Supply, Delivery, Installation and Commissioning for the Rehabilitation, Automation and Energy Management System of Bucal Pumping Station

TERMS OF REFERENCE

1.0 SOFWARE TECHNICAL REQUIREMENTS - FOR WATER MANAGEMENT SYSTEM SCADA, POWER MANAGEMENT SYSTEM, AND VIDEO MANAGEMENT SYSTEM

1.1 WATER MANAGEMENT SYSTEM (WMS) SCADA Software

• Capacity	5000 points
• Architecture	Standalone
• Licenses	Development and Runtime License Server/Client License Web License
• Supported Protocols	Modbus TCP DNP3 OPC UA
• Brand	Preferably same with Main PLC for seamless integration
• Minimum Function Description	<u>SCADA Monitoring Function</u> • MCC Local/Remote mode indication • Booster Pump VFD status indication – stop, run and trip • Booster Pump VFD speed/ frequency output • Booster Pump VFD parameter monitoring • Booster Pump VFD Auto/Manual mode indication • Gas Chlorinator status indication – stop, run trip • Booster pump Suction Pressure monitoring • Booster Pump Flow status indication • Well / Reservoir Low/High level status • Well / Reservoir continuous level monitoring • Priming Valves Position indication • MOV status • Flow Totalizer • UV System Monitoring • Gas Chlorine Dosing System Monitoring • Gas Chlorine weight monitoring system • Gas Chlorine leak detection alarm • Pump Health Monitoring (Vibration and winding temperature) <u>SCADA Control Function</u> • Remote VFD/RVAT start/stop command (Manual Mode) • Remote VFD frequency command (Manual Mode) • Booster pump-Level Controlled Filling Sequence (Automatic Mode) • Priming valve automation • Pump Duty Cycle Operation (Automatic Mode) • Report Generation

1.2 POWER MANAGEMENT SYSTEM (PMS)

• Capacity	For 15 units Power Meter
• Architecture	Modular
• Licenses	Development and Runtime License Server/Client License Web Client License
• Device License	1 Mid-Range Device 14 Entry Range Devices
• Display	High Level Power Monitoring Dashboard Electrical System Network Diagram Real Time Trending Alarm and Events Diagnostic Analysis
• Report Generation	General (Dashboard, Data Export, Tabular) Usage Trending Power Quality

1.3 VIDEO MANAGEMENT SYSTEM (VMS)

• Architecture	Server/Client
• Device License	Up to 96 Cameras
• Features	Video Analytics Abandoned Motion Tracking and Missing Object Picture Capture with text insertion of date and time 10x Digital Zoom features both on live view and recorded videos EMAP with live camera display for increased response time during emergencies Search by Camera, Date, Time
• Recording and Playback	H.264 Recording Support for NTSC and PAL Search and Play back of stored videos Single and Multi-playback function
• Backup and Archiving	Easy Back-up function to CD-RW or DVD-RW and Restore old videos, Saves as .mp4 output file On Demand back-up using remote NVR, Web View via web browser

2.0 HARDWARE TECHNICAL REQUIREMENTS – WMS-SCADA, PMS and VMS

2.1 Server Machine for WMS-SCADA+PMS

• Base	Rack-mounted Server
• Processor	Intel Xeon ,Silver 4310 14C/24T, 10.4GT/s , 18M Cache, Turbo, HT (120w) DDR4-2666
• Memory	40GB RDIMM, 3200MT/s, Dual Rank (24 DIMM slots)
• Storage	600GB Hard Drive SAS 12Gbps 10k 512n 2.5 Hot-Plug
• Power Supply	Single, Hot-plug, power supply (1+0), 1400W, Mixed mode
• Operating System	Windows Server 2019 or latest

2.2 Work Stations for WMS-SCADA, PMS and VMS

• Processor	Intel® Core™ 9th Gen Intel® Core™ i7-9700 (12 MB cache, 8 cores, 8 threads, 3.00 GHz to 4.80 GHz Turbo)
• Memory	16GB RAM Memory
• Storage	4TB HDD, 256 GB, 2.5-inch, SATA, SSD
• GPU	NVIDIA® T1000 8 GB GDDR6, 4 m DP to DP adapter or Equivalent
• Embedded Software	Operating System Windows 10 Pro or latest; Microsoft Office 2019 (or latest) or Microsoft 365
• Peripherals	Wireless Keyboard and Mouse

2.3 Display Monitors

• Panel Type	LED Video wall
• Size	40 inches
• Resolution	1920 x 1080
• Port	HDMI, DVI in, Display Port
• Power	AC100-240 V 50/60 Hz

2.4 Server Network Switch

• Type	Rack mounted
• Port	16 x 10/100/1000 (PoE+) + 2 x Shared Gigabit SFP
• Interfaces	16 x 1000Base-T RJ-45 PoE+ 30W, 2 x SFP
• Form Factor	Rack-mountable
• Performance	Forwarding performance: 23.8 Mpps , Switching capacity: 32 Gbps
• Manageable	Yes
• Routing Protocol	IGMP, IGMPv2, IGMPc3, Static IPv6 routing
• Remote Management Protocol	HTTP, HTTPS, SNMP
• Power Over Ethernet (PoE)	PoE+
• PoE Budget	185 watt or higher
• Power Supply	120/230 V AC 50/60 Hz
• Supports	Access Control List (ACL) support, Bandwidth control, Class of Service (CoS), Denial of Service (DoS), DHCP snooping, DHCP support, Duplicated Address Detection, Dynamic VLAN Support (GVRP), GREENnet technology, IPv6 support, Jumbo Frames support, Link Aggregation Control Protocol (LACP), LLDP support, Loopback, MAC address filtering, Management Information Base (MIB), Multiple Spanning Tree Protocol (MSTP) support, Neighbor Discovery Protocol (NDP), Network Access Control (NAC), Port mirroring, Rapid Spanning Tree Protocol (RSTP) support, Reset button, Spanning Tree Protocol (STP) support, Strict Priority Queuing (SPQ), Tagged VLAN, VLAN support, Weighted Round Robin (WRR) queuing

2.5 Uninterruptable Power Supply (UPS)

• Form Factor	Rack-mountable
• Load Capacity	3000 VA / 2700W
• Transfer Time	4ms
• Input	165-300VAC 50/60Hz 1phase
• Output	220 , 230 , 240 VAC
• Backup / Run Time	3 mins
• Typical Battery recharge time	5 Hours

3.0 TECHNICAL REQUIREMENTS - CONTROLLERS, NETWORK SWITCHES, AND GATEWAYS HARDWARE

3.1 Field Network Switches

• Type	Industrial Metal switch with protection class IP-30, DIN Rail mounted
• Port	8 x Gigabit ports + 2 x Gigabit RJ-45 / SFP shared ports
• Performance	20 Gbit/s switching capacity
• Manageable	Yes
• Operating Temperature	-40° to 75°C (-40° to 167°F)
• Input Power	24 – 57 VDC Dual redundant power supplies input with overload protection and Power failure alarm
• Supports	LACP, STP/RSTP, VLAN and IGMP snooping

3.2 Fieldbus Gateway (Modbus Concentrator)

• Type	Ethernet TCP/IP to wireless devices Ethernet/serial, DIN Rail mounted
• Communication Network	Ethernet, 10/100BASE-T Wi-Fi2.4 GHz Wireless, IEEE 802.15.4 Modbus RTU, Modbus RTU master even/odd or none parity, at 1.2...115.2 kbit/s
• Communication port protocol	Modbus TCP DHCP HTTPS NTP/SNTP IPv4 IPv6 TCP/IP
• Communication port support	2 RJ45: ETHERNET Screw terminal block: RS485
• Number of Slave	128 Modbus RTU: 100 IEEE 802.15.4:
• Mounting	DIN Rail
• Web Services	HTTPS server
• Communication Services	Device Profile for Web Services (DPWS) Modbus TCP client Modbus TCP server SNTP client DHCP client DHCP server
• Function	Embedded web page for configuration and upgrade Diagnosis capabilities, reports, and communication Energy management With integrated web server

	Event Logger Energy and alarm reports via email Firmware update Backup/restore configuration Configurable event CSV export
• Protection Rating	IP40 (front face) IP20 (casing)
• Temperature	-40 … 85 deg C

3.3 Main Programmable Logic Controller CPU

• Type	Redundant and Hot-standby processor module
• Redundancy System	Hot Standby system detects a switchover causal event within 15ms
• Integrated Connection Type	1 Ethernet TCP/IP for service port 2 Ethernet TCP/IP for device network USB type mini B 1 Ethernet for HSBY port
• Number of remote I/O station	16 – 2 rack(s) per X80 and Quantum drops
• Number of distributed equipment	64
• Communication module processor capacity	8 AS-Interface module 4 Ethernet communication module;
• Application Specific I/O	Interface to other popular fieldbus and device networks including AS-Interface Serial (Modbus, Character) PROFIBUS CANopen HART Advanced integration of electrical power system and RTU capabilities with IEC61850, IEC101/104, and DNP3
• Communication service	RIO scanner DIO scanner
• Memory description	Expandable flash, 4 GB for data storage Integrated RAM, 10 kB for system memory Integrated RAM, 16 MB for program Integrated RAM, 2048 kB for data
• Number of instruction per ms	30 Kinst/ms 65 % Boolean + 35 % fixed arithmetic, 40 Kinst/ms 100 % Boolean
• Security	Cybersecurity ready with Achilles Level 2 certification and advanced built-in cybersecurity features Embedded security features as defined by standard IEC 62443
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.4 PLC Power Supply Module

• Type	Power Supply module
• Input	100…240VAC, 50/60 Hz
• Output	10.8 W 24 V DC sensor power supply 16.8 W 24 V DC I/O module power supply and processor 8.3 W 3.3 V DC I/O module logic power supply
• Voltage Limit	85...264 V
• Frequency limits	47…63 Hz
• Protection Type	Internal fuse not accessible for primary circuit Overload protection for secondary circuit Overvoltage protection for secondary circuit Short-circuit protection for secondary circuit
• Maximum Power Dissipation	8.5 watts
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.5 Fiber Optic Converter Module

• Type	Fiber Optic repeater
• Optic Fiber Type	Multi-mode
• Port	2 RJ45 with 100BASE-TX port Ethernet conforming to IEEE 802.3u 2 fiber optic with 100BASE-FX port Ethernet conforming to IEEE 802.3u
• Rated Voltage	24 V
• Wavelength	1310 nm
• Operating Distance	0 …2000 m
• Attenuation	-23.5…-14 dB (50/125 µm) -20…-14 dB (62.5/125 µm)
• Rise /Fall Time	3 ns
• Receiver sensitivity	- 31...- 14 dBm
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.6 Ethernet Control Router Module

• Type	Ethernet Communication Module
• Integrated connection type	3 Ethernet, connector type: RJ45, transmission rate: 10/100/1000 Mbps, transmission mode: double shielded twisted pair
• Port Ethernet	10BASE-T/100BASE-TX/1 Gb
• Communication Service	Bandwidth management FDR server Modbus TCP I/O Scanner and Messaging Ethernet/IP I/O Scanner and Messaging Embedded 4-port switch RSTP support IP forwarding
• Web server	Advanced
• Web services	Factory Cast configurable

• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.7 Serial Link Module

• Component Type	Serial Links module
• Integrated connection type	RS232 RJ45 115.2 kbit/s 8 wires RS485 RJ45 57.6 kbit/s 1 twisted pair
• Supports	Support 2 communication protocols: - Modbus Serial (Master or Slave) - Character Mode Minimum 2 channels, 32 number of devices can link per channel
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.8 Remote IO Controller

• Component Type	Remote I/O expansion module
• Number of Port	3
• Integrated Connection Type	1 port for service or distributed equipment 2 port for Ethernet RIO Network (RSTP)
• Communication network type	IPv4 (internet protocol)
• Communication port protocol	EtherNet/IP
• Communication Service	Ethernet/IP adapter RSTP (Ring topology support) Ethernet RIO network Quality of Service (QoS) CIP Explicit messaging (server) Modbus TCP server for module diagnostics DHCP client TFTP client FTP client FDR client SNTP client SNMP agent
• Cybersecurity	Enable/disable communication ports Syslog protocol support
• Connector Type	3 RJ45
• Transmission rate	10/100 Mbit/s
• Port Ethernet	10/100BASE-TX
• Function available	CCOTF (configuration change on the fly) Input data is collected and published to the remote I/O head adaptor Output modules are updated with the data received from remote I/O head adaptor Diagnostics for remote I/O devices (Device DDT) Port mirroring

	System time stamping Non-interfering type 1 I/O extension rack
• Data recording	10 ms time stamps
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.9 Distributed Controller

• Rated Supply Voltage	24 V DC
• Maximum number of I/O expansion module	7 (local I/O-Architecture) 14 (remote I/O-Architecture)
• Inrush current	50 A
• Power consumption W	32.6…40.4 W (with max number of I/O expansion module
• Memory capacity	8 MB for program 64 MB for system memory RAM
• Data backed up	128 MB built-in flash memory for backup of user programs
• Data storage equipment	<= 16 GB SD card (optional)
• Battery type	<= 16 GB SD card (optional)
• Execution time for 1 KInstruction	0.3 ms for event and periodic task 0.7 ms for other instruction
• Integrated connection type	USB port with mini–B USB 2.0 connector Non isolated serial link serial with RJ45 connector and RS232/RS485 interface Dual-port Ethernet 1 with RJ45 connector Ethernet port Ethernet 2 with RJ45 connector
• Transmission rate	1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m for RS485 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m for RS232 480 Mbit/s for bus length of 3 m for USB
• Port Ethernet	Ethernet 1 marking 10BASE-T/100BASE-TX - 2 copper cable Ethernet 2 marking 10BASE-T/100BASE-TX - 1 copper cable
• Web services	Web server
• Communication service	Downloading IEC VAR ACCESS Modbus TCP client Modbus TCP server Modbus TCP slave device Monitoring NGVL Programming Updating firmware

	SMS notifications DHCP client (Eth1) DHCP server (Eth2) Ethernet/IP originator (Eth2) Ethernet/IP target (Eth1, Eth2) Ethernet/IP scanner (Eth2) Modbus TCP I/O Scanner and Messaging (Eth2) FDR FTP client/server SNMP client/server SQL client Send and receive email from the controller based on TCP/UDP library Web server (WebVisu & XWeb system) OPC UA server DNS client
• Maximum number of connections	8 Modbus server 8 Modbus client 16 Ethernet/IP target 4 FTP server 10 web server
• Number of slaves	16 EtherNet/IP: 64 Modbus TCP:
• Cycle time	10 ms 16 EtherNet/IP 64 ms 64 Modbus TCP
• Ambient air temperature for operation	-10…35 °C (vertical installation) -10…55 °C (horizontal installation)
• Relative humidity	10…95 %, without condensation (in operation)
• IP degree of protection	IP20 with protective cover in place

3.10 Digital Input Module

• Component Type	Discrete Input Module
• Input number	At least 32 points
• Input type	Isolated, Current sink (logic positive)
• Input Voltage	24 V DC, discrete input logic: positive
• Input current	2.5 mA
• Input Compatibility	With 2-wire/3-wire proximity sensors conforming to IEC 60947-5-2 With 2-wire/3-wire proximity sensors conforming to IEC 61131-2 Type 1
• Sensor power supply	19…30 V
• DC typical response time	4ms
• DC maximum response time	7ms
• Protection type	1 external fuse per group of channel0.5 A fast blow reverse polarity protection
• Voltage detection threshold	< 14 V DC sensor fault > 18 V DC sensor OK

• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.11 Digital Output Module

• Component Type	Discrete Input Module
• Output number	32 points
• Output Type	Solid state (logic positive)
• Output voltage	24 V DC, 19…30 V DC
• Output current	0.1 A
• Current per channel	0.125 A
• Maximum current per module	3.2 A
• Power dissipation	3.6 Watts
• Response time on output	1.2 ms
• Protection type	External fuse reverse polarity protection short-circuit protection overload protection overvoltage protection
• Output overload protection	With current limiter With electronic circuit breaker 0.125 A < Id < 0.185 A
• Output overvoltage protection	With transil diode
• Output short-circuit protection	With 2 A external fuse
• Reverse polarity protection	Reverse mounted diode
• Voltage detection threshold	< 14 V DC preactuator fault > 18 V DC preactuator at state 0
• Maximum overload time	15 ms
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.12 Relay Output Module

• Component Type	Discrete Output Module
• Output number	16 points conforming to EN/IEC 61131-2
• Output Type	Relay
• Output voltage	24...48 V 19...60 V DC 24...240 V 19…264 V AC
• (Ith) conventional free air thermal current	2 A
• Power dissipation	3 Watts
• Typical current consumption	79 mA at 3.3 V DC
• Response time on output	< 8 ms activation < 10 ms deactivation

• Output overload protection	Use 1 fast blow fuse per channel or group of channel
• Output overvoltage protection	Use discharge diode on each output DC Use RC circuit on each output AC Use ZNO surge limiter on each output AC
• Output short-circuit protection	Use 1 fast blow fuse per channel or group of channel
• Maximum switching current	1 mA 5 V DC
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.13 Analog Input Module

• Component Type	Analog Input Module
• Input number	8 Channels, High level, Isolated between channels
• Input Type	Current +/- 20 mA Current 0...20 mA Current 4...20 mA Voltage +/- 10 V Voltage +/- 5 V Voltage 0...10 V Voltage 0...5 V Voltage 1...5 V
• Fast read cycle time	1 ms + 1 ms x number of channels used
• Nominal read cycle time	9 ms for 8 channels
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.14 Mixed Analog Input / Output Module

• Component Type	Mixed Analog I/O Module
• Input number	4 Channels analog input, High level, Non Isolated between channels
• Input Type	Current 0...20 mA Current 4...20 mA Voltage +/- 10 V Voltage 0...10 V Voltage 0...5 V Voltage 1...5 V
• Fast read cycle time	1 ms + 1 ms x number of channels used
• Nominal read cycle time	5 ms for 4 channels
• Output number	2 Channels analog output, High level
• Output Type	Current: 0...20 mA Current: 4...20 mA Voltage: +/- 10 V
• Conversion Time	<= 2 ms
• Operating Temperature	0 …60 deg. C

• Protection Rating	IP20

3.15 Temperature Analog Input Module

• Component Type	Analog Input Module
• Input number	4 Channels analog input, Low level, Isolated between channels
• Input Type	Four (4) Isolated inputs, RTD, thermocouple and voltage inputs Six (6) nature of voltage input type: +/- 40 mV +/- 80 mV +/- 160 mV +/- 320 mV +/- 640 mV +/- 1.28 V Ten (10) nature of thermocouple input type: B, E, J, K, L, N, R, S, T, U 2-, 3-, 4-wire RTD: Type Pt100, JPt 100, Pt1000, JPt1000, Ni100, Ni1000
• Cold junction compensation	External by PT100 probe
• Nominal read cycle time	400 ms with temperature probe 200 ms with thermocouple
• Operating Temperature	0 …60 deg. C
• Protection Rating	IP20

3.16 Human Machine Interface (HMI)

• Component Type	Advance touchscreen panel
• Display colour	65536 colours
• Display Size	10.4 inch
• Display Type	Backlit colour TFT LCD
• Display resolution	640 x 480 pixels VGA
• Touch sensitive zone	1024 x 1024
• Battery	Lithium battery for internal RAM, autonomy: 100 days, charging time = 5 day(s), battery life = 10 year(s)
• Memory	96 MB Flash EPROM, 512 kB internal RAM (SRAM)
• External Data Storage capability	Yes
• Integrated connection type	COM1 serial link SUB-D 9, interface: RS232C, transmission rate: 2400...115200 bps COM2 serial link RJ45, interface: RS485, transmission rate: 2400...115200 bps COM2 serial link RJ45, interface: RS485, transmission rate: 187.5 kbps compatible with Siemens MPI Ethernet RJ45, interface: 10BASE-T/100BASE-TX Ethernet RJ45, interface: IEEE 802.3 USB 2.0 type A USB 2.0 type mini B
• Supply	External Source 24 VDC rated voltage
• Supply voltage limits	19.2 … 28.8 V

• Inrush current	30 A
• Maximum power consumption	12 W when power is not supplied to external devices 7 W when backlight is OFF 8 W when backlight is dimmed 17 W
• Operating Temperature	0 …55 deg. C

4.0 TECHNICAL REQUIREMENTS – FILED INSTRUMENTATION

4.1 Flow Switch

Type	Vane Operated Flow Switch
Material	316 SST
Size	2 inch
Service	Liquids compatible with wetted materials that are non-coating and non-crystallizing.
Wetted materials	Vane 301 SS
Process Connection	316 SS
Temperature Limits	-40 to 250°F (-40 to 121°C)
Pressure Limits	250 psi (17.2 bar)
Enclosure Rating	Weatherproof, meets NEMA 4X (IP66)
Switch Type	SPDT Snap Switch
Electrical Rating	10 A @ 125, 250, 480 VAC; 1/8 hp @ 125 VAC, 1/4 hp @ 250 VAC

4.2 Turbidity Analyzer

Type	**Analytical Turbidity Water Transmitter with Indicator**
Enclosure	Polycarbonate
Output	4 to 20 mA DC
Power Supply	90 ...265 VAC, 50/60 Hz
Communication Module	Ethernet
Component	**Turbidity Probe**
Sensor Type	Stainless Steel
Sensor Range	0 - 4000 NTU (Nephelometric Turbidity Units) or 100,000 mg/l
Mounting Option	Dip pole assembly
Sensor Cable Length	10 meters
Documents	Complete with Dry Standard verification / calibration kit

4.3 Residual Chlorine Analyzer

Type	Total and free residual chlorine measurement, Reagentless operation
Sensor Type Channel	Chlorine Cell
Voltage	230 VAC, 50/60 Hz

Measurement Range	0 ...20 ppm
Measurement Technology	Amperometric cell
Output	4 to 20 mADC
Sensor Cable Length	10 meters
Documents	Complete with Dry Standard verification / calibration kit
Features	Multiple sensor input capability Self-cleaning sensor assembly Fast response time Pressure-regulated sample flow

4.4 Gas Chlorine Weighing Scale

Type	Floor weighing scale
Material	Smooth, 304 Stainless Steel
Capacity	3,000 Kg
Readability	0.200 Kg
Features	Rugged Stainless-Steel Design • Removable, Smooth, 304 Stainless Steel top deck for easy access and cleaning, • Rigid 304 stainless steel channel frame • 4 OIML R60 C3 approved Stainless Steel, welded seal IP68, shear beam load cells • Hermetic Junction Box and wiring cables according to IP67 • 4 adjustable stainless steel support feet
Platform Size	1500 x 1500 mm
Display	Remote Digital Weight Indicator
Material	Stainless Steel Indicator
Indicator Protection Rating	IP68 Rated
Communication	Modbus TCP

4.5 Pressure Transmitter

Type	Pressure Transducer, Blind
Measuring Range	0 to 10 Bars
Process Connection	½ inch NPT, ASME B1.20.1
Material	316L SST
Output	4 to 20 mA DC
Supply	2-Wire Loop Powered
Electrical Connection	4-Pole Plug Connection With Hinged Cover ISO4400
Protection Rating	IP65
Communication interface	Via Bluetooth

4.6 Reservoir Level Transmitter (Radar)

Type	Non-contact Radar Continuous Level Measurement
Antenna Version	Integrated Plastic Horn Antenna
Operating Frequency	80 GHZ (W-Band)
Approval	None Ex-proof
Measuring Range	Up to 15 meters
Accuracy	+/- 2mm
Beam Angle	8 Degree
Process Connection	Threaded 1-1/2 inch NPT
Thread Material	PVDF
Operating Temperature	-40 to 80 Deg. C
Output	4 to 20mA DC Plus HART
Supply	2-Wire Loop Powered
Communication interface	Via Bluetooth

4.7 Well Submersible Level Transmitter

Type	Hydrostatic Level Transmitter
Cable Material	Suspension Cable PE
Cable Length	26 meters
Measuring Range	0 to 10 Bars
Output	4 to 20 mA DC
Supply	2-Wire Loop Powered
Accessories	Integrated Remote Display

4.8 Level Switch

Type	Conductive Multiple Cable Electrode
Version	Party Insulated Cable
Number of Cable Electrode	5 Wire Electrode
Electrode Length	• L1 : Longest 10,000 mm • L2 : Shortest 1,500 mm • L3 : 8,000 mm • L4 : 6,000 mm • L5 : 4,000 mm
Process Fitting	G1-1/2 inch
Level Controller device	For 5 Points Electrodes
Level Controller Protection Rating	IP20
Input	2x input for conductive rod probe
Output	2x operating relay (SPDT)
Ambient Temperature	-20 …60 deg C

Display	DIP switch adjustment , LED indication

4.9 Motor Winding Temperature Sensor

Type	Single RTD Flat laminated “stick” (strip)
Element	PT100
Application	Fit in slots between stator windings to monitor temperature rise and prevent overheating

4.10 Pump Vibration Transmitter

Type	Velocity
Sensing Element	PZT Ceramic
Material	316L Stainless steel
Mounting	¼ - 28
Connector (Non-Integral)	2Pin MIL-C-2015
Measuring Range	0-25.4mm/sec
Input	15- 30 VDC
Output	4….20 mA DC (+/- 10% tolerance)
Operating Temperature	-40 to 100 deg C
Sealing	Welded, Hermetic

4.11 Chlorine Gas Detector System

Type	Detector and Alarm
Sensing Range	0 to 10 PPM Chlorine
No. of sensing point	Single
Enclosure Rating	NEMA 4X
Contact Output	Alarm (configurable): 3 SPDT Trouble: 1 SPDT Power Failure: 1 SPDT

5.0 TECHNICAL REQUIREMENTS - ACTUATING DEVICES

5.1 On/Off Valve (Primming valve)

Actuation Type	Motorized, On/Off
Valve Size	50 mm (2 inch), Butterfly
Body Material	A216-WCB
Disc Material	316 SST
Seat	PTFE
End Connection	Wafer, Rating ANSI 150 Lbs.
Supply Voltage	220 VAC, 60 Hz, 1 phase
Status Feedback Output	Close or Open

5.2 Motor Operated Valve (MOV)

Actuation Type	Motorized, Modulating
Valve Size	14 inches, Butterfly
Body Material	A216-WCB
Disc Material	316 SST
Seat	PTFE
End Connection	Wafer, Rating ANSI 150 Lbs.
Supply Voltage	440 VAC, 60 Hz, 3-Phase
Status Feedback Output	4 to 20 mA DC

5.3 Gas Chlorination Feed System

Type	Gas Feed System
Regulator	Includes vacuum regulator mounted at the gas supply for 2 Tonner tanks
Gas control unit	Complete with: Rotameter for indication of feed rate Manual and remote-control mode Automatic Positioner – flow control Inputs: 4-20 mA DC Output: 4-20mA DC (Gas feed rate signal) Vacuum Gauge Vacuum switch provides an alarm in the event of a high or low vacuum condition signifying a loss of gasfeed.
Injectors	3/4” for capacities up to 200 PPD (90 kgs/day)

6.0 TECHNICAL REQUIREMENTS - MCC/MDP, VFD, AND ACTIVE HARMONICS FILTER

6.1 MCC/MDP

Type	Modular Free Standing Enclosure
Busbar current rating and bracing capacity	(To be determined during Power Analysis, submit short circuit calculation)
Breaker rating	To be determined during Power Analysis
Enclosure:	Sectionalized and modular Floor-mounted Indoor type GI sheet Guage 16, Powder coated Complete with: Main Circuit Breaker Manual Transfer Switch for Genset MCCB for VFDs MCCB for other connected loads Digital Power Metering Surge Protection Device Grounding system

6.2 Active Harmonics Filter

Type	Active Harmonics Filter
Size	(To be determined during Power Quality Analysis simulation)
Enclosure:	Floor-mounted indoor type complete with: Main disconnect Front door-mounted LCD Display Fully programmable Modbus Communication

6.3 Variable Frequency Drive

Type	General Purpose Drive
Ratings Kw/Voltage/Ph.	200Hp, 380 to 480 Vac ±10%, 3 Phase, 45 to 66 Hz
Feature:	• 5 Years Manufacturer's Warranty as Standard • Extended warranty with or without premiums is not accepted. • Available local technical support • High overload capability: 180% for 3 seconds or 150% for 60 seconds • PCBs conformal coated for resilience to harsh environments • Ingress protection: IP20/NEMA 1 - UL Type 1 • With Ethernet communication port • Built-in Digital and Analog IOs. • Equipped with energy saving features • Automatic 3-speed cooling fan - keeps energy usage & acoustics noise to a minimum • High efficiency up to 98% • Onboard PLC with built-in independent PID control