Technical Teaching Equipment

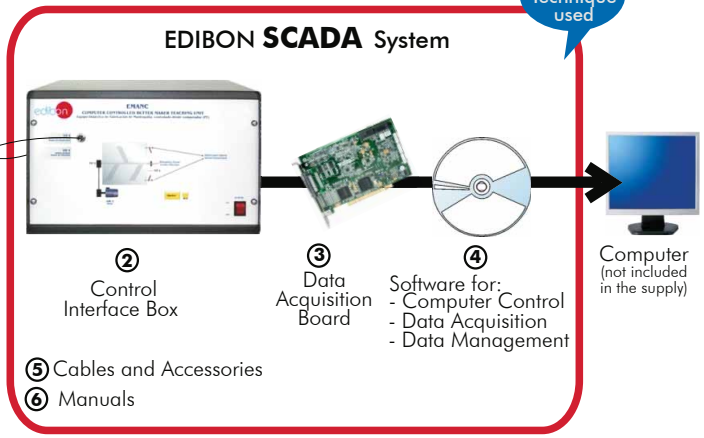
Computer Controlled **Butter Maker Teaching Unit,** with SCADA

EMANC

① Unit: EMANC. Butter Maker Teaching Unit

EDIBON PATENT

Teaching Technique used



*Minimum supply always includes: 1 + 2 + 3 + 4 + 5 + 6
(Computer not included in the supply)

Key features:

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL

- **Advanced Real-Time SCADA.**
- **Open Control + Multicontrol + Real-Time Control.**
- **Specialized EDIBON Control Software based on Labview.**
- **National Instruments Data Acquisition board (250 KS/s , kilo samples per second).**
- **Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Capable of doing applied research, real industrial simulation, training courses, etc.**
- **Remote operation and control by the user and remote control for EDIBON technical support, are always included.**
- **Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).**
- **Designed and manufactured under several quality standards.**
- **Optional CAL software helps the user perform calculations and comprehend the results.**
- **This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.**

www.edibon.com
Products
Products range
Units
12.-Food & Water Technologies

For more information about Key Features, click here:

ISO 9000: Quality Management
(for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate
(total safety)

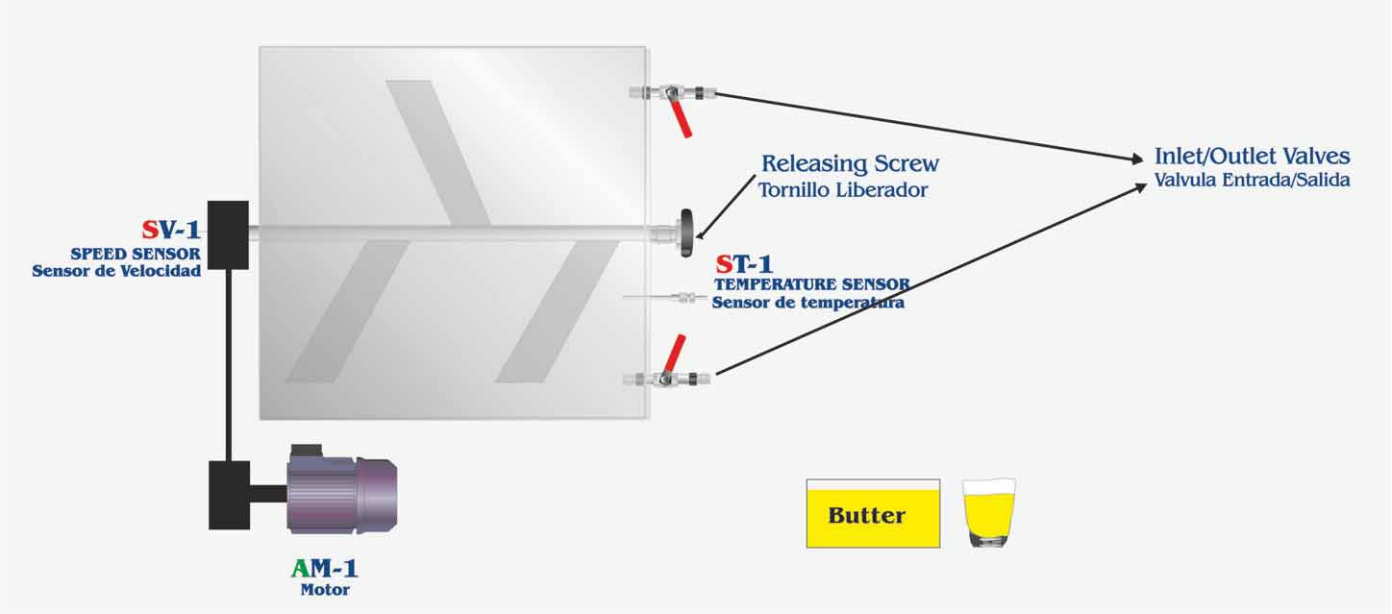
Certificates ISO 14000 and **ECO-Management and Audit Scheme**
(environmental management)

Worlddidac Quality Charter Certificate
(Worlddidac Member)

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION

1 actuator and 2 sensors controlled from any computer, and working simultaneously

OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL



Items supplied as standard

① EMANC. Unit:

This unit has been designed to provide practical training in butter making.
The main structure of EMANC is a 25 l. stainless steel tank. On the upper part, a (stainless steel) lid with four braces (two on each side) seals the tank. There is a round window to visualize the state of the inner product. Within the tank, a set of blades churn the product.
The motor is the most important element of the unit, since it makes the blades roll. It is controlled by two switches, a green one to start and the red one to stop. Besides these switches, the process can be controlled by the computer through the interface.
A security system (magnetic sensor) blocks the blades while the lid is not in place.
The blades can be removed thanks to a releasing knob, what helps cleaning the interior.
There exist two valves. The upper valve allows the inlet of fresh water for washing the butter. The lower valve has a draining function for both the water and buttermilk.
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution to the elements in the real unit.
Up to 13 l. of cream may be used on a single batch.
Computer controlled electric motor and agitator.
Temperature sensor.
Speed sensor.
Approx. 0.5 kg of butter produced out of 1.5 kg of cream.

EMANC Unit

② EMANC/CIB. Control Interface Box :

Control interface box with process diagram in the front panel and with the same distribution that the different elements located in the unit, for an easy understanding by the student.
All sensors, with their respective signals, are properly manipulated from -10V. to +10V computer output.
Sensors connectors in the interface have different pines numbers (from 2 to 16), to avoid connection errors.
Single cable between the control interface box and computer.
The unit control elements are permanently computer controlled, without necessity of changes or connections during the whole process test procedure.
Simultaneous visualization in the computer of all parameters involved in the process.
Calibration of all sensors involved in the process.
Real time curves representation about system responses.
Storage of all the process data and results in a file.
Graphic representation, in real time, of all the process/system responses.
All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process.
All the actuators and sensors values and their responses are displayed on only one screen in the computer.
Shield and filtered signals to avoid external interferences.
Real time computer control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process.
Real time computer control for pumps, compressors, resistances, control valves, etc.
Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.
Three safety levels, one mechanical in the unit, other electronic in the control interface and the third one in the control software.

EMANC/CIB

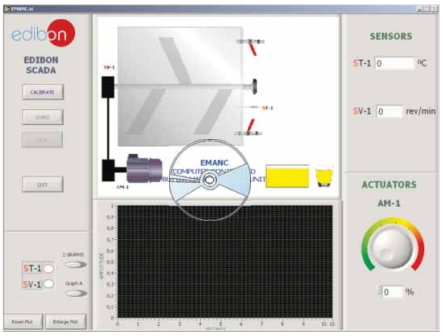
③ DAB. Data Acquisition Board:

PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.
Analog input:
Number of **channels= 16** single-ended or 8 differential. **Resolution=16 bits**, 1 in 65536.
Sampling rate up to: 250 KS/s (Kilo samples per second).
Input range (V)=±10V. Data transfers=DMA, interrupts, programmed I/0. Number of DMA channels=6.
Analog output:
Number of **channels=2**. **Resolution=16 bits**, 1 in 65536. Maximum output rate up to: 833 KS/s.
Output range(V)=±10V. Data transfers=DMA, interrupts, programmed I/0.
Digital Input/Output:
Number of **channels=24 inputs/outputs**. D0 or DI Sample Clock frequency: 0 to 1 MHz.
Timing:
Counter/timers=2. Resolution: Counter/timers: 32 bits.

DAB

④ EMANC/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process in screen.
Compatible with the industry standards.
Registration and visualization of all process variables in an automatic and simultaneous way.
Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.
Management, processing, comparison and storage of data.
Sampling velocity up to 250,000 data per second.
Calibration system for all sensors involved in the process.
It allows the registration of the alarms state and the graphic representation in real time.
Comparative analysis of the obtained data, after the process and modification of the conditions during the process.
Open software, allowing to the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access to different work levels.
This unit allows the 30 students of the classroom to visualize simultaneously all results and manipulation of the unit, during the process, by using a projector or an electronic whiteboard.



EMANC/CCSOF

⑤ Cables and Accessories, for normal operation.

⑥ Manuals:

This unit is **supplied with 8 manuals:** Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

✱References 1 to 6: EMANC + EMANC/CIB + DAB + EMANC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.

Continue...

Additional and optional items to the standard supply

PLC. Industrial Control using PLC (7 and 8):

⑦ PLC-PI. PLC Module:

Circuit diagram in the front panel.

Front panel:

Digital inputs(X) and Digital outputs (Y) block:

16 Digital inputs, activated by switches and 16 LEDs for confirmation (red).

14 Digital outputs (through SCSI connector) with 14 LEDs for message (green).

Analog inputs block:

16 Analog inputs (-10V. to + 10V.)(through SCSI connector).

Analog outputs block:

4 Analog outputs (-10V. to + 10V) (through SCSI connector).

Touch screen:

High visibility and multiple functions.
Display of a highly visible status.
Recipe function.
Bar graph function.
Flow display function.
Alarm list.
Multi language function.
True type fonts.

Back panel:

Power supply connector.
Fuse 2A.
RS-232 connector to PC.
USB 2.0 connector to PC.

Inside:

Power supply outputs: 24 Vdc, 12 Vdc, -12 Vdc, 12 Vdc variable.

Panasonic PLC:

High-speed scan of 0.32 μsec. for a basic instruction.
Program capacity of 32 Ksteps, with a sufficient comment area.
Power supply input (100 to 240 V AC).
DC input:16 (24 V DC).
Relay output: 14.
High-speed counter.
Multi-point PID control.
Digital inputs/outputs and analog inputs/outputs Panasonic modules.

Communication RS232 wire, to computer (PC).

PLC-PI

⑧ EMANC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

Items available on request

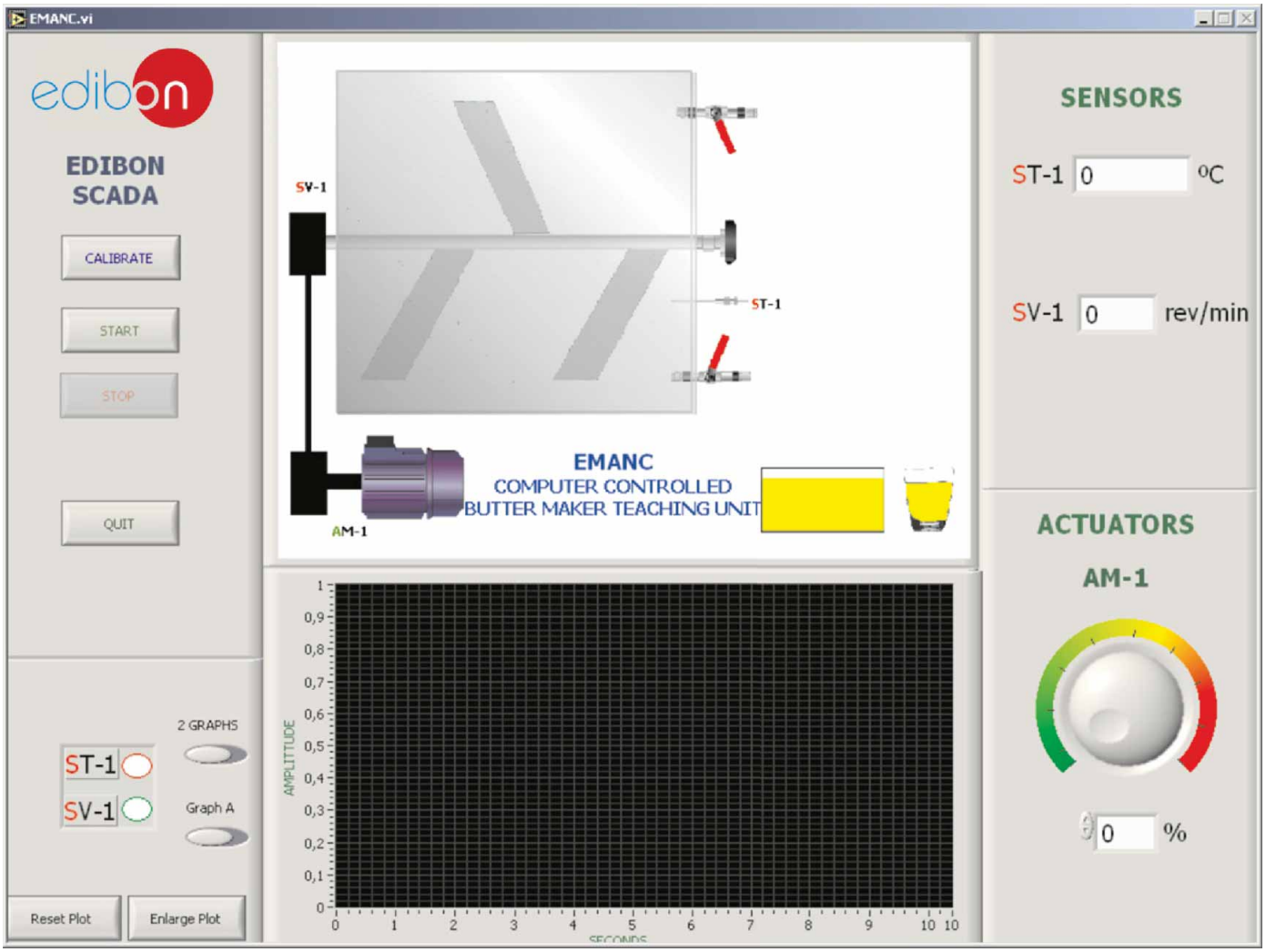
⑨ EMANC//CAL. Computer Aided Learning Software (Results Calculation and Analysis).

⑩ EMANC/FSS. Faults Simulation System.

Software Main Screens

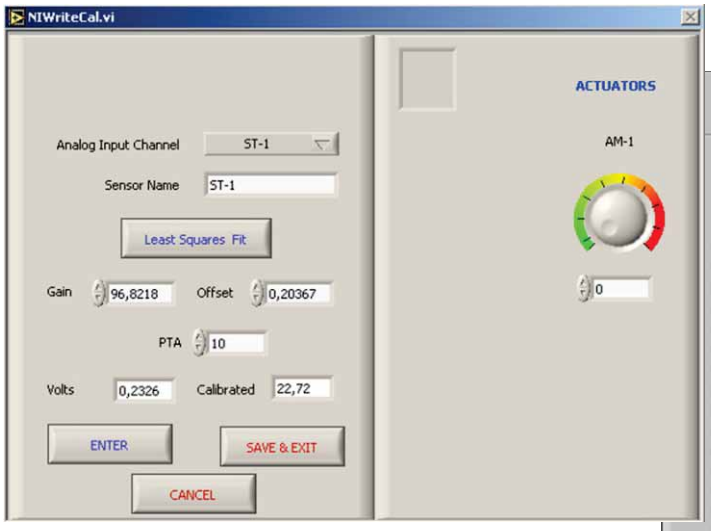
Main screen

Main screen of the software. As usual, on the right side all the sensors are shown (stirrer speed and chamber temperature). On the bottom, the motor control is made through a potentiometer. An automatic control over the motor can be made thanks to the "time experiment" control. With this, we can set the time that we want the motor to be working.

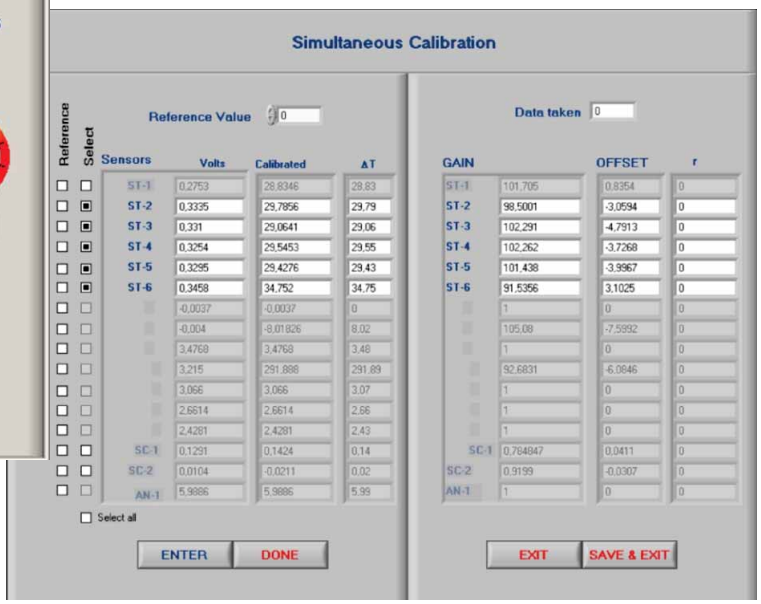


Note: ST=Temperature sensor. SV=Speed sensor. AM=Motor.

Examples of Sensors Calibration screens



Typical EDIBON software calibration window, from where the sensor to calibrate can be selected. Voltage measured from the sensor and calibrated value can be viewed at the same time. On the right side, the actuators, in this case, just the motor which makes the stirrer to rotate.



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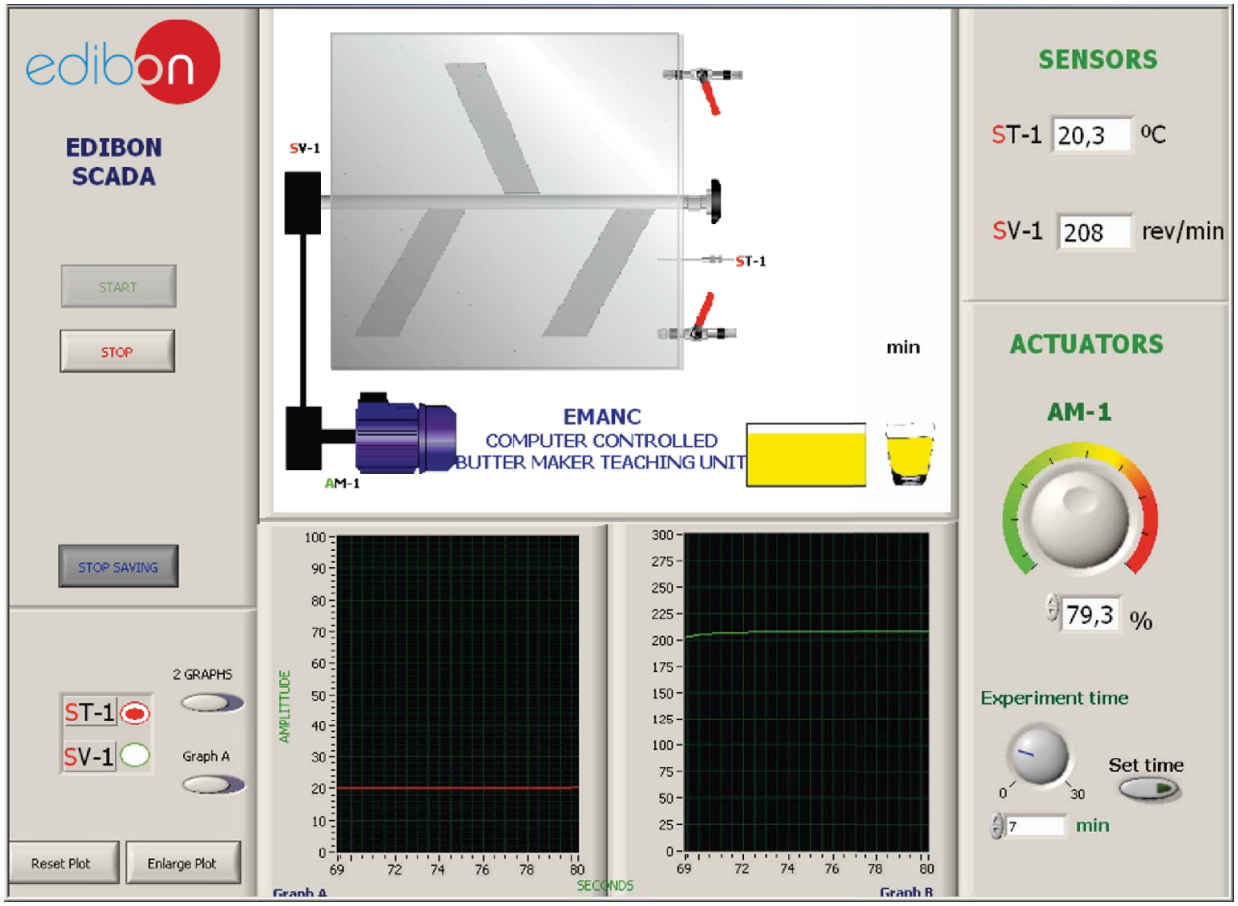
Some typical exercises results

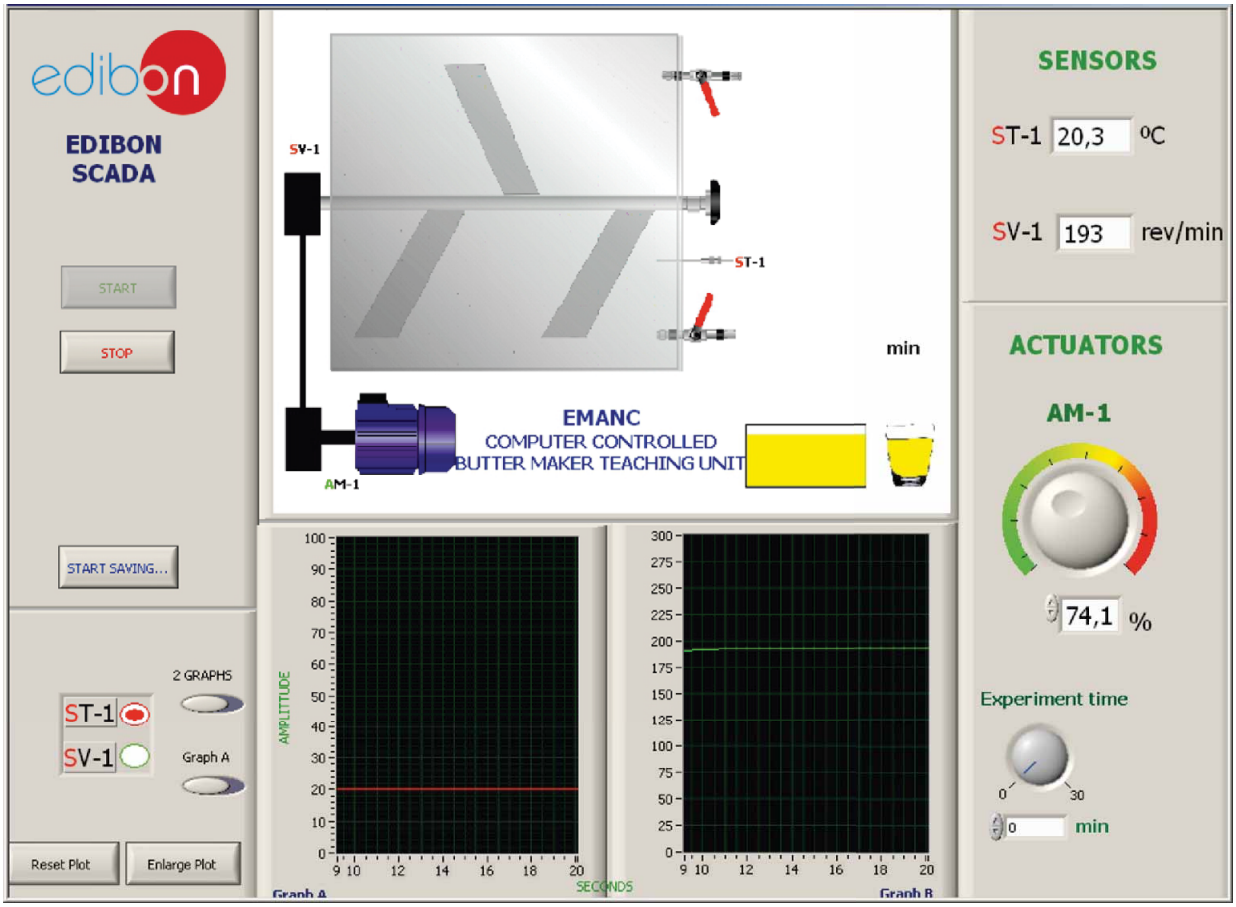
Automatic operation.

By choosing an experiment time value and setting the time, the software starts to save the data and turn on the motor in an automatically way. When the selected time has expired, the saving process ends and the motor turn off. It is the best way to have a control over the experimet time without any external help.



Manual operation.

The typical way of doing the experiments, in which we need to use an external clock to control the experiment time. The motor starts to work when a different from zero speed is selected and the saving process does not begin until the "start saving" button is clicked on.



EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Production of butter from different types of liquid cream.

2.- Production of butter by different methods with analytical and qualitative resolutions.

3.- Temperature study and agitation during the process.

4.- "Phase inversion" of the oil/water emulsion which occurs in churning.

5.- Thermodynamic evolution analysis of the butter production process.

6.- Duration influence study of the final product process.

7.- Influence study of the turning speed in the final product quality.

Other possible practices:

8.- Sensors calibration.

Practices to be done by PLC Module (PLC-PI)+PLC Control Software:

9.- Control of the EMANC unit process through the control interface box without the computer.

10.- Visualization of all the sensors values used in the EMANC unit process.

11.- Calibration of all sensors included in the EMANC unit process.

12.- Hand on of all the actuators involved in the EMANC unit process.

13.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).

14.- Simulation of outside actions, in the cases do not exist hardware elements. (Example: test of complementary tanks, complementary industrial environment to the process to be studied, etc).

15.- PLC hardware general use and manipulation.

16.- PLC process application for EMANC unit.

17.- PLC structure.

18.- PLC inputs and outputs configuration.

19.- PLC configuration possibilities.

20.- PLC program languages.

21.- PLC different programming standard languages.

22.- New configuration and development of new process.

23.- Hand on an established process.

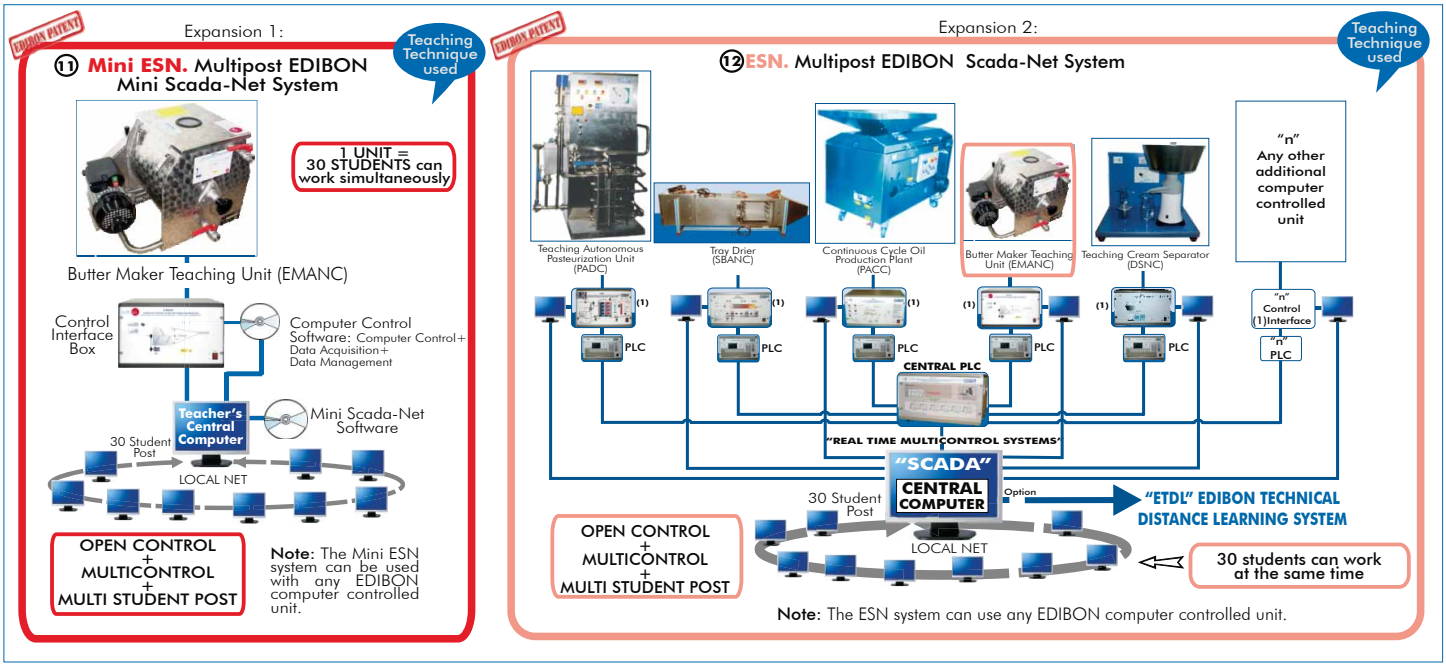
24.- To visualize and see the results and to make comparisons with the EMANC unit process.

25.- Possibility of creating new process in relation with the EMANC unit.

26.- PLC Programming Exercises.

27.- Own PLC applications in accordance with teacher and student requirement

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS



ORDER INFORMATION

Items supplied as standard

Minimum configuration for normal operation includes:

① **Unit: EMANC. Butter Maker Teaching Unit.**

② **EMANC/CIB.Control Interface Box.**

③ **DAB.Data Acquisition Board.**

④ **EMANC/CCSOF. Computer Control + Data Acquisition + Data Management Software.**

⑤ **Cables and Accessories**, for normal operation.

⑥ **Manuals.**

* **IMPORTANT: Under EMANC we always supply all the elements for immediate running as 1, 2, 3, 4, 5 and 6.**

Additional and optional items to the standard supply

PLC. Industrial Control using PLC (7 and 8):

⑦ PCL-PI.PLC Module.

⑧ EMANC/PLC-SOF. PLC Control Software.

⑨ EMANC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request)

⑪ EMANC/FSS. Faults Simulation System. (Available on request).

Expansions

⑫ Mini ESN. Multipost EDIBON Mini Scada-Net System.

⑬ ESN. Multipost EDIBON Scada-Net System.

REQUIRED SERVICES

-Electrical supply: single-phase, 220 V./50Hz or 110 V/60 Hz.
-Water supply and drainage.
-Liquid cream with a 33% minimum content of fat.
-Computer (PC).

DIMENSIONS & WEIGHTS

EMANC Unit:	-Dimensions: 550 x 470 x 410 mm. approx.
	-Weight :30 Kg. approx.
Control Interface Box:	-Dimensions: 490 x 330 x 310 mm. approx.
	-Weight: 10 Kg. approx.
PLC Module (PLC-PI):	-Dimensions: 490 x 330 x 310 mm. approx.
	-Weight: 30 Kg. approx.

AVAILABLE VERSIONS

Offered in this catalogue:

- EMANC. Computer Controlled **Butter Maker Teaching Unit.**

Offered in other catalogue:

- EMAN. **Butter Maker Teaching Unit.**

✱Specifications subject to change without previous notice, due to the convenience of improvements of the product.

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