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Inquiry Document for CO & H2 Gas Analyzer

Direct Reduction Plant I & II



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1. Scope

This Inquiry covers the minimum requirements and provides guidance for the selection and specification of on-line gas analyzers to be used in the DRI I & II plants of Sirjan Jahan steel company.

Vendor shall design, supply, assemble, commission and start up two packages of CO & H2 Gas analyzer and preconditioning unit with inter-connection pipe.

Any deviation from the present specification at any stage of the project shall be subject to consultant approval.


2. Documentation Requirement and Inspection

Documents to be provided in BID documents:

- All manufacturer standard general catalogues and detailed catalogues pertinent to each piece of analyzers shall be attached to each copy of the bid documents.

The following drawings and documents shall be provided to the purchaser in one copy and one copy of file format:

- Complete structural drawings showing
 - Arrangement
 - Dimensional plan and elevation, and any other elevation and sectional views,
 - Conduit entrance locations and dimensions
 - Incoming and outgoing terminator position
 - Incoming and outgoing signal wiring terminal block locations and any other signal terminal block location
 - Grounding connections
 - Weight of equipment.
- One-line diagrams showing
 - Relays
 - Meters
 - any other pertinent devices
- Elementary diagrams for each control scheme showing all terminal blocks with identification numbers, control devices and device pertinent contacts, identified with their proper device

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functional tag number.

- Detailed connection (wiring) diagrams showing
 - All wiring within each unit
 - All interconnection wirings between units
 - Identification of all terminals and terminal blocks
 - Clear identification of all wiring to be installed by purchaser.

Final Information

- The following documents shall be delivered to the purchaser after Factory Acceptance Test (FAT)
 - Operation Manuals:

Complete operation manual for each individual analyzer shall be provided in three hard copies and one reproducible DVD.
 - Maintenance Manuals

Complete maintenance manual for each individual analyzer shall be provided in three Hard copies and one reproducible DVD.

Factory Acceptance Test (FAT)


- General:

Inspection shall be conducted at the manufacturer's factory or at the facility of an analyzer system supplier who has the contract to furnish analyzers.

All inspection and test work for individual analyzers shall be performed in the manufacturer's shop.

Craftwork performed in the shop shall be inspected and tested for acceptance at the source prior to shipment to the site or location for installation. This craftwork shall include; fabrication, painting, mounting of equipment, piping and wiring.

The manufacturer shall provide all inspection and test equipment required for the purchaser assigned inspector and shall correct all deficiencies or malfunctions detected in inspection period. Factory Acceptance Test check-out will be divided into two parts; inspection and functional testing. Inspection shall include a visual check of the instruments and equipment against specifications and shall include a leak test of piping and tubing.

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The arrangement of equipment for accessibility and craft-workmanship shall also be reviewed in inspection period. Functional testing shall emphasize on the total system operation, as well as demonstrating the ability of the analyzer to make the required function with a known sample as a stability test.

- Recheck out preparations

The final vendor's factory inspection must be completed and the system calibration must be performed by the analyzer vendor before arrival of purchaser's assigned inspectors to conduct checkout of the analyzers. As part of the precheck out preparation, necessary arrangements must be made, in advance, to set up the system and/or systems complete with sample, sample conditioning cabinet, the analyzers to be checked out, and any pertinent control units.

The vendor shall provide any information or documentation requested by the purchaser's inspectors which are deemed to be necessary for performing the test and inspection.


- Final Acceptance Test

Visual inspection shall consist of visually verifying that all features of the quotation or purchase order are included. With the factory check sheet as a guide, all hardware shall be visually checked for defects and misalignment and their proper locations. The following specific visual checks shall be made:

- The sample conditioning apparatus shall be checked for completeness and for workmanship of the tubing.
- The wiring to the terminal boards shall be visually inspected for neatness, labelling, and compliance with codes.
- The case dimensions shall be verified against any certified dimensional outlines to preclude discrepancies when panels are mounted.
- The model number of the components shall be checked against the specification and the purchase order.
- The materials shall be checked for appropriateness of use with the particular stream being analyzed.

Operation Testing Shall Include the Following:

- The factory test shall be an operating test to demonstrate that the analyzer's performance complies with the purchaser specification.
- Test shall be performed only after the system has been warmed up and stabilized for 24 hours.
- Results of final factory calibration and testing shall be reviewed.

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- Leak testing shall be done on the entire system.
- The performance of the analyzer during a run-on calibration gas shall be witnessed.
- Reproducibility shall be demonstrated continuously for a minimum period of 8 hours using one or more standard samples.
- Calibration shall be demonstrated with a test sample giving approximately one-half scale reading for the component of interest. The concentration of the component of interest in the test sample shall be at least 25% of span different from the concentration of the same component in the standard sample used for the reproducibility test.
- On multi-stream analyzers, operation of the auto-select and/or manual-select switches and valves shall be verified. Standard gas shall be connected to enable verification that the analysis is repeatable and the stream selector valve and switching program is operational. It shall be confirmed that the instrument will provide analysis for the number of streams, as specified.
- The range of the recorder used to track the analysis shall be verified against the range given in the specification. If a transducer is used to condition output signals, the signal levels for compatibility with furnished panel-mounted components, such as recorders and controllers, shall be verified. This is important for chromatograph analyzers.
- The tag number, date of test, identification of each peak, or trace, attenuator settings, and signatures of the test personnel shall be recorded
- If the factory test is not run at the specified voltage and frequency, the suitability of the equipment for the specified voltage and frequency shall be established by nameplate data on equipment components or certified by the equipment component's manufacturers.
- A punch list of all items requiring correction shall be prepared.
- An inspection report listing the tests performed and the results obtained shall be signed by purchaser's inspector.


SUPERVISORY

Supervision on erection (if any), commissioning, and performance test at site is in the responsibility of supplier (The man-day rate should be mentioned in the supplier's offer).

DEFINITIONS & ABBREVIATION

PACKAGE: A group of equipment, machinery and systems that is engineered and built by one SUPPLIER to form an integrated item.

VENDOR: The manufacturer and/or supplier of a commodity, equipment, system or piece of equipment to perform the specified duty. This may be the MANUFACTURER, or his agent, an integrator or fabricator. Several sub suppliers or sub vendors may supply equipment to the same VENDOR.

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Shall & Should:

The words “shall” and “must” are to be understood as mandatory.

The word “should” as strongly recommend complying with the requirements of this document.


The word “Will” is used in the preferred sense.

The word “Includes” means “includes but not limited to”.

3. Environmental Conditions

The site is located in the vicinity of Sirjan city, 50 kilometers of Sirjan city center, IRAN

- Longitude 55° 22' 47" East
- Latitude 29° 8' North
- Elevation from sea level 1750m
- Atmospheric Temperature
 - Maximum Recorded +40°C (for design 45°C considered)
 - Minimum Recorded -12°C
 - Average Recorded +15.9°C
- Atmospheric Pressure 814 mbar
- Relative Humidity Max 70%
- dry bulb temperature 25 °C
- Wet bulb temperature: 21 °C*
- Dew Point Temperature 19 °C
- Precipitation
 - Annual rainfall Av 160 mm
 - Maximum monthly rainfall 260 mm
 - Maximum daily rainfall 58 mm
- Wind Condition
 - Prevailing Wind Direction SE to NW
 - Wind speed 4.8 m
 - Vector wind direction SW to NE
 - Wind speed 0.3m/s
 - Fastest wind direction NE to SW
 - Max wind speed 25 m/s

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4. Training

Training Requirements

The vendor shall provide full description of his training program in his bid proposal considering the requirements mentioned herein.

Training of personnel involved with analyzers shall be divided in two general categories;

- Instrument engineers, process engineers and operators responsible for application (professionals).
- Instrument technicians, inspectors which are usually responsible for maintenance (specialists).

Professional training program shall focus on the capabilities and limitations of specific analyzers and on the experiences of other analyzer users in particular process applications. Maintenance training must include general background updating of the personnel as well as specific training on analyzers. The background knowledge listed below must be taught to specialists assigned to analyzer maintenance;

- Pertinent chemistry, physics, electronics, hydraulics pertinent to each specific analyzer.

Training Programs

Vendor shall provide training courses for their proposed analyzers. These courses shall be detailed in their proposal for purchaser's engineers and technicians.

Vendor Training shall be of high quality using a format that combines classroom sessions, demonstrations, and Hands-On familiarization.

5. Gas Analyzers Technical Specification

The Analyzer shall be infrared photometer or thermal conductivity type.

On-line process analyzers using spectrometric techniques shall be proposed for selective measurement of the concentration of one or more components in the gaseous phase.


The analyzers shall be provided for monitoring the concentration of **Carbon monoxide and Hydrogen** in Iron Direct Reduction reformed gas.

Thermal Conductivity Measuring System

The thermal conductivity gas analyzer measures gas concentration by utilizing the difference of thermal conductivities between two gas components.

Infrared Photometer Measuring System

The measuring system of the analyzer shall be based on absorption principle.

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The measuring system shall be made of dual beam infrared source and Luft-type detector, which to be filled with the component to be analyzed.

The dual IR radiation from either a single or dual source shall be chopped and passed in phase through the sample and reference cells to the detector.

Absorption of IR radiation by the sample molecules shall result the detector imbalance to be sensed as a change in capacitance to be amplified and transduced by an electronic unit to provide 4-20 mA output corresponding to component concentration in the sample.

The analyzer shall be equipped with suitable narrow band-pass filters enabling to select only the wave-lengths of interest from the source of radiation. Filter cells shall also be added to remove undesirable wavelengths from both sample and reference beams.

The spectrometer measuring system shall be equipped with suitable equipment for temperature control and damping external vibrations of the Luft-type detector.

The analyzer optical path shall not have any exposure to ambient air, allowing measurement of gas concentration below those in the environment around the instrument.

Internal calibration shall be provided by an optical wedge in a manner to provide full-scale signal with zero gas in the sample cell.

- **Response time** at 90% of full scale shall be less or equal to **5 seconds**.

The analyzer shall be suitable for gas phase measurement.

Analyzer Requirements


The analyzer shall be continuous, on-line instrument to measure the concentration of all gases specified in project Data sheets.

Measurement ranges from 0-100% shall be provided by the instrument to suit the particular application as specified in the attached Data Sheets.

The repeatability shall be within $\pm 0.5\%$ of full scale.

The analyzer shall be multi-stream system with automatic sequencing to accept various configurations to suit customer requirements. The analyzer control unit shall be of microprocessor-based system capable of handling up to 24 process streams with automatic calibration, sequencing and shall have Local Display/Keyboard as the operator interface.

The analyzer shall be suitable to interface with CS and process computer systems.

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The analyzer shall be capable of multi-component analysis by using multi-wave length IR source beam and detector.

The analyzer shall be suitable for measurement in process gases and shall cover the spectral wavelength range of 1-10 μm minimally.

The analyzer shall be wall mounting type as approved by purchaser's engineering body in charge of the project.

Drift of the measurement shall be less than $\pm 1\%$ per 24 week.

Accuracy and reproducibility of the analyzer shall be better than $\pm 2\%$ of full scale.

All spectrometer analyzers shall be solid state type with 4-20 mA dc analog output signal plus alarm relays which can directly operate valves or equipment for totally automated process control. The analyzers shall be inherently stable, meaning that, compensation for lamp aging, window deposits, and turbidity to be performed automatically. An automatic zeroing feature shall be included in the analyzer system to assure drift-free performance.

The linearity of the analyzer system shall be 1%.

Sample Conditioning

The vendor shall provide complete sample conditioning system complete with his necessary valves (ball, needle, check, 3-way ball, etc.) and all necessary pressure regulator, filter/regulator, pressure gauges, flow meters, water traps, moisture switches, etc.


The bidder shall submit his proposed sample conditioning drawings complete with parts list for purchaser's evaluation by his bid proposal.

Safety Requirements

The measuring system enclosure shall be of purged type according to NFPA-496 certified for application in NEC, Class I, Groups B/C/D, Division 1 or zone 0, Group II, T3 certified by authorized agencies according to CENELEC EN-50.016 'P'.

The electronic control unit enclosure shall be explosion-proof type certified for application in NEC Class I, Groups B/C/D. Division 2 area by UL or zone 2, Group II, T3 by authorized agencies according to CENELEC. EN-50.018 'd'.

The Display terminal enclosure may be of general-purpose type.

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Electrical Requirements

The supply voltage of the system shall be considered 220 V AC / 50 Hz.

Data sheet and technical data

For more technical data and information refer to the attachments (datasheet).

6. Precedence

In the case of conflict between applicable documents, the following order of precedence shall apply:

- KOM, Vendor / Manufacture Clarification letter / MOM
- Agreed Documents and data sheets
- Purchase Order
- This document
- Plant Specification
- International Codes & Standards
- Applicable Local Regulation

VENDOR shall notify in due time any discrepancy found by him for decision. In all documents, Agreed Documents mean all documents that have been agreed between VENDOR / SUPPLIER and Client.

7. Inspection & Testing, General Requirements (Where Applicable)

Inspection:

Company reserves the right for inspection at any stage of manufacturing, testing or preparation for shipment. Approval by the Inspector shall not relieve the Vendor of his commitments under the terms of purchase documents and this specification.


The VENDOR/SUPPLIER shall submit "Inspection and Test Plan" (ITP) document with their tender showing the details, timing and acceptance criteria of inspection and shop tests.

Inspection and tests plan (ITP) shall be approved by Client.

Tests and Calculations:

The following tests shall be certified and/or witnessed and 3 copies of certified tests to be supplied to Company.

- Analyzer-system shall be workshop tested in accordance with the relevant test specification

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and the relevant standards and codes. The PURCHASER reserves the right to attend the workshop tests. The VENDOR shall invite the PURCHASER latest ten working days before the date for performing the tests.

- Generally, all materials and equipment of Analyzer-system shall be subject of Vendor's permanent quality control with all necessary inspections and tests.
- PURCHASER reserves the right for inspection during manufacturing phase Analyzer-System concerned at mutually agreed date.


8. Packing and Marking

- The package shall be suitably packed and protected against all damages or defects, which may occur during handling, sea shipment to the port and rough road haulage to site and extended tropical open-air storage.
- After approval and before dispatch, each part of the contract works shall be thoroughly cleaned and appropriately protected and packed in accordance with the requirements of
 - carriers and shippers and suitably for prolonged storage.
 - Following testing and inspection, prefabricated materials and non-fabricated materials shall be preserved for shipment and long term outside storage.
- Adequate temporary bracing for the package shall be provided to avoid overstressing or damage during shipping, transportation and erection, as required.
- All parts of package shall be packed and weather protected for export. Loose parts shall be boxed and shipped along with an itemized packing list with the main assembly.
- Opening of Packages & Inspection (OPI) after delivery shall be done at the client's place and certificates of origin for all equipment in the packages shall be presented by VENDOR.

9. Erection, PreCommissioning, Commissioning & Start-Up

Each Package shall be installed, commissioned and started up by the VENDOR at the analyzer rooms of DRI I & II plants of Sirjan Jahan Steel Company.

The reformed gas sample is available at the analyzer room which is used by other analyzers with AIT-XA31.1 & AIT-XA31.2 Tags. Certainly, the necessary parts (including valve, tube, ...) and tubing for transferring sample to new packages shall be considered and done by the VENDOR.

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A complete set of spare parts for erection, pre-commissioning, commissioning, and start-up the system shall be proposed based on Vendor experience and shall be included in the offer.

10. Spare Parts for 2 Years of Operation

A recommended spare parts list for two years of operation with unit price shall also be included as option. Spare parts shall comply with the same specification as original parts.

List of two years Spare Part shall be approved by the Client.


11. Guarantees

The supplier shall guarantee that the complete package is of first-class material and workmanship.

The supplier shall replace any damaged equipment resulting from poor workmanship or low-quality material.

The supplier shall also replace any equipment or component failed under normal operation for a minimum of “**12 month after initial start-up**”.


VENDOR shall be primarily responsible toward the purchaser for all aspect of the work performance by VENDOR and his sub-vendors covered by assigned order. This shall include but not limited to responsibility for management and design development, quality, cost and schedule performance.

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12. List of documents should be submitted by Vendor

Item	Description	For Tendering/QTY	Before Manufacturing /QTY	Final Document/QTY
1	COPY OF ALL INQUIRY DOCUMENTS (STAMPED & SIGNED)	S & P/1	S	-
2	COMPLETED DATA SHEETS (STAMPED & SIGNED)	S & P/1	S	S & P/1
3	FRONT VIEW, INTERNAL VIEWS, PLATE LAYOUT	-	S	S & P/1
4	SCHEMATIC & WIRING & DIAGRAMS	S & P/1	S	S & P/1
5	PROCESS & INSTRUMENTATION DIAGRAMS	S & P/1	S	S & P/1
6	TERMINAL DIAGRAMS & CABLING TABLES	-	S	S & P/1
7	INPUT/OUTPUT COMMANDS & SIGNALS LIST	-	S	S & P/1
8	LIST OF ALL USED EQUIPMENT (SUPPLIER & CATALOGUE No. TO BE MENTIONED)	S & P/1	S	S & P/1
9	TECHNICAL CATALOGUES FOR ALL USED EQUIPMENT	S & P/1	S	S & P/1
10	INSTRUCTION MANUAL FOR ALL MAIN EQUIPMENT	-	S	S & P/1
11	INSTRUCTION MANUAL FOR INSTALLATION, MAINTENANCE & REPAIRMENT OF EACH SYSTEM	-	S	S & P/1
12	SPARE PARTS LIST (WITH DETAILED PRICE)	S & P/1	S	S & P/1
13	PACKING LIST & TRANSPORTATION DOCUMENTS		S	S & P/1
14	MANUFACTURING TIME SCHEDULE	S & P/1	S	S & P/1
15	Final Book	-	-	S & P/1

Note: S=Software (MEANS COMPUTER SOURCE FILE (reproducible file such as word, excel, AutoCAD etc.) ALSO, TO BE SUBMITTED BY VENDOR, P=Paper Copy

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13. Deviation List

Vendor shall list all of the deviations from the project requirements described in this document and all other reference documents. Vendor shall deliver this list at quotation. Leaving the list blank means there is no deviation from the project requirements. Leaving the list blank means there is no deviation from the project requirements. Even if there will be no deviation, Supplier should fill up the list and write “No Deviation”.

Item	Document Name	Vendor shall fill in description of any deviation from requirements	Response
1	Data sheet for CO & H2 Gas Analyzer		
2	Inquiry Document for Co & H2 Gas Analyzer		
3	Inquiry Document for Gas Analyzer Capsules		
4	Inspection and Test Plan (ITP) for Analyzer Packages		


14. Documents Attached to this Inquiry

The documents listed as Reference Documents List shall form an integral part of this Requisition, and in case of conflicts between requirements, as a general rule, the most restrictive requirements shall govern.

Item	Description	Document No.	Remarks
1	Data sheet for CO & H2 Gas Analyzer		Last Revision
2	ABB Analyzer Data sheet	ABB_EL3040_DataSheet	Last Revision
3	Inquiry Document for CO & H2 Gas Analyzer		Last Revision
4	Inquiry Document for Gas Analyzer Capsules		Last Revision
5	Inspection and Test Plan (ITP) for Analyzer Packages		Last Revision

15. Gas Analyzer list

Item	Tag	Service	Type	Qty.
1	AIT-XA35	Reformed Gas CO Content	Infrared	2
2	AIT-XA36	Reformed Gas H2 Content	Thermal conductivity	2

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16. MTO for Gas Analyzer Tube

Item	Tag	Service	Tube(m) (For sampling and span calibration)	Tube(m) (For zero calibration)	Tube(m)+20%
1	AIT-XA35	Reformed Gas CO Content	30	20	60
2	AIT-XA36	Reformed Gas H2 Content	30	20	60
			Total: For 2 Packages of CO & H2 Gas Analyzer		240 Meter