



Corrosion Technology Services

Case Study - 2006-C-001

CP of Reinforced Concrete Cooling Tower, KSA

Start:	April 2006
Completion:	July 2008
CP Project Cost:	US\$ 3 million
Scope of Project:	Cathodic Protection of Forced Draft Reinforced Concrete Sea Water Cooling Tower and Pump Station

Introduction

The cooling tower is situated inside a petrochemical plant in Saudi Arabia. With a diameter of 127m and a height of 80m it is one of the largest cooling towers in the region.

To mitigate any corrosion problems created by the seawater and the harsh environment, Cathodic Protection (CP) was installed on all exposed surfaces of the reinforced concrete.



Cooling Tower Near Completion

System Description

An impressed current system using MMO coated titanium anode ribbon mesh was installed to protect the exposed concrete surfaces of the structure for a design life of 40 years.

The system is monitored by over 1,100 Ag/AgCl reference electrodes (RE's) which are embedded in the concrete throughout the structure. The CP system does not interfere with the operation of the cooling tower as all components and cables are encapsulated in the concrete. Cables exit the structure through conduits at specific locations which are then terminated in junction boxes located around the structure.



Inlet Duct During Early Construction

Protected Areas

The following areas of the Cooling Tower and Pump Station are protected:

Pump Station	Cooling Tower
• Base Slab	• Ring Beam
• External Walls	• Fan Supports
• Partition Walls	• Inlet and Outlet Ducts
• Columns	• Riser
• Roof Slab	• Base Slab
	• Wall Stiffener/Partition
	• Distribution Channel



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CP Power and Monitoring

The system is powered by 5 air cooled, multi channel Transformer Rectifiers (TR's). The structure was divided into 155 zones, each zone has between 7 and 15 RE's. Due to the size and complexity of the system a remote monitoring and control system was utilized.

Below details some features of the monitoring and control system:

- Energize / de-energize each zone
- Read and set operating parameters
- Monitor each zone in real time
- Conduct global depolarization tests
- Set high/low limits (Alarm enabling)



Fan Support

Commissioning and Performance

During 2009 and 2010 the system was commissioned and the CP system was assessed using the following criteria:

- An instant off potential more negative than -720mV with respect to Ag/AgCl RE's
- A potential decay of at least 100mV from instant off

At the end of the commissioning all locations were achieving either of the above criteria, demonstrating sufficient protection throughout the structure.



Ring Beam, Columns and CT Shell (first lift)

Project Statistics

- $> 100,000 \text{ m}^2$ of concrete surface area protected
- $> 250,000\text{m}$ of anode ribbon mesh
- > 1100 Reference Electrodes
- 5 TR's powering 155 Zones
- $> 10\text{km}$ of component cable
- 300 CP design drawings