ANNEX 1A
TECHNICAL SPECIFICATION - REQUIREMENTS FOR GOODS AND SERVICES

I. INTRODUCTION.

Monómeros Colombo Venezolanos SA hereinafter referred to as **"Monómeros",** is looking for different quotes under the context of a market research the supply of a technology for secondary abatement of Nitrous Oxide (N_2O) to be installed in the ammonia oxidation reactor (Tag Number R-1101) the nitric acid production plant located in Barranquilla, Atlántico (Colombia).

Technical specifications described in this document are part of a **market research stage** in which suppliers of this type of technology, hereinafter **"interested suppliers"**, will be invited to check availability of the requested equipment and services in the market and to establish an estimated cost for them.

This document contains technical information about the nitric acid plant - See *Table 1A.*1 - and the technical specifications required by **Monómeros** for this services. It should be noted that this annex does not intend to specify all the technical requirements, nor the ones already covered by the applicable codes and standards, since it is expected that suppliers interested in this market research have the experience and knowledge required to provide this service.

At this market research stage, **interested suppliers** are allowed to suggest in the quote all the equipment and services not mentioned in this document, which according to its criteria, are required to guarantee the total execution of the scope requested by **Monómeros**.

1. TERMS AND CONDITIONS OF THE GOODS AND SERVICES TO BE QUOTED - SCOPE OF SUPPLY OF SECONDARY NITROUS OXIDE ABATEMENT TECHNOLOGY (N_2O).

1.1. Scope.

The quote presented by the **interested suppliers** must include the unit cost the activities described in this document.

It is important to point out that this is a market research, not a tender process. Nevertheless, according to the Colombian Public Procurement Law, every requirement that can have impact on the cost of the service to be procured must be detailed from this stage, so scope of the future service is fully described in this section. Only the awarded supplier in a next tender process will be demanded to execute all these activities, when the contract for the supply of secondary abatement technology is signed.

1.1.1. To carry out the engineering study, design and manufacture of a new basket associated with a secondary nitrous oxide (N_2O) abatement system. It should be noted that the basket must be designed to support both the primary catalytic gauzes and the new secondary abatement catalyst.

For the manufacture of the new basket, the awarded supplier shall provide labor, materials, tools and consumables required for this purpose. It should be noted that labor used for the fabrication of the support basket shall include welders qualified under the ASME Section IX code or equivalent, certified welding inspectors -AWS or equivalent-, with knowledge of ASME Codes and certified non-destructive testing technicians in accordance with the SNT-TC-1A code or equivalent.

The awarded supplier shall also provide the components and accessories required for the initial installation of the new basket to be - installed by **Monómeros**.

1.1.2. To select, supply and deliver the secondary catalyst load, according to the technical requirements specified by **Monómeros** in this document.

1.1.3. To carry out the transportation and delivery of the goods described in this annex, at the **Monómeros'** facilities, located in Barranquilla, Atlántico (Colombia).

1.1.4. To provide *on-site* technical assistance required for supervision during the assembly, installation and commissioning process of the components associated with the secondary abatement system.

1.1.5. To provide training of technical personnel from **Monómeros** for the installation, operation, maintenance and troubleshooting of the abatement system.

1.1.6. To provide after-sale technical support to ensure optimum performance of the secondary catalyst for at least 5 years after successful commissioning of the system.

1.1.7. To perform an on-site field inspection of the abatement system at the end of the first year of operation campaign of the primary catalyst in order to assess its mechanical and operational performance.

1.2. General description of the Scope.

1.2.1. Regarding item 1.1.1: The engineering study performed by the awarded supplier shall include an analysis of the plant and equipment operation requirements to ensure the correct installation and operation of the proposed abatement system. Therefore, the study shall report all the modifications required by the awarded supplier for the commissioning of the proposed system.

1.2.2. Regarding item 1.1.1: The engineering study and design of the basket include the review of the mechanical design of the current reactor, including the flange where the new basket will be supported. The purpose of this activity is that the awarded supplier guarantees the operation and reliability of these supports affected by the additional load that the new basket, which will support the primary catalyst and contain the secondary one.

1.2.3. Regarding item 1.1.1: During the design of the support basket, the awarded supplier shall ensure that gauzes must be attached to the basket through a "Weighted ring" method or equivalent, in order to avoid ammonia slip.

1.2.4. Regarding item 1.1.1: During the manufacturing process of the support basket, the awarded supplier shall deliver to **Monómeros** for approval of activities, the Inspection Test Plan, which shall include and not be limited to the following activities: fabrication drawings – as built, positive material identification application report -PMI-, weld inspection report, application of non-destructive tests such as penetrant dyes, radiography data sheets, furnace charts for heat treatment, dimensional measurements report and pictures.

1.2.5. Regarding item 1.1.3: The goods shall be delivered at Monómeros' facilities at the following address: Via 40 Las Flores, Barranquilla, Atlántico (Colombia).

1.2.6. Regarding item 1.1.4 and 1.1.5: The awarded supplier shall provide supervision and training of **Monómeros'** technical personnel during the assembly, installation and commissioning of the secondary abatement system. The estimated time for these activities is ten (10) days.

1.3. On-site Visit.

At the next tender stage, interested suppliers may perform on-site visit to the **Monómeros'** facilities, to clarify technical concerns and to verify service conditions in the field. Travel and living expenses associated with the visit will be assumed by the supplier. **Monómeros** will not refund or recognize any amount of money for this concept. This visit is not mandatory for suppliers, and is not required to bid.

1.4. Kick–Off Meeting.

Before starting the execution of the services, **Monómeros** will invite the awarded supplier to a Kick-off Meeting (on-site or virtual) in order to coordinate the activities to be carried out.

1.5. Monómeros' liabilities.

Once the respective supply contract is signed, **Monómeros** will be responsible for:

- Providing all technical information on equipment and reference drawings required for the execution of the contract.
- Unloading and storage of the abatement system components at the **Monómeros'** facilities.
- Supplying technical personnel for the assembly and start-up of the abatement system.

1.6. Hold Points during the execution of the contract.

The following will be the hold points that the awarded supplier will have during the execution of the contract, which will be they must include and will not be limited to the below listed activities. **Monómeros** will give the final approval prior to the start of the basket manufacture by the awarded supplier.

- The engineering study and design.
- The manufacturing drawings.
- The inspection test plan.

Monómeros will also give the final approval to the manufactured components described in the scope of this contract before the dispatch of these items to **Monómeros'** facilities.

1.7. Deliverables.

The awarded supplier shall deliver the following documents to **Monómeros**:

- The engineering study report associated with the installed abatement system. The report must include all engineering designs, risk assessment, resistance analysis and equipment sizing that may be required. This report must be submitted in digital PDF format.

- The “as-built” manufacturing drawings regarding the installed abatement system. This documents must be submitted in both PDF and DWG digital formats.

- The Project Document Package” – which must containing: List of components, quality inspection and dimensional control report, fabrication drawings as built, inspection test plan, non-destructive test reports -NDT- such as: penetrating liquid data sheets, positive material identification test report -PMI-, radiographic data sheets, WPS, PQR, WPQR, furnace charts for heat treatments, material certificates -material test reports-, list of spare parts, list of special tools (if necessary).

- Training documents such as guidelines, manuals and/or guides regarding the abatement system, delivered in PDF digital format.

2. WARRANTY CONDITIONS REQUIRED FROM THE AWARDED SUPPLIER.

a. Performance Guarantee:

Monómeros expects an N_2O reduction of at least 85% compared to the N_2O concentration estimated before installation of the secondary technology. The awarded supplier will select the secondary abatement catalyst accordingly, and will guarantee the expected performance for at least 5 production campaigns of 360 days each.

Likewise, the awarded supplier must guarantee that its design causes the least technically achievable pressure drop, in order to avoid limitations in the system's hydraulics that affect the plant operation.

b. Mechanical Guarantees:

The awarded supplier must guarantee an operation time of 100000 hours for the support basket structure of the abatement system. The support basket will be protected against any failure due to design, material, welding or other causes the awarded supplier is accountable for.

The acquisition of materials, machining, heat treatment, welding, thermal stability and tightness must be guaranteed by the awarded supplier.

c. Bank Guarantees:

See “Table 2. Bank guarantees that will be required from the awarded supplier, after signing the contract” contained in the document Request for Information from Suppliers – SIP, Monómeros – 001 of 2023.

3. GENERAL INFORMATION OF THE NITRIC ACID PRODUCTION PLANT.

The required technical information associated with the nitric acid plant for which the abatement system will be acquired is provided below. Likewise, in the **Annex 1B contains the plans associated with the ammonia oxidation reactor.**

GENERAL SPECIFICATIONS OF THE PLANT

Name of the company	Monómeros SA	
Plant location	25QH+55 Barranquilla, Atlántico - Colombia	
Plant type (atmospheric, medium or high pressure)	Medium - mono pressure	
Design (Chemico, Weatherly, GP, Uhde, etc.)	Stamicarbon	
Reactor Supplier	Breda/Borsig(Revamping 2006)	
Year of commissioning	1972	
Reactor pressure (bar, absolute)	4.5	
Number of plants	1	
Number of reactors per plant	1	
Reactor inner diameter	3090	mm
Reactor operating pressure	3.5	kgf/cm^2 (gauge)
Mixing gas temperature	150 - 160	°C
Gauze temperature	850 - 870	°C
NH_3 content	10.0	%
Duration of the gauze campaign (Min)	365	days
Actual plant production (max.)	280	Metric tons per day HNO_3 (100%)
Campaign production rate	100000	Metric tons HNO_3 (100%)
HNO_3 aqueous solution (%)	50	%
Actual average conversion efficiency	96	%
Average N_2O emissions	1200	ppmv
¿N_2O reduction catalyst installed in the reactor?	No	
Plant cleaning frequency	5 years	
Type of support system (basket, secondary catalyst, Raschig rings others, yes/no)	Hex Grid - Basket is not designed to support secondary catalyst	
Global composition of MP losses	Pt: 16.00 Pd: 36.00 Rh: 4.00	
Average number of stoppages per year	8	
Operational run time (days per year)	360	

Table 1A.1 General information of the Monómeros nitric acid plant.

SPECIFIC INFORMATION		
Oxidation efficiency at the beginning of the campaign	96%	
Oxidation efficiency at the end of the campaign	92%	
Air flow, primary to reactor	41567 Nm^3/h	
Ammonia gas flow	3491 kg/h	
Air flow, secondary to bleaching	7318 Nm^3/h	
Platinum Alloy Catalytic Gauze System	Number of gauzes	4
	Diameter of gauzes	3076 mm
	Composition	97% Pt, 3% Rh
	Wire diameter	0.076 mm
Palladium Alloy Woven Catchment Gauze System	Number of gauzes	3
	Diameter of gauzes	3076 mm
	Composition	95% Pd, 5% Ni
	Wire diameter	0.076 mm
Depth available for De-N_2O system (mm)	650 mm	Estimated
Actual pressure loss	10 mbar	Designed

Table 1A.2 Specific information of the Monómeros nitric acid plant.

4. SPECIFICATIONS OF THE SECONDARY N_2O REMOVAL TECHNOLOGY.

SPECIFICATION - SECONDARY CATALYST.

Description	Catalyst for N_2O reduction selected by each **interested supplier** based on the best available technological proposal.
Shape	Defined by each **interested supplier**.
Layer thickness	Defined by each **interested supplier.**
Allowable pressure drop	80 mbar or less.
Expected useful life	Minimum of 5 production campaigns of 360 days each.
N2O reduction efficiency	85% minimum, monthly average.
Impact on NO yield.	None

Table 1A.3 Technical specifications of the secondary catalyst.

EQUIPMENT SPECIFICATION - CONVERTER BASKET.

Function	**Support the primary gauzes together with the new N_2O reduction catalyst.**	
Ability	**Ammonia gas flow**	3491 kg/h ammonia (3775 kg/h max);
	Mixed gas flow to the reactor (Ammonia + Air)	45334 kg/h (46158 kg/h max) 55125 kg/h (56127 kg/h max)
Design specifications	**Service Life**	The service life must be 100000 operating hours or more.
	Design style	The design style must be “Weighted ring” or similar.
	Pressure drop	Depending on the selected N_2O reduction system, but the design must be low differential pressure.
	Temperature	850°C – 870°C
	reactor dimensions	See plan EO-11-0005 (Annex 1B).
Material of construction	**Mounting flange; Housing and heat shield:**	Defined by each **interested supplier.**
	Gauze support flange:	Defined by each **interested supplier.**
	Weighted ring:	Defined by each **interested supplier.**
	Gauze support grid:	Defined by each **interested supplier.**
	Support display:	Defined by each **interested supplier.**
	Hexagonal grid:	Defined by each **interested supplier.**

Table 1A.4 Technical specifications of the basket.