Anaerobic Digester

PDAN

Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION
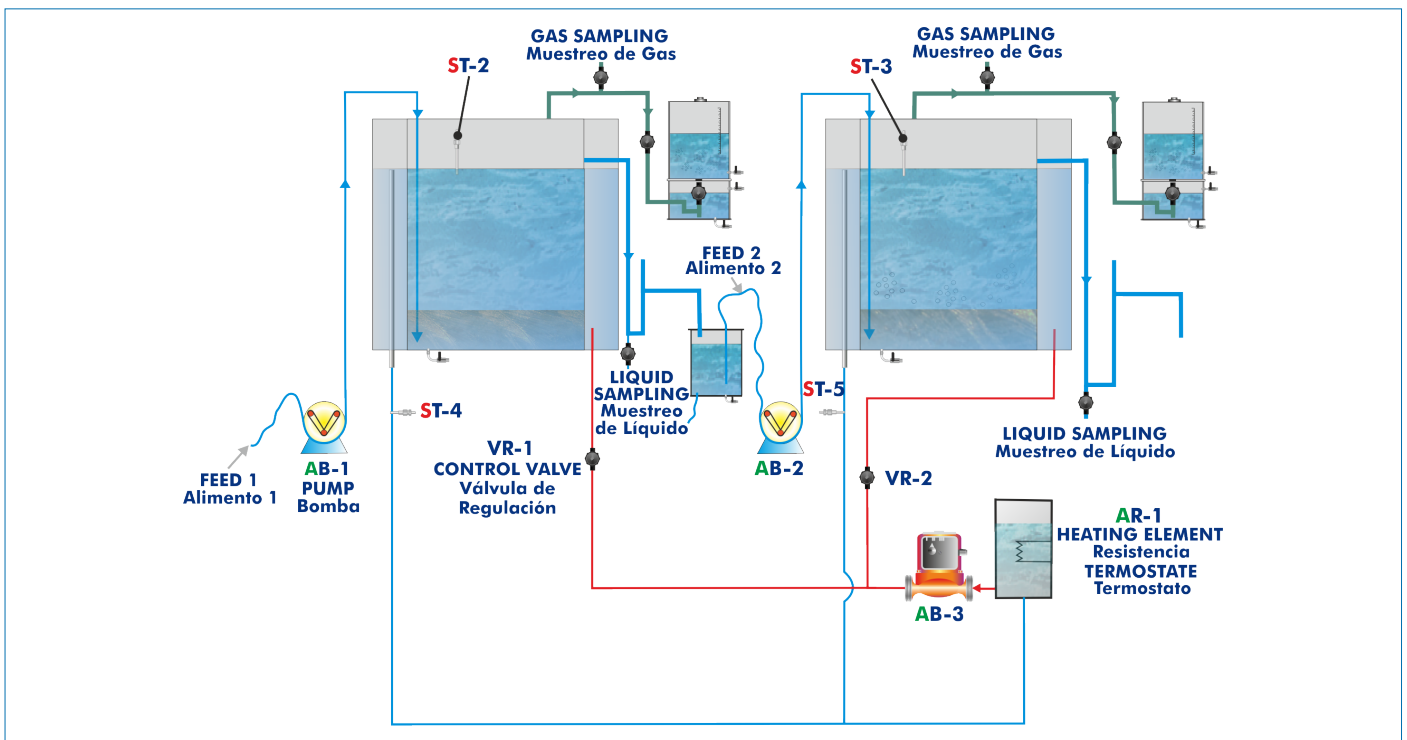
GAS SAMPLING
Muestreo de Gas

GAS SAMPLING
Muestreo de Gas

ST-2

ST-3

FEED 2
Alimento 2

LIQUID
SAMPLING
Muestreo
de Líquido

ST-4

ST-5

VR-1
CONTROL VALVE
Válvula de
Regulación

AB-2

LIQUID SAMPLING
Muestreo de Líquido

FEED 1
Alimento 1

AB-1
PUMP
Bomba

VR-2

AR-1
HEATING ELEMENT
Resistencia
TERMOSTATE
Termostato

AB-3

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 mean 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.

GENERAL DESCRIPTION

The objective of the Anaerobic Digester, "PDAN", is to study and understand the stages of the anaerobic digestion, as well as the anaerobic digestion process itself. It 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 water circuit with valves to regulate the appropriate temperature in each part of the process and the operation with different ranges depending on the microorganisms used. Thus, it can operate at the psychrophilic range (room temperature), mesophilic range (temperatures around 35 °C) or thermophilic range (temperatures around 55 °C). The heating system of the digesters consists in making hot water from a thermostatic bath flow through the jacket of the reactor.

The unit has two peristaltic pumps to impel the supply to be introduced in the digesters. When working with a two-stage anaerobic digestion, 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. Two flowmeters measure the working flows.

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.

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 bed reactors (Anaerobic digesters) that may be operated in series or parallel flow arrangement:

    Capacity: 5 l.

    Heating jacket.

    Reactor packing: 25 mm diameter BioBalls.

Two feed peristaltic pumps.

Water circulation pump of the thermostatic bath.

Thermostatic bath up to 60 °C.

Two volumetric tanks to measure and store the volume of gas generated.

Damping vessel, capacity: 1 l.

Two water flow meter; range: 0 - 50 cm³/min.

Five temperature sensors "J" type.

Electronic Console:

    Metallic box.

    Temperature sensors connections.

    Digital display for temperature sensors.

    Selector for temperature sensors.

    Pumps switches.

    Thermostatic bath switch.

    Main switch.

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.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Stabilization process study.

2.- Effect of temperature in the purification.

3.- Effect of the effluent pH in the digestion.

4.- Survey of the feeding rate in the purification.

5.- Study of the effluent strength.

6.- Study of the relation between the nutrient concentration in the effluent and purification.

7.- Study of the effect of the hidraulic charge in the purification.

8.- Study of the influence of the inhibitors to the anaerobic digestion.

9.- Comparison between mesophilic and termophilic anaerobic digestion.

10.-Determination of the optimal working temperature.

11.-Determination of the optimal feeding rate.

12.-Determination of the optimal solids/ water ratio.

13.-Determination of the optimal degradable/non-degradable.

14.-Demonstration of the multistage nature of anaerobic digestion.

15.-Kinematic determination.

16.-Carbon balance.

17.-Solids Balance.

18.-Biogas Balance.

19.-Study of the effect of pH.

20.-Influent nutrient concentration.

21.-Preparation, warming and acclimation of an anaerobic reactor.

22.-Effluent treatability studies, including solids, carbon and biogas balances for determining the purification (COD-BOD).

23.-Study of the effects on purification performance of:

Feed ratios.

Hydraulic loading.

Temperature.

Influent strength.

Nutrient deficiency.

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.

REQUIRED ELEMENTS (Not included)

- Feed and product tanks (40 l approx).

DIMENSIONS AND WEIGHTS

PDAN:

Unit:

-Dimensions: 1000 x 800 x 1000 mm approx.

(39.36 x 31.49 x 39.36 inches approx.)

-Weight: 50 Kg approx.

(110 pounds approx.)

Electronic console:

-Dimensions: 300 x 230 x 135 mm approx.

(11.81 x 9.05 x 5.31 inches approx.)

-Weight: 2 Kg approx.

(4.4 pounds approx.)

ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- For measurement of BOD, COD, alkalinity, suspended solids and total volatile acids.
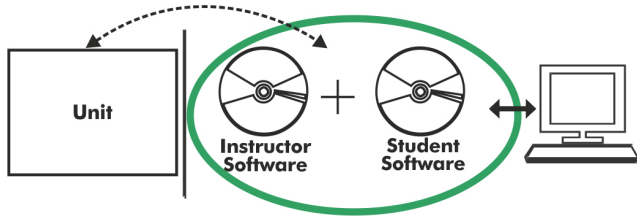
SIMILAR UNITS AVAILABLE

Offered in this catalog:

- PDAN. Anaerobic Digester.

Offered in other catalogs:

- PDANC. Computer Controlled Anaerobic Digester.

- PDA. Aerobic Digester.

- PDAC. Computer Controlled Aerobic Digester.

PDAN/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.
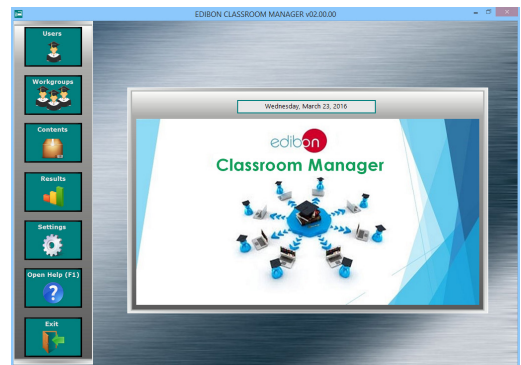
<u>Instructor Software</u>

- 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.

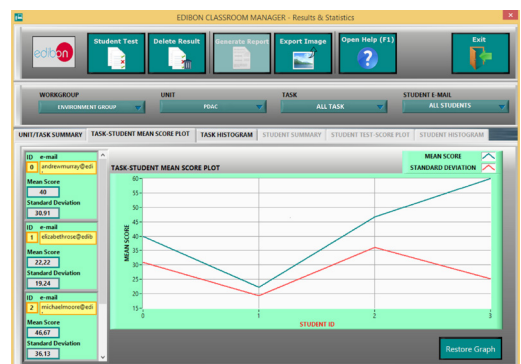• Report generation, User Progression Monitoring and Statistics.

ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen
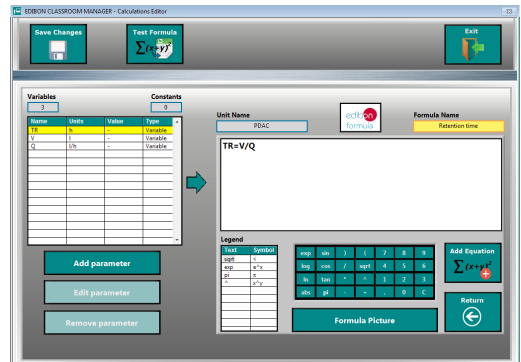
ECAL. EDIBON Calculations Program Package - Formula Editor Screen
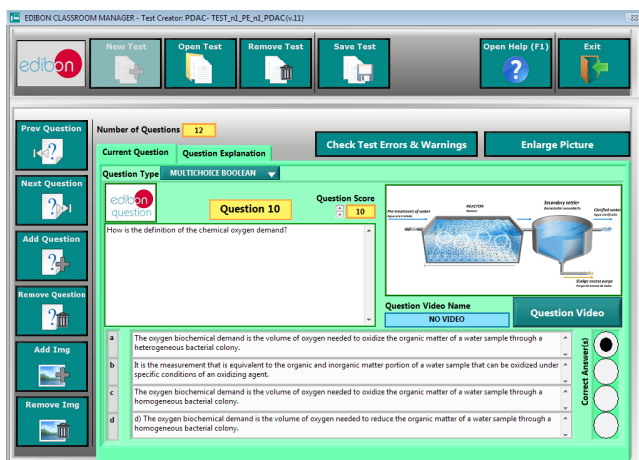
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

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

- 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.

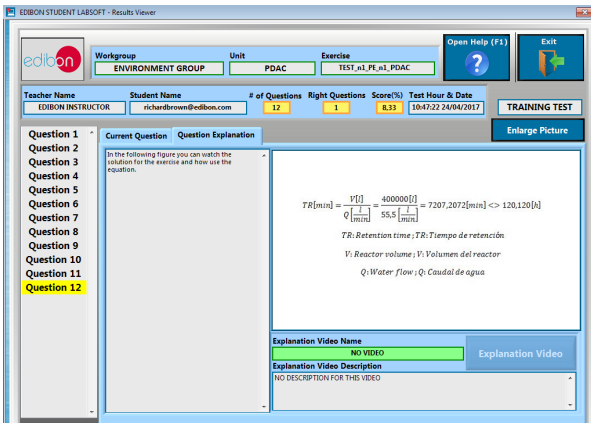For more information see **ICAI** catalogue. Click on the following link:
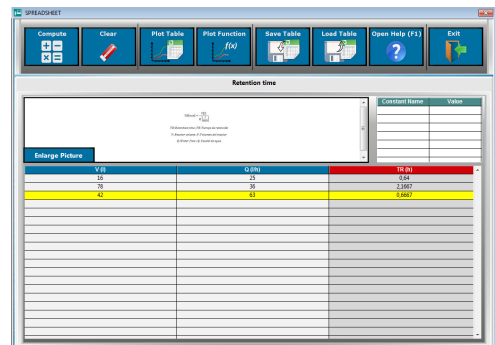www.edibon.com/en/files/expansion/ICAI/catalog

ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen
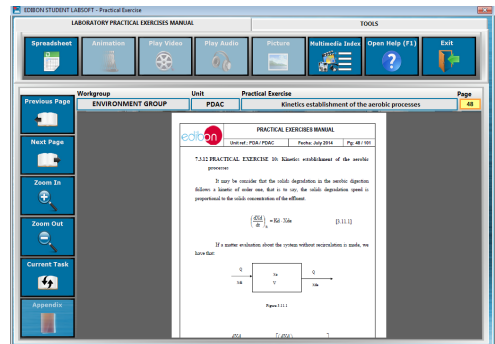
EPE. EDIBON Practical Exercise Program Package Main Screen

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.

REPRESENTATIVE: