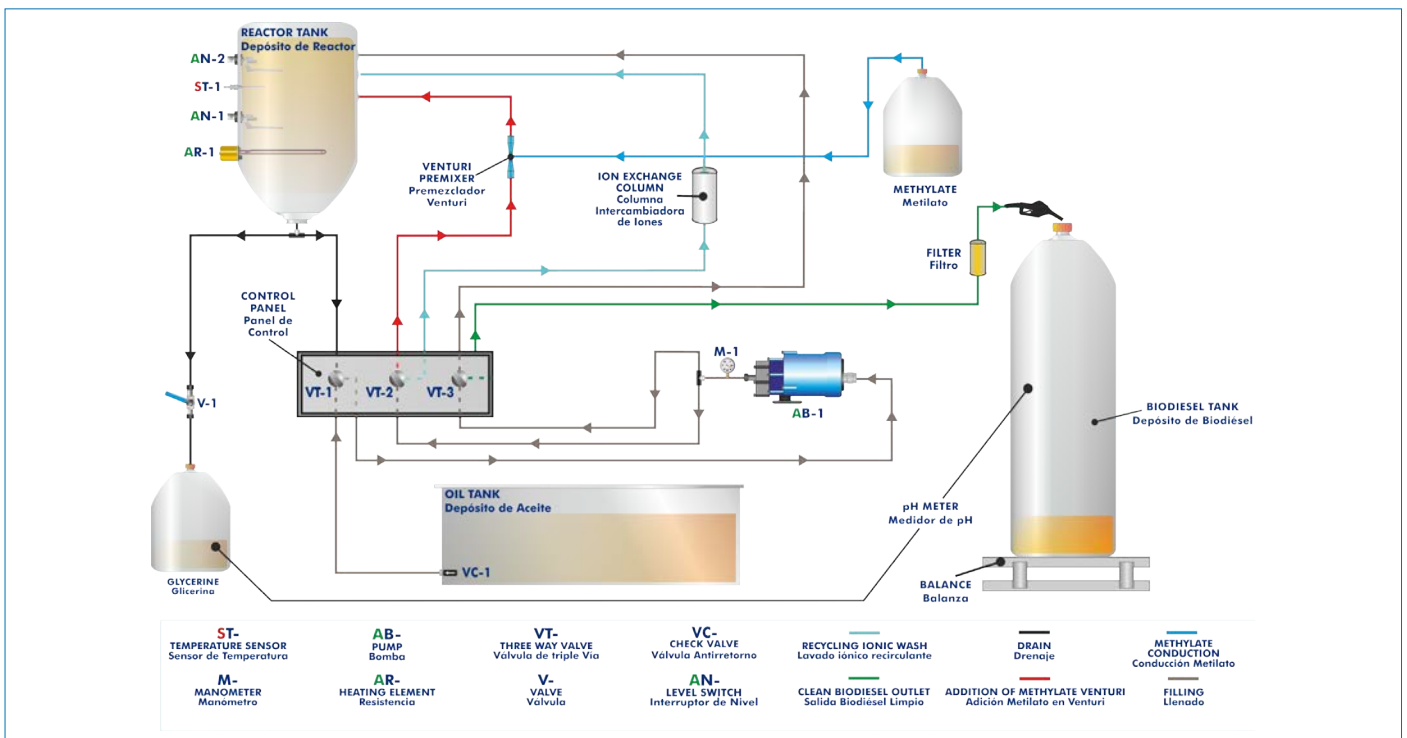




Electronic console

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)



Certificate and Worlddidac Member

INTRODUCTION

The Biodiesel Process Unit, "EBDB", developed by EDIBON, is a unit which allows the study of the biodiesel production cycle in different stages. Different parameters that affect the whole process, as well as the obtained biodiesel quality, may also be studied.

Biodiesel is a biological and renewable fuel. It is obtained from used or raw vegetable oils or animal fats. It is used in automobile engines as a substitute of the conventional fossil origin gas-oil.

Its main advantages are related to energy and the environment. Among the energy related advantages, we can mention that biodiesel constitutes a help for the energy diversification and farming sector activation. And among the environmental advantages we can mention the recycling of a residue such as used oil, or regarding the greenhouse effect, the fixation of the CO₂ emitted in the biodiesel combustion during the growth of the crops.

The Biodiesel Process Unit, "EBDB", produces biodiesel from vegetable oil and allows the user to analyze the process and all the variables involved.

GENERAL DESCRIPTION

The process carried out by the Biodiesel Process Unit, "EBDB", consists on transforming the fatty acids contained in vegetable oils into a high energy content biofuel.

Basically, the process consists of two well-defined stages:

Stage I: Mixing the products with the stirring technique. It consists on combining and stirring the raw materials required to make biodiesel (vegetable oil and a catalyst) under a homogenous heating provided by a heating element. This stage is carried out in a reactor made of polyethylene that includes a temperature sensor. The stirring consists in recycling the product driven by a pump.

Stage II: Separating and washing the products obtained. A second stage fundamental after the reaction is the separation of the main product from the rest of by-products. It is usually done with a first two-phase decantation, thanks to the conical shape of the reactor, to remove the glycerin and a biodiesel washing through ion exchange resin.

Finally, the efficiency of the unit and the quality of the biodiesel can be assessed thanks to a balance and a titration kit (pipettes, droppers, etc.).

SPECIFICATIONS

Anodized aluminum frame and panels made of painted steel.

The unit includes wheels to facilitate its mobility.

Main metallic elements made of stainless steel.

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

Recirculation hose made of specific polymer for fuels.

Venturi tube made of polymer resistant to chemicals and fuels.

Filter made of cellulose with pore size of 10 microns.

Purification compartment with ion exchange resin.

Single-phase pump specific for diesel oil:

Inside made of stainless steel.

Gaskets made of polymer resistant to chemicals and fuels.

Maximum flow rate: 80 l/min.

Maximum head: 25 m.

Reactor tank:

Conical vessel made of high density polyethylene resistant to fuels.

Lower outlet for decantation.

Capacity: 120 l.

Includes:

Heating element of 1.5 kW.

Two level switches made of polymer resistant to fuels.

"J" type temperature sensor.

Glycerin outlet tube and drain tap made of stainless steel.

Oil tank:

Vessel made of high density polyethylene resistant to fuels.

Capacity: 130 l.

Includes:

Removable funnel with cover.

Mesh filter for solid particles.

Methylate tank:

Vessel made of high density polyethylene resistant to chemicals.

Includes:

Lower tap to regulate the flow of product to be added.

Graduated volumetric scale up to 10 l.

Glycerin tank:

Vessel made of high density polyethylene resistant to fuels.

Capacity: 25 l.

Includes:

Lower tap with adjustable flow.

Graduated scale up to 25 l.

Biodiesel tank:

Vessel made of high density polyethylene resistant to fuels.

Capacity: 60 l.

Includes:

Lower tap with adjustable flow.

Graduated scale up to 60 l.

Meters:

Digital Balance to measure the biodiesel and glycerin mass obtained; range: 0 - 150 Kg.

pH meter to study the quality of the biodiesel obtained; range: 0 - 14 pH.

Manometer.

Titration kit:

Suitable bottle for methanol.

Bottle for titrant.

Four droppers of 7 ml.

Three glasses of 250 ml.

Pipette of 10 ml with hand pump.

Plastic wash bottle of 500 ml.

Electronic console:

Metallic box.

Temperature sensor connection.

Digital display for the temperature sensor.

Heating element switch and control.

Switch and regulator for the pump (0 - 100%).

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.- Study and performance of tests to determine the appropriate amount of catalyst to be used in the biodiesel generation process (titration).
 - 2.- Familiarization with the operation of a biodiesel production unit during the products reaction, extraction and washing process.
 - 3.- Study of the agitation and mixing level influence on the final quality of the obtained biodiesel.
 - 4.- Study of the washing and purifying stage influence on the final quality of the obtained biodiesel.
 - 5.- Study of the influence of temperature during the vegetable oilspreheating and reaction stage on the final quality of the obtained biodiesel.
 - 6.- Analysis and tests to determine the biodiesel quality.
- Additional practical possibilities:
- 7.- Study of vegetable oils transesterification with an alcohol to produce biodiesel.

REQUIRED SERVICES

- Electrical supply: single-phase, 220 V/50 Hz or 110 V/60 Hz.

RECOMMENDED CONSUMABLES (Not included)

- For the production of 60 l of high quality biodiesel (every 24 hours):
60 l of raw or used oil.
8 l of methanol.
Catalyst (liquid methylate NaOH or KOH are recommended).
Titration indicator.

DIMENSIONS AND WEIGHTS

EBDB:

Unit:

-Dimensions: 1800 x 810 x 1550 mm approx.
(70.86 x 31.89 x 61.02 inches approx.)

-Weight: 160 Kg approx.
(352.74 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.)

AVAILABLE VERSIONS

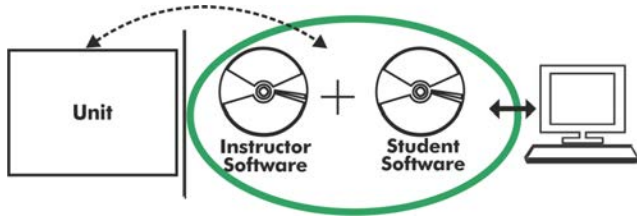
-EBDB. Biodiesel Process Unit.

Offered in this catalogue:

-EBDC. Computer Controlled Biodiesel Process Unit.

Offered in other catalogue:

EBDB/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer (PC), 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:

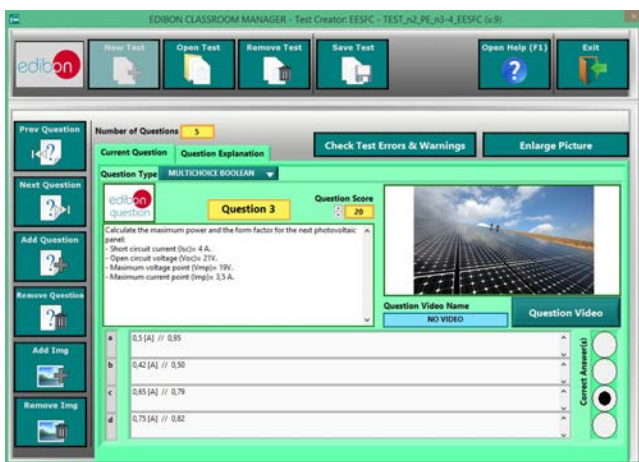
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- 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:

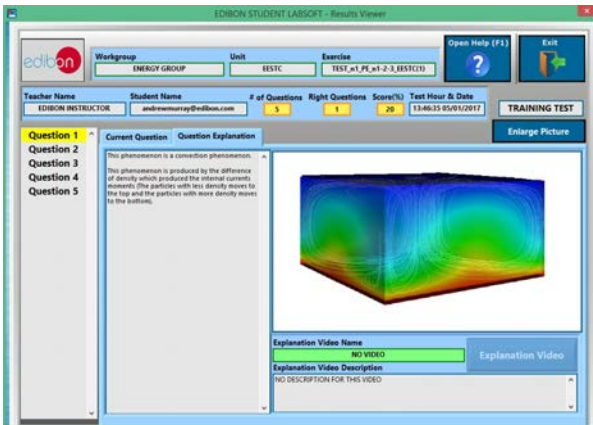
www.edibon.com/en/files/expansion/ICAI/catalog



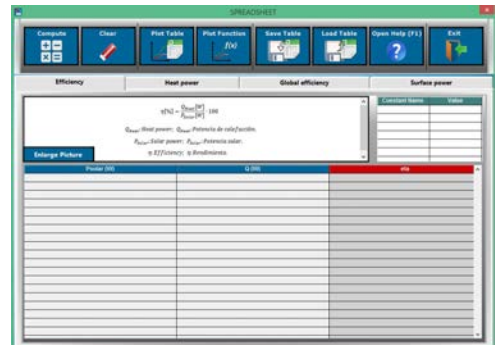
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



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.



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REPRESENTATIVE:

