

Tender Number / Project name: XXXXXXXX

Date: XX. XX. XXXX

TECHNICAL PROCUREMENT SPECIFICATION

Item.	Qty.	Technical description	Price per unit	Amount
		Agitator for aeration tank Task The solids (mud flakes, mud, fibers, Sands, etc.) in the treated wastewater must be kept in suspension and the velocity of the liquid in the complete basin shall have a velocity between 0,20 - 0,30 m/s to avoid the sedimentation of solids. Technical details of the basins Activated sludge: 2 - 6 g/l dry solids Sludge Volume Index (SVI) 50 - 150 ml/g Number of basins: X Basin shape: XXXXXXXXXXXXXXXX Dimensions: diameter X m / length X m / channel width X m Water depth = XX m Volume per basin: approx. XXXX m3 Number of agitators: X unit per basin Propeller diameter: 2.5 m Range of thrust: at least XXXX to XXXX N (F) To minimize the power consumption it shall be possible to adjust the required propeller speed and trust during the Nitrification and Denitrification phase. The agitator shall be equipped with an internal frequency drive (VFD) and a RS485 + Modbus RTU interface that can be controlled via a PLC. The use of an external VFD to modify the propeller speed is accepted if the cost is included in the price of the Agitator. The supplier must guarantee the following performance. Required performance and max. Power consumption during Nitrification (Aeration on): Propeller speed: XX min⁻¹ Guaranteed thrust: XXXX N Max. Power consumption: XX kW (P1) Specif. Thrust vs. power: XXX N / kW (F / P1) according to ISO 21630 Specif. Energy consumption per m3: XX W / m3 (P1 total / V) Required performance and max. Power consumption during Denitrification (Aeration off): Propeller speed: XX min⁻¹ Guaranteed thrust: XXXX N Max. Power consumption: XX kW (P1) Specif. Thrust vs. power: XXX N / kW (F / P1) according to ISO 21630 Specif. Energy consumption per m3: XX W / m3 (P1 total / V)		
1.01		Submersible Agitator The Agitator shall be capable of handling raw, screened sewage. It shall be possible to easily raise and lower the mixer on a 100x100 mm guide bar system without the need for personnel to enter the tank. The Agitator shall be equipped with an extended lifting handle.	X,-	X,-

Fill in the Data for XXX and delete text of alternative which is not applicable

		The agitator, the motor and the cable, shall be capable of continuous submergence without loss of watertight integrity to a depth of 20 m according to IP 68. Rated Power P2: >= XX kW Motor efficiency class.: IE4 It shall be possible to run the motor on 380-480V at 50 or 60Hz. Starting method: Speed ramp up at reduced current. Motor and drive The mixer shall have a high efficiency synchronous speed motor with an integrated variable speed drive, housed in an air filled, watertight chamber. The motor efficiency shall be equivalent to IE4 levels. The shaft speed shall be adjustable via a gateway with Modbus RTU / TCP 4-2mA signals. The drive shall monitor temperature and current and stop the mixer in case of overload. The Stator shall be inverter duty rated in accordance with NEMA MG1, Part 31 and be insulated according to class H 180°C (356°F). The motor shall be capable of an unlimited number starts per hour. The motor shall be equipped with 10m submersible and screened cable including 2 leads for the sensors. The cable entry seal shall consist of cylindrical elastomer bushings, without epoxies, silicones, or other secondary sealing systems. Gear Unit The reduction of the motor speed to the propeller speed shall be carried out by a Two-step helical gearbox in an oil bath. The calculated service life of the gearbox shall be at least 100,000 h according to ISO 281. The gear box chamber shall be filled with a gear box oil of type Mobil gear 630 or similar. Oil housing and mechanical seals In addition to the gear box the Agitator shall have an oil chamber for the shaft sealing system with the option to equip it with a conductive seal monitoring. In addition to the gearbox, the agitator shall have an oil housing for the shaft seals and the possible connection of a conductive seal monitoring system. The outer seal of the propeller shaft shall be a mechanical seal made of corrosion-resistant cemented carbide (WCCR) and shall be suitable for direct contact with the medium. The inner seals shall be rubber lip seals. All seals shall be sufficiently lubricated and cooled by the oil. All seals must be maintenance-free. The oil chamber shall be filled with a medical white oil of paraffin type. The oil shall be free from aromatic hydrocarbons and be approved according to FDA 172.878. Propeller Unit The agitator shall be designed as a self-cleaning 2-bladed propeller with a backward curved leading edge. The pitch of the blades shall be positive and any adjustment or loosening of the blades during operation shall be excluded by design. The propeller diameter shall be 2500 mm. Material Motor and Gear box : Cast iron EN1561-GJL250 Propellerhub : Cast iron EN1561-GJL250 Support frame : AISI 316 / DIN 1.4436 Propellerblades : fibreglass reinforced polyurethane Propellerwelle : AISI 420 / DIN 1.4057 Fasteners : AISI 316 / DIN 1.4436		
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1.011		CFD (Computational Fluid Dynamics) Analysis The Contractor shall submit the following information for review and approval: License and Software Proof of the employed CAD, CFD or any additional CFD Pre/Postprocessing software shall be shown on demand. This can include a copy of a paid license receipt or any other document supporting the claim. Finite volume based CFD software capable of multiphase modelling shall be used. CFD model Turbulence effects shall be represented with the help of realizable k-ε (or other) model that provides an improved prediction for the spreading rate of both planar and round jets. Submersible mixer shall be modelled appropriately and correctly account for generated thrust, torque and radial forces. Apparent viscosity of the liquid shall lie between 1-10 cP based on the given TS concentration. Computational mesh shall adequately represent relevant internal obstacle and tank geometry with 0.1 m as a maximum size of the computational element. Wall effects shall be well resolved with the corresponding y+ value below 100. Gas-liquid two-way coupling shall be applied. Reported results shall correspond to a converged numerical solution. Proof of convergence in a form of residual plot and volume average velocity magnitude shall be presented. The volume average velocity shall be proven converged. The total air mass imbalance shall be maximum 5%. The total mass imbalance for net through flow cases shall be maximum 3%. CFD results The report shall describe problem at hand, agreed work scope and analysed scenarios. This shall include setup for each scenario, corresponding running conditions, flow rates, chosen mixer equipment and other relevant information. For the sake of clarity, geometry shall be shown in different perspective (side, top and isometric), important dimensions shall be		

		specified, and all relevant internal objects and obstacles shall be shown. Boundary conditions and other modelling assumptions shall be presented and justified. Presented results shall build a solid understanding of the resulting flow pattern. Important flow features shall be visualized. Sedimentation risks shall be evaluated and, if necessary, addressed. Air entrainment risks near mixers shall be evaluated. Volumetric mean age distribution shall be provided for net through flow cases in order to evaluate short-circuiting/stagnation risks. To allow for independent audit of the numerical solution and to eliminate CFD model propriety risks, result files shall be, on demand, submitted in a format that is compatible with the Tecplot visual analysis tool.		
1.02		Installation set for permanent installation of Submersible agitator. The installation set shall contain: 1 freestanding tripod guide bar 100x100x 4mm for floor mounting including anchor bolts. The guide bar shall be applicable for an installation depth up to 6 m The guide bar shall have a support for the agitator. During operation, the wire shall not suspend the agitator. The guide bar and anchor bolts shall be made of AISI 316 (1.4571) The supplier of the agitator shall provide an installation drawing with detailed instruction about the position and orientation of the Agitator based on CFD report specified in item 1.02	X,-	X,-
1.02A		Installation set for permanent installation of Submersible agitator. The installation set shall contain: 1 freestanding tripod guide bar 100x100x 4mm for floor mounting including anchor bolts. The guide bar shall be applicable for an installation depth up to 6 m The guide bar shall have a support for the agitator. During operation, the wire shall not suspend the agitator. The guide bar and anchor bolts shall be made of AISI 304 The supplier of the agitator shall provide an installation drawing with detailed instruction about the position and orientation of the Agitator.	X,-	X,-
1.03		Mobile Lifting davit for Agitator or pump Adjustable for reach and height, Reach 650 - 1200 mm, Including Winch with bracket and 15-meter wire. Max. lifting load: 320 kg Material: David: Stainless steel EN 1.4301 or AISI 304 Winch: Stainless steel or Aluminium Hook & Lifting wire: Stainless steel AISI 316 Model: FLYGT SK 320 or equivalent	X,-	X,-
1.03A		Mobile Lifting davit for Agitator or pump Adjustable for reach and height, Reach 1600 - 2000 mm, Including Winch with bracket and 15-meter wire. Max. lifting load: 300 kg Material: David: Stainless steel EN 1.4301 or AISI 304 Winch: Stainless steel or Aluminium Hook & Lifting wire: Stainless steel AISI 316 Model: FLYGT SK 300 or equivalent	X,-	X,-

1.04		Lifting device with automatic hook Shall enable the operator to catch, lift, lower and release the Agitator below water level. Material: Stainless steel 1.4436 Model: FLYGT AVR 834126 or equivalent	X,-	X,-
1.05		Floor mounted David holder including anchor bolts Material: Stainless steel AISI 316	X,-	X,-
1.05A		Option: Wall mounted David holder including anchor bolts. Material: Stainless steel AISI 316	X,-	X,-
2.01		PLC control Cabinet for Agitator The cabinet shall be made of Reinforced plastic or stainless steel and it shall be prepared for an installation on a wall and be isolated according protection class IP 66. It shall contain following equipment: 1 Power switch, which can be locked in the off position 1 Communication gateway Modbus RTU/TCP 4-20mA 1 A Job wheel operator panel 1 Heating element with thermostat Power supply shall ne 24 V DC Model: FLYGT VOS-Standard III (FOP315+APP412) or equivalent	X,-	X,-
3.01		Delivery of described agitator and accessories according incoterm DAP to <u>XXXXXXXXXXXXXXXXXX</u>		X,-
3.02		Installation of described Agitator and accessories Under the condition that that the Basins are accessible with a truck and that lifting gear is available. Place of Installation: XXXXXXXXXXXXXXXXXXXX		X,-