Absorption Refrigeration Unit

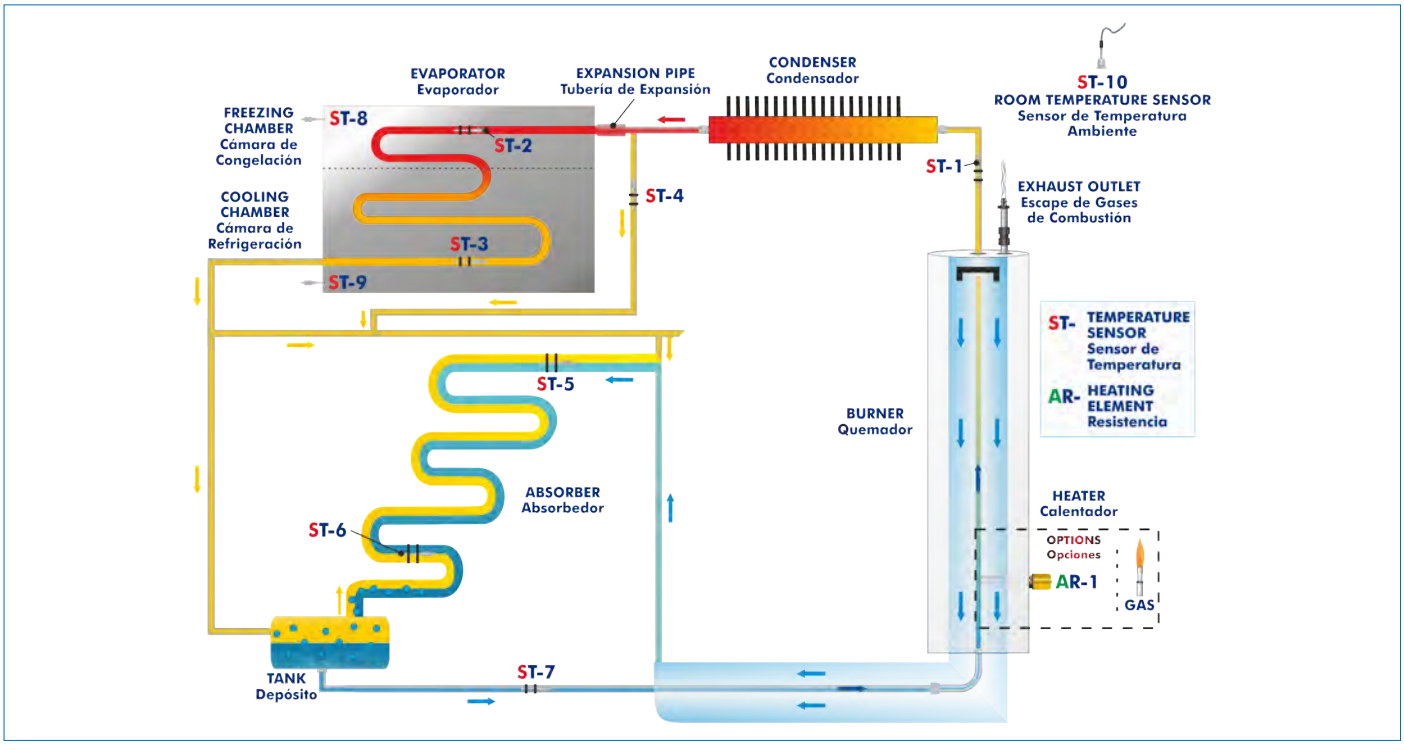
TRAB

Engineering and Technical Teaching Equipment

www.edibon.com
PRODUCTS
9.- THERMODYNAMICS & THERMOTECHNICS

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 absorption refrigeration system is a means to generate cold that makes use of the fact that substances absorb heat when changing from liquid to gas state. These systems are based on the principle that certain substances, known as absorbents, are good absorbing vapors from other substances, known as refrigerants, thus generating enough pressure decrease for the refrigerant evaporation and consequent refrigeration.

The Absorption Refrigeration Unit, "TRAB", designed by EDIBON, is a unit that enables the students to learn about devices that use absorption cycles to refrigerate.

The importance of these devices in large installations is increasing, since they generate cold from the residual heat of some manufacturing processes. Nowadays, more and more cogeneration thermal plants (electric energy + heat) use their residual heat as a thermal source to operate absorption machines, introducing the concept of trigeneration (electricity, heat and cold generation).

As a result, by using the "TRAB" unit, students will familiarize with each of the individual components of an absorption refrigeration unit (freezing and cooling) and will have the possibility of selecting the heat source between an electrical resistance or LPG.

GENERAL DESCRIPTION

The Absorption Refrigeration Unit, "TRAB", developed by EDIBON, is a complete laboratory unit for the demonstration of absorption refrigeration.

This unit is provided with a dual power source (heat source) of LPG and electricity. A pressure regulator to adapt the gas to the corresponding inlet pressure (30 – 50 mbar) is supplied for the operation with LPG.

TRAB detail

The fluid used in the refrigeration cycle of the "TRAB" unit is a solution of water and ammonia (NH_3), being ammonia the refrigerant and water the absorbent. An important advantage is that these agents are totally innocuous for the environment. The cycle uses the great affinity of ammonia with the water, being the ammonia used as refrigerant since it is easily absorbed by water.

The water and ammonia solution is heated at a high pressure in the generator or heater. Two substances are separated then by boiling: on one hand, vapour with a high concentration of ammonia, called concentrated solution, and on the other hand, a liquid solution with a low concentration of ammonia, called diluted or poor solution.

Vapour passes through a condenser (finned exchanger) where it is cooled until it condenses and passes to liquid state, reducing its temperature.

This ammonia concentrated solution enters a heat exchanger, where it is further cooled and its pressure is reduced to enter the evaporator.

Due to this pressure difference, it is evaporated at a low temperature.

The unit includes a tank for the absorber, where the solution rich in ammonia in liquid state formed by the absorber and the ammonia vapour from the evaporator stay together.

The absorber makes it possible to obtain a low pressure in the evaporator, so that the refrigerant (ammonia) boils at a lower temperature, taking the required heat from the water, reducing its temperature.

The liquid solution rich in ammonia coming from the absorber is heated in the generator to separate the pure ammonia vapours and the water (absorber). Ammonia vapours go to the condenser and the poor solution goes to the absorber, where the absorption of the ammonia in vapour state is generated again.

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.

Condenser: finned exchanger.

Evaporator.

Absorber.

Absorption tank.

Compartment with freezing zone and cooling zone with one temperature sensor in each zone.

Solenoid valve.

Generator or heater, possibility to select the heat source between an heating element or LPG:

- To work with LPG:
  - Burner and piezoelectric igniter: to ignite the flame of fuel.
  - Pressure regulator with manometer (range 0 – 3 bar) to regulate the LPG inlet pressure to the generator.
- To work with an electrical heating element:
  - Electrical heater: 230 V, 125 W.
  - Control of power.

Instrumentation:

- Ten temperature sensors distributed at key points of the unit.
- Sensors for the power by the electrical heating element.

The unit includes all the safety measures required for a safe operation:

- The unit is perfectly watertight to avoid ammonia leakages.
- Safety pushbutton.

Electronic console:

- Metallic box.
- Connectors for the temperature sensors.
- Sensor selector for temperature sensors.
- Digital display for temperature sensors.
- Heating element switch.
- Heating element regulator.
- Digital display for the power of the heating element.
- Main switch.

Cables and Accessories, for normal operation.

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

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Demonstration of the refrigeration process.

2.- Demonstration of the vapour absorption refrigeration cycle and visualization of the most important processes.

3.- Familiarisation with the individual components of the absorption refrigeration unit.

4.- Operation of the gas absorption refrigeration unit using either an electric element or LPG as the heat source.

5.- Comparison of the refrigeration temperature obtained using LPG or an electrical element as heat source.

6.- Measurement of the electrical power.

7.- Influence of the electrical power in the refrigeration temperature obtained.

8.- Measurement of the temperature in the main points of the absorption refrigeration process.

REQUIRED SERVICES

- Electrical supply: single-phase, 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.
- The unit must be operated in a ventilated space with fume extraction system.

DIMENSIONS AND WEIGHTS

TRAB:

Unit:

-Dimensions: 700 x 700 x 700 mm approx.
(27.55 x 27.55 x 27.55 inches approx.)

-Weight: 70 kg approx.
(154.32 pounds approx.)

Electronic console:

-Dimensions: 490 x 330 x 310 mm approx.
(19.29 x 12.99 x 12.2 inches approx.)

-Weight: 10 kg approx.
(22 pounds approx.)

REQUIRED CONSUMABLES (Not included)

- LPG gas. Fuel consumption = 18 g/h at 30 – 50 mbar (the unit is supplied with a pressure regulator).

SIMILAR UNITS AVAILABLE

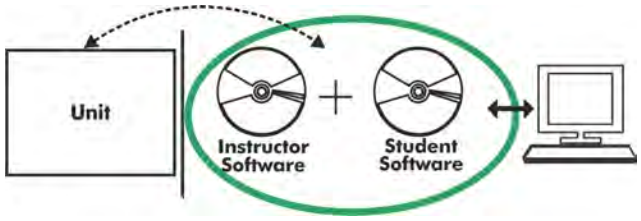
Offered in this catalogue:

- TRAB. Absorption Refrigeration Unit.

Offered in other catalogue:

- TRAC. Computer Controlled Absorption Refrigeration Unit.

TRAB/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.

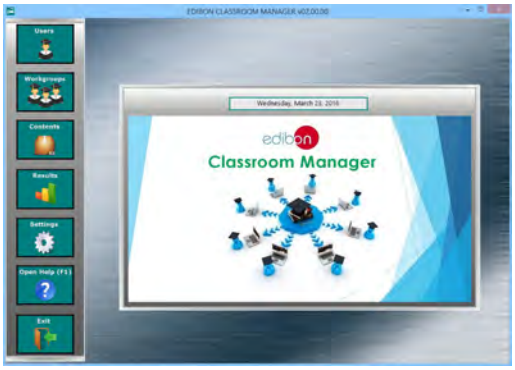
Instructor Software

- 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.

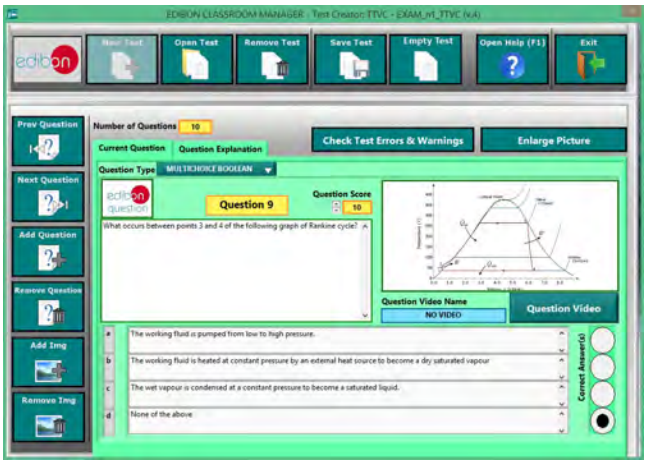
Innovative features:

- **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.

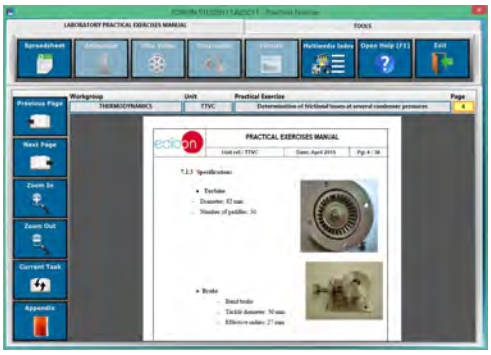
Innovative features:

- **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.**

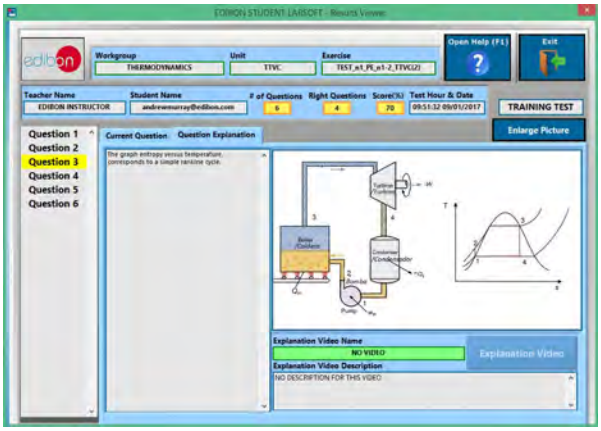
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen

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

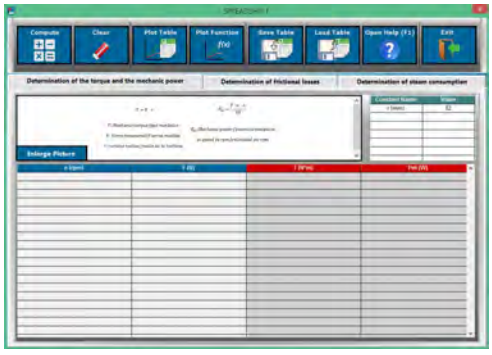
www.edibon.com/en/files/expansion/ICAI/catalog



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: