TKIL Industries Pvt. Ltd.

(formerly known as thyssenkrupp Industries India Pvt. Ltd.) Pimpri, Pune - 411 018, India

FOR 9.9 MW WASTE HEAT RECOVERY POWER PLANT

END USER

M/s TORORO CEMENT LTD, MOROTO,

THE REPUBLIC OF UGANDA

Consultant

HOLTECH CONSULTING PVT. LTD.

TECHNICAL SPECIFICATIONS

FOR VIBRATION MONITORING SYSTEM

0	29.05.2025	Issued for procurement
Rev.	**Date**	**Description**

Project No.	26M.0018	Name / Sign	Date	WBEe No : 26M.0018-7404-TS-2049
Prepared By		DKM	29.05.2025	WBSe Description: Technical specifications for VMS
Checked By		KDB		
Approved By		SNS		
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f. DC control supply for DCS interrogation voltage - 24 VDC
g. SOV Coil voltage - 24 VDC
h. Instrument Air Supply - 5Kg/Cm2

SECTION – I - PROJECT INFORMATION

M/s Tororo Cement Ltd, Moroto, the Republic Of Uganda is intends to install the Waste Heat Recovery Power Plant for their upcoming cement plant line.

The power generated from the WHRS plant shall be utilized for the cement plant operation. The Intention of the purchaser to establish a Waste Heat Recovery based power plant is to generate the green power to generate in house power thereby reducing power cost and production cost.

M/s Holtec Consulting Private Limited (Holtec) will provide the engineering consulting and project Management services for the WHRS Power Plant

SITE LOCATION – Katikekile, Moroto

A	GENERAL	
	PURCHASER	TKIL Industries Pvt. Ltd. (formerly known as thyssenkrupp Industries India Pvt. Ltd.)
	END USER	M/s Tororo Cement Limited, Uganda
	SUPPLIER	ACC Vendor
	Plant location	Katikekile, Moroto (Longitude: 34°50'24.77"E, Latitude: 2°23'9.18"N)
B	CLIMATOLOGICAL DATA	
	Altitude	1479-1448 M above MSL
	Ambient temp. (°C)	Max. 36 Min. 10 (Consider 32 ^{0}C & 65% RH as ACC design temp.)
	Wet Bulb Temp (°C)	28 °C
	Electrical Design Temperature	50 ^{0}C
C	RAIN FALL	
	Average	1200 mm
	Period of monsoon showers	April to July
D	RELATIVE HUMIDITY	
	Maximum	73.5 %
	Minimum	38.53 %
E	WIND DATA	
	Max wind pressure	(as per IS 875 part - 3) 47m/s at height of 10 meter (gust 3.0s)
F	SEISMIC DATA	

	Zone	Zone-III as per Uganda Standard US 319:2003
G	Environmental condition	
	Area of classification	Safe and non - hazardous
H	Electrical System Design parameters	
	Electrical Design Ambient Temperature	50 °C
	AC Supply	415 V ± 10% (for LV loads)
		220V ± 10% (for Control)
	Frequency for AC system	50 HZ ± 5%
	Fault level – 3Phase short circuit	50 KA for 1 sec for 415 V AC System
	Grounding System	
	415 V AC System	Solidly grounded
	AC Motors	415V AC, 3 phase
	UPS Power Supply	220 VAC, 50 Hz, 1 Phase
	Non-UPS Power Supply	230 VAC, 50 Hz, 1 Phase

In case offered equipment needs further any other supply, it shall be arranged by the SUPPLIER by providing suitable transformer, converter and/or inverter.

INSTRUMENTATION AND CONTROL

1.0 BASIC REQUIREMENTS

The specifications included in this covers the Control & Instrumentation Systems for the Waste Heat Recovery System.

1.1 STANDARDS

In general, the equipment/ components shall be designed, assembled and tested in accordance with the latest editions of the standards of the International Standards Institutions; Institution of Electrical & Electronics Engineers, USA (IEEE); National Electrical and Manufacturers Association, USA, (NEMA); International Electro-technical Commission (IEC) or National Standards Institution of the country where they are manufactured.

Some of the standards that are applicable are as below-

- IEEE 519 -Recommended Practice and requirements for harmonic control in Electrical Power Systems
- IEC 61158 - Digital data communication for measurement and control – field bus for use in industrial control systems
- IEC 61784 - Profile sets for continuous and discrete manufacturing relative to field bus use in industrial control systems
- EN 50170
- IEEE 802.3 – Ethernet
- IEC – 61131
- IEC – 60255, EN 55022, EN 50082 (EMC, noise immunity)
- IEC 68/2 Testing for the Electronics Components and Equipments
- IEC 529 Degree of Protection by enclosure
- IEC 801-3 Radiated EMF requirements
- ISO standards ISO 9001-9002 QS
- IEEE 802.3 information processing , LAN

In cases, where the SUPPLIER deviates from the generally accepted codes and standards. The SUPPLIER shall indicate clearly in his documents for the standards adopted by him along with details thereof and reasons for deviation.

1.0 GENERAL SCOPE & SPECIFICATIONS FOR INSTRUMENTATION

1. This specification covers the design and supply of instruments required for incorporating the control system, complete with all the accessories and materials along with special test equipment that are required for the satisfactory and safe operation

2. The SUPPLIER shall be fully responsible for design, materials selection, sizing and choosing the proper instruments.

3. All equipment supplied shall be of field proven quality both with respect to design and materials.

4. Boiler Equipment / Instruments shall be considered as Safe & non-hazardous area.

5. Test Certificates for instruments shall be furnished as per manufacturers' standard format.

1.1 Design Philosophy

1. Instrumentation shall be complete in every respect and liberal to the extent of providing data on all operational variables, sufficient for the safe, efficient, easy operation, start up and shut down of the plant.

2. The equipment should be designed so as to ensure safety of operating and maintenance personnel. The ease of maintenance, testing and repair should be given due consideration while designing the equipment.

1.1 Salient Design features

The major design aspects of the system will be as follows:

1. The design and installation of instruments shall be generally in accordance with ISA recommended practices and other applicable standards like BIS etc. Material specifications and practices shall, in general, conform to appropriate ASTM or equivalent standards. All standards and code of practices shall be of the latest edition.

2. All instruments and equipment's shall be suitable for use in a hot, humid and tropical industrial climate. As a minimum, all instruments and enclosures in field shall be dust proof, weatherproof to NEMA 4 and secured against the ingress of fumes, dampness, insects and vermin. All external surfaces shall be suitably treated to provide anti-corrosion protection.

3. The instruments like control valves, thermowell, orifice flanges, level instruments etc. coming on pipes and vessels under IBR shall be certified by IBR.

4. Location of tap-off connections shall be either from the side or from the top of the boiler equipment but not from the bottom. This requirement is applicable to both pipes and vessels. The location of lower side connection shall be high enough to prevent plugging due to dirt or other suspended solids. In addition, the connections shall be short, vertical or horizontal and without any pockets.

5. Materials of construction of instruments shall be consistent with temperature, pressure, and corrosion conditions.

6. Ranges for instruments shall be selected, in general, such that in normal process operation the indication on the indicator is between 40% to 60% of span for linear and 60% to 80% of span for square root.

7. Orifice plate calculations shall in general, follow BS 1042. Orifice diameters shall be selected so that d/D radio is between 0.3 to 0.7. SUPPLIER shall submit the sizing calculations for orifice plates, for CONSULTANT's approval.

8. Equipment / devices requiring maintenance shall be suitable to ensure easy accessibility.

1.1 Applicable Standards

Design and terminology shall comply International Codes & standards, as a minimum, with the latest editions.
Some of them are as below.

ANSI:	American National Standards Institute.
B 2.1	Pipe Threads
B 16.5	Steel pipe flanges and flanged fittings
B 16.104	Control valve leakage classification
MC 96.1	Temperature measurements, thermocouple.
BS 1042	Measurement of fluid flow in pipes
DIN 43760	Temperature Vs Resistance curves for RTDs.
IEC	International Electrical Commission
ISA	International Society of Automation
	- Standards and Practices of Instrumentation.
BIS	- For Overall Project

CONTRACTUAL REQUIREMENTS

1. Vibration Transmitter for FANS AND PUMPS

The SUPPLIER shall provide the Vibration sensors with transmitters for Fans like ACC / Cooling Tower Fans and pumps like Boiler Feed Pumps (BFPs).

a) The system shall be provided with Horizontal (X) and Vertical (Y) vibration transducers. The vibration transducers shall be complete with interconnecting cables and accessories. Selection of vibration probes shall be Supplier's responsibility and for each drives both drive end and non-drive end bearings shall be provided.

We have considered loop powered sensor and Qty considered as per IO list given by M/S TKIL.

TECHNICAL REQUIREMENTS

1	General	Make	As Per Approved Vendor List — Forbes Marshall Pvt Ltd.
2		Model	Vendor to specify — FMLPS-420 Series
3		Tag Number	Refer attached annexure-A — Noted.
4		Application	Refer attached annexure-A — Noted.
5	Vibration Transmitter	Type	Accelerometer — Loop Powered sensor offered.
6		Sensing Element	PTZ ceramic — Noted.
7		Range	0 – 20 mm/Sec — 0-20 mm/sec RMS considered.
8		Frequency Response	10Hz to 1kHz — ±10% _____ 10 Hz - 1.0 kHz ±3 dB ____ 3.5 Hz - 2.0 kHz
9		MOC	SS 316 — 316L stainless steel
10		Sealing Type	Welded, Hermetic — Sealing : hermetic
11		Response time	Less than 60 sec. — Turn on time, 4-20 mA loop - 30 seconds
12		Output	4–20mA, 24VDC (2 wire type) — 4-20 mA DC proportional to RMS velocity (mm/s)
13		Operating Temperature	Up to 85 Deg. C — -40 to 105°C
14		Humidity	95% Relative Humidity non cond. — Hermetic Sealing.
15		Electrical case isolation	100 Mega ohms — Case isolated, internally shielded
16		Electrical connection	2 Pin MIL-C-5015 top — 2-pin MIL-C-5015
17		Frequency Range	10 to 1 KHZ — Frequency Response: ±10% _____ 10 Hz - 1.0 kHz ±3 dB ____ 3.5 Hz - 2.0 kHz
18		Mounting Angle	At any angle on bearing housing circumference — Top Mounted.
19		Mounting Hardware	Mounting pad and stud to be provided of SS 316 MOC — Noted.
20		Stud details	M8 X 1.25 thread x 15mm Deep – For mounting sensor — Noted.
21		Cable	10 mtrs. long teflon coated SS armoured cable from sensor to junction box for each sensor

FM std 10 meter extension cable with Flexible SS conduit considered.

Notes For vendor:

a) Seaworthy Packing Shall be Considered.
b) Qty shall be as per Annexure -A attached with Tag No.

Noted.

INSPECTION & TESTING

Following Test Shall be Witnessed 100% by TKIL /their client/third party appointed by tkIl/their client

1	Calibration Test	TCs shall be submitted.
2	Visual &Dimension Check	

DESIGN LIFE

*The criterion of design life does not apply to items which are considered as consumable

UNITS OF MEASUREMENT

SI units in accordance with ISO 31 & ISO 100 shall be used

SAFETY

Safety features shall be incorporated which enable operations to be performed with minimum risk to operations staff, and the design of which are based on established good engineering practices.

LIST OF VENDOR DRAWINGS & DOCUMENTS - BEFORE ORDER		
SR#	DRAWING / DOCUMENTS	REMARKS
1	List of Commissioning Spares	Vendor to Specify
2	List of 2 Years operational Spares	Vendor to Specify
3	List of Special Tools required	Vendor to Specify
4	Signed Technical Specification & attachments	Vendor to provide as compliance
5	Engineering & Manufacturing Schedule	Vendor to provide
6	Type Test Reports	Vendor to provide
7	Deviation list	Vendor to provide
8	Filled TKIL format Datasheets	

LIST OF VENDOR DRAWINGS & DOCUMENTS - AFTER ORDER		
SR#	DRAWING / DOCUMENTS	REMARKS
1	Operation & Maintenance Manual	Vendor shall provide
2	General Arrangement drawings	Vendor shall provide
3	Datasheets	Vendor shall provide
4	QAP	Vendor shall provide
5	Test Certificates, Calibration report.	Vendor shall provide
6	Factory Internal Test Report	Vendor shall provide

SPECIAL NOTES	
DOCUMENT NO.	26.0018-7404-TS-2049
REVISION NO.	0
DATE	29.05.25

ORDER OF PRECEDENCE

In case of conflict, the following order or precedence shall be applied, final closure shall be subject to acceptance by the Purchaser

SR#	DOCUMENT NO.	TITLE
1	26M.0018-7404-TS-2049	Technical Specification of Control valves

DEVIATIONS & DESCRIPANCIES

In case the bidder needs to take any deviation regarding any requirement enlisted in this technical specification, then a list of deviation shall be provided by the bidder before placement of order. The deviation shall be supported with due justification.
Any deviation raised before order shall be subjected to acceptance by Purchaser
Deviations raised after the placement of order shall NOT be accepted, and thereby complete compliance to technical specifications shall be met by the manufacturer without any delivery and or commercial implications to purchaser
In case there is a discrepancy between any of the attachments of this technical specification vendor shall clearly highlight the same and get the resolution from Purchaser before proceeding for commercial discussions.

QUALITY OF DRAWINGS AND DOCUMENTS SUBMITTED TO PURCHASER

All drawings and documents shall be submitted as hard copies and or electronic copies as required by the Purchaser
All drawings and document shall be submitted in editable formats as required by the Purchaser
Use of non-licensed versions of software for making drawings or documents is not accepted
All drawings and documents shall be submitted as "As Built" after manufacturing
Piecemeal / Incomplete Submissions shall not be considered for review, delay in such a case shall be to the manufacturer's account
Vendor shall be responsible to incorporate all the corrections / comments given by purchaser on the drawings submitted for approval
BOM, Technical or commercial offer [if any] submitted during quotation shall not be binding on the purchaser, this technical specification shall be compiled without any commercial or delivery implications, after placement of order

Annexure- A Vibration Monitoring System

M/S TORORO CEMENT LIMITED,UGANDA	ANNEXURE-A	PROJECT CODE-26M.0018	REV-0	DATE-29.05.25

SR. NO.	TAG NO.	P&ID TITLE	SERVICE	INSTRUMENT TYPE	RANGE.LOW	RANGE.HIGH	ENGG. UNIT
1	BC-BFW-1-VT-001A	DEAREATOR & BFP	BFP MOTOR 1-FAN NDE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
2	BC-BFW-1-VT-001B	DEAREATOR & BFP	BFP MOTOR 1-FAN NDE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
3	BC-BFW-1-VT-001C	DEAREATOR & BFP	BFP MOTOR 1-FAN DE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
4	BC-BFW-1-VT-001D	DEAREATOR & BFP	BFP MOTOR 1-FAN DE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
5	BC-BFW-1-VT-001E	DEAREATOR & BFP	BFP PUMP 1-MOTOR DE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
6	BC-BFW-1-VT-001F	DEAREATOR & BFP	BFP PUMP 1-MOTOR DE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
7	BC-BFW-1-VT-001G	DEAREATOR & BFP	BFP PUMP 1-MOTOR NDE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
8	BC-BFW-1-VT-001H	DEAREATOR & BFP	BFP PUMP 1-MOTOR NDE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
9	BC-BFW-1-VT-002A	DEAREATOR & BFP	BFP MOTOR 2-MOTOR NDE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
10	BC-BFW-1-VT-002B	DEAREATOR & BFP	BFP MOTOR 2-MOTOR NDE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
11	BC-BFW-1-VT-002C	DEAREATOR & BFP	BFP MOTOR 2-MOTOR DE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
12	BC-BFW-1-VT-002D	DEAREATOR & BFP	BFP MOTOR 2-MOTOR DE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
13	BC-BFW-1-VT-002E	DEAREATOR & BFP	BFP PUMP 2-MOTOR DE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
14	BC-BFW-1-VT-002F	DEAREATOR & BFP	BFP PUMP 2-MOTOR DE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
15	BC-BFW-1-VT-002G	DEAREATOR & BFP	BFP PUMP 2-MOTOR NDE X VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
16	BC-BFW-1-VT-002H	DEAREATOR & BFP	BFP PUMP 2-MOTOR NDE Y VIBRATION	VIBRATION TRANSMITTER	0	20	mm/sec
					TOTAL QTY:		16