

TERMS OF REFERENCE

Supply of equipment to phase-out methyl bromide in cut flowers in Uruguay

1. GENERAL INFORMATION

These terms of reference shall be used for the preparation of bids for the supply of monitoring and control services required to phase-out 4 tons of Methyl Bromide used in the production of cut flowers.

1.1 Two (2) mobile compact steam producing units for soil pasteurization composed each one of:

- X A tubular boiler producing minimum 600 kg/hr of steam at a working pressure of not less than 3 kg/cm² and at a temperature not lower than 142° Celsius, overheated up to 160° Celsius. The boiler shall use water at room temperature, as per specifications described later. Boilers shall be designed for using hard water properly corrected by a magnetic mobile field device and shall be designed for easy cleaning of calcium deposits.
- X A power generator having the necessary power output and voltage to operate the above boiler independently from the power grid.
- X A platform in which the boiler, a power generator, a 200 liters fuel tank and a intermediate 1.000 liters water reservoir is firmly mounted.
- X Gas-oil and water pumps to fill these tanks from external sources
- X 70 m of steam resistant flexible hose
- X Manuals

Each compact monoblock mobile unit complying with the specifications described below shall include all required components in order to pasteurize agricultural soil.

Overseas suppliers shall deliver DDU to Montevideo. The Contractor shall be responsible for costs, fees and charges in respect of the export and transit of the equipment and technical documentation, but not for customs duties, taxes or license fees in the project area, which are the responsibility of the project counterpart. The contractor shall also obtain, at his own risk and expense, any export license or other governmental authorization(s) necessary for the export of the equipment and technical documentation. The Uruguayan Government will authorize a free customs clearance.

National suppliers shall deliver to Montevideo. The National contractor shall be responsible for payment at its own cost of all local and national taxes, assessments, liens and charges, which will be due to be paid by the contractor as a result of this contract.

2. THE PROJECT

Uruguay participated in a demonstration project for the use of Methyl Bromide alternatives in protected horticulture. The demonstration project ended in July 2001 and the technologies experienced have been proven very well adapted to the country. In view of the growing consumption of methyl bromide, which will create a much bigger problem in the near future, the Government of Uruguay has decided to quickly phase out MeBr in such sector and to apply all the current legal mechanism to avoid any increase of consumption.

The objective of this project is to eliminate the use of 40 tons of methyl bromide in protected horticulture farms (tomatoes), four (04) of them in the cut flowers and nurseries.

3. SCOPE OF SUPPLY

For the purpose of implementing the phase-out of methyl bromide, the contractor shall supply:

(A) **Two (2) mobile** compact monoblock units for soil pasteurization with steam, each one composed of the following elements:

- A 600 kg/hr (minimum), 3 bar steam generator which includes the following essential components: boiler, operation control elements and switchboard panel, burner, fuel and water pumps, 1000 liters water tank, 30 liters fuel tank, safety systems, etc. as specified in 3.1
- A 380 Volts/50 Hz three phase power generator having the required output for full operation of the boiler and its accessories, as specified in 3.2.
- A complete set of documents as per specifications detailed in 3.3.
- 70 meters of flexible hose designed for continuous working with steam at 3 bar and 160 ° Celsius.

3.1 Steam generator specifications (Minimum 600 kg/hr)

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| <u>Type of boilers:</u> | Monoblock, horizontal with fire tubes |
| <u>Output:</u> | Minimum 600 kg/hr of steam at 160° Celsius (with over heater) at an operating pressure of 3 bar. |
| <u>Steam quality:</u> | Minimum 98% |
| <u>Heating surface</u> | As required |
| <u>Testing pressure</u> | 6 bar |

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| <u>Security coefficient</u> | Steel security coefficients used in design and calculations shall be a minimum of 50% |
| <u>Codes:</u> | Boiler shall be built in accordance with the latest edition and addenda of the A.S.M.E. Boiler and Pressure Vessel Code or European equivalent. It shall be registered by the corresponding authorities |
| <u>Design temperature</u> | 250° Celsius |
| <u>Efficiency:</u> | Minimum 86% fuel to steam efficiency |
| <u>Dimensions</u> | Not larger than 3.5 m length, 1.8m tall, and 1.5 m width. Shall fit in the trailer with all accessories specified in the scope of supply. Boiler and accessories shall be assembled in a sky shoe type metal structure. |
| <u>Use:</u> | Outdoors use, waterproof and corrosion resistant. No condensate recovery. |
| <u>Top cover</u> | The boiler shall be at least partially covered by a roof in order to minimize heat losses. |
| <u>Water input</u> | Medium hard water, which could contain additives. The boiler has to be designed for easy regular maintenance cleaning and removal of calcium residues. Minimum input water temperature 10° Celsius. |
| <u>Fire tubes</u> | Mandril attached to the base plaques. No welded seams. Minimum wall thickness 2.5 mm. Turbulators shall be factory installed. |
| <u>Heating body</u> | <p>Heating body shall be composed of:</p> <ul style="list-style-type: none"> • Furnace • Turnaround chunk fully submerged in water • Fire tubes • Steam super heater <p>Fire tubes and combustion chamber shall be fixed, on one side, at the front and in the other side to the gases turnaround rear box. This set of three elements shall be easily removable from the boiler's external cylinder for cleaning and inspection without disturbing the burner equipment and controls.</p> <p>As the boiler has to operate with medium hard water, the easy removal of calcium deposits is a strict pre-condition for qualification. The contractor shall include diagrams, photographs and mechanical procedures to separate the heating parts of the boiler from the main body (shell) as well as specifications of nuts and bolts used.</p> <p>Turnaround chunk shall be fully submerged</p> |

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| <u>Front</u> | The front of the boiler shall preferably be flanged in order to get easy access to the system used to fix the heating body to the external body. |
| <u>Steam outlet</u> | Shall be bolted and designed to overheat the outgoing steam. Shall include a 2 ^{1/2} ” globe type manual blocking and regulation valve with body in cast iron and internal parts in brass. |
| <u>Safety valves</u> | A minimum of two safety relief valves, starting opening at nominal pressure and reaching maximal flow at 10% higher above nominal pressure, shall be installed. These calibrated spring valves shall allow a minimum flow of steam of 100% of nominal capacity each when fully open. |
| <u>Water inlet</u> | One inch (1”) manual blocking valve of external cast iron body and internal parts in brass, plus 1” solenoid valve internal parts in brass with epoxy resin encapsulated coil, IP65 protection, at 220 Volts/50 Hz. DIN connection plug to the control box. A water filter and a non-return valve shall also be included |
| <u>Bottom drain</u> | Shall be of 4” with 1 ¼” spherical valve |
| <u>Super heater drain</u> | Shall be of 1 ¼” with spherical blocking valve |
| <u>Control instruments</u> | The boiler shall be equipped with at least the following instruments: <ul style="list-style-type: none"> • One Bourdon type manometer to measure steam pressure in the boiler, with 4” quadrant, IP65 protection; box bourdon and connection. Class 1. Range 0-6 Kg/cm², ½”NPTM connection integral manifold in brass with blocking and blow off. Shall have a ½” hydraulic seal. • Two class 1 pressure/switcher/transmitter to regulate independently burner flame and security stop. Range 0.2-3 Kg/cm²; 0.08-0.25 adjustable differentials with graduated scale, IP65 protection, ½” NPTM process connection ½” NPTF electrical connection, and SPDT connection terminals. Shall have ½” hydraulic seal. • One bimetallic thermometer to measure steam temperature in the boiler. 4” quadrant, IP65 protection; AISI316 class 1 box, connection range 0-150°C, with NPTM ½” connection. Length to be determined by the supplier, with ½” to ¾” sheath • An independent class 1 pressure-switcher, to generate stop and activate alarm when there is steam over-temperature in the boiler. Range 0-4 bar adjustable from outside with graduated scale, IP65 protection, ½” NPTM connection. ½” to ¾” sheath, NPTF ½” electrical connection, and SPDT connection. |

- Two visual REFLEX type level gauges with bodies of adequate length,
- A low level electronic switch to stop burner and activate sound alarm (90 db) when water level is very low in the boiler. Shall be mounted directly on an outlet at the top of the boiler shell, with independent converter, connected to the control box.
- A three point level electronic system with appropriate sensors to regulate water level, which will activate/deactivate water pump and solenoid valve and stop burner at very low water level. Shall be mounted in a metallic vessel, external to the boiler, connected to it without blocking and drain at the bottom through an at least ½” spherical valve with cast iron body and internal in brass.
- A key switch for manual operation of the water pump in case of switch-off because of very low water level. This system prevents the operator or the water feeding pump to start when the tube-fires are too hot.

Burner:

Compact burner from a well-known international manufacturer having local service in Uruguay or Region (i.e. Mercosur countries, Chile) shall be delivered mounted on the boiler, with all electrical connections.

The burner shall be calibrated to use standard gas-oil with a minimum calorific power of about 10,200 kcal/kg. The burner shall have:

- Easy access to the head.
- Minimum effective power 550 kW
- Three-phase 380 VAC/50 Hz
- Combustion head including diffuser, screen, electrodes, fuel/air regulation and two gas-oil injection nozzles.
- Flame detector
- Gas-oil pump of adequate flow rate, coupled to the fan and manometer for pressure control. The specifications of this pump are described latter
- Centrifugal fan of adequate power with mesh protection, three phase 380 VAC/50Hz, with IP55 protection
- Two gas-oil filters with two three way valves, to shift from one to the other while the boiler is on
- Ignition electrodes insulated with ceramics and high voltage transformer
- Control switchboard on a IP55 cabinet with screw lock, with instruments controlling flame, fan, gas-oil pump, thermal protection switch, fuses, push buttons, outlet signal by dry contact to generate alarm condition, hour counter to record working hours, etc

Burner’s control cabinet may be integrated with boiler’s controls in a single cabinet and shall be designed for outdoors work (rain, dust and hail).

Water circuit:

Water is not easily available in field conditions; therefore, water circuit will be integrated in the compact unit and shall be composed of the following elements:

- A centrifugal water pump, which will pump water from the farm supply or auxiliary tank (not included in the supply), into a central water tank described latter. The pump shall be centrifugal with a minimum flow rate of 1000 liters per hour at 1 bar.
- A horizontal epoxy water tank with capacity of 1000 liters. Shall have a 0.5m manhole with lid and vent at the top and a 1” drain at the bottom. An electronic level sensor regulated at 90% and 10% of tank capacity, shall automatically regulate water level in the tank. Purge spherical valves shall be installed at the bottom of tank. The water tank shall be horizontal and transversally fixed to the platform of the trailer.
- Boiler’s water feeding pump connected at the bottom of the above tank shall be designed for a pressure over 5 bars and water temperature until 105° Celsius. The pump shall be designed for a steady flow under all conditions.
- An easily accessible water filter.
- A water softener based on magnetic variable field device technology, shall be included in the supply to prevent hard calcium deposits.

Water circuit shall be delivered complete, with all pipes, valves, and electro valves. Valves shall be in AISI 316. The system shall be automatic with all commands centralized in the switchboard.

The contractor shall include in the bidding documentation, a flow sheet and a complete description of the water circuit.

Gas-oil circuit: Gas-oil circuit shall include the following components:

- A centrifugal pump to transfer gas-oil from drums or farmer’s storage tanks to the 300 liters central tank described after. The gas-oil pump shall have a minimum flow rate of 500 liters/hour.
- A small centrifugal pump to feed the auxiliary tank of the power generator or any other system to ensure a continuous work of the power generator.
- An automatic electronic system to start/stop pumps in order to keep a steady supply of gas-oil to de burner.
- High-pressure pump with regulation from 10 to 15 bars to feed the boiler’s burner. (Included in the burner).
- Pipes, by-passes and valves as required.
- Two filters with adequate capacity and valves to work independently allowing cleaning and maintenance of one of them while the other is in operation.

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| <u>Insulation:</u> | 1 cm air layer plus 4 cm mineral wool (K=0.27) totally covering the smoke box and the shell with at least 0.6 mm aluminium sheet except in the openings |
| <u>Lifting eyes</u> | Two |
| <u>Welding</u> | Welding shall be carried-out by officially certified welders according to well know norms. Lineal welds shall be random x-ray inspected. Joint welds shall be fully x-ray inspected. Welding procedures shall be included in the bid. |
| <u>Painting</u> | All metallic surfaces shall be painted with high temperature resistant paint. |
| <u>Switchboard</u> | The central switchboard control unit cabinet, designed for outdoors conditions (IP65) shall include: <ul style="list-style-type: none"> ▪ Punch type pushbutton for start/stop operation of all burner elements, pumps, regulation and safety systems and separate pushbuttons for water pump. ▪ Green light indicators of all active elements and red light indicators for malfunction or alarm indicators. ▪ Power failure alarm, boiler failure alarm, low water level alarm, high pressure alarm shall activate flashing red indicators and a buzzer. Recognition and acceptance push buttons for each alarm condition shall be included in the panel board. When the acceptance button is pushed, alarm indicators shall remain red without flashing. ▪ Diagram and acrylic labels of elements written in Spanish (or English). ▪ Control and signal system shall be 220 Volts sourced from one of the three phases and neutral. A differential disruptor and a luminous indicator on/off shall be installed. |

3.2 Electrical Power Generators

The electrical power generators shall be compact units from a recognized international brand and mounted in on the platform of the trailer. The main characteristics shall be the following:

- Power output shall be adequate to run the boilers according to their capacity and specifications, and all of its accessories plus an additional 25%. Mounted on the platform. Three phase 380 Volts/50 Hz with at least one three phase outlet with neutral and earth and two single-phase 220 Volts outlets.
- Automatic voltage regulator
- Electrical startup
- Maximum 1500 rpm
- Water refrigerated
- IP66 outdoor protection

- Fuel: gas-oil as per boiler specifications
- Thermal disruptor
- Volt and Ampere output indicator
- Connections to the main gas-oil tank and gas-oil pump, water tank and pump and boiler
- Gas-oil filter or use of filtered gas-oil from burner circuit

3.3 Manuals and Documents

Each unit shall include the following manuals and documents:

- Boiler: Three complete operating and maintenance manuals in Spanish or English with wiring diagrams and full description of the operating and security systems. Manuals shall include identification references for all spare parts.
- Generator: Two complete operating and maintenance manuals in Spanish or English with wiring diagrams and full description of the operating and security systems. Manuals shall include identification references for all spare parts.
- Welding inspection and welding procedures including type of electrodes, pre-heating, etc. Certificate of welders qualifications
- Testing certificate established by national Authorities.
- Compliance with norms and codes.
- Fire test report

3.4 Hoses

- A 70 m flexible hose, diameter 70 mm, reinforced, with high capacity synthetic fibers, flexible and adequate to carry steam at 3 bars and 160° Celsius, will connect the steam outlet of the boiler with an “Y’ 3” quick coupling connector. From this connector two 5 meters of flexible hoses (Diameter 50 mm) of the same characteristics than above, will conduct steam to the injection system. Quick coupling connectors for these 2x5 m.

4. FACTORY FIRETESTS

All elements included in the supply shall be mounted and the unit shall be ready for final connection of water, steam and fuel.

The factory fire test shall be a complete functional test conducted at the maximum pressure and, at a minimum, is to consist of filling the boiler with water and operating the burner throughout its complete range of operation. Additionally, all components wired into the boiler safety control circuit are to be tested by simulating a failure condition. A copy of the fire test report is to be included in the delivery. Upon completion of the factory fire test, the boiler shall be cooled and hydrostatically tested, and the external piping documented.

5. DELIVERY SCHEDULE AND DELIVERY SITES

The contractor shall deliver the two boilers during the first semester 2003.

6. CONTRACTOR'S GENERAL RESPONSIBILITIES

- The contractor shall assume overall responsibility for the quality and timeless supply of the equipment and services related to this contract.
- The contractor shall arrange for transportation and insurance of the materials and bear all costs risks thereof.
- The contractor shall be responsible for applying best international procedures, including safety aspects in the equipment supplied.
- The contractor is responsible for securing that all equipment supplied is new.
- The contractor shall be responsible for the control of all the work, services and supplies that might be executed by local subcontractors.
- The contractor shall be responsible for the quality and completeness of its technical services.
- The contractor shall be responsible for the insurance and social benefits of any personnel, working in Uruguay.

7. CONTRACTOR QUALIFICATIONS

- The contractor shall be a manufacturer of the equipment having its own production facilities and the necessary technical personnel. The contractor shall include in the bid documentary evidence of this.
- The contractor shall have proven experience in manufacturing boilers and accessories for soil pasteurization. The contractor shall include in the bid the corresponding documentary evidence.
- The contractor shall include a list of its production equipment and prove its capabilities to accomplish the delivery plan.

8. TERMS OF GUARANTEES

The contractor shall guarantee the quality and completeness of its work, equipment, supplies and its compliance with the specifications described above.

UNIDO will keep the right to carry out quality tests. In case of non-compliance with the aforementioned specifications, UNIDO will stop the payments and return the equipment to the supplier at its own expenses.

9. LANGUAGE OF THE PROPOSALS

All proposals shall be written in English. Welding and Testing Certificates can be supplied in the original language.

10. CURRENCY OF THE PROPOSALS

All proposals shall be quoted in United States dollars and the contract will be awarded in this currency. Proposals in other currencies will be automatically convert into US\$. The contractor shall bear all exchange rate risks/rewards.

11. SHIPMENT DOCUMENTS (FOREIGN FIRMS)

In order to avoid unnecessary delays and demurrage costs at the border, firms from countries other than Uruguay, **shall confirm** in the proposal their commitment to provide UNIDO, **one week** before dispatching any shipment, with the following documents:

- Three original invoices in English
- One certificate of origin and its translation into Spanish and English
- Three originals of the shipment documents
- One original packing list in English

12. TECHNICAL DOCUMENTS TO BE INCLUDED IN THE BIDDING OFFER

All bidding offers shall include the following technical documents:

- A reference list of clients
- A full and detailed description of the boilers and its specifications as per above scope of supply
- A full description of the procedures to detach the heating components from the boiler's body, for cleaning and inspection
- Blue prints and draws of the monoblock unit and accessories, as well as their distribution on the platform
- Blue prints and draws of plaques and the structure to which they are attached
- List and specifications of the materials
- Diagram of the operating and safety circuits
- Welding procedures and certification
- Water circuit flow-sheet
- Gas-oil circuit flow-sheet