



1 *Power plant driven by crude oil and used for the desalination plants in Jeddah. Source: ALSTOM*

## SHOAIBA PHASE III: DRINKING WATER SUPPLY IN SAUDI ARABIA

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### Water in the desert state

The Kingdom of Saudi Arabia has a fast growing population which has an average age of about 21 years (for comparison, Germany: 41 years), almost two thirds of the population is under the age of 25 years. Water plays a crucial role in the quality of life of the inhabitants, but it is also an important requirement for economic prosperity, for example in a growing industry and in the agricultural sector. Together, both variables will cause a further increase in water demand in Saudi Arabia, which can't be covered completely through the ground water resources as well as the inexistent river systems or lakes. Therefore, the Kingdom of Saudi Arabia assumes considerable efforts to sea water desalination plants installed at the coast and carrying water by huge pipeline systems to the major consumption centers in the up-country.

One example is the »Shoaiba III Water Transmission Project«. It involves five pumping stations, three water reservoirs and a 213 miles long pipeline network which carries water from the desalination plants driven by crude oil to the cities of Jeddah, Taif and Mecca with altogether about five million inhabitants. By order of the ABB AG, the Fraunhofer Application Center System Technology AST develops a state-of-the-art leak location and simulation system which ensures a highly available water network along with a modern SCADA system. All elements (e.g. pump resource scheduling, filling the reservoirs, capacity utilization of desalination plants) are optimally coordinated by using the water pipeline forecasts of the management solution »HydroDyn«. Thereby, non-revenue-water and operating costs can be minimized.





**Technology**

The pipeline system carries the water via 30 pumps from the coast up to 1700 m altitude. As a result, a pressure up to 80 bar occurs, which would correspond to a depth of 800 meters. The Fraunhofer AST provides a process oriented simulation for the completely water system of pipes, pumps, valves and tanks. Thereby, the simulation software »HydroDyn« is directly linked with ABB SCADA system, which allows an online comparison of simulated and measured values. In order that, possible errors within the pipeline system can be detected and the operation control can be optimized. In addition, the system enables a simulation based leak detection and leak location, which avoids the expensive manual observation of the water pipelines and tunnels.

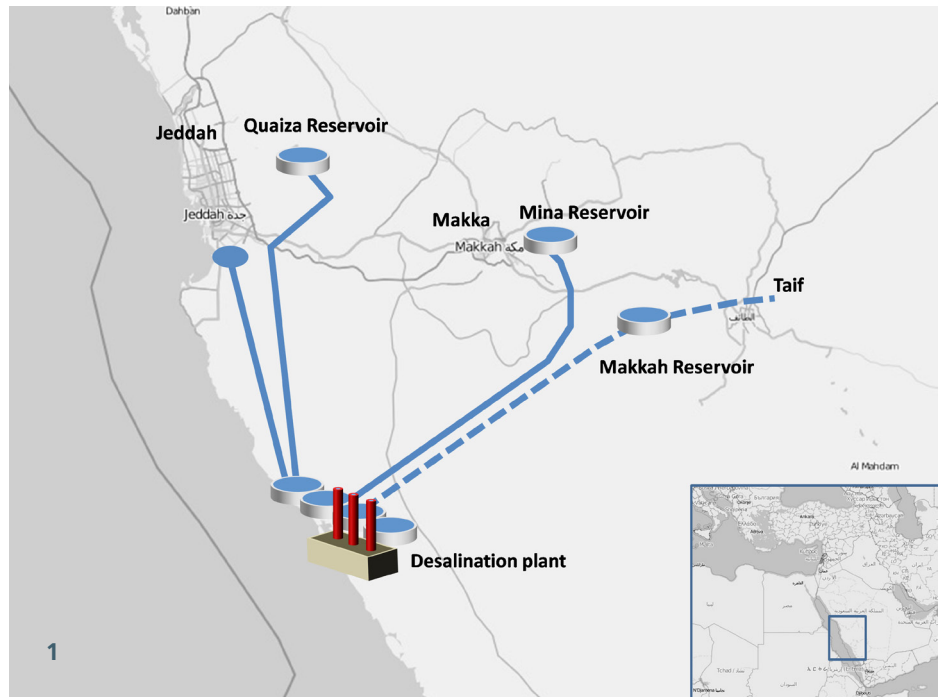
**Prospect**

The water management solution »HydroDyn« and its close connection to the ABB SCADA system supports the operator to optimize the operation of the pipeline system, helps to detect incorrect conditions and allows the test of certain pre-operating scenarios with a PC. Furthermore, the operating personnel can be trained. Due to the rising international value of water and energy as crucial resources, technical solutions like »HydroDyn«, which minimize the loss of water and optimize the energy consumption, will become a standard equipment in the water supply in the near future. Several similar public work efforts in Saudi Arabia are planned.

**Project partner**

ABB is a global leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact. The ABB Group employs approximately 117,000 employees, including 11,000 in Germany.

1 Pipeline system  
 2 Pipeline construction in Saudi Arabia. Source: Press release iLF Consulting Engineers



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