| | | | |
|---|---|---|---|
| MDC energia é valor | **TECHNICAL SPECIFICATION** | Nº: **P0000-PRC-001** | |
| | PROJETO: **BIOMETHANE PLANT** | | FOLHA: 1 de 6 |
| | NÚMERO: **00.0000** | | |
| | LOCAL: **PARANÁ - BRAZIL** | | |
| | TÍTULO: **SD-200** | | |

## INDEX OF REVISION

| REV. | DESCRIPTION |
|---|---|
| 0 | FOR QUOTATION |

| | REV. 0 | REV. 1 | REV. 2 | REV. 3 | REV. 4 | REV. 5 | REV. 6 | REV. 7 | REV. 8 |
|---|---|---|---|---|---|---|---|---|---|
| DATA | 28/09/2021 | | | | | | | | |
| PROJETO | 00.0000 | | | | | | | | |
| EXECUÇÃO | JEF | | | | | | | | |
| VERIFICAÇÃO | LNF | | | | | | | | |
| APROVAÇÃO | BFC | | | | | | | | |

## 1.SCOPE OF SUPPLY

The purpose of this specification is to establish the minimum requirements for the quotation and purchase of 01 (ONE) **fully automated** Biogas Upgrading Plant to be installed in Paraná State, Brazil.

The PROPONENT must comply with process conditions informed in Item 6. PROCESS DATA AND REQUIREMENT.

Vendor must quote upgrading plant to remove $CO_2$ from biogas.

Equipment for biogas pretreatment and/or postreatment like VOC/Siloxanes removal and $H_2S$ removal must be offered as optional.

## 2.SYSTEM OF UNITS

The quotation must be addressed in International System of Units (SI). With exception to pressure that must be informed in bar / barg and temperature that must be informed in ºC, where applicable.

## 3. LOCAL ENVIRONMENT CONDITIONS

| | **Design** | Hot Day | Cold Day | Aver. Day | Units |
|---|---|---|---|---|---|
| Barometric Pressure | **0,920** | 0,920 | 0,920 | 0,920 | bar a |
| Dry Bulb | **28,6** | 32,9 | 12,1 | 19,7 | $^0$C |
| Wet Bulb | **24,6** | 28,9 | 7,1 | 15,7 | $^0$C |
| Relative Humidity | **72,63** | 73,36 | 49,76 | 66,97 | % |
| Wind Speed | 15 | | | | km/h |
| Seismic Zone | Not Applicable | | | | - |
| Power | 440 V / 60 Hz / 3 phases | | | | - |
| Classification Area | Green Field | | | | - |

## 4. UTILITIES AND POWER

**All** utilities and power consumption needed to biogas purification to biomethane shall be listed and quantified in the quotation.

## 5. EFFLUENT AND EMISSIONS

All effluent and emissions shall be informed in the quotation with flow and composition.

## 6. PROCESS DATA AND REQUIREMENT

| | | |
|---|---|---|
| Tag | | SD-1000 |
| Type (Adsorption/Absorption/Membrane) | | By Vendor |
| Operation | | Continuous |
| Service | | Biomethane |
| **Product Requirements(2)** | | |
| Flow min(1) | 200 | $m^3/h$ |
| Pressure Min. | (3) | barg |
| Temperature Max | 45 | °C |
| Composition | | |
| Methane min | 0.955000 | mol frac. |
| Carbon Dioxide max | 0.030000 | mol frac. |
| Oxygen max | 0,008000 | mol frac. |
| Water Dew Point | -45 | °C |
| Siloxanos | 0.3 | $mgSi/m^3$ |
| Hydrogen Sulfide max | 10 | $mg/m^3$ |
| Wobbe Index min | 46500 | $kJ/m^3$ |
| | | |
| **Raw Gas Design Conditions(2)** | | |
| Flow Max(1) | 385 | $m^3/h$ |
| Pressure Min @ battery limit | (3) | mbarg |
| Temperature Max | 50 | °C |
| **Raw Gas Design Composition** | | |
| *Methane min* | 0.540000 | mol frac. |
| *Carbon Dioxide* | balance | mol frac. |
| *Hydrogen max* | 0.001000 | mol frac. |
| *Oxygen max* | 0.002000 | mol frac. |
| *Nitrogen max* | 0.010000 | mol frac. |
| *Volatile Organic Compound max* | 290 | ppm |
| *Hydrogen Sulfide max(4)* | 100 | ppm |
| *Water* | saturated | mol frac |
| *Siloxane max* | 25 | $mg/Nm^3$ |

**Notes:**

(1) $m^3/h$ refers to 20 °C @ 1 atm.

(2) Minimum $CH_4$ recovery guarantee 96%.

(3) Vendor to inform required minimum inlet pressure and available outlet pressure.

(4) Vendor must inform the max $H_2S$ content allowed at the $CO_2$ removal system inlet battery limit.

## 7. REQUIRED WITH QUOTATION

Proponents must issue technical-commercial proposal with the following documents as a minimum:

I. Process Description
II. Block Flow Diagram
III. Product and Wastes with composition and process conditions;
IV. Turndown condition;
V. Methane recovery;
VI. Availability;
VII. Utilities;
VIII. CAPEX and OPEX
IX. Overall schedule
X. Catalogs

## 8. STANDARS AND CODES

**Process and Mechanical**

ASME BPVC VIII Div.1 Boiler and Pressure Vessel Code
ASME B16.5 Pipe Flanges and Flanged Fittings
ASME B16.9 Factory-Made Wrought Buttwelding Fittings
ASME B16.10 Face-to-Face and End-to-End Dimensions of Valves
ASME B16.11 Forged Fittings, Socket-Welding and Threaded
ASME B16.34 Valves - Flanged, Threaded and Welding End
ASME B18.2.2 Square and Hex Bolts and Screws (inch series)
ASME B31.3 Process Piping
ASME B36.19 Stainless Steel Pipe
ASME RTP-1 Reinforced Thermoset Plastic Corrosion-Resistant Equipment
API 520 Sizing, Selection, and Installation of Pressure-relieving Devices
API 521 Pressure-Relieving and Depressing Systems
API 526 Flanged Steel Pressure Relief Valves

**Electrical**

IEC 60079 Explosive Atmospheres
NFPA 70 National Electrical Code (NEC) - Installation of electrical wiring and equipment
NFPA 497 Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Area