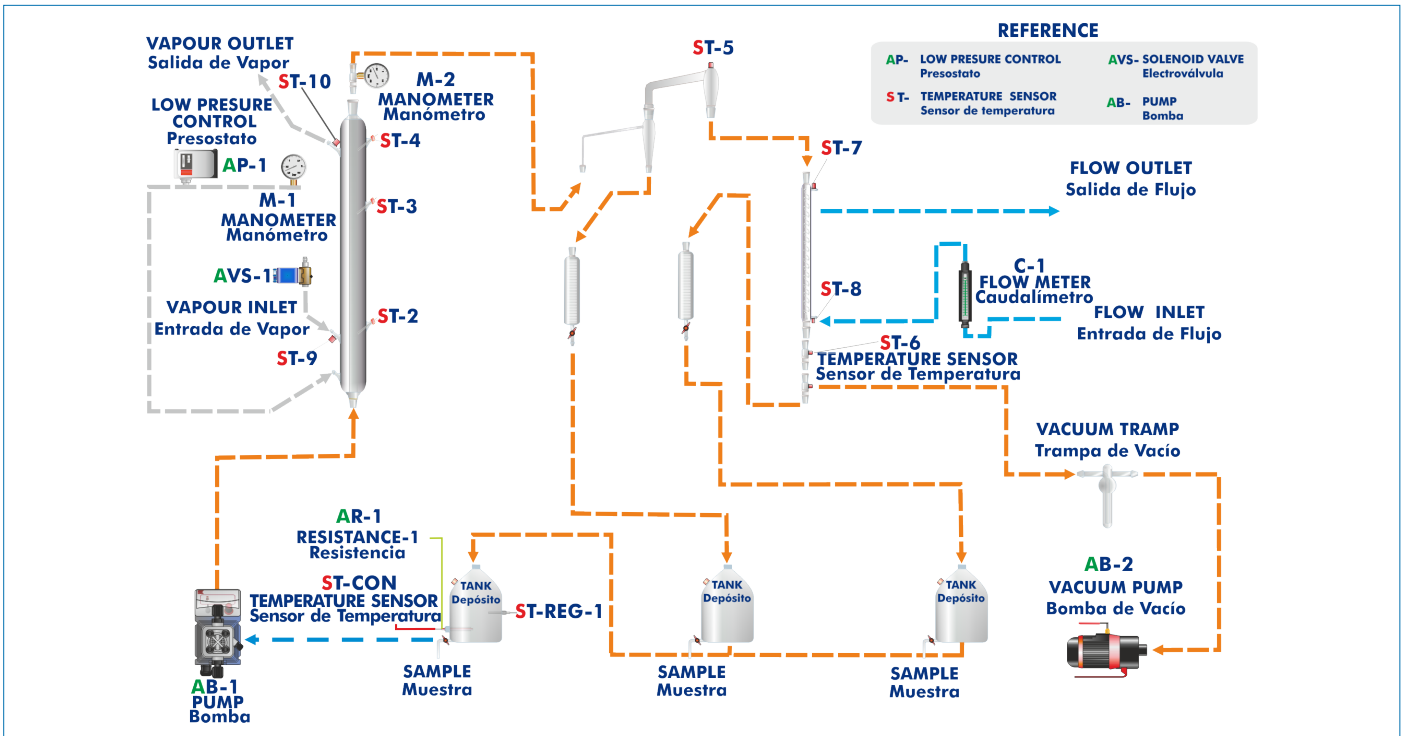




Electronic console

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

The objective of the evaporation is to concentrate a solution containing a non-volatile solute and a volatile solvent. In most evaporation processes the solvent is water. Evaporation means vaporizing part of the solvent to obtain a concentrate solution of thick liquor.

Rising or falling film evaporators are very useful if the product to be concentrated breaks down easily when subjected to high temperatures for a long period of time, since these evaporators work at a lower temperature. These evaporators can be used to concentrate, for example, juices, milk and dairy products, effluents, etc.

The multiple effect method is used to improve the global thermal economy of the process without increasing the capacity of the plant.

The Rising Film Evaporator, "EPAB", designed by EDIBON, allows to study the operating processes of a rising film evaporator. It allows the monitoring of all the variables for a complete study of the process according to the working conditions and to investigate the effects of the variation of process parameters such as: vacuum, temperature, flow, etc. in the rising film evaporation.

GENERAL DESCRIPTION

The objective of evaporation is to concentrate a non-volatile solute, carrying out the elimination of a volatile compound. Water is the volatile compound used in most evaporations.

Basically, the Rising Film Evaporator, "EPAB", consists of the following circuits:

The feed circuit that consists on a feed pump that introduces the product in a double jacket column, which has temperature sensors. The product leaves the tank through a cyclone placed at the output of the column and it is collected in a 500 ml graduated vessel. The vessel is also connected to a 10 l tank for the storage of the concentrated product. This last tank is connected to the feed tank for its recirculation.

The distillation circuit starts at the top of the column, where a joint with a pressure meter has been assembled. It is also connected to the cyclone to separate the concentrated product and the distilled one that goes through a spiral condenser. The distilled product is stored in a graduated vessel that is connected to a 10 l collection tank. This last one is connected to the feed tank for its recirculation in a continuous process.

The steam circuit, introduced in the external jacket of the column, contains a pressure meter for the control of the temperature of steam. This meter is connected to a high-pressure cutout control that opens or closes a control electrovalve for the steam supply.

The vacuum circuit consists on a vacuum pump; one trap placed at the output of the condenser and other trap placed at the output of the cyclone.

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.

Evaporation double jacket column, with a heating surface of 0.122 m², 30 mm of internal diameter, 60 mm of external diameter and 1300 mm of length.

Membrane dosing pump, maximum flow 15 l/h, with flow control.

Single effect vacuum pump, maximum flow 3 m³/h and maximum vacuum of 150 microns.

Three tanks, capacity: 10 l (for feeding, concentrated and evaporated).

Two graduated vessels for the storage of concentrated and evaporated product, capacity: 500 ml.

Coil coolant with length of 400 mm.

Heating element, range: 300 W.

Pressure safety cut out for pressure control in the column.

Ten temperature sensors, type "J".

Flow meter (0.2 – 2 l/min).

Two manometers (0 – 2.5 bar).

Solenoid valve.

Electronic console:

Metallic box.

Temperature sensors connections.

Digital display for temperature sensors.

Selector for temperature sensors.

Pumps switches.

Heating resistance switch.

Heating resistance temperature control.

Solenoid valve connection.

Pressure safety cut out connection.

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.

Required elements (Not included):

- TGV. Steam Generator (3 kW).

Additional recommended elements (Not included):

- EPDC. Falling Film Evaporator.



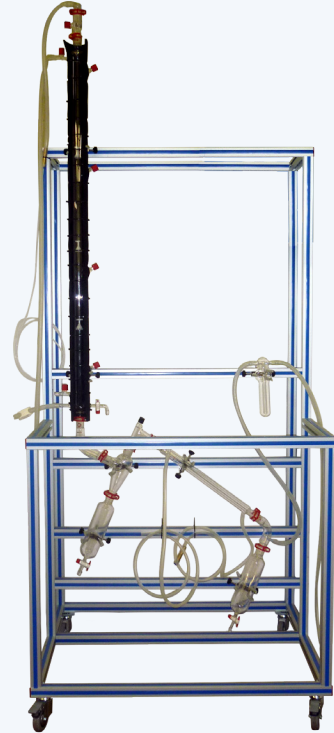
EPAB detail

Additional Recommended elements (Not included):

EPDC. Falling Film Evaporator

Basically, it consists of the following elements:

- Falling film evaporation column with jacket for the steam and temperature takings.
- Cyclone to favor the separation of the most volatile component from the least volatile component.
- Vessel of 500 ml to collect the concentrated product, located under the cyclone.
- Liebig-Wet refrigerant to condense the distilled product (useful length of 400 mm).
- Vessel to collect the evaporated.



EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Determination of the capacity of the evaporator.
- 2.- Study of the capacity of the evaporator in function of the work conditions.
- 3.- Study of the relation between condensed product and evaporated product.
- 4.- Verification of the mass balance over all system.
- 5.- Study of the mass balance of the solute.
- 6.- Verification of the mass balance of the water.
- 7.- Determination of the concentration of a sugared solution.
- 8.- Calculate the enthalpy of the volatile vapours.
- 9.- Calculate the mass of steam is used by means of an energy balance calculation.
- 10.-Determination the economy of evaporator.
- 11.-Energy balance of the tubular condenser.
- 12.-Determination of the heat transfer global coefficient.
- 13.-Determination of the Cl coefficient for a tubular condenser.
- 14.-Investigation of effect of varying process parameters such as: vacuum, flow rate, temperature, recycle rate.
- 15.-Fruit juices and vegetable extracts concentration.
- 16.-Concentrated milk obtaining.
- 17.-Determination of the efficiency of the steam generator.

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

- EPAB:
Unit:
- Dimensions: 1000 x 805 x 2300 mm approx.
(39.37 x 31.69 x 90.55 inches approx.)
 - Weight: 115 Kg approx.
(253.5 pounds approx.).
- Electronic console:
- Dimensions: 490 x 330 x 310 mm approx.
(19.29 x 12.99 x 12.20 inches approx.).
 - Weight: 10 Kg approx.
(22 pounds approx.).

REQUIRED ELEMENTS (Not included)

- TGV. EDIBON Steam Generator (3 kW), or similar steam generator.
- Stopwatch.

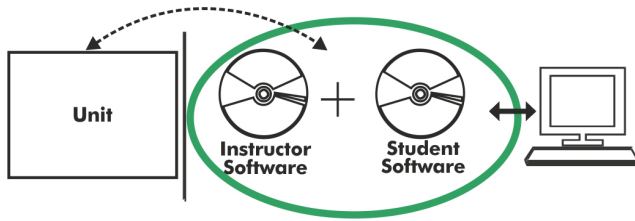
ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- EPDC. Falling Film Evaporator.

SIMILAR UNITS AVAILABLE

- Offered in this catalog:
- EPAB. Rising Film Evaporator.
- Offered in other catalogs:
- EPAC. Computer Controlled Rising Film Evaporator.
 - EPDC/C. Computer Controlled Falling Film Evaporator.
 - EDPAC. Computer Controlled Double Effect Rising Film Evaporator.
 - EDPAB. Double Effect Rising Film Evaporator.

EPAB/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.

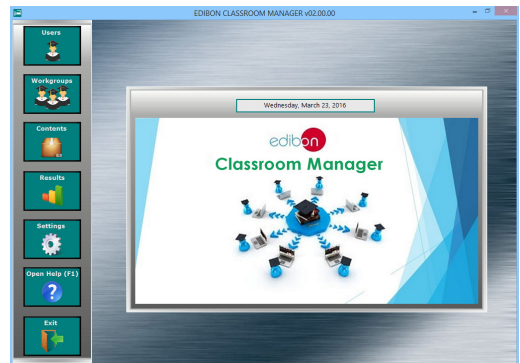
Instructor Software

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

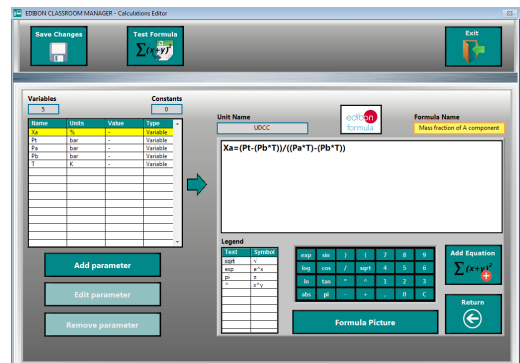
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

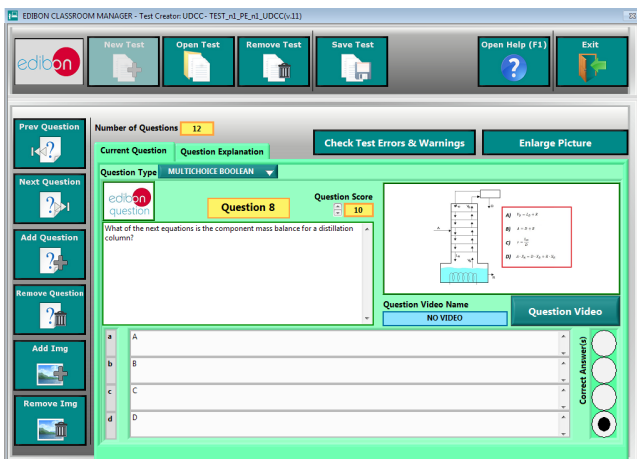
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



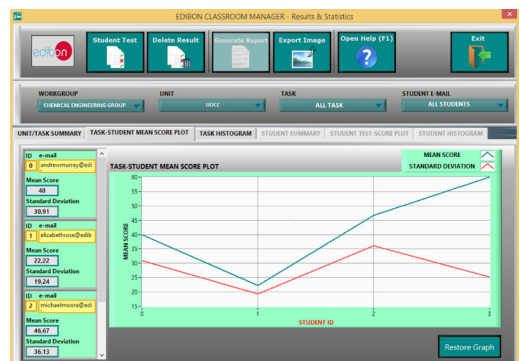
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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

