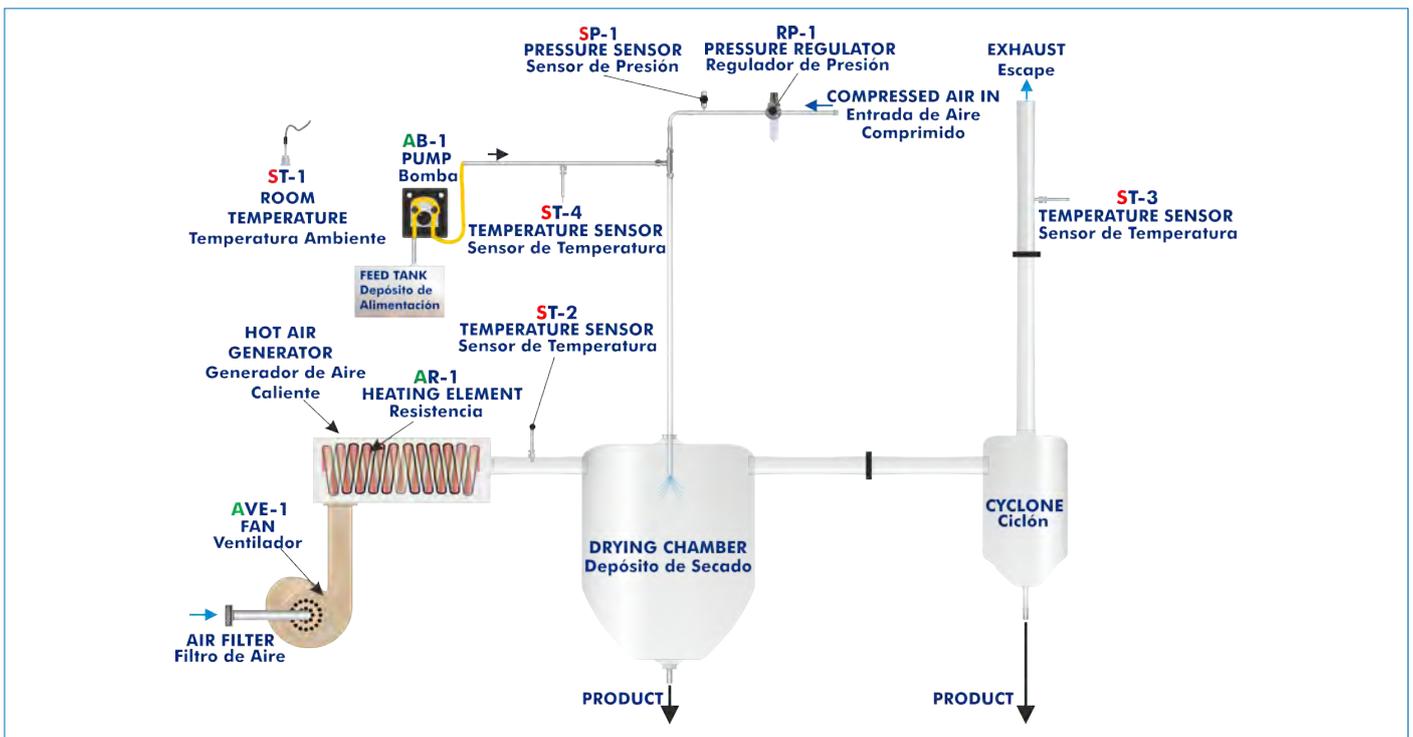




PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



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

Drying is the process by which an amount of water from a substance is totally or partially eliminated. Therefore, this definition can be applied to solids, liquids or gases. Drying or dehydration is a food-conservation process that makes it possible to eliminate a big amount of water from the product, inhibiting all microbial or enzymatic activity that deteriorates it.

Spray or atomization drying is a drying process in which a liquid substance is dispersed in very fine dewdrops in the middle of a current of hot gases. This way, the humidity in each drop evaporates very quickly, leaving residual particles of dry powder, which have to be separated from the air current.

This technique can be used in a wide range of applications where the production of a free flowing powder sample is required. This technique has successfully processed materials in the following areas: beverages, milk and egg products, plant and vegetable extracts, heat sensitive materials, fish extracts, cereals, etc.

GENERAL DESCRIPTION

The Spray Drier, "SSPB", allows to study processes that involve aqueous emulsions, solutions, suspensions and colloidal solutions.

A peristaltic pump delivers the liquid sample from a container through a small diameter jet into the drying chamber. At the same time compressed air enters the outer tube of the jet which causes the liquid to emerge as a fine atomized spray into the drying chamber. Heated air is blown through the drying chamber evaporating the liquid content of the atomized spray.

The solid particles of the material are separated from the exhaust air flow by a cyclone and collected in the sample collection bottle. The exhaust airflow is directed to the atmosphere or to an extraction system existing in the laboratory.

SPECIFICATIONS

Bench mounted spray drier for processing aqueous emulsions, solutions, suspensions and colloids. This unit is suitable for aqueous solutions only.

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

Downward co-current operation (a fine jet of the product is brought into contact with a hot air stream).

The unit components are made of glass with gasket free ground glass flanges.

The unit includes a panel at the top of the frame with 4 displays for the temperature sensors, switch on/off for the feed pump and feed pump speed controller, switch on/off for the fan and switch on/off for the heating element (resistance).

Characteristics:

Maximum drying capacity: 1000 ml/h approx.

Temperature range: 40 - 200°C (temperature at inlet).

Dry air volume range: 0.2 - 0.65 m³/min.

Spray air pressure range: 0.5 - 2.5 kg/cm².

Feed pump volume range: 102 - 1800 ml/h approx.

Maximum air pressure: 70 mbar.

The chemically resistant powder coated housing includes the fan and heating element (resistance).

All clamps and fittings are designed to allow assembly and removal of the glass elements rapidly and easily.

Fan:

Power: 0.4 kW.

Velocity: 3000 rpm.

Drying air throughflow: 70 m³/h (fixed).

Heating element (resistance) of 3 kW.

Drying chamber:

Material: borosilicate glass.

It includes a spray nozzle, diameter: 0.5 mm.

The spray assembly incorporates a manual de-blocking device that prevents the jet nozzle from becoming blocked.

Feed pump: peristaltic pump.

Cyclone:

Material: borosilicate glass.

Sample collection bottle:

Material: hard glass.

Volume: 500 ml.

Exhaust tube:

Outer diameter: 50 mm.

Filter/air regulator located between the compressor (not included) and the unit to ensure that the drying air does not include contaminants.

Four temperature sensor type "J" to measure:

Environmental temperature.

Air inlet temperature in the drying chamber.

Exhaust air temperature.

Feed temperature.

Glass vessel, volume: 1 l.

Cables and Accessories, for normal operation.

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

EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Operation principle of a spray drier.
 - 2.- Effect of the drop size on the drying process.
 - 3.- Effect of the air input temperature on the drying process.
 - 4.- Effect of the feed flow of the product on the drying process.
 - 5.- Mass balance of a spray drier.
 - 6.- Spray drier efficiency.
- Additional practical possibilities:
- 7.- Energy balance of a spray drier.

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.
- Compressed air supply (approx. 45 l/h at 8 bar).

DIMENSIONS AND WEIGHTS

- SSPB:
- Dimensions: 500 x 500 x 1200 mm approx.
(19.68 x 19.68 x 47.24 inches approx.)
 - Weight: 80 Kg approx.
(176.36 pounds approx.).

REQUIRED ELEMENTS (Not included)

- Measuring flask.
- Weighing scale.

REQUIRED CONSUMABLES (Not included)

- Whole milk or any other fluid to be treated.

SIMILAR UNITS AVAILABLE

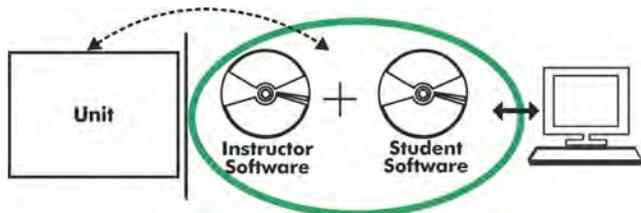
- SSPB. Spray Drier.

Offered in this catalogue:

- SSPC. Computer Controlled Spray Drier.

Offered in other catalogue:

SSPB/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.

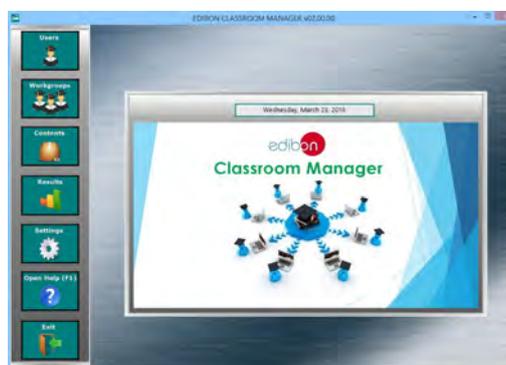
Instructor Software

- 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:

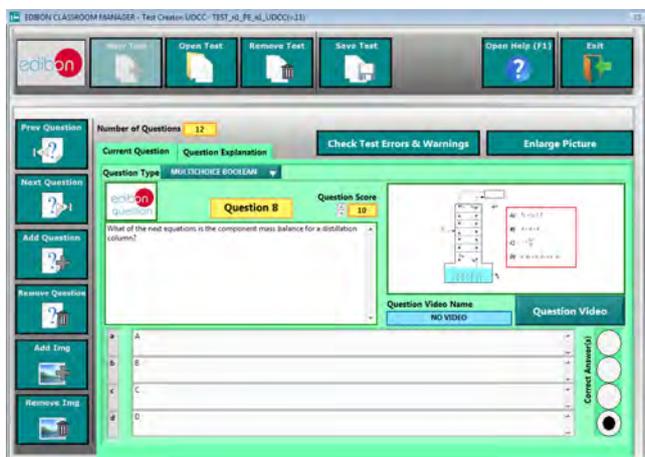
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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

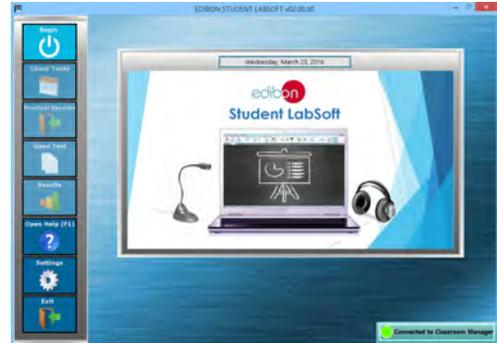
ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are 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:

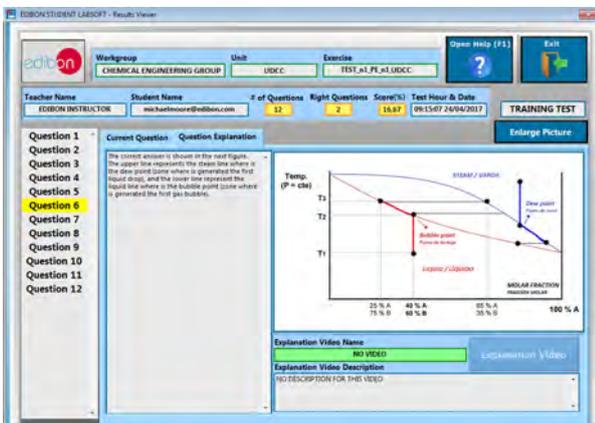
www.edibon.com/en/files/expansion/ICAI/catalog



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

| | F1 (kmol) | F2 (kmol) | F (kmol) | T (kmol) | X (kmol) |
|----|-----------|-----------|----------|----------|----------|
| 1 | 10 | 10 | 20 | 20 | 0.50 |
| 2 | 10 | 10 | 20 | 20 | 0.50 |
| 3 | 10 | 10 | 20 | 20 | 0.50 |
| 4 | 10 | 10 | 20 | 20 | 0.50 |
| 5 | 10 | 10 | 20 | 20 | 0.50 |
| 6 | 10 | 10 | 20 | 20 | 0.50 |
| 7 | 10 | 10 | 20 | 20 | 0.50 |
| 8 | 10 | 10 | 20 | 20 | 0.50 |
| 9 | 10 | 10 | 20 | 20 | 0.50 |
| 10 | 10 | 10 | 20 | 20 | 0.50 |
| 11 | 10 | 10 | 20 | 20 | 0.50 |
| 12 | 10 | 10 | 20 | 20 | 0.50 |
| 13 | 10 | 10 | 20 | 20 | 0.50 |
| 14 | 10 | 10 | 20 | 20 | 0.50 |
| 15 | 10 | 10 | 20 | 20 | 0.50 |
| 16 | 10 | 10 | 20 | 20 | 0.50 |
| 17 | 10 | 10 | 20 | 20 | 0.50 |
| 18 | 10 | 10 | 20 | 20 | 0.50 |
| 19 | 10 | 10 | 20 | 20 | 0.50 |
| 20 | 10 | 10 | 20 | 20 | 0.50 |

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:

