internal coating and an external concrete weight coating was applied.

The coaters assigned to the Dolphin Gas Project are Socotherm in Qatar and PSL Limited in India. The Socotherm Group, headquartered in Italy, operates in five continents. The company provides anti-corrosion pipe coating for the oil, gas and water transportation industry and is also involved in deep water pipe insulation and coating technology. PSL produces steel pipes and anti-corrosion coating for pipelines for both onshore and offshore applications. One of the largest pipe manufacturers in India, PSL has seven pipe mills with an annual capacity of more than 500,000 metric tonnes.

## Selection of the Borcoat coating system

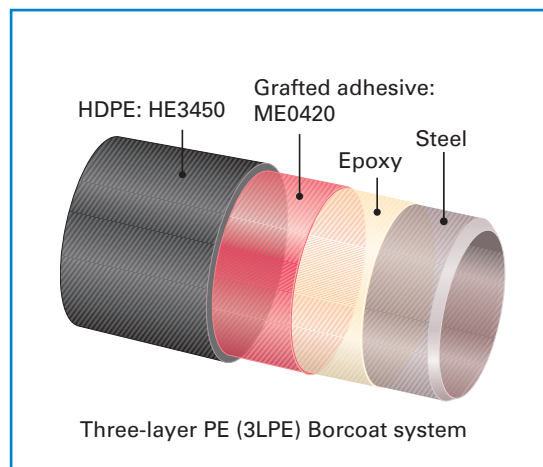
20 km of the offshore pipeline will be coated with a Three-Layer PP (3LPP) Borcoat coating system. It comprises of an epoxy primer, Borcoat BB127E grafted adhesive and Borcoat BB108E-1199 manufactured in Europe by Borealis. To meet stringent insulation requirements for its pipeline sections near the gas well, where service temperature is elevated, the 20 km of pipelines will

be protected by a PU foam system covered by a jacketing skin. This jacketing skin is produced into Borstar® HE3470-LS, a HDPE black component.

320 km of the pipeline will be coated with a Three-Layer PE (3LPE) Borcoat coating system, an epoxy primer, Borcoat ME0420 grafted adhesive and Borcoat HE3450 black HDPE top coat.

Besides offering protection from corrosion and damage, the Borcoat 3LPE coating system is suitable for application across a broad temperature range. Together the Borcoat PE and PP coating systems allow the pipeline system to sustain temperatures up to 115°C and withstand deep sea pressure and corrosion.

Using the Borcoat PP and 3LPE coating systems for the Dolphin Gas Project ensures the quality and durability of the 340 km pipeline. The excellent mechanical properties of the grades mean a long lifetime and the Borstar bimodal process gives a tailored product to allow stable processing of the material. The high compression strength and creep resistance of the jacketing and thermal insulation materials will enable the pipeline to withstand corrosion and damage which helps reduce repair and maintenance costs. Furthermore, the material is readily available from Borouge's Ruwais, Abu Dhabi unit, a real logistical benefit for the Dolphin Gas Project.



The 3LPE Borcoat coating system involves one layer of epoxy resin over the steel, one layer of adhesive with a topcoat of polyethylene. (Please refer to diagram) Using the 3LPE system ensures the pipeline is suitably protected externally.

## Project realisation

<b>Customer Name</b>	Dolphin Gas Project, Qatar and UAE
<b>Application/Product</b>	Sub-sea gas pipeline
<b>Grade(s) Used</b>	3LPE: Borcoat HE3450 (topcoat), ME0420 (adhesive) 3LPP: Borcoat BB108E-1199 (topcoat), HE3470-LS (jacket skin), BB127E (adhesive)
<b>Functional Requirements</b>	Good quality, long lasting and withstanding sea pressure High compression strength and creep resistance
<b>Benefits</b>	Good processability, logistics and availability Higher compression strength and creep resistance than other materials Durable, prevents damage and corrosion, reduces maintenance costs

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