TERMS OF REFERENCE

Environmentally Sustainable Aeration System Upgrade at the Wastewater Treatment Plant of Zenein, Egypt

1. Introduction

The Partners voor Water (PvW) Delta Egypt initiative is part of the bilateral cooperation between the Netherlands and Egypt on water sectoral challenges and opportunities. The interdepartmental programme involves four Dutch ministries and their Egyptian counterparts. It aims to strengthen the cooperation on water and delta management between the partner countries on a number of water-related topics, with a priority on the water and agriculture nexus, coastal protection and water supply & sanitation sectors.

The technical upgrade assignment is to support a specific niche within the water & sanitation sector in Egypt. The project aims at the technical and operational upgrading of the automated aeration capacity at the wastewater treatment plant (WWTP) of Zenein (Egypt).

2. Background of the assignment

Current (WWTP) operations in Egypt imply high environmental and operational costs. With the current technical operations, the full costs of treatment cannot be financed by the end-user fees, making wastewater treatment facilities difficult to sustain financially. A key pathway to improvement in this regard is the strategic upgrade of key wastewater treatment steps is the most important pathway to reduce both the environmental impact (e.g. from fossil fuel use) and the operational expenses.

The Holding Company for Water and Wastewater (HCWW, the Egyptian state authority to operate and maintain WWTP's) prioritizes the improvement of WWTPs. A recent Life-Cycle Analysis (LCA) study on selected Egyptian WWPT's found that the upgrading and automation of WWTP aeration regimes may offer a cost-effective upgrade to reduce operational costs and CO_2-eg. emissions simultaneously.

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3. Objective

This assignment serves as an important step in the (future) upgrading of aeration regimes at the Egyptian WWTP's. The direct objectives of the assignment include

1. The technical upgrading of the aeration equipment and regime at the municipal WWTP of Zenein (Cairo; 450.000 m^3 wastewater.d^{-1}).
2. The development of a report on the complete upgrading intervention in order to support independent aeration equipment and regime upgrading – independently from this assignment – of other, similar municipal WWTP's in Egypt.

4. Scope of the assignment

The assignment considers the technical upgrading of the aeration unit and the proper reporting of activities in order to allow – from this assignment independent – upscaling of the solution at other, similar municipal WWTP's in Egypt.

The activities consider (i) technical and (ii) operations and governance type of support activities.

Technical

A previous study indicated a potentially optimal technical upgrading approach for this assignment (see the attached technical study on the aeration unit at the municipal WWTP in Zenein (Annex 7a of the Tender Document).

The technical needs and activities are detailed in Annex I in this document. In short, the following activities are foreseen for this assignment by Contractor:

1. Verification of the local need and existing infrastructure regarding the aeration and aeration control units at Zenein WWTP in Egypt;
2. Realisation of a low voltage panel control of aeration system, including:
    a. Supply, installation, testing, and commissioning of an aeration system panel according to the marked specifications (Annex I)
    b. Supply, installation, testing, and operation of three (3) Butterfly valves
    c. Supply, installation, and testing of various cables and auxiliary hardware
    d. Supply, installation, testing, and operation of six (6) digital Dissolved Oxygen (DO) analysers
    e. Supply, installation, testing, and commissioning of a PLC panel
    f. Any and all minor hardware necessary for the operationalisation of the unit

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3. Post-realisation activities (see next section).

Operations and Governance

After the operationalization and approval (by HCWW) of the new aeration equipment, Contractor will provide a strategic document that offers a detailed overview of the technical and capacity building activities of aeration upgrade in (similar) municipal WWTP's. The quality of the report has to be sufficient so that the authority HCWW can independently execute similar upgrading activities in the future.

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5. Planning and timeline

Annex II contains a proposed timeline for the assignment. The offer of the Tenderer may deviate from this timeline provided the total duration of the implementation does not exceed 12 months. Tenderer must also offer proper argumentation on the proposed deviations from the timeline in Annex II.

During the execution of the assignment, the Contractor will be working on the premises and with the close cooperation of HCWW, the national authority on WWTP management in Egypt: the HCWW.

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Annex I: Proposed inventory of the technical parts and their application

Important Notes

1. All panels located outside buildings must be rainproof with a protection rating of no less than IP54. The panel body must be made of stainless steel 316 to resist corrosion, with a thickness of no less than 2 mm. Panels inside buildings must be electrostatically coated with a protection rating of IP42.
2. All panels must be of the Type Tested variety. The electrical components must be produced by one of the approved companies, such as Schneider, ABB, or Siemens.
3. The contractor will be compensated based on the actual lengths of cables required on-site. The cables must be produced by one of the approved companies, such as Egyptian Cables, El Sewedy, Giza Cables, BICC, or Misr Cables.
4. For cables, the item includes excavation, backfilling, inspection chambers, conduits, cable pulling, restoration to the original condition, and all necessary works to complete the job to the highest standard.
5. The components of the earthing network are indicative, and the contractor must submit the calculation notes for the various earthing networks based on the soil resistivity at each location.
6. Measuring devices must be produced by one of the approved companies, with the country of origin being European, Japanese, or American, and of the highest quality available in the local market.
7. The lighting fixtures and ventilation fans are of the highest quality available in the local market.

Low Voltage Panel Control of Aeration System

1. Supply, installation, testing, and commissioning of a aeration system panel containing a 40A MCCB main circuit breaker, (6) MCB 16A Circuit breaker for DO Measure panel for modules , (4) M.A Motor starter 1.6A for electric modulating valves also the Panel containing voltmeter, three ammeters, indication lamps, and all necessary fittings to complete the work perfectly. The panel shall be fully assembled.
2. Supply, installation, testing, and operation of three (3) Butterfly valves with diameter 750 mm complete with electric multi- turn actuators for modulating duty input source 3 Ph+N+E ,380 v , 50 HZ and input signal (4-20 mA) and the valve must be installed in existing pipe line in site) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.

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3. Supply, installation, and testing of a low voltage cable (~300 m) with a cross-section of (4x2.5) mm², CU/PVC for Electric Modulating Valves) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.
4. Supply, installation, and testing of a low voltage cable (~100 m) with a cross-section of (4x10) mm², CU/XLPE/PVC for feeding the main circuit breaker in the panel.) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.
5. Supply, installation, heat-resistant flexible diameter 25 mm cable (~150 m) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.
6. Supply, installation, hot dip galvanized cable (~800 m) trays with a width of 20 cm, a height of 5 cm, and thickness of 2 mm compete with cover) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.
7. Supply, installation, testing, and operation of six (6) digital Dissolved Oxygen (DO) analyzer input source 1 Ph+N+E ,220 v, 50 HZ and output signal (4-20 mA) with an external panel near the tanks with IP55 protection and a display screen and installation of connection cables from the control panel to the analyzer and from the analyzer to the sensors. , including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.
8. Supply, installation, and testing of a low voltage cable (~800 m) with a cross-section of (3x3) mm², CU/PVC for power source to digital Dissolved Oxygen (DO)) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.
9. Supply, installation, and testing of a low voltage shield cable (~800 m) with a cross-section of (2x 2.5) mm², CU/PVC for signal source from digital Dissolved Oxygen (DO) analyzer along to PLC control panel) including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.

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10. Supply, installation, testing, and commissioning of a PLC panel that Containing a CPU, digital input/output and analog input/output cards, for operating (3) Butterfly valves with certain value (4-20mA) according to the required oxygen level for the tank, the dissolved oxygen (DO) output (4-20 mA) to feed PLC panel and controlled the operation of Butterfly valves including any and all auxiliary activities needed, in order to complete the necessary work in high quality and restore everything to its original state in accordance with the drawings, technical specifications, the relevant Egyptian code, and instructions from the supervising authority.

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Annex II: Timeline (Gantt table)

Activity	Timeline [months]											
	1	2	3	4	5	6	7	8	9	10	11	12
The assessment and verification of the Zenein technical report	■											
Proposal workplan	■	■										
Progress meetings - RVO, HCWW*	■		■		■		■		■		■	■
Installation & testing of the hardware and software elements*		■	■	■	■							
Progress report						■						
Demonstration of operations of the new system							■	■	■			
Knowledge transfer, training on operation and maintenance							■	■	■	■		
Full transfer of operations to HCWW											■	
Strategic report for efficient the upgrading of aeration at other Egyptian WWTP's.											■	■
Final report and presentation												■

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