

Design, Supply, and Installation of Reverse Osmosis (RO) Water Treatment System

Introduction:

Blumont seeking proposals for the design, supply, installation, operation, and maintenance of a Reverse Osmosis (RO) system. The selected solution will play a critical role in enhancing water quality, operational efficiency, and environmental sustainability. Interested vendors are invited to submit detailed offers that highlight their expertise, proposed technology, and the long-term benefits of proposed RO system.

General Overview

Objective: Design, supply, installation, commissioning, and maintenance of a turnkey RO water treatment system.

Location: West of Al Hol Camp, Northeast Syria (36.37188° N, 41.12126° E)

Source: Al-Dabaghiya Well (36.37028° N, 41.08282° E)

Production Capacity: 24 m³/h.

Scope of Work:

The scope of this solicitation includes three main components:

1. **Design, Supply, and Installation of the RO System and Its Components including Operational and Maintenance (O&M) Support**
 - Testing the water source providing the water analysis table.
 - Design the RO system based on the vendor assessed water quality parameters and desired production capacity
 - Supply and deliver all necessary components and equipment, including but not limited to pre-treatment units, RO membranes, pumps, post-treatment systems, and control systems and spare parts for a 90-day O&M period.
 - Install the RO system at the designated site, ensuring proper integration with existing infrastructure.
 - Conduct testing and commissioning to verify that the system meets the specified performance criteria.
 - Provide comprehensive O&M support for the RO system for 90 days after commissioning.
 - Train local personnel on the operation and maintenance of the system.
 - Conduct regular maintenance checks and provide technical support to ensure optimal performance.
 - Confirm to providing Certificate of Origin for all pumps generators and accessories after contract signing
 - Provide a detailed O&M manual and ensure spare parts availability during the support period.

2. Civil Works to House the RO System

- Design and construct the necessary civil infrastructure to house the RO system, including but not limited to:
 - A secure building or structure to protect the equipment from environmental elements.
 - Foundation and flooring suitable for heavy equipment.
 - Proper ventilation, lighting, and access control.
 - Installation of utility connections, including electrical, water supply, and drainage systems.
 - Full design and drawing of the raw water tank with the connections.
 - Final site layout considering all related facilities within (attached civil work BoQs) and above points.
- Ensure the civil works comply with local building codes and regulations.

Design Specifications

The design specifications for the RO system are provided below. These specifications outline the required water quality standards, system performance criteria, and technical parameters that the selected RO system must meet.

1- Feed Water Quality Parameters: The following points to be considered, Testing the water source and providing the water analysis table. Determine the levels of contaminants, as considering below.

- Total Dissolved Solids (TDS)
- pH
- Hardness
- Turbidity
- Iron and Manganese concentration
- Nitrate concentration
- Bacteriological contaminants
- Any specific contaminants relevant to the region.

2. Designing of the RO system

- Specify the number of RO stages and membrane types required for optimal performance, filtration,
- Consider the need for pre-treatment components such as sediment filters, carbon filters, or water softeners.
- Water analysis table as in below:

Water Source Name			Depth	Static Water Level	Water Source	GPS Coordinates:		Government	Village
Name	Owner	Mob				Latitude	Longitude		
16	WELL X		N/A	Asterian	Well			Hasaka Syria	

Physical parameters:

#	Test Name	Test Unit	Test Result 1 5/4/2023	Test Result 2 5/20/2023	Test Result 3 7/3/2023	Test Result 4 7/27/2023	Test Result 5 8/12/2023	Test Result 6 8/22/2023	Test Result 7 9/14/2023	Test Result 8
1	Colour		no	.....	no	no	no	no	no	.....
2	Taste		light salty	.....	light salty	light salty	light salty	light salty	light salty	.....
3	Odour		no	.....	no	no	no	no	no	.....
4	Temperature	C°	22.4	.....	30.4	32.5	33.7	34	27	.....
5	Turbidity (NTU)	NTU	2.6	.....	2.569	2.57	2.561	2.49	2.42	.....
6	Solids	ppt	1.96	.....	1.881	1.891	1.879	1.794	1.767	.....
7	Electrical	ms	3.24	.....	3.283	3.299	3.188	2.6	2.36	.....

Chemical parameters:

#	Test Name	Test Unit	Test Result 1 5/4/2023	Test Result 2 5/20/2023	Test Result 3 7/3/2023	Test Result 4 7/27/2023	Test Result 5 8/12/2023	Test Result 6 8/22/2023	Test Result 7 9/14/2023	Test Result 8
1	PH		7.2	.....	6.9	7.2	7.8	7.3	7.4	.....
2	Alkalinity	mg/L	0	.....	0	0	0	0	0	.....
3	Hardness	mg/L	195	.....	185	195	189	187	186	.....
4	arsenic	mg/L	0	0	0	0	0	0	0	.....
5	chloride	mg/L	0.14	.....	0.9	0.8	0.6	0.6	0.4	.....
6	nitrogen	mg/L	70	.....	55	42	49	51	47	.....
7	phosphorus	mg/L	0.63	.....	0.7	0.5	0.2	0.3	0.1	.....
8	Sulfur	mg/L	204	.....	198	210	218	211	204	.....
9	calcium	mg/L	>> Device Range	.....	>> Device Range	>> Device Range	>> Device Range	>> Device Range	>> Device Range	.....
10	magnesium	mg/L	4.15	.....	4.01	4	3.78	3.4	2.6	.....
11	potassium	mg/L	0	.....	0	0	0	0	0	.....
12	Carbonate /bicarbonate	mg/L	>> Device Range	.....	>> Device Range	>> Device Range	>> Device Range	>> Device Range	>> Device Range	.....
13	sodium	mg/L	0	.....	0	0	0	0	0	.....
14	iron	mg/L	0.08	.....	0.12	0.18	0.21	0.19	0.17	.....
15	fluoride	mg/L	0	.....	0	0	0	0	0	.....
16	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
17	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
18	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
19	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
20	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
21	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
22	heavy metals	mg/L	0	.....	0	0	0	0	0	.....
23	BoD5	mg/L	0	.....	0	0	0	0	0	.....
24	COD	mg/L	0	.....	0	0	0	0	0	.....
25	DO	mg/L	97	.....	50	66	70	64	59	.....

Biological parameters:

#	Test Name	Test Unit	Test Result 1 5/4/2023	Test Result 2 5/20/2023	Test Result 3 7/3/2023	Test Result 4 7/27/2023	Test Result 5 8/12/2023	Test Result 6 8/22/2023	Test Result 7 9/14/2023	Test Result 8
1	Total Coliform	coli / 100ml	0	.....	0	0	0	0	0	.....
2	E coli	coli / 100ml	0	.....	0	0	0	0	0	.....

3. Compliance and Certifications

- Ensure the system meets relevant local, national, and international standards and certifications for water treatment systems.

4. Cost Considerations

- Request detailed cost estimates, including initial purchase price, installation costs, and ongoing operating expenses.
- Consider total cost of ownership, including maintenance and replacement costs over time.

RO System Providing 24 m3/hr Treated Water				
#	Item Description	Duration / days	Cost \$	Remark
1	RO system			
1.a	Design Details of all the RO System with full detailed BoQ and Drawings.			
1.b	Production,			
1.c	Delivery and Installation			
2	Generator, accessories, boards and electrical work connection for full station			2 generators considering
3	Civil work, Room for tools and accessories of the RO system Water tank for raw water not less than 70 M3			
4	Piping works for the system including all necessary details and drawing			
Total			\$ -	
5	maintenance and operation per month			

5. Post-treatment System

- Treated water quality, including TDS reduction, pH balance, and removal of specific contaminants, and the water quality should compliance with drinking water standards
- The company responsible for testing the water quality after RO system production and installation and providing water table analysis in reliable laboratory determinate by Blumont.
- The water samples should be taken in WATER SAMPLE BAG WITH THIOSULFATE, 100ml, to avoid any change within the water specification during transporting the samples to the laboratory.

6. Performance Criteria

- Recovery Rate: Minimum 75%.

7. Construction and Installation Requirements

- Skid-Mounted/Containerized Design for ease of transport and installation.
- All materials and equipment should be certified and comply with international standards (e.g., ANSI, ASME, ASTM)
- Material (Piping and valves): Stainless steel or suitable alternative for corrosion resistance.
- Pressure ratings appropriate for system design.
- Control panel with necessary protection and automation.
- Instruments: Flow meters, pressure sensors, conductivity meters.

8. Documentation and Training

- **Technical Documentation:**
 - o Detailed design drawings and specifications.
 - o Operation and maintenance manuals.
 - o As-built drawings.
 - o A final inspection and acceptance certificate.
- **Training:**
 - o Comprehensive training for local operators on system operation, maintenance, and troubleshooting.

9. Maintenance and Warranty

- **Warranty Period:**
 - o Minimum one year for the entire system.
- **Maintenance Plan**
 - o Providing plan and recommendation for regular scheduled maintenance as per manufacturer recommendations.
 - o Confirming availability of spare parts and consumables in the market.

10. Performance Testing and Acceptance

- **Testing:**
 - o Initial system performance testing upon commissioning.
 - o Water quality analysis to confirm treated water meets specified standards.
- **Acceptance Criteria**
 - o System must meet the specified production capacity and performance criteria.
 - o Compliance with water quality standards for potable water.

Water Quality Standards

A: Biological Aspects of Drinking Water

NO	Indicators	Maximum limit 100 ml /Colony- forming units	Notes
1	Total Coliform (T. Coli)	0/100ml	At 37°C for 24-48 hours
2	Escherichia coli (E. coli)	0/100ml	At 44°C for 24-48 hours
3	Enterococci Fecalis (E.Fecalis)	0/100ml	At 35 to 37°C for 48 hours
4	Fecal coliform (F. coli)	0/100ml	At 44°C for 24-48 hours
5	Staphylococcus aureus (S. aureus)	0/100ml	At 35° -37°C for 24-48 hours
6	Total Bacterial Count (TBC)	100/200 ml	At 37°C for 24 hours
		100/2000 ml	At 22°C for 72 hours
7	Residual Free Chlorine	0.5-2.0 mg/L	In the Water network, not less than 0.5 ml/l at the end of the network in a contact time of not less than 30 minutes and not more than 2 mg/l at the beginning of the network
		0.5-2.0 mg/L	In wells and water tanks, it should not be less than 0.5 mg/l and not more than 2 mg/l when filling.

B: organic Chemical Indicators

Serial No.	Component	Symbol	Unit	Permissible Limit
1	Chemical Oxygen Demand (COD)	COD	mg/l	3

C: Nonorganic Chemical Indicators

NO	Component	Symbol	Unit	Maximum Allowed Limit
1	Ammonium	NH ₄ ⁺	mg/L	1.5
2	Antimony	Sb	mg/L	0.02
3	Arsenic	As	mg/L	0.01
4	Barium	Ba	mg/L	1.0
5	Beryllium	Be	mg/L	0.012
6	Boron	B	mg/L	2.4
7	Calcium	Ca	mg/L	0.005
8	Chromium	Cr	mg/L	0.05

9	Cyanide	CN ⁻	mg/L	0.07
10	Fluoride	F	mg/L	1.5
11	Lead	Pb	mg/L	0.01
12	Mercury	Hg	mg/L	0.006
13	Molybdenum	Mo	mg/L	0.07
14	Nickel	Ni	mg/L	0.07
15	Nitrite	NO ₂ ⁻	mg/L	3.0
16	Nitrate	NO ₃ ⁻	mg/L	70
17	Phosphate	PO ₄	mg/L	1.0
18	Selenium	Se	mg/L	0.04

D: Physical Indicators

1	Ph	Ph	-	6.5-8.5
2	Color	TCU	TCU	20
3	Turbidity	TUR	NTU	25
4	Aluminum	Al	mg/L	0.2
5	Chloride	Cl ⁻	mg/L	500
6	Copper	Cu	mg/L	2.0
7	Electrical Conductivity	Cond	μS/cm	2000
8	Hydrogen Sulfide	H ₂ S	mg/L	0.1
9	Iron	Fe	mg/L	1.0
10	Manganese	Mn	mg/l	0.5
11	Phenols	(as C ₆ H ₅ OH)	mg/l	0.005
12	Sodium	Na	mg/l	300
13	Sulfates	SO ₄ ²⁻	mg/l	500
14	Total Dissolved Solids (TDS)		mg/l	1200
15	Total Hardness (TH)		mg/l	700
16	Zinc	Zn	mg/l	5