Specification number 04044-MEC-3-GEN-1 for the supply of the PUMP FOR INFLUENT PUMPING STATION M-2-1003

Version 1.3

1. General

The Ashdod domestic sewage treatment plant operates using an activated-sludge treatment process. Influent wastewater is pumped after course and fine screens and grit removal stage to the primary clarifiers.

This specification details the specification for submersible pump for the pump for the influent pumping station.

The current pumping station is equipped with three pumps. This specification requests the addition of a fourth pump.

The equipment shall be suitable for operation in wastewater treatment installations under harsh conditions both for continuous long-term operation and for intermittent operation. The system shall be designed for maintenance free (except for routine maintenance, long life at 24-hour per day operation.

See P&ID drawing for details 04044_3.1_PID_GEN-065_01

Quantity:			:	1
Location/position			:	submersible in sump
Medium:				
-	type		:	mixed liquor
-	temperature min./max.	°C	:	17 - 35
-	pH		:	6 - 8
-	density	kg/m^3	:	1,050
-	solids			
	average	gr/m3	:	up to 500
	max	gr/m3	:	up to 1,000
-	oxidation/reduction value	mV	:	between -200 to 200
-	chlorides content	gr/m3	:	up to 300
-	TDS	gr/m3	:	up to 1,500
Site conditions:				
-	location		:	submersible adjacent to the headworks
-	area classification		:	non-explosive
-	ambient temperature min/max.	°C	:	5 / 45
-	humidity	%	:	approx. 90
-	sandstorm		:	not applicable
-	site elevation		:	30 m above sea level
-	site location		:	approx. 2.0 km from the Mediterranean Sea

2. Previous Experience

All equipment to be supplied shall be solely made in OECD countries.

The manufacturer shall demonstrate proven experience in the design, manufacture, and supply of over 3,000 submersible pumps for the municipal wastewater sector. As evidence, the manufacturer shall submit documentation of at least ten (10) installations of pumps of comparable duty — flow ≥1,500 m³/h and motor ≥150 kW — in OECD municipal wastewater service, in successful operation for over 3 years.

The Israeli supplier-representative shall show that the company operates a qualified service team in Israel with at least 2 qualified technicians and has been the representative of the manufacturer for proposed equipment for at least 2 years – documentation concerning shall be given.

3. General

Requirements:

- The complete pumping unit shall operate without overload on any component at any point along the pump entire full speed operating curve.
- The pump shall be furnished with a motor sized to operate continuously at the power requirement for very condition even though the power requirements at the rated condition may be less
- efficient, reliable and trouble free to operate
- require a client representative witnessed Factory Acceptance Test according to the ISO 9906 second edition May 1, 2012, and a Site Acceptance Test (SAT) as detailed below.
- The pump shall be quiet in operation and free from vibration
- The pump shall be adequately designed to assume a rigid support of the impeller and to rotate without whip, vibration or undue deflection at all operating speeds and under all operating conditions
- The pump manufacturer shall be responsible for the design of the anchor bolting system and conform to the relevant Hydraulic Institute Standards
- The impellers designed to give a non-overloading characteristic over the range of duties stated

Scope of supply:

- One pump with an integral motor
- One foot pedestal with rapid coupling and uncoupling function
- 316L brace for guide rail and 316L guide rail
- SS316 lifting chain
- all fastening accessories – screws, anchor bolts etc
- 15 m shielded cable for VFD operation
- vibration sensor
- PT100 sensor
- water in oil, water in motor, water in connection chamber
- All documentation including but not limited to, shop drawings for installation, O&M manuals, installation manuals etc.
- All necessary special tools required for installing and maintenance of the specific pumps
- Project engineering including all installation requirements, inlet chambers and sump dimensions submittal preparation, design drawings, reviewing the contractors detailed design in applying the manufacturer's

equipment, preparing the FAT and SAT tests etc.
- Preparing and allocating all necessary resources for conducting a full FAT procedure in accordance with these specifications witnessed test by client and the manufacturer at the manufacturer's factory site.
- On-site supervision by a qualified representative of the manufacturer of the installation
- Providing approval that the equipment has been installed by the contractor in full accordance with the manufacturer's specific instructions.
- The presence of the manufacturers technician or approved representative during the initial wastewater water commissioning at the -Ashdod WWTP as required by this specification.
- The presence of the manufacturer's technician or approved representative 45 days after initial operation with wastewater for operation evaluation of the system.
- The presence of the manufacturer's technician at the Ashdod site in case of a substantial malfunction as required by this specification.
- On-site training by the manufacturer's technician or approved representative
- All parts required for on-site erection, ready for operation, including lubricants

4. Pump

4.1 General

Manufacturer		:	KSB, Flygt, Sulzer or approved equivalent by the Client's Designer
Type		:	centrifugal submersible, non-clogging, single impeller
Permissible fluctuations of testing equipment		:	grade 1
Pump acceptance tolerance band		:	1U as detailed in table 8 in ISO 9906:2012
Volute type		:	open
Free passage	mm	:	100
Discharge Flange		:	DIN300
Provision		:	hoisting cable of stainless steel AISI 316 of sufficient length with eyes and hooks to lift the pump out of the wet pit
Guaranteed Duty Point			
Flow	m^3/hr	:	1,900
Head	meter	:	23.0
Minimum combined efficiency	%	:	80

5. Motor

Principle		:	electric motor, direct coupled to the pump
Motor type		:	squirrel type rotor inductive
Power supply	V/Hz	:	3 x 400 / 50
Motor efficiency standard		:	IE3
Starting method and control		:	frequency converter
Frequency at max. capacity	Hz	:	50
Frequency at min. capacity	Hz	:	30
Rated speed (max.)	rpm	:	no more than 1,480
Pole		:	4
Operating mode		:	S3-40% – intermittent periodic duty – 6 operations per hour

Lifetime bearings (L_{10h} according to ISO) h	:	≥ 50,000
Lubrication	:	oil bath
Insulation rating	:	F
Protection rating	:	IP68
Cable length	:	15 m

6. Materials

-	impeller and wear plate	:	cast iron (EN-GJL-250)
-	shaft	:	SS 316
-	casing	:	cast iron EN-GJL-250
-	lifting handle	:	SS316
-	O-rings	:	nitrile buna rubber
-	mechanical seal, inner	:	silicon carbide
-	mechanical seal, outer	:	silicon carbide

7. Protective coatings

All Stainless-steel components shall undergo a complete passivation - by immersion process. No spray treatment or painting shall be allowed. The internal process shall be documented.

All carbon steel surfaces shall be coated except for stainless steel surfaces.

Welding details between parts shall be conducted in accordance with best practices as outlined in chapter 5.5 “Geometric Considerations” given in Design of Municipal Wastewater Treatment Plants – Manual of Practice #8 fifth edition.

All welds shall be cleaned before passivation.

No field welds shall be allowed.

Any ferrous metal surfaces that are not SS shall be coated. The coatings shall be completely shop applied (no field finishing) and shall be verified by the following ISO standards tests or any other equivalent standard approved by the client:

-	Painting layers adhesion	:	ISO 2409:2007 – Cross cut test ISO 4624:2016 – Pull of test for adhesion
-	Preparation of steels before painting	:	ISO 8501-1:2007 - preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness ISO 8503-1:2012 - Preparation of steel substrates before application of paints and related products - Surface ISO 8503-1- 5:2012 - Preparation of steel substrates Before application of paints and related products – surface roughness characteristics of blast-cleaned steel substrates

8. Fastening materials

Flanges		:	DIN
Bolts			
-	Thread type	:	M
-	Bolt head type	:	Hex
-	Identification	:	in accordance with ISO 3506-1
-	Length	:	thread shall protrude at least 2 thread pitches and no more than three thread pitches.
-	Material	:	SS316L
Nuts			
-	Style of nuts	:	Hex
-	Identification	:	in accordance with ISO 3506-2
-	Material	:	SS316
Washers - material		:	SS316
Spring washers - material		:	SS316

9. Nameplates

- a stainless steel 316 identification nameplate shall be fixed to the equipment.
- all information provided shall be engraved (not printed)
- the nameplate shall include the following information:
  - Manufacturer's name
  - Model number
  - Serial number
  - Tag number from P&ID
  - Date of manufacture
  - Power supply
  - Protection rating
  - Amperage
  - Speed
  - Rated capacity
  - All other pertinent data
- motor data shall include in addition:
  - Number of poles
  - Electrical connection
  - Efficiency
  - Isolation class
  - Service factor

10. Spare parts

Spare parts to be supplied within the scope of supply shall adhere to the following:

- All spare parts shall be identical and interchangeable with the original parts.
- All spare parts shall be properly packed and clearly labelled separately and packed in containers.
- Each container will be labelled showing the contents of the container.

- Suitable provisions shall be made to protect the spare parts against corrosion.

11. Submittals

To obtain approval from the Client's Designer, submittal documents shall be prepared. The submittal shall provide standard documentation for easy reference. Submittals that are not in accordance with this requirement will be automatically disqualified. All submitted documents shall be in English only.

Document 1: First page:

a. Equipment Name
b. Tag number (or numbers) in accordance with the P&ID drawings
c. Manufacturer's name
d. Model Number
e. Equipment country of origin
f. Supplier's signature
g. Contractor's signature
h. Date
i. Version number

Document 2: Signed documents by manufacturer - Tender specification, the relevant P&ID and the specific drawings that pertain to the specific equipment shall be signed on each page by the manufacturer and the local certified supplier stating that the proposed equipment is in full compliance with all the tender and this specification requirements.

Document 3: Technical data - Technical data that verifies full compliance with this specification. The data shall be submitted in the following manner, and shall include (but not limited to) the following:

- **Document 3A**: technical data sheets, including the manufacturer's technical offer
- **Document 3B**: electrical wiring drawings, control configuration, proposed software, proposed communications protocol, power requirements, electrical standards adopted, etc.
- **Document 3C**: brochures,
- **Document 3D**: The proposed performance curves (pump and motor) with flows, head, efficiencies, rated power, service factor, rated voltage, nominal speed etc. all at various speeds.
- **Document 3E**: drawings of proposed equipment (detailing dimensions and proposed installation),
- **Document 3F**: standard installation manual and O&M manuals.

Document 4: Bill of Materials – A Bill of Materials of all components to be supplied. The bill of materials shall be provided in a table format as detailed below:

No.	Name of component	Weight Static/dynamic/wet [kg]	Sub-component	Sub-component manufacturer's part number	Required sub-component material of construction in tender documents	Proposed sub-component material of construction	Quantity
1	TTTTTTTT	XXX/YYY/ZZZ	AAAAAA	GGG-HHH-FFF	JJJJJJ	SSSSSS	

			BBBBBB	GGG-HHH-FFF	JJJJJ	SSSSSS	
			CCCCCC	GGG-HHH-FFF	JJJJJ	SSSSSS	
			DDDDDD	GGG-HHH-FFF	JJJJJ	SSSSSS	
			FFFFFFF	GGG-HHH-FFF	JJJJJ	SSSSSS	
			GGGGGG	GGG-HHH-FFF	JJJJJ	SSSSSS	

Note: Capitalized letters are to be replaced by actual information

Document 5: Previous Experience –

- **Document 5A:** Manufacturers list of previous installations in OECD countries (not including Israel) – the list shall be in the following format:

No.	Year of installation	WWTP name	Country	Design capacity of WWTP [m3/day]	Model type of installed equipment	Contact name, telephone, e-mail
1						

- **Document 5B:** Manufacturers list of previous installations in Israel) – the list shall be in the following format:

No.	Year of installation	WWTP name	Country	Design capacity of WWTP [m3/day]	Model type of installed equipment	Contact name, telephone, e-mail
1						

- **Document 5C:** Name list of the service team in Israel – a list shall be in the following format:

No.	Name of qualified technician (first and last name)	Number for years working on equipment from the specific manufacturer	Number of years' experience	Contact name, telephone, e-mail
1				
2				
3				
4				

If the submittal is not accepted, the contractor shall revise the submittal in accordance with the Client's/Client's designer's remarks.

The resubmittal shall include the entire submittal package, and all changes shall be marked (using "Track Changes"). The re-submittal shall be designated with an updated revision number.

Revised submittals that are not marked and with updated revision numbers shall not be checked and shall be handed

back to the contractor and shall not be approved.

The contractor must use the approved submittal as the official document for procurement.

12. Factory Acceptance Test

12.1 General

After complete manufacturing of the system the manufacturer shall notify the client that the entire scope of equipment supply has been completed and is ready for the factory acceptance test.

Sixty (60) days prior to the factory visit, the supplier shall send the following:

Updated submittal documents (1 through 4) as required above in a final version, stamped with "final version", with no marked changes on it.

Document 5: Certified installation drawings – certified final drawings of the equipment including dimension prints detailing equipment dimensions, installation details including but not limited to all required anchor bolt locations, weights, grove locations, openings, access areas and channel connection details etc. All drawings will be also provided in electronic files – CAD 2025 format. The electronic file drawings shall be both in 2D and 3D.

Document 6: Electrical drawings – The following technical data shall be provided:

- **Document 6A:** Complete wiring diagrams for the all the components supplied,
- **Document 6B:** Complete P&ID drawings of the equipment including the required control diagrams
- **Document 6C:** Control Narrative for Process Control
- **Document 6D:** Complete I/O lists and other process related information
- **Document 6E:** Detailed communication tables. These communication tables shall include but not limited to addresses and data for all types of events, motor status, instrumentation information, valve positions, motor speeds, power consumption, input and output discrete and analog raw data.

Document 7: Manufacturer's recommended procedures for jobsite storage and handling of equipment.

Document 8: Dedicated Installation, Operation and Maintenance Manuals: Prior to delivery of equipment and updated as required during installation of the equipment, the manufacturer shall furnish complete and detailed installation, operation and maintenance manuals which shall include the following information as a minimum requirement:

1) A description of each equipment and item, normal operating characteristics and limiting conditions including but not limited to performance curves, engineering data etc.
2) Assembly, installation and adjustment instructions.
3) Electrical diagrams, control philosophy and shop drawings for installation
4) Complete descriptive literature of all materials and components furnished.
5) Erection drawings with equipment mark numbers
6) Guide for trouble shooting with easy to read tables and charts
7) Lifting instructions
8) Field test protocols in line with the specification tests
9) Start-up instructions

10) Operating instructions
11) Routine maintenance and preventive maintenance schedule instructions
12) Control software documentation
13) Malfunction detection instructions
14) Safety instructions
15) Spare parts list and ordering procedure, including recommended quantities of spare parts to be stored onsite.

Document 9: Complete part list of the equipment to be tested. This shall be identical to what is required to be supplied by the manufacturer.

Document 10: Copy of the internal quality acceptance tests to be performed by the manufacturer

Document 11: Written approval of the supplier that the equipment fully complies with all that required in the tender specifications and has passed all internal quality acceptance.

The factory acceptance test shall proceed only after the documentation has been approved by the Client and the Client's Designer.

a. In case the local control panel is manufactured in Israel, the manufacturer shall conduct the FAT test with the specific equipment at manufacturer's factory with manufacturer's control panel that has identical functional hardware and software to what will be provided for the Ashdod project.

The factory acceptance test shall be witnessed by the client's representative.

The factory acceptance test shall include but not limited to:

a. Verifying that the manufacturers acceptance test procedure is accordance with required standard.
b. Visual inspection that the equipment is of high quality as detailed below:
    1) no damages or flaws are seen,
    2) no corrosion is seen
    3) all critical sizes conform to the specifications
    4) all materials provided are accordance with specifications and this shall be conducted by proof of material tracing
    5) complete passivation on stainless steel components has been conducted
    6) no non-similar metals have been connected
    7) all fastening equipment has been provided
    8) motors plates are in accordance with specs and what has been offered
    9) plastic/rubber parts are new and not cracked
    10) name plate is identical to what was required
c. Client's witness in full the ISO 9906 second edition May 1, 2012, Hydraulic Performance Acceptance Test. – see full detail below
d. Validate the discharge, head, efficiency guaranteed curves over the whole permitted flow range by operating the pump at 4 separate points at detailed in the above specification for each pump with 6 (six) readings.

12.2 ISO 9906:2012 - Hydraulic Performance Acceptance Test

This pump test, as aforementioned above, shall be conducted at the manufacturers testing facilities on each pump and witnessed onsite by the client's representative to verify the initial performance of new pumps as well as checking for repeatability of test results.

Testing procedures shall be in full accordance with the ISO 9906 second edition May 1, 2012, standard.

All random fluctuations of the testing equipment shall be in accordance with table 3 ISO 9906 second edition May 1, 2012, standard – grade 1. Maximum permissible measurement device uncertainty at guaranteed point shall be in accordance with table 5 – grade 1 (see ISO 9906 second edition May 1, 2012, standard). The overall measuring uncertainty shall be in accordance with table 6 – grade 1 (ISO 9906 second edition May 1, 2012, standard) and overall uncertainties of efficiency shall be in accordance with table 7 – grade 1 (ISO 9906 second edition May 1, 2012, standard). Test results that are based equipment that does not achieve these gradings and levels shall be disqualified.

Pump performance test acceptance grade shall be 1U as stated in table 8 (see ISO 9906 second edition May 1, 2012, standard) and given below:

Maximum tolerance allowed during the Factory Acceptance Tests

Parameter	**Tolerance**
Rate of flow	0 to +10%
Total head	0 to +6%
Minimum efficiency	≥0%

Note: all tolerances are percentages of values guaranteed.

The test results shall be evaluated to the extent possible while the tests are in progress so that questionable measurements can be re-evaluated.

After completion of the acceptance test, full report by a certified engineer (and signed by the manufacturer) shall be prepared by the pump manufacturer. This report shall record all the necessary information on the procedure and the results of the test as detailed in Annex F ISO 9906 second edition May 1, 2012, standard

Positive acceptance – All the pumps must pass the following tests: visual inspection, ISO 9906 second edition May 1, 2012, standard Hydraulic Performance Acceptance Test with the clarifications given in this specification, ISO 2151, and verification of the 5 operating points as detailed.

Negative acceptance - if after a second set of witness tests show non-compliance the entire scope of supply shall be annulled.

13. Site Acceptance Tests (SAT)

13.1 General

The site acceptance tests shall include:

a. Conducting and approved completion of the dry-running tests
b. Conducting and approved completion of specific equipment performance tests
c. Conducting and approved completion of clean water tests
d. Conducting and approved completion of wastewater tests

13.2 Dry-running tests

Dry-running tests shall only be performed on equipment that allows dry-running, such as electric boards, pumps, some instruments, etc.

Complete I/O tests shall be conducted, and simulation of the process will be accomplished.

No dry-running tests may be performed on equipment that must be operated with water, such as pumps, etc.

The supplier shall provide the client, manufacturers written approval that supplied equipment is in accordance with the manufacturer's instructions.

The supplier shall provide calibration documents that all the equipment has been calibrated in accordance with the manufacturer's written instructions.

13.3 Specific Equipment Performance Tests

The specific performance tests shall be carried out along the complete designed operating range of each specific piece of equipment.

The performance tests shall be carried out in the presence of both the client's representative and the supplier's authorized representative.

The duration time of the performance tests shall be in accordance with the manufacturer's specific written instructions. At the end of each performance test the manufacturer's representative shall sign a document stating the equipment have been installed in according to the manufacturer's recommendations, the equipment has passed all performance tests for the specific equipment and that the equipment is entitled to have the extended warranty as required by the tender.

13.4 Clean Water Tests

No clean water tests will be carried out, as the sump is a working sump.

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13.5 Wastewater Tests

Prior to operating the pump with wastewater water, the following documentation from the manufacturer shall be provided:

- Complete equipment submittals – Documents 1 through 12 – in 5 copies in colour prints and in electronic file – PDF, DWG and WORD files
- Written approval from the manufacturer that the equipment is ready for operation

After successfully commissioning with wastewater, the supplier will notify the client that the plant is ready for the wastewater site acceptance test.

A manufacturer's technician or authorised local representative must be present within three days of starting the "Wastewater Tests." If they arrive later, the test period will begin only upon their arrival.

The equipment shall operate during the 30-day “Wastewater Test” with no substantial equipment malfunctions due to defects in design, workmanship, material of the equipment and installation. A substantial equipment malfunction is defined as:

- The equipment has been inoperable for a period of more than 24 hours and requires a qualified technician from the manufacturer/supplier to mitigate the problem.

- The equipment has been inoperable for more than 3 times and required a qualified technician from the manufacturer/supplier to mitigate the problem regardless of the down-time period.

- The accumulative down-time for all types of malfunctions (with or without the assistance of a qualified technician of the manufacturer or supplier) shall be no more than 36 hours.

In the event of a significant malfunction, the clean test period will be restarted.

A senior manufacturers engineer (together with the local supplier’s technician) shall be present at the Ashdod WWTP site in the following circumstances:

a. **Scenario A** - The contractor has not been capable of passing the 30 day wastewater test within 100 days.
b. **Scenario B -**A serious event has occurred where the new pump causes an issue that leads to a cascade of malfunctions, resulting in the entire pumping station to failing. In such circumstances, the entire wastewater treatment plant would be affected.

In Scenario A, a senior manufacturer's engineer will arrive on site within one month.

In Scenario B, a local technician will arrive within 4 hours, while the manufacturer’s senior engineer is expected on-site within one week of the incident.

The cost for the manufacturer's senior, all local technical representatives and all related tests and works done shall be solely borne by the contractor.

Positive acceptance – pass the 30-day test with no substantial equipment malfunction.

Negative acceptance - if after 160 days the equipment does not pass the Wastewater Tests the entire equipment package shall be considered non-compliant as defined in the contract.

14. Warranty

The pump package supplied under this Specification shall carry a warranty **for one (1) year from date the equipment passes the wastewater acceptance test.**

The manufacturer shall provide the client the manufacturer's warranty made in favour of the client, that the equipment supplied shall be warranted by the manufacturer to be free from defects in design, workmanship, and material for the duration of the Manufacturers warrantee period.

The manufacturer shall provide specific instructions on how to store the equipment until installation and from installation until continuous operation. The manufacturer's representative shall from time to time visit the storage facilities and update project management on the storage conditions. If the manufacturer's representative sees that the storage conditions are not satisfactory, due notice must be given promptly.

Equipment shall be tested in accordance with the manufacturer's instructions. The manufacturer shall provide documentation approving the installation and operation of the equipment.

If any part of the equipment supplied under this Specification should fail during the warranty period, the defective part shall be replaced immediately at the manufacturers' expense. All work associated with fixing the equipment will also be borne by the manufacturer. If for any reason the same equipment breaks down consecutively with the same malfunction, the manufacturer's technician shall provide a site visit for evaluation on the manufacturers' expense. If the equipment continues to malfunction (over a period of 5 months) the manufacturer shall replace the entire package at the manufacturers expense. If the malfunction continues to other units as well, the manufacturer shall replace all the packages in their entirety on the manufacturers expense. If in spite of all the replacements, the system still continues to malfunction, the manufacturer shall rebate the client the complete cost of the system and pay all damages as a result of the equipment failure.

In addition, the manufacturer shall guarantee the following:

1. The equipment that is offered is represented in Israel and technical assistance shall be given locally for a period of at least 7 years.
2. The equipment manufacturer shall guarantee the availability of spare parts for 7 years from the day of commissioning.