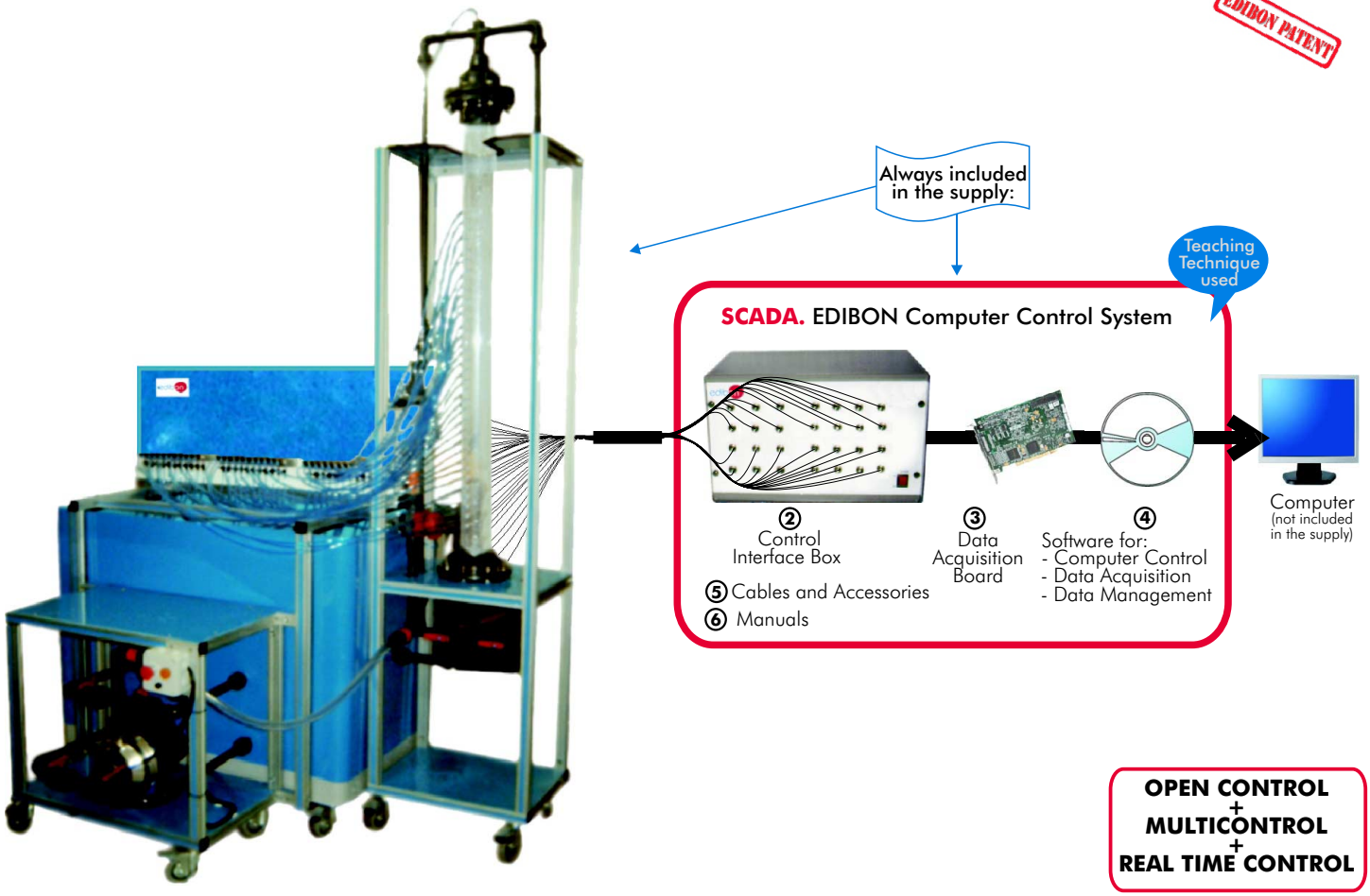
Computer Controlled **Deep Bed Filter Unit**

EFLPC

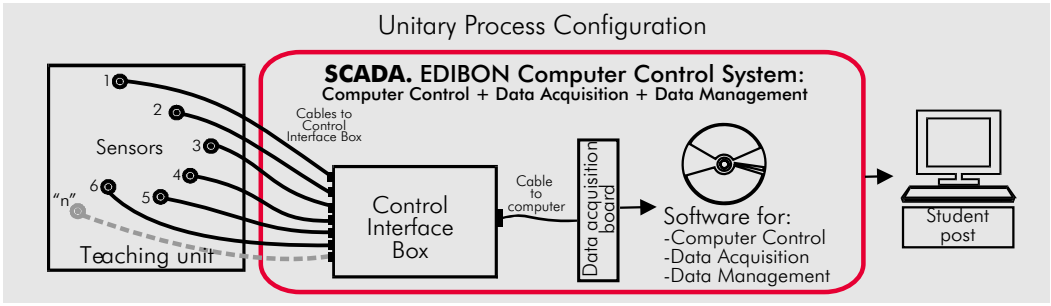
Technical Teaching Equipment

EDIBON PATENT



OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL

① Unit: EFLPC. Deep Bed Filter Unit



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Products
Products range
Units
11.- Chemical Engineering
or
13.-Environment

ISO 9001:2000
Certificate of Approval

European Union Certificate

Certificates ISO 14001: 2004 and
ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter
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DESCRIPTION

The Deep Bed Filter Unit allows us to filter a fluid in order to eliminate particles in suspension, to have it in more adequate conditions for its subsequent use or consumption.
Students can visualize and study with this unit one of the most common treatment processes of water destined to supplying cities and in most industrial uses.
In the design of this unit, all the elements have been integrated in a mobile, self-contained and compact system, that permits an itemized study of the deep-bed filter.
Taking note of both the pressures and the efficiency of the filtering throughout the column, through sampling and pressure measurements, the student can rapidly and simply visualize and study the filtering process.
This Computer Controlled Unit, is supplied with the EDIBON Computer Control System (SCADA), including: Control Interface Box + Data Acquisition Board +Computer Control and Data Acquisition Software, for controlling the process and the parameters involved.

SPECIFICATIONS

Items supplied as standard

① EFLPC. Unit:

Anodized aluminium structure and panels in painted steel.
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution to the elements in the real unit.
Filter column:
In it the porous media is formed. This includes the following elements:
Transparent filter column of circular section (column height: 1300 mm), with removable top and bottom covers.
Support filter of the porous bed.
Filtering bed.
30 Pressure takings.
29 Sample capturing takings.
Pressure sensors.
Tanks:
Their objective is to prepare the suspension for being filtered. There is a tank with two reservoirs:
Reservoir 1 = 350 litres.
Reservoir 2 = 350 litres.
Total capacity: 700 litres.
Both reservoirs have water heigh level and system for agitation with help of the water return.
Pump:
Centrifugal pump: 0.6 kW, 2850 r.p.m.
In order to take the fluid to the upper part of the filter column (filtering operations), or the bottom part of the column (washing operation of the porous bed).
Pipes and valve system to stablish several circuits and regulate the flows.
Flow sensor.
Mesh filter.
Air purger for eliminating bubbles which are initally in the circuit.
The unit incorporates wheels for mobility.

EFLPC. Unit

② EFLPC/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. **Simultaneously 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 placed in only one computer screen.
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 time and in a real time , of parameters involved in the process simultaneously.
Three safety levels, one mechanical in the unit, other electronic in control interface and the third one in the control software.

EFLPC/CIB

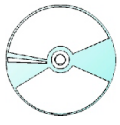
③ DAB. Data Acquisition Board:

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 EFLPC/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 simultaneously 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 guaranteed. Calibration system for the 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 at different work levels.
This unit allows that the 30 students of the classroom can visualize simultaneously all results and manipulation of the unit, during the process, by using a projector.



EFLPC/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: EFLPC + EFLPC/CIB + DAB + EFLPC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.

Continue...

Complementary 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.

PLC-PI

Back panel:

Power supply connector.
Fuse 2A.
RS-232 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.
Free input AC voltage(100 to 240 V AC).
DC input:16 (24 V DC).
Relay output: 14 (250 V A AC/2 A).
High-speed counter.
Multi-point PID control.
Digital inputs/outputs and analog inputs/outputs Panasonic modules.

Communication RS232 wire, to computer (PC).

⑧ EFLPC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.

Items available on request

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

⑩EFLPC/FSS. Faults Simulation System.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Determination of the initial head loss of a porous bed.
2.- Evolution through time of the head loss of the porous bed.
3.- Measuring how fast total head loss increases with filtration run time.
4.- Measuring pressure drop profiles through the filter bed.
5.- Measuring suspension concentration profiles through the filter bed.
6.- Filtration efficiency. Clarification.
7.- Demonstration of reversed flow fluidisation and backwashing.
8.- Filtering in open and closed circuit.
9.- Washing and filtering circuits.
10.- The column may be readily adapted for absorption and ion exchange studies.

Other possible practices:

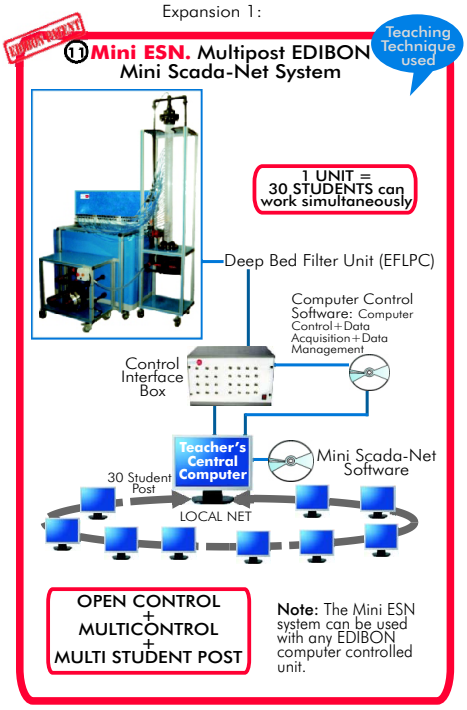
11.- Sensors calibration.

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

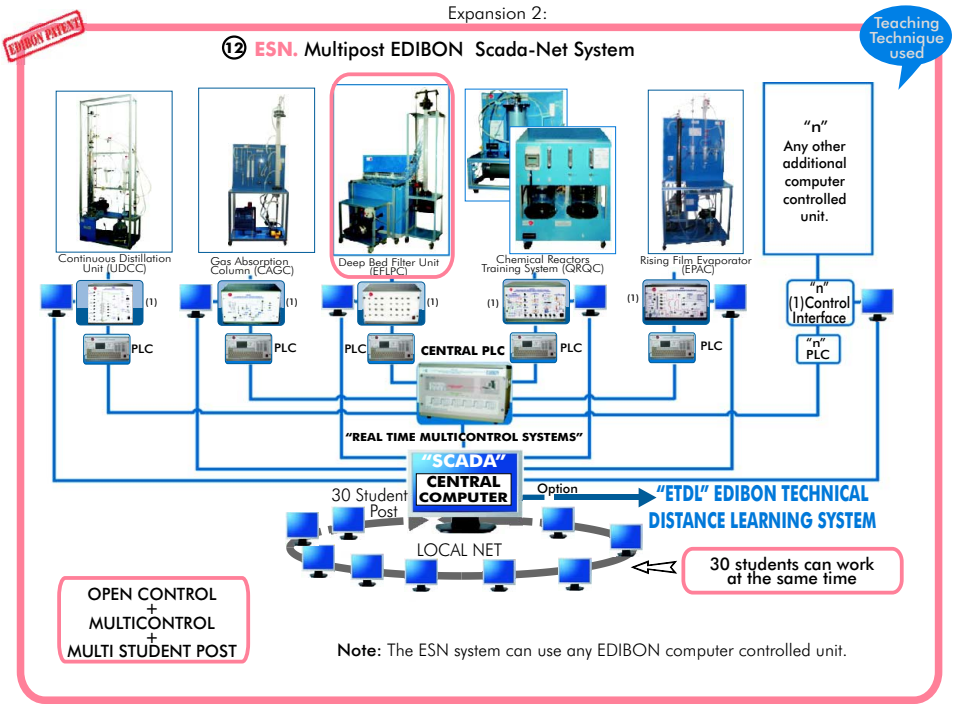
12.- Control of the EFLPC unit process through the control interface box without the computer.
13.- Visualization of all the sensors values used in the EFLPC unit process.
14.- Calibration of all sensors included in the EFLPC unit process.
15.- Hand on of all the actuators involved in the EFLPC unit process.
16.- Realization of different experiments, in automatic way, without having in front the unit. (This experiment can be decided previously).
17.- 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).
18.- PLC hardware general use and manipulation.
19.- PLC process application for EFLPC unit.
20.- PLC structure.
21.- PLC inputs and outputs configuration.
22.- PLC configuration possibilities.
23.- PLC program languages.
24.- PLC different programming standard languages (literal structured, graphic, etc.).
25.- New configuration and development of new process.
26.- Hand on an established process.
27.- To visualize and see the results and to make comparisons with the EFLPC unit process.
28.- Possibility of creating new process in relation with the EFLPC unit.
29.- PLC Programming Exercises.
30.- Own PLC applications in accordance with teacher and student requirements.

POSSIBILITIES OF OTHER AVAILABLE EXPANSIONS

Expansion 1:



Expansion 2:



ORDER INFORMATION

Items supplied as standard

Minimum configuration for normal operation includes:

① **Unit: EFLPC. Deep Bed Filter Unit.**
② **EFLPC/CIB.Control Interface Box.**
③ **DAB.Data Acquisition Board.**
④ **EFLPC/CCSOF. Computer Control + Data Acquisition + Data Management Software.**
⑤ **Cables and Accessories**, for normal operation.
⑥ **Manuals.**

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

Complementary items to the standard supply

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

⑦ PCL-PI.PLC Module.
⑧ EFLPC/PLC-SOF. PLC Control Software.
⑨ EFLPC/CAL. Computer Aided Learning Software (Results Calculation and Analysis). (Available on request).
⑩ EFLPC/FSS. Faults Simulation System. (Available on request).

Expansions

⑪ Mini ESN. Multipost EDIBON Mini Scada-Net System.
⑫ ESN. Multipost EDIBON Scada-Net System.

REQUIRED SERVICES

-Electrical supply: single-phase, 220V./50Hz or 110V./60Hz, directly from the mains.
-Water supply and drainage.
-Computer (PC).

DIMENSIONS & WEIGHTS

EFLPC Unit:	-Dimensions: 2400 x 1500 x 2700 mm. approx. -Weight: 250 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.

RECOMMENDED ACCESSORIES

-Bottles for collecting samples.
-Turbidity meter or spectrophotometer.

AVAILABLE VERSIONS

Offered in this catalogue:

- EFLPC. **Computer Controlled Deep Bed Filter Unit.**

Offered in other catalogue:

- EFLP. **Deep Bed Filter Unit.**

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

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