

SULFUR RECOVERY UNITS RIYADH REFINERY



PROJECT NAME	SULFUR RECOVERY UNIT
LOCATION	RIYADH, SAUDI ARABIA
CLIENT	TECHNIP / SAUDI ARAMCO
CONSTRUCTION PERIOD	25 MONTHS

MAC was entrusted by Technip Abu Dhabi, as its main sub-contractor, to execute the multi-discipline civil, buildings, mechanical, electrical, instrumentation, insulation and painting construction works for two new Sulfur Recovery Units at Saudi Aramco Riyadh Refinery. The Project consisted of:

- Two new buildings: Electrical Substation # 88 and Process Interface Building (PIB) # 5, of a blast resistant design in reinforced concrete on a Lump Sum Turn Key (LSTK) basis including detailed engineering and construction of the buildings, plumbing, HVAC, electrical, grounding, instrumentation and communication works
- A new Amine-Treating Unit (ATU-4) based on 50% wt MDEA solution comprising installation of: Flash drum, regenerator, overheads and reboiler systems, heat exchangers, filtration, chemical injection, storage, drains & fresh make-up facilities
- Revamping of the existing Amine Treating Unit (ATU-2) by retraying Fuel Gas Absorber Regenerator to suit the revised loads/process requirements and hooked up with the new unit. The booster pumps in the existing hydrocracker unit were replaced
- A shutdown period, involving execution of 123 tie-ins of the new units to existing systems. The tie-ins were subjected to special authorizations delivered by SAUDI ARAMCO/TECHNIP under strict Quality and Safety regulations
- A new sour water stripper (SWS-2) with overheads and reboiler systems, raw & stripped water heat exchanger & associated systems
- As part of Sour Stripper (SWS-1) modifications, a new degassing drum was added for pumping degassed and skimmed sour water to new storage





- Two Sulfur Recovery Units each of 70MT/day capacity with common KO drums receiving acid gas and SWS gas feeds from ATU-2, ATU-4, SWS-1 & SWS-2. Each SRU consisted of one thermal, three catalytic reactors & associated facilities such as a waste heat recovery boiler, sulfur condensers, reheaters, thermal oxidizer, thermal oxidizer stack, liquid sulfur degassing and storage pit, sulfur pumps etc.
- The project involved over 3.3 million man-hours of Direct labor and over 0.8 million man-hours of Indirect labor with a sustained peak load of direct manpower of 950 plus 150 indirect labor & supervision totaling 1100 men. All personnel were accommodated & catered for in MAC's camp adjacent to the job site where full life support facilities were provided
- The achieved Quality Control Index was 97.8%
- The Safety Record involved over 4 million worked man-hours without any Lost Time Accident

The scope of work consisted of:

- **CIVIL WORKS** - Hand excavation in rock was performed in areas where underground existing services were encountered. Foundations for new equipment, tanks, pumps and structures totalled 14,000 m³ and involved construction of 2 new 7.50 m deep underground sulfur storage pits, major concrete foundations for stacks, miscellaneous foundations and plinths on paving for pipe supports, fire proofing to existing steel structures, concrete cable trenches, ducts for underground cables, pit for underground drum and concrete paving for all new plant area
- **STRUCTURAL STEEL** – Erection totalling 1600 ton that included pipe racks, support structures for equipment and Fin Fan Coolers including stairs and platforms, extensions and reinforcements to existing pipe bridges, and steel trestle towers
- **UNDERGROUND PIPING WORKS:**
 - Oily water sewer drainage and surface storm water collection of the new Sulfur Recovery Units, as well as firewater run-off from paved areas. The system comprised an underground piped gravity sewer with manholes, catch basins, equipment hub drains and a lift station with lift-pumps that were tied to the existing network
 - An amine drain to carry amine drainage, of hard piped closed gravity drain to a below ground holding tank in a concrete pit
 - Underground fire water network tied to the existing network including installation of hydrants, monitors and hose-reels, external underground networks for buildings including storm water drainage, from network up to tie in with existing drainage network, installation of drinking water for the buildings and the plant
- **MECHANICAL WORKS** - Static and rotary equipment installation and pre-commissioning, including columns, exchangers, vessels, converters, pumps and blowers; assembly and erection of derrick structure and thermal oxidizer stack 93.0 m high; installation of new and replacement of existing trays, assembly of Air Cooled Exchangers and structure
- **ABOVEGROUND PIPING** - Installation of new interconnecting lines to carry feed gas (acid gas and SWS gas) from tie-ins within existing SWS-2 & ATU-2 units to the new SRU's via upgraded existing structural racks within the refinery and new pipe bridges and racks connecting common and train racks



- An existing 18" jacketed line converted to a sour flare header, terminating in an existing sour flare pipe at existing flare
- Electrically traced Molten Sulfur Transfer lines from the new SRU's to the new Sulfur Holding Tanks running across existing process area
- Installation of electrically traced Loading and Drainage lines from Sulfur Holding Tanks & Pumps to new Sulfur Loading Arms on new elevated pipe supports & bridges
- Interconnecting Process & Utility Piping to and from the new equipment
- More than 1,100 ton of large bore piping was fabricated and installed including steam jacketed piping as well as 80 ton of small bore piping for steam tracing supply and condensate return across the systems
- ELECTRICAL WORKS - Installation of equipment, power, lighting, grounding systems for the new plant units including all works related to modifications inside the existing plant area:
 - Supply of 13.8kV power from existing substation via feeder cables to the new substation through new circuit breakers; distribution to 4.16 kV & 480 V double ended SRU switchgear via step down transformers and installation of neutral grounding resistors, bus ducts, switchgear, distribution boards, UPS system, control panels and transformers to 480 V for skin effect heat tracing system
 - 4.16 Adjustable Frequency Drives (AFD) panels for blowers and 125 V DC system comprising 2 battery chargers, DC panel board, batteries, racks and monitoring panels
 - Installation of 4,600 m of cable trays, 13,500 m of conduits and 155,000 m of cables
- INSTRUMENTATION WORKS - Procurement of bulk materials for the control, instrumentation and telecommunication systems including loop checking, testing, calibration, pre-commissioning, inspection in operating units with control room and technical room energized, work involved revamping works as well
The scope of work included installation, inspection & testing of:
 - Detection, monitoring, control and sampling systems
 - Analyser instrumentation, communications systems for the two new sulfur plants and amine treating units with a sour water stripper and valves including stroking of all control and emergency isolation valves
 - Cable ladders, cable tray supports, installation of marshalling cabinets, auxiliary cabinets and system cabinets within Central Control Room (CCR) and existing PIB
 - Installation of wiring between existing facilities; new Uninterrupted Power Supply (UPS)
 - Installation of fibre optic cables, PAGA speakers, telephone and telecom wiring
 - Hook up, air tubing, junction boxes, wiring, connection & grounding to marshalling and system cabinets
 - Installation involved 9,065 m of cable trays and 145,000 m of cables
- INSULATION WORKS - Turnkey supply, fabrication and installation for HRSG and Steam Cycle Piping
- PAINTING WORKS - for all uninsulated equipment and piping

