



# STRUCTURAL REPAIR WORKS AND CATHODIC PROTECTION SYSTEM

COOLING TOWER FOR JUBAIL UNITED PETROCHEMICALS





MAC was entrusted by Saudi Basic Industries Corporation (SABIC), to repair the Concrete Structure of their existing cooling tower at UNITED plant in Jubail. The LSTK Contract to demolish and reconstruct the slab and walls of the basin; concrete repair of the columns and beams; installation of cathodic protection system to the existing columns/beams and to the replaced slabs/walls and the application of a special coating system to the whole basin.

#### Details of existing Cooling Tower

The original design of the existing Cooling tower involved pre-cast columns, beams and the elevated basin was built with pre-cast slabs and wall panels resting on pre-cast beams with a screed that was laid above the pre-cast panels to facilitate water tightness. This system was, however, not sufficient to ensure a leak-proof basin. Thus, few years after its construction, leakage started in the slab that led to the corrosion of the reinforcement of the slab and wall panels, beams, corbels, as well as the columns. As a result the Client decided to:

- Demolish and re-construct new cast-in-situ slabs and walls for the water basin.
- Repair the affected columns, beams and corbels.
- Protect the existing and new concrete elements with a cathodic protection system.

#### Major Challenge – Tight schedule and difficult site conditions

The major challenge was to work on this critical part of the plant component during its operation whilst ensuring timely execution in a 3-phased schedule. The existing cooling tower is divided into three basins: the North, South and New Basin. The demolition and reconstruction works of the basins were split into 3 years by the shut-down of only one basin



at a time during the winter season of each year, however without affecting the functioning of the plant. The activities under the basin slabs such as the concrete repair of columns/beams, CP works for columns, beams and foundations were done during the summer season post-shut-down; while the demolition, reconstruction and CP works and coating of the basin were done during the winter season shutdown.

It was a critical job to cut and remove the existing pre-cast wall and slab panels of the basin, some weighing up to 18 tons at heights varying from 4 to 6 meters above the ground level without damaging the existing plant piping. Heavy duty temporary supports were installed under the slab, the slab/wall panels were cut into manageable pieces by wall-saw cutters, and then were lifted and removed by means of high capacity fork-lifts and cranes. Safety and protection of the existing pipelines and utilities within and around the basin was a major concern during the lifting of the cut panels.

#### The scope of work consisted of:

##### CIVIL & STRUCTURAL WORKS:

- Temporary supports under the slab - 8,090 M<sup>2</sup>
- Saw cutting 300mm thick slab panels - 4,200 LM
- Lifting and disposal of slab/wall - 13,000 Tons
- Concreting of slab and wall - 4,700 M<sup>3</sup>
- Epoxy polysulphide coating inside basin - 12,000 M<sup>2</sup>
- Concrete repair for columns and beams - 3,500 M<sup>2</sup>

##### CATHODIC PROTECTION WORKS:

###### Consisting of:

- Cathodic Protection of existing foundations and pedestals with tubular discrete anodes
- Cathodic Protection of existing columns, corbels and beams as well as new slab and wall of the basin with anode ribbons

#### The major Cathodic Protection Installations for the work involved were as follows:

- Discrete Anodes - 16,000 Nos
- Anode Ribbons - 92,000 LM
- Anode Mesh - 500 M<sup>2</sup>
- Reference Electrodes - 360 Nos
- Power and Control Cables - 50,000 LM
- Cable Trays - 400 LM
- CP Transformers and Control Units - 50 Nos.



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