Design and construction of Raoued (Tunis) long outfall

Miguel Pires[1]

ABSTRACT

The Raoued submarine outfall Project, located in Tunis – Tunisia, consisted of the Design and Construction of a 6.300m HDPE pipe Ø1600mm. The Scope of Works entailed a surge chamber and the supply, assembling and installation of the submarine outfall. The main purpose of this marine pipeline was to allow effluents to be discharged into the sea. In essence, this outfall consists of the following four sections:

- Section 1: 1185 meters of buried pipes in trench to water depth of – 7.00 m;
- Section 2: 1430 meters of partially buried pipes (emerging section), up to a water depth of – 10.40 m;
- Section 3: 3435 meters of pipes laid on the seabed;
- Section 4: Diffuser with 250 meters long, up to a water depth of – 20.80 m CD, with 20 orifices. The orifices are equipped with "duckbill" type valves.

The main Scope of Works of the Raoued submarine outfall were:

1. Complete Design including Plans, Calculation notes, technical memories.
2. Construction of a surge chamber structure and the connection of the upstream and downstream pipes, including a level detection system with data transmission and display at the pumping station. Faced with the characteristics of the foundation terrain encountered during the execution of the additional geotechnical investigations, the surge chamber was built on an indirect foundation consisting of five vertical piles of Ø1.20m with an average length of 28m per pile.
3. Supply, transport and storage inside Rades Port of 6300 linear meters of OD 1600mm pipes in HDPE SDR 26 and accessories. Pipelines were manufactured in Norway and towed to site for installation in 12 stretches of ≈525 m. Rades Port, located 25NM from construction site was where pipes were stored in flotation.

[1] *Miguel Pires, ETERMAR, Portugal – m.pires@etermar.pt*

4. Prefabrication of 1260 reinforced concrete ballast elements.
5. Assembly of pipes with 1260 concrete ballast elements and sinking accessories.
6. Construction of temporary works consisting of a temporary groin 400 meters long and 400 meters double curtain of cofferdam.
7. Trench dredging of about 80.000 m_3 by a backhoe dredger, prior to installation of the submarine outfall in a length of 2615 meters (Sections 1 and 2).
8. Installation (Sinking) of 6300 meters of HDPE pipes, including the diffuser.
9. Construction and installation of an anti-trawling system for protection against action of anchors along the last 4550 ml of pipeline (corresponding to the transition section and the section simply laid on the sea bottom), consisting of concrete blocks with metallic profiles linked to each other by metal chains.
10. Submarine Outfall and surge chamber hydraulic operation tests.

The main Project challenge was the Sinking of long length Stretches with 1050 m considering the actual site Met oceanographic conditions and the passage of these long length section inside the port of Tunis.

Other important challenge was the revision of the Design considering the soil characteristics revealed by the additional Soil Investigation which resulted in adoption of indirect foundations for the surge chamber.