project description

Shuweihat Water Transmission Scheme

assignment

The overall Shuweihat Water Transmission Scheme (SWTS) involves the bulk transfer of desalinated water from a new plant at Shuweihat to Mussafah in Abu Dhabi, a distance of some 250 km (DN1600 dual pipeline of ductile iron). The SWTS, with a future capacity of 25,000 m^3/h (160 mg/d), is designed to meet the increasing water demand of the United Arab Emirates, due to population growth and rapid industrial development.

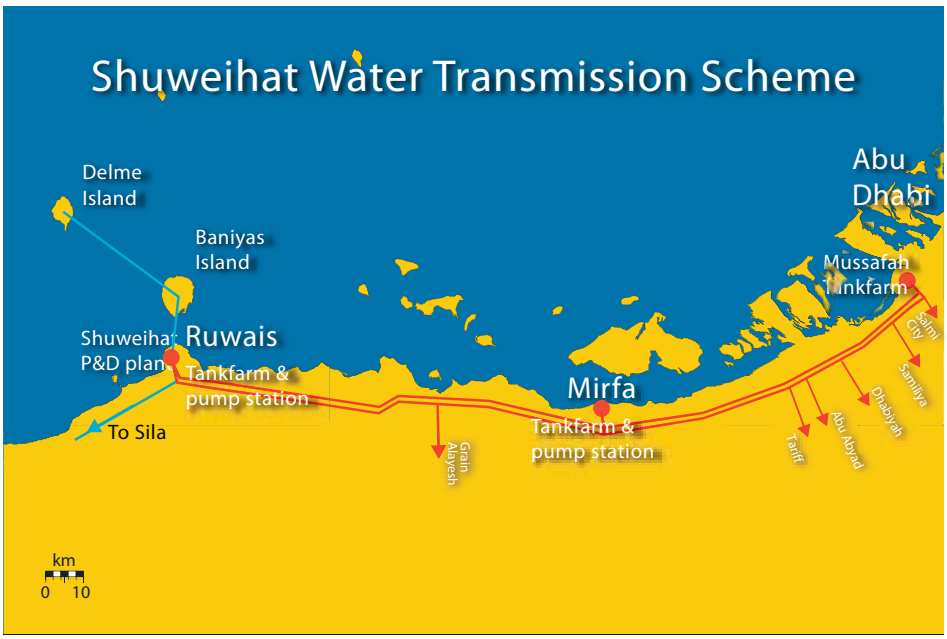
Fisia Italimpianti and Torishima Pump MFG.Co., Ltd. commissioned WL | Delft Hydraulics to perform steady state verifications for different operating conditions and pressure surge analyses. The surge analyses include the evaluation of normal and emergency operations and design of appropriate anti-surge devices and measures.

clients

Fisia Italimpianti, Genova, Italy and Torishima Pump MFG.CO., Ltd., Japan.

period

2002 - 2004



keywords:
water pipelines, pressure surge analysis, control systems

H4065/H4078/H4218

WL | delft hydraulics

System description

The scheme is contractually divided into 5 lots according to table 1.

'A'	Dual Transmission line (approx. 100 km) from Shuweihat to Mirfa, including Shuweihat pumping station. Pipeline A: Transmission line / Pipeline B: Distribution line
'B'	Dual Transmission line (approx. 150 km) from Mirfa to Mussafah Pipeline A: Transmission line / Pipeline B: Distribution line Single transmission line between Mussafah and Unit IV (13 km)
'C'	Mirfa City and pumping station
'D'	Mussafah City and pumping station
'E'	Single transmission line (approx. 100 km) from Shuweihat to Sila

Table 1: Overview of SWTS lots

Lot A and B include the dual DN1600 main lines. One line is used as a transmission line only, the parallel line is used as a distribution line to feed local distribution areas. One of the pumps of the Shuweihat pumping station supplies Delma Island and Baniyas Island.

Lot C covers the intermediate pumping station at Mirfa and the pump station feeding the existing distribution network of Mirfa City.

Lot D covers the Mussafah tank farm, the city pumping station and the city network. Finally Lot E is a separate DN1000 transmission line from Shuweihat to Sila of 100 km.

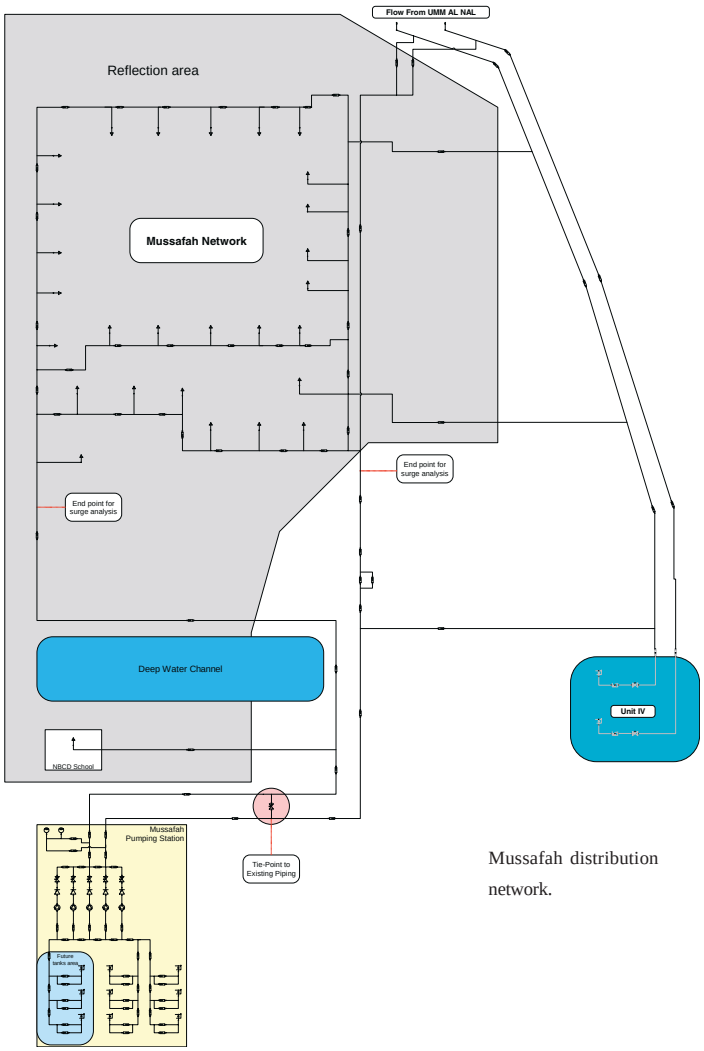
Simulation models have been built for all transmission and distribution lines up to the reservoirs in Mirfa, Mussafah and intermediate city reservoirs. Furthermore, detailed models of the Shuweihat and Mirfa pumping stations have been set up to study the pump trip transients in the suction lines. In total, 10 models have been built.

Conclusions

The transient scenarios include full pump trip scenarios, tank valve closures and start-up scenarios; about 50 scenarios in total.

The full pump trip scenario without surge provisions lead to inadmissible cavitation in the dual transmission lines of Lot A and B.

Air vessels (total volume 4000 m^3) have been sized to protect the systems. The downstream part of the transmission lines is also protected with air valves. The hydraulic specification of the air valves (minimum inflow capacity and maximum outflow capacity) resulted from the study.



Mussafah distribution network.

A normal shut-down event prevents air admission, if pump trip is combined with downstream valve closure. Therefore a normal pump start will not need a venting phase.

The presence of the air vessels protects the transmission lines, but, on the other hand, increases the dynamic forces on suction lines and check valves. These effects have been studied with a detailed model, leading to hydraulic specification of the check valves and additional measures.

A number of recommendations on the normal operation of the system have been given, confirming the added value of a pressure surge analysis.

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