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.

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.

Protected Areas

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

**Pump Station**
- Base Slab
- External Walls
- Partition Walls
- Columns
- Roof Slab

**Cooling Tower**
- Ring Beam
- Fan Supports
- Inlet and Outlet Ducts
- Riser
- Base Slab
- Wall Stiffener/Partition
- Distribution Channel
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)

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.

Project Statistics
- > 100,000 m² of concrete surface area protected
- > 250,000m of anode ribbon mesh
- >1100 Reference Electrodes
- 5 TR’s powering 155 Zones
- >10km of component cable
- 300 CP design drawings