Solids Handling Study Unit

INTRODUCTION

Solids are, usually, more difficult to treat than liquids, vapours or gases.

During the processes the solids may be presented in some types: big angular pieces, continuous wide sheets or powders pulverized in a refined way. They may be hard and abrasive, resistant or gummy, soft or fragile, dusty, plastic or sticky. Independently of its shape, it is necessary to find ways to manipulate the solids in the way they are shown, and, if it is possible, to improve its manipulation characteristics.

The QMS is a teaching unit that allows students to study in depth easily the basics that they may have about the unitary operations of solids manipulation. The student will obtain data and very useful experimental results for the perfect practical comprehension of the processes and, therefore, for the technical training of the student.

GENERAL DESCRIPTION

The Solids Handling Study Unit "QMS" is designed to introduce the students in different aspect of solids behaviour, unit operations as size reduction, mixing, transport, discharge, weighing, etc.

The unit consists of a bench on which are mounted several elements: ball mill, shaker and sieves, V-blender, cyclone, rotary cylinder, balance, etc.

Operations object of study and the elements used for it:

Size reduction: Ball mill with various sizes of balls.

Analysis of grain measure by sieve: vibratory sieve and other sieves.

Solids blending: V-Blender.

Solids conveyor: Pneumatic conveyor.

Solids separation: Cyclone.

Solids storage: Rotary cylinder.

Solids unloading: Hoppers and collecting tray.

Solids properties: Graduated test tube.

Solids weighing: Balance (scale).

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION

Control panel in detail:
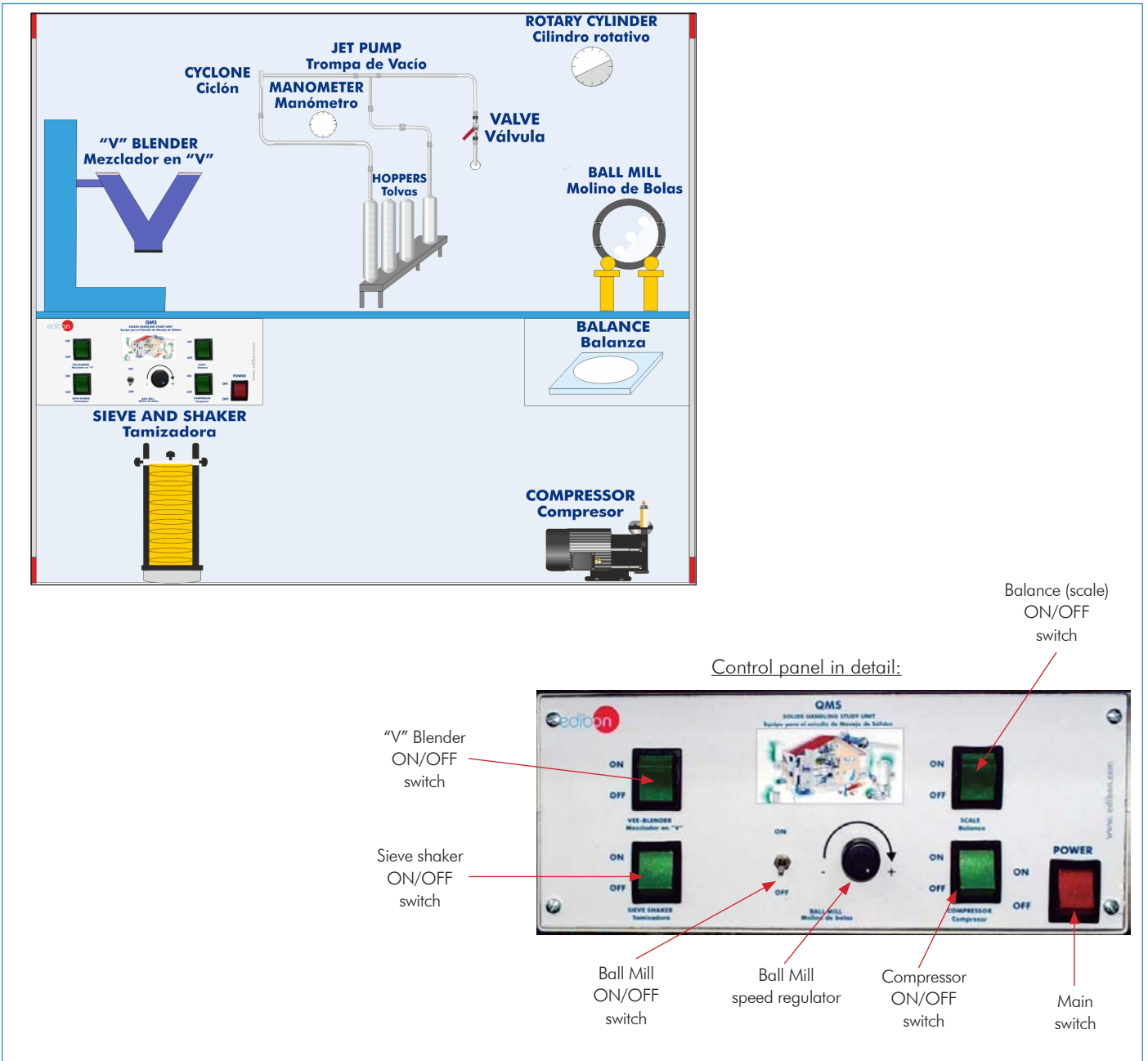
SPECIFICATIONS

Bench with anodized aluminum structure and metallic panels, and with wheels for its mobility.

Main metallic elements of stainless steel.

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

Ball mill with variable speed and various sizes of balls. Total volume: 5 l., capacity: 1.25 l.

Motor for the ball mill.

Vibratory shaker and a set of eight sieves with several hole mesh, from 2 mm to 0.063 mm.

V-Blender, total volume: 1 l.

Motor for the V-Blender, range: 18 rpm, (timer: 60 min.).

Blowing and ejector.

Compressor.

Glass cyclone (inlet diameter: 10 mm.), and pneumatic conveyor.

Transparent horizontal angle of repose rotary cylinder with protractor.

Cylindrical hoppers (capacity: 100 cc.) with different size of exit orifices.

Collecting tray.

Balance (scale).

Graduated test tube.

Control panel:

   - V-Blender ON/OFF switch.

   - Sieve shaker ON/OFF switch.

   - Balance (scale) ON/OFF switch.

   - Compressor ON/OFF switch.

   - Ball Mill ON/OFF switch.

   - Ball Mill speed regulator.

   - 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

<u>Some Practical Possibilities of the Unit:</u>

1.- Sieving techniques.

2.- Granulometric analysis by sieving.

3.- Study of size reduction.

4.- Classification study according to the size.

5.- Milling: Ball mill. Observation of the comminution of solids processed through a ball mil.

6.- Study of the angle of repose and demonstration of stratification.

7.- Study of the apparent density.

8.- Study of the effect of mixture content.

9.- Determination of bulk solids parameters of density.

10.-Solids unloading study in hoppers.

11.-Cyclone operation. Solids separation.

12.-Pneumatic conveying.

13.- Study of solids mixing.

14.- Solids weighing.

Other possible practices:

15.- Mixer operation.

16.- Sieves operation.

REQUIRED SERVICES

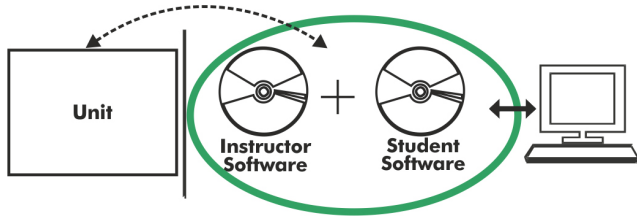-Electrical supply: single-phase, 220V./50Hz or 110V./60Hz.

RECOMMENDED ACCESSORIES

-Suitable solids to be studied: sand, salts, sugar, colour chalks, etc.
-Chronometer.

DIMENSIONS & WEIGHT

-Dimensions:1020 x 850 x 1700 mm approx.
-Weight: 200 Kg approx.

QMS/ICAI. Interactive Computer Aided Instruction Software System:

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.
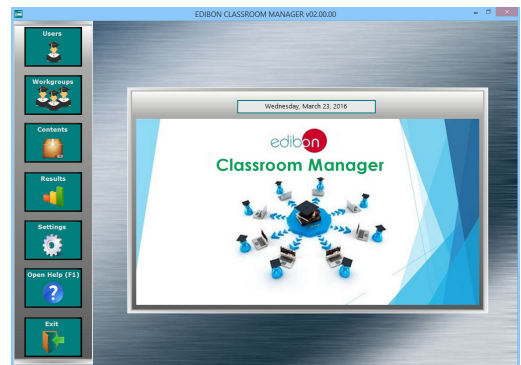
Instructor Software

### - 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.

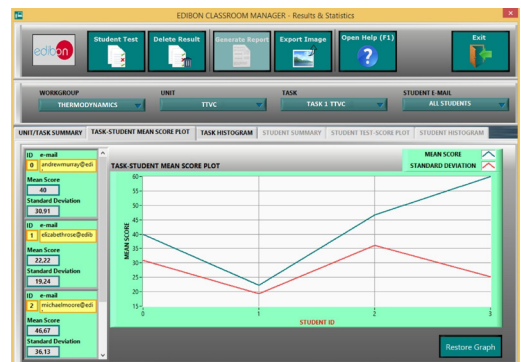- Report generation, User Progression Monitoring and Statistics.

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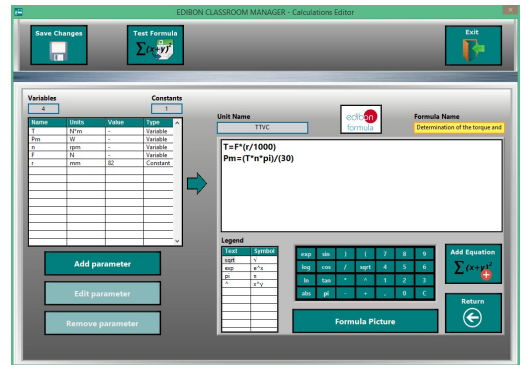
ECAL. EDIBON Calculations Program Package - Formula Editor
Screen
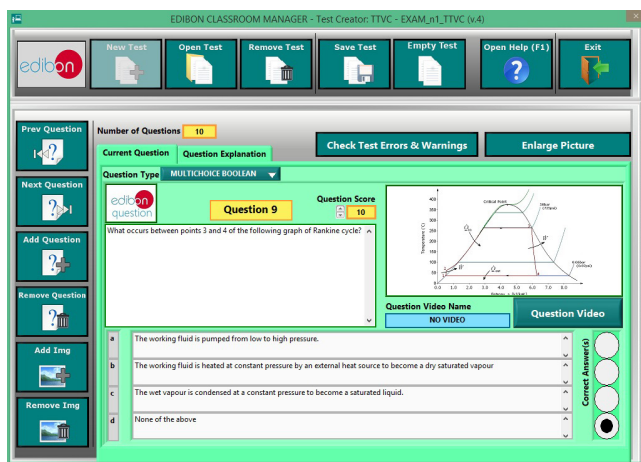
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with
Numeric Result Question

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

- 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.
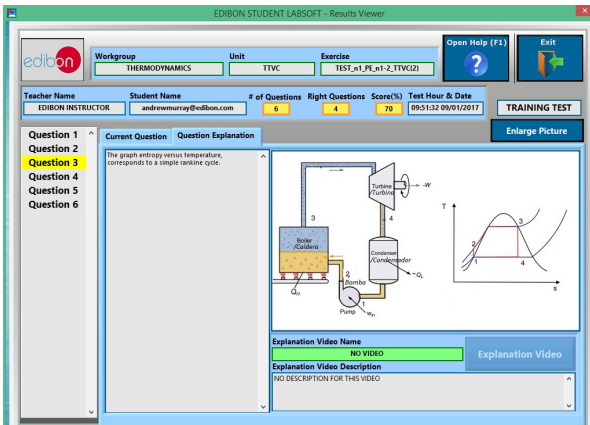- Multimedia-Supported auxiliary resources.

For more information see **ICAI** catalogue. Click on the following link:
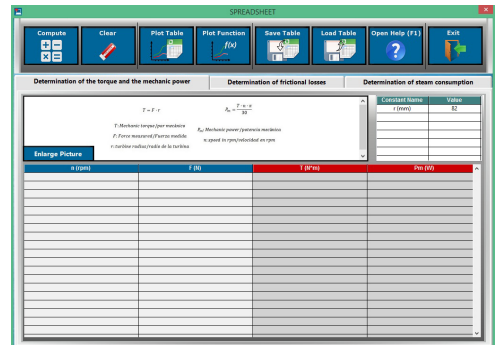www.edibon.com/en/files/expansion/ICAI/catalog
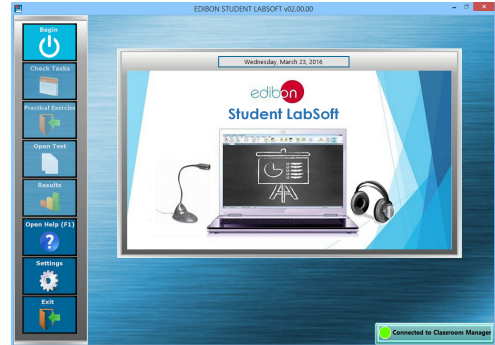
ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen
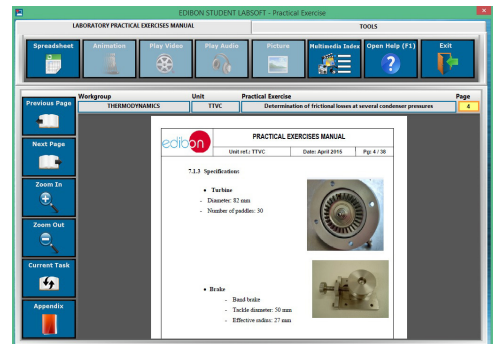
EPE. EDIBON Practical Exercise Program Package Main Screen

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.

INTERNATIONAL

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REPRESENTATIVE: