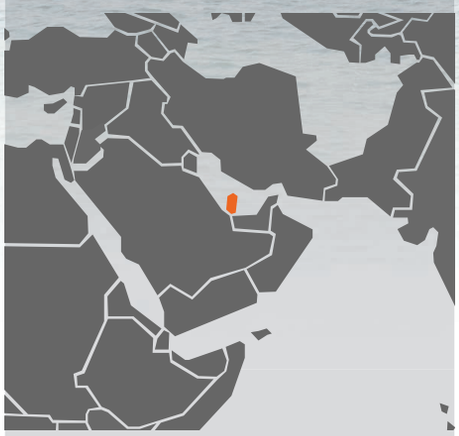
Project Sheet

Delta Marine Consultants
H.J. Nederhorststraat 1, 2801 SC Gouda, P.O. Box 268, 2800 AG Gouda, The Netherlands
T +31 (0)182 59 06 10, dmc@dmc.nl, www.dmc.nl
Delta Marine Consultants is a trade name of BAM Infraconsult bv

Adaptation Cooling Water Outfall



During a maintenance shutdown in March 2010, diver inspections revealed that the outfall head (T-head diffusor) of a cooling water system was completely lifted of the GRP pipeline. At the area around the outlet box the installed scour protection system was found to be partly washed away with a local scour. Thyssenkrupp Uhde contracted DMC to investigate potential reasons for the failure of the outlet box and to propose repair/adaptation measures to improve the performance of the system.

Client
Thyssenkrupp-Uhde

Completion
2013

Location
Qatar

Construction costs
Euro 3.5 million

Consultancy Fees
Category 4 (see page 2)

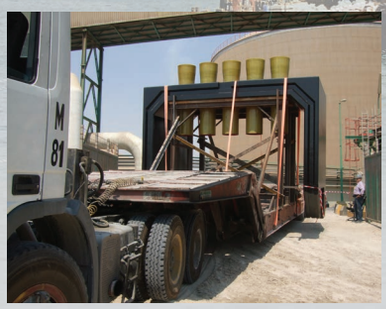
Scope
Weirbox and Outfall location

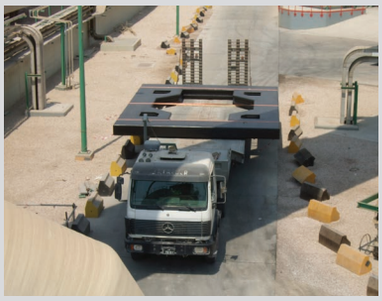
Services
Assessment of existing system
Study on flow regime and air entrainment
Advice on model testing
Detailed Design

Pictures
All pictures with courtesy of ThyssenKrupp-Uhde

Delta Marine Consultants

Adaptation Cooling Water Outfall





Project Description

The detailed assessment of the outfall system revealed that the trigger of the diffusor box failure at the seabed was excessive air entrainment at the weirbox located on land. The high air content led to extreme flow velocities, turbulences and pressure peaks above original design assumptions.
The limited size of the outfall chamber of the weirbox (3x10x20m) did not allow to de-aerate the discharged water of up to 14m3/s. Since an extension of the outfall chamber was impossible a non-standard solution had to be found and assessed in view of feasible installation and reliable operation.

The adaptation design consists of implementation of five DN500 GRP siphon pipes which connect the upstream and downstream chamber, effectively reducing air entrainment and therefore the loading at the outfall box. To enhance the operational safety the weight of the outfall structure was substantially increased.

The design required thorough model tests (scale 1:10) using salt water to model the air bubbles.

Role DMC

DMC provided advice during the tests and carried out the detailed design entailing examination of the complex jet conditions of the two phase flow at the outfall openings in the sea.

Consultancy Fees: 1: 50.000€ 2: 50 - 150.000€ 3: 150 - 300.000€ 4: 300 - 600.000€ 5: > 600.000€

Delta Marine Consultants