edibon

Engineering and Technical
Teaching Equipment

Biogas Process Unit

EBGB

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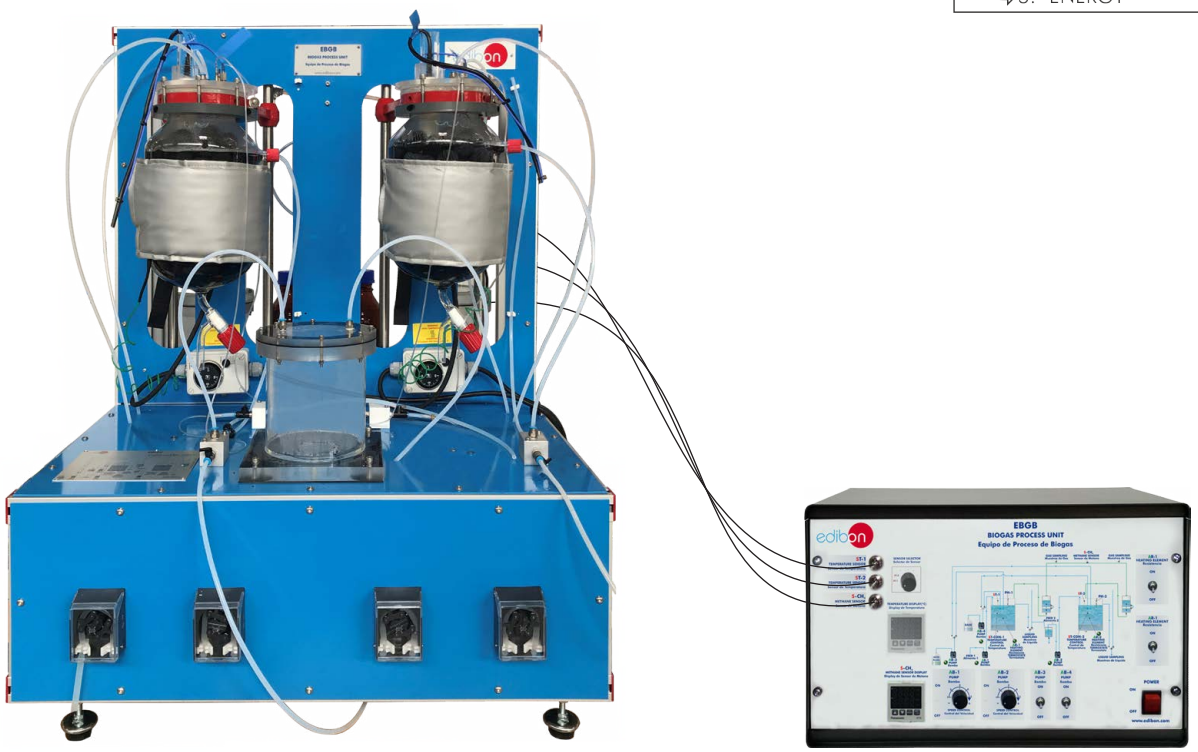
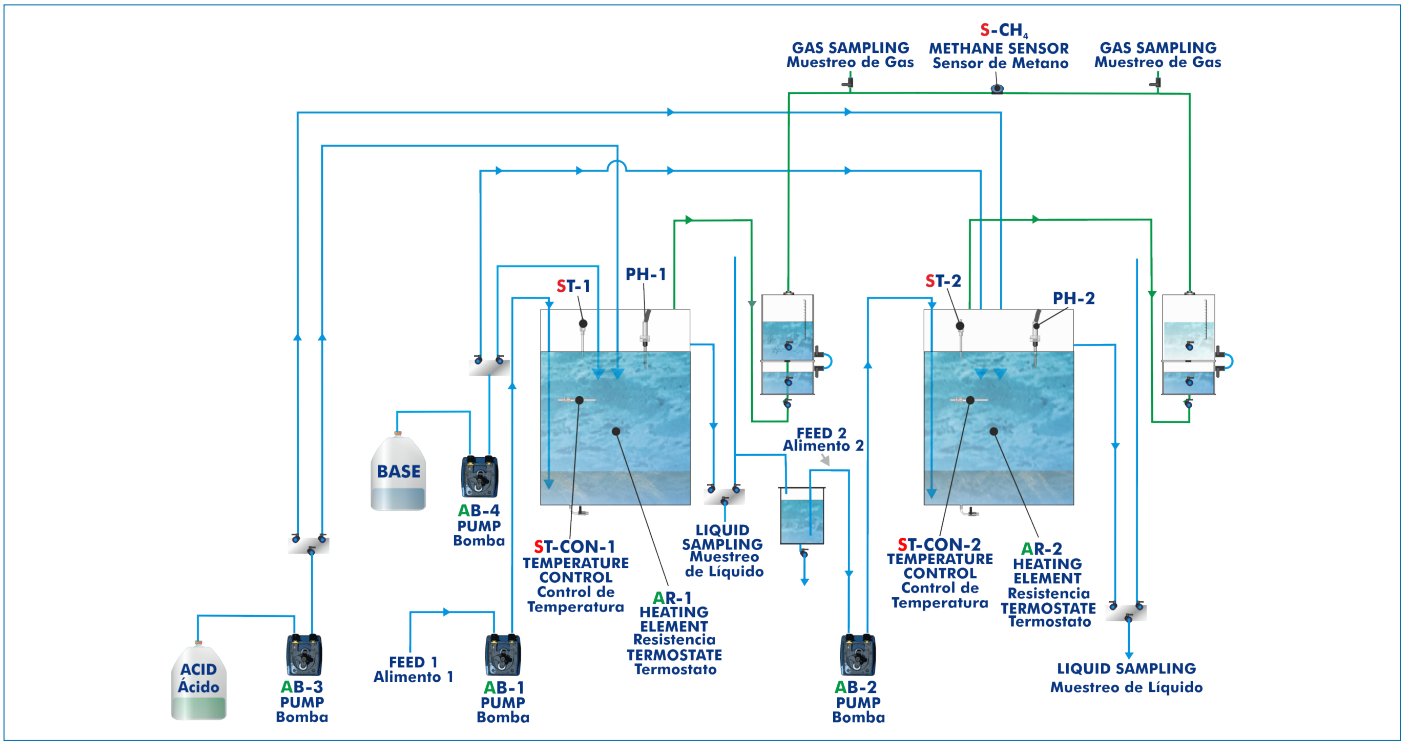
↳PRODUCTS
↳5.- ENERGY



Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



ISO 9001: Quality Management (for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate (total safety)

Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)

"Worlddidac Quality Charter" and Platinum Member of Worlddidac

INTRODUCTION

Anaerobic digestion (also known as methane fermentation) is a biological process that takes place naturally. In this process certain microorganisms break biodegradable material in the absence of oxygen. Biogas obtained in this process is a new energy source used in as a useful means of decontamination and as an alternate source of renewable energy.

Biogas generation through anaerobic breakdown is considered useful when treating biodegradable residues, since it generates valuable fuel, as well as an effluent that can be applied as a soil conditioning substance or generic fertilizer.

This gas can be used to generate electrical energy by means of turbines or power plants working with gas, in ovens, heaters, driers, boilers or other combustion systems working with gas, properly adapted to such application.

The Biogas Process Unit, "EBGB", is designed to study and understand the different processes given during the biogas generation through anaerobic breakdown, as well as the study of the different parameters that affect the anaerobic digestion itself and the value of the obtained biogas.

GENERAL DESCRIPTION

The Biogas Process Unit, "EBGB", is supplied with two packed anaerobic digesters. In this way, the user can work either in only one stage or in two stages, separating the different phases of the digestion process (the processes of hydrolysis, acidogenesis and acetogenesis would take place in the first digester, and the methanogenesis in the second digester).

Both digesters have a heating blanket that allows to regulate both the appropriate temperature for each part of the process and the operation with different ranges depending on the used microorganisms. Thus, it can operate at the psychrophilic range (room temperature), mesophilic range (temperatures around 35 °C) or thermophilic range (temperatures around 55 °C).

The unit has four peristaltic pumps which enable the propelling of both the supply to be introduced in the digester and the acid and the base (introduced in two vessels located at the rear side) in order to adjust and control thoroughly the pH in each stage of the process. In case of working in an anaerobic digestion in two stages, one of the pumps carries the product from one of the digesters to the other, passing through a buffer tank which collects the excess of flow from the first reactor. The control of these pumps allows to know the different flows with which the unit is working.

Two volumetric tanks are also included for the storage and volume measurement of the generated biogas. The generated biogas flows through a pipe from the upper side of the digesters to these tanks, where the biogas volume is measured by means of a water displacement. Such tanks have two parts: the upper side is where the generated biogas is collected and the second part, smaller than the first one and located below it, is used to collect the displaced water.

Each digester has a temperature sensor and a pH meter. Their function is to follow the whole process and study the influence of the different controlling parameters in the anaerobic digestion.

Finally, the volumetric tanks, by their upper side, enable the flowing of the collected biogas through a pipe and its passing through a methane sensor (CH_4) which allows to know the methane concentration in such current and this way, the biogas quality depending on four the physical-chemical conditions under which the anaerobic digestion is developed can be determined, as well as its value as a renewable energy source.

The unit is supplied with the suitable sensors and instrumentation for the most representative parameters measurements and controls (electronic console).

SPECIFICATIONS

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

Main metallic elements made of stainless steel.

Diagram in the front panel with distribution of the elements similar to the real one.

Two packed anaerobic digesters of 5 l. Reactors packing: 25 mm diameter bactoballs.

Two heating blankets of 120 W with a thermostat and a temperature probe to control the heating temperature. Temperature range: 0 – 90 °C.

Four peristaltic pumps.

Feeding flows measurement by the pumps calibration.

Two volumetric tanks for the storage and volume measurement of the generated biogas.

Buffer vessel, of 1 l of capacity.

Two glass vessels, of 1 l of capacity, for the acid and the base.

Methane sensor to measure its concentration in the generated biogas, 0 – 100 %.

Two pH meters, range: 0 – 14.

Two "J" type temperature sensors.

Electronic console:

- Metallic box.
- Temperature sensors connections.
- Digital display for the temperature sensors.
- Selector for the temperature sensors.
- Methane sensor connection.
- Digital display for the methane sensor.
- Pumps switches.
- Pumps controllers.
- Heating blankets switches.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices manuals.

EBGB detail

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Study of the stabilization process.
2.- Study of the effect of temperature in the anaerobic digestion, purification and quality of the obtained biogas.
3.- Study of the pH effect of the feeding waste water in the anaerobic digestion, purification and quality of the obtained biogas.
4.- Study of the influence of the feeding rate in the anaerobic digestion, purification and quality of the obtained biogas.
5.- Study of the influence of the type of the feeding waste water in the anaerobic digestion, purification and quality of the obtained biogas.
6.- Study of the concentration of nutrients influence of the feeding waste water in the anaerobic digestion, purification and quality of the obtained biogas.
7.- Study of the hydraulic load effect in the anaerobic digestion, purification and quality of the obtained biogas.
8.- Study of the inhibitors influence in the anaerobic digestion, purification and quality of the obtained biogas.
9.- Comparison between the mesophilic and thermophilic anaerobic digestion and their influence in the biogas obtention.
10.- Determination of the optimum operation temperature.
11.- Determination of the optimum feeding rate.
12.- Determination of the optimum solids/water relation.
13.- Determination of the optimum degradable/non degradable solids relation.
14.- Determination of the multistage nature in the anaerobic digestion.
15.- Determination of the kinetics.
16.- Carbon balance.
17.- Solids balance.
18.- Biogas balance.

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.
- Waste and feeding tank.
- Anaerobic sludge.
- Supply waste water.

DIMENSIONS AND WEIGHTS

EBGB:

Unit:

- Dimensions: 1000 x 800 x 1000 mm approx. (39.37 x 31.49 x 39.37 inches approx.)
- Weight: 70 kg approx. (154.32 pounds approx.)

Electronic console:

- Dimensions: 490 x 330 x 310 mm approx. (19.29 x 13 x 12.20 inches approx.)
- Weight: 10 kg approx. (22 pounds approx.)

SIMILAR UNITS AVAILABLE

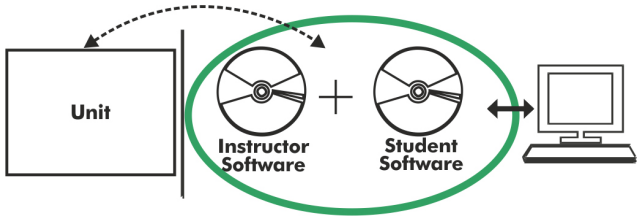
Offfered in this catalog:

- EBGB. Biogas Process Unit.

Offered in other catalog:

- EBGC. Computer Controlled Biogas Process Unit.
- PBGC. Computer Controlled Biogas Processing Plant.

EBGB/ICAI. Interactive Computer Aided Instruction Software:



With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF)**. Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

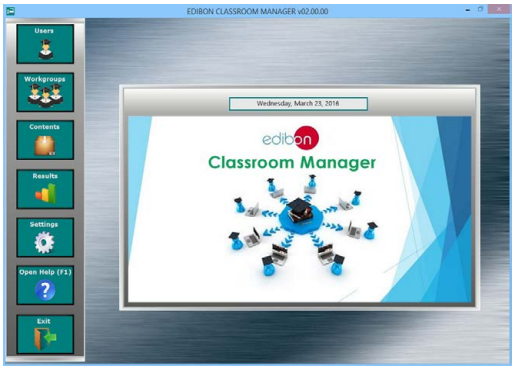
Instructor Software

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

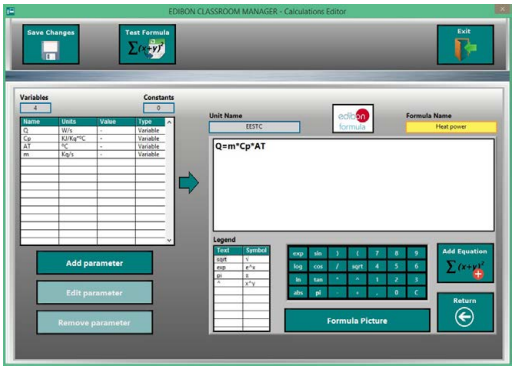
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

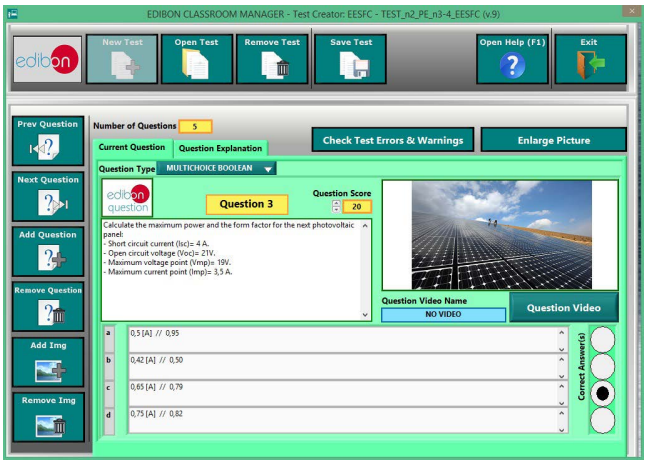
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation System Solver Engine.**
- **Updatable Contents.**
- **Report generation, User Progression Monitoring and Statistics.**



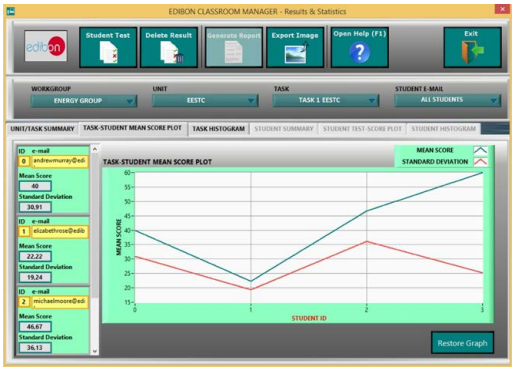
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question



ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

Optional

Student Software

- ESL-SOF. EDIBON Student Labsoft (Student Software).

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

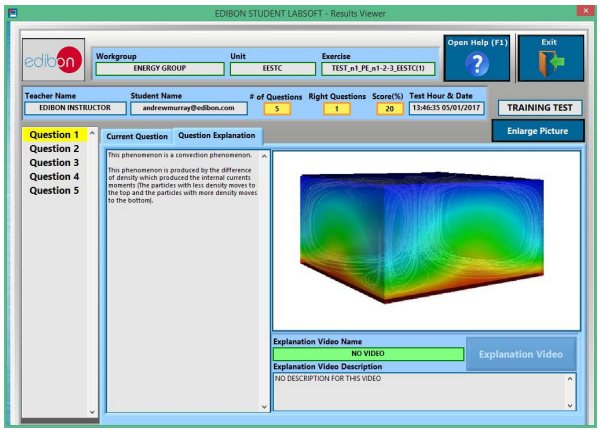
- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge and progression.**
- **Test self-correction.**
- **Calculations computing and plotting.**
- **Equation System Solver Engine.**
- **User Monitoring Learning & Printable Reports.**
- **Multimedia-Supported auxiliary resources.**

For more information see **ICAI** catalogue. Click on the following link:

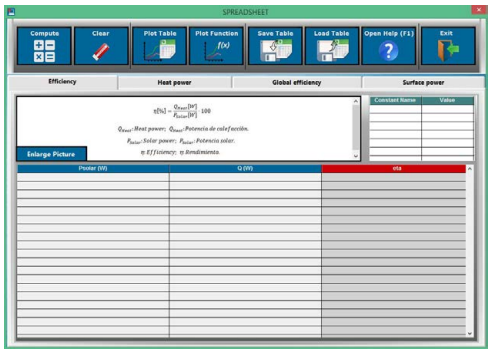
www.edibon.com/en/interactive-computer-aided-instruction-software

ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen

EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

✱ Specifications subject to change without previous notice, due to the convenience of improvement of the product.

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