Summarized
Catalogue

five (5)

13. Environment

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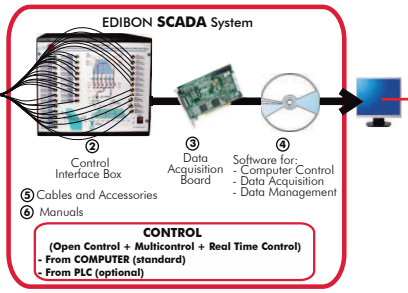
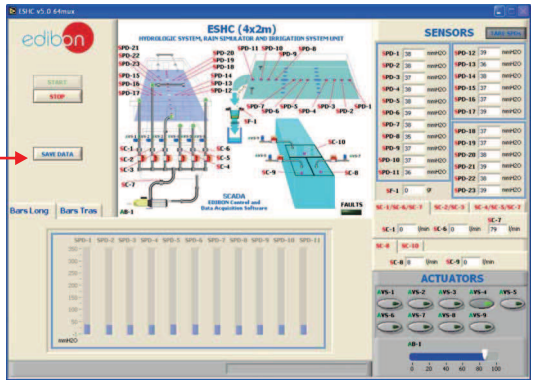
13.- Environment

Equipment list

ESHC(4x2m). **Computer Controlled Hydrologic Systems, Rain Simulator and Irrigation Systems Unit (4x2m)**

① Unit: ESHC(4x2m). Hydrologic Systems, Rain Simulator and Irrigation Systems Unit (4x2m).





SPECIFICATIONS SUMMARY

Items supplied as standard

① ESHC(4x2m). Unit:

The Computer Controlled Hydrologic Systems, Rain Simulator and Irrigation Systems Unit (4x2m) "ESHC(4x2m)" is a self-contained unit designed to demonstrate some of the physical processes found in hydrology and fluvial geomorphology, including: rainfall hydrographs for catchment areas of varying permeability, the formation of rivers and their features and effects of sediment transport, the abstraction of ground water by drains, both with and without surface recharge from rainfall, etc.

This unit allows to demonstrate, on a small scale, the hydrological principles of ground water flow and the applications of these principles to some engineering constructions. Moreover, it allows to study the use of drains for water abstraction, de-watering and drainage of lakes, and demonstration of flood risks linked to land drainage works.

Metallic structure and panels. Diagrams in the front panel with similar distribution to the elements in the real unit.

This unit includes wheels for its mobility and steps for a correct visualization of the practical exercises performed in the test tank.

Test tank, made of fiberglass, with 4 windows made of polycarbonate, to be filled with sand. It provide a large working surface, dimensions: 4 m. long, 2 m. wide and 0.40 m. deep.

4 Storage tanks of 400 l., that supply the water required to the test tank.

2 Flexible separate hoses, placed at the test tank front side, allow to add great inlet flows.

A tank attached to the inlet of the test tank and other tank attached to the outlet of the test tank to simulate a river:

The river outlet tank allows to measure the amount of sediment collected over a certain period of time.

The communication of the river tanks with the test tank is done through a floodgate that includes two trap doors.

Spray and shower nozzles located above the test tank to simulate rain:

8 Spray nozzles are mounted at a double line mobile bridge to give an even distribution across the test tank.

2 Shower nozzles with multiple flows allow to simulate storms and local inputs.

2 French sources/drains.

2 Drainages.

2 Overflows: they allow to keep water table (or phreatic surface) constant in the test tank.

3 Outlet tanks for the flow measurement in the drainages and French sources/drains. Each outlet tank includes: 1 spillway and 1 differential pressure sensor that allow to determine the flow removed in the drainages and French sources/drains. They include a valve to drain them.

Computer controlled centrifugal pump that impels water from the storage tank to the test tank through 6 different inlets.

The test tank includes 23 tapping points, configured in a cruciform pattern. These tapping points have two functions: to take water samples and to use with 23 differential pressure sensors.

6 Orifice plates that, together with 6 differential pressure sensors, and a flow sensor, allow to determine the flow through every inlet that connect the outlet of the pump to the test tank.

Load cell (force sensor) to measure the quantity of sediment collected over a certain period of time in the river outlet tank.

9 Diaphragm valves: 6 of them are located in each inlet that connect the outlet of the pump to the test tank, and 3 of them are located in each outlet that connect the drainages and French sources/drains to the outlet tanks.

9 Computer controlled solenoid valves: 6 of them are located in each inlet that connect the outlet of the pump to the test tank and 3 of them are located in each outlet that connect the drains and French sources/drains to the outlet tanks.

② ESHC(4x2m)/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot.

16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ ESHC(4x2m)/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Flexible, open and multicontrol software.

Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second).

It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 4600 x 2250 x 2000 mm. Weight: 1990 Kg.
Control Interface Box: 490 x 450 x 470 mm. Weight: 20 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/ESHC(4x2m).pdf

PRACTICAL POSSIBILITIES

1.- Determination of the surface drag.
2.- Determination of a hydrograph.
3.- Study of the hydrograph of one or several storms.
4.- Calculation of concentration time for a short storm.
5.- Determination of the compactness index.
6.- Determination of the drainage density.
7.- Obtaining of the pressure profile in a dike.
8.- Determination of the water obtained thanks to the gravity force and the field capacity.
9.- Study of fluvial-mechanical experiments.
10.- Formation and development of rivers over time.
11.- Study of sediment transport in models of rivers.
12.- Study of a meandering river.
13.- Study of the erosion on river beds and the speed of the flow.
14.- Study of groundwater catchment.
15.- Study of the cone of depression of a well.
16.- Study of the interaction of cones of depression by two adjoining wells.
17.- Study of a well in the center of a round island.

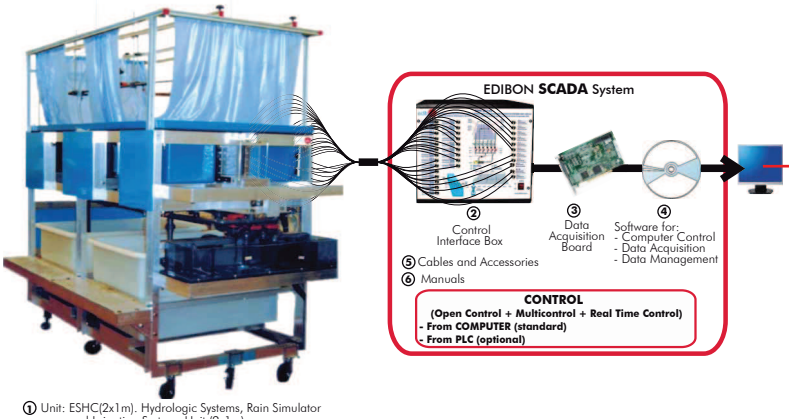
Additional practical possibilities:

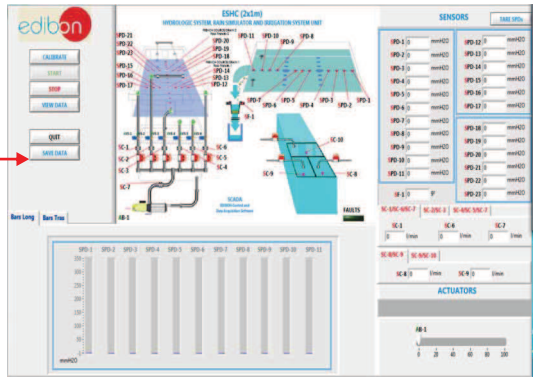
18.- Study of the storm hydrograph of a previously saturated catchment.
19.- Study of the storm hydrograph of an impermeable catchment.
20.- Study of the effect of a moving storm on a flood hydrograph.
21.- Study of the effect of reservoir storage on a flood hydrograph.
22.- Study of the effect of drain pipes on a flood hydrograph.
23.- Investigation of stream flows modeled in alluvial material.
24.- Study of sediment transport, bedload motion, scour and erosion.
25.- Construction of drawdown curves for one well and two wells systems.

Other possible practices:

26-44.- Practices with PLC.

ESHC(2x1m). **Computer Controlled Hydrologic Systems, Rain Simulator and Irrigation Systems Unit (2x1m)***





① Unit: ESHC(2x1m). Hydrologic Systems, Rain Simulator and Irrigation Systems Unit (2x1m).

SPECIFICATIONS SUMMARY

Items supplied as standard

① ESHC(2x1m). Unit:

The Computer Controlled Hydrologic Systems, Rain Simulator and Irrigation Systems Unit (2x1m) "ESHC(2x1m)" is a self-contained unit designed to demonstrate some of the physical processes found in hydrology and fluvial geomorphology, including: rainfall hydrographs for catchment areas of varying permeability, the formation of rivers and their features and effects of sediment transport, the abstraction of ground water by drains, both with and without surface recharge from rainfall, etc.

This unit allows to demonstrate, on a small scale, the hydrological principles of ground water flow and the applications of these principles to some engineering constructions. Moreover, it allows to study the use of drains for water abstraction, de-watering and drainage of lakes, and demonstration of flood risks linked to land drainage works.

Metallic structure and panels. Diagrams in the front panel with similar distribution to the elements in the real unit.

This unit includes wheels for its mobility and steps for a correct visualization of the practical exercises performed in the test tank.

Test tank, made of fiberglass with 4 windows made of polycarbonate, to be filled with sand. It provides a large working surface, dimensions: 2 m. long, 1 m. wide and 0.40 m. deep.

2 Storage tanks of 400 l., that supply the water required to the test tank.

2 Flexible separate hoses, placed at the test tank front side, allow to add great inlet flows.

A tank attached to the inlet of the test tank and other tank attached to the outlet of the test tank to simulate a river:

The river outlet tank allows to measure the amount of sediment collected over a certain period of time.

The communication of the river tanks with the test tank is done through a floodgate that includes two trap doors.

Spray and shower nozzles located above the test tank to simulate rain:

8 Spray nozzles are mounted at a double line mobile bridge to give an even distribution across the test tank.

2 Shower nozzles with multiple flows allow to simulate storms and local inputs.

2 French sources/drains.

2 Drainages.

2 Overflows: they allow to keep water table (or phreatic surface) constant in the test tank.

3 Outlet tanks for the flow measurement in the drainages and French sources/drains. Each outlet tank includes: 1 spillway and 1 differential pressure sensor that allow to determine the flow removed in the drainages and French sources/drains.

Computer controlled centrifugal pump that impels water from the storage tank to the test tank through 6 different inlets.

The test tank includes 23 tapping points, configured in a cruciform pattern. These tapping points have two functions: to take water samples and to use with 23 differential pressure sensors.

5 Orifice plates that, together with differential pressure sensors, and 2 flow sensors, allow to determine the flow through every inlet that connect the outlet of the pump to the test tank.

Load cell (force sensor) to measure the quantity of sediment collected over a certain period of time in the river outlet tank.

9 Diaphragm valves: 6 of them are located in each inlet that connect the outlet of the pump to the test tank, and 3 of them are located in each outlet that connect the drainages and French sources/drains to the outlet tanks.

② ESHC(2x1m)/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot.

16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ ESHC(2x1m)/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Flexible, open and multicontrol software.

Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second).

It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 2700 x 1500 x 2000 mm. Weight: 950 Kg.
Control Interface Box: 490 x 450 x 470 mm. Weight: 20 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/ESHC(2x1m).pdf

PRACTICAL POSSIBILITIES

1.- Determination of the surface drag.
2.- Determination of a hydrograph.
3.- Study of the hydrograph of one or several storms.
4.- Calculation of concentration time for a short storm.
5.- Determination of the compactness index.
6.- Determination of the drainage density.
7.- Obtaining of the pressure profile in a dike.
8.- Determination of the water obtained thanks to the gravity force and the field capacity.
9.- Study of fluvial-mechanical experiments.
10.- Formation and development of rivers over time.
11.- Study of sediment transport in models of rivers.
12.- Study of a meandering river.
13.- Study of the erosion on river beds and the speed of the flow.
14.- Study of groundwater catchment.
15.- Study of the cone of depression of a well.
16.- Study of the interaction of cones of depression by two adjoining wells.
17.- Study of a well in the center of a round island.

Additional practical possibilities:

18.- Study of the storm hydrograph of a previously saturated catchment.
19.- Study of the storm hydrograph of an impermeable catchment.
20.- Study of the effect of a moving storm on a flood hydrograph.
21.- Study of the effect of reservoir storage on a flood hydrograph.
22.- Study of the effect of drain pipes on a flood hydrograph.
23.- Investigation of stream flows modeled in alluvial material.
24.- Study of sediment transport, bedload motion, scour and erosion.
25.- Construction of drawdown curves for one well and two wells systems.

Other possible practices:

26-44.- Practices with PLC.

* Non computer controlled version available too.

EFAS. **Ground Water Flow Unit**

SPECIFICATIONS SUMMARY

Unit for demonstrating the hydrological principles of groundwater flow and the applications of these to different engineering constructions. It allows the investigation of ground water flows, the drainage processes and the effect of the permeability. It is possible to study the use of wells, de-watering and drainage of lakes, and demonstration of ground drainage works, among others. This unit allows a quick configuration of any easy situation of tridimensional flow and to measurement the piezometric levels at different and appropriate places within the model, making possible to obtain realistic experimental results.

Unit mounted on anodized aluminum profiles and painted steel panels.

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

A test tank, made in fibreglass reinforced polyester, 1000 mm of length x 500 mm of width and 240 mm of depth.

Two membrane valves to regulate water inlet flows to the test tank.

Two wells simmetrically located in the test tank.

Two membrane valves to regulate water outlet flows from the wells.

19 tappings to measure the hydraulic gradients, connected to column water manometers of 300 mm. long. The manometers have individual ball valves to purge the tubes.

Air manual pump connected to the manometers.

Three accessories that make it easy the construction of the different models object of study: rectangular model for a lake construction, rectangular model for an excavation construction, cylindrical model for a confined aquifer construction.

Flexible pipes and quick connectors.

Manual: This unit is supplied 8 Manuals.

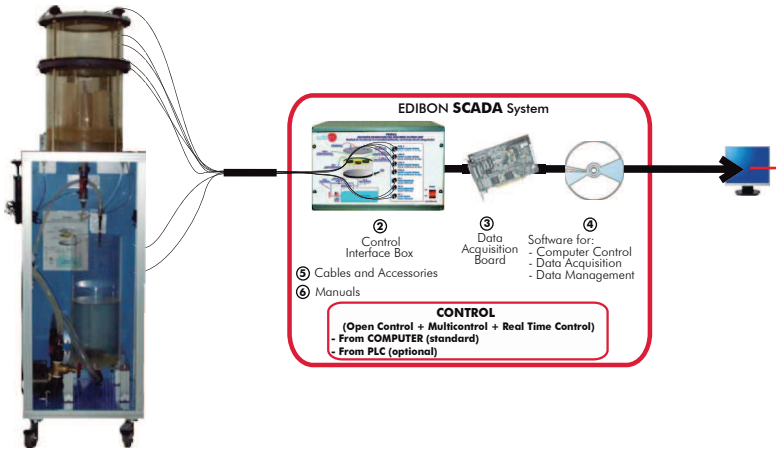
Dimensions (approx.) = 1100 x 650 x 1400 mm. Weight: 100 Kg.

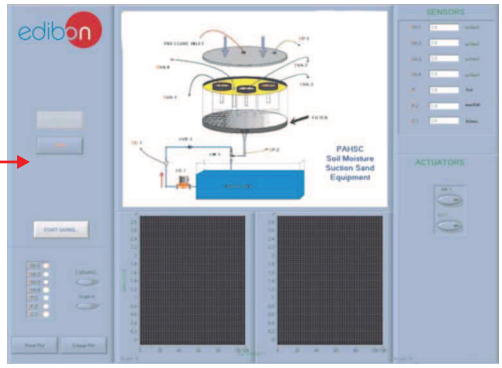
More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/EFAS.pdf

PRACTICAL POSSIBILITIES

1.- Demonstration of hydraulic gradients in ground water flow, including the effect of permeability.
2.- Investigation of hydraulic gradients for different models built on the test tank.
3.- Determination of the ground water level between inlet and outlet.
4.- Demonstration of the Darcy's Law.
5.- Study of the cone of depression for a well in a confined aquifer.
6.- Study of the cone of depression for a well in a free aquifer.
7.- Study of the cone of depression cone for two wells.
8.- Experiment to obtain hydraulic gradients for a model with two wells. Compare it with the result of only one well by the superposition method.
9.- Draining of or lake model.
10.- De-watering of an excavation model under freatic level.
11.- De-watering of an excavation model using two wells.
12.- Interaction of cones of depression by two adjoining wells.
13.- Draw-down curves for one well and two wells systems.
14.- Comparison of different profiles, combinations.
15.- How to fill the manometer tubes.

PAHSC. Computer Controlled **Soil Moisture Suction Sand Unit** ✱





①Unit: PAHSC. Soil Moisture Suction Sand Unit

SPECIFICATIONS SUMMARY
Items supplied as standard

① PAHSC. Unit:

Unit, computer controlled, designed to study and understand the water retentivity principles, in terms of soil suction, as well as for the derivation of characteristic curves of the ground´s humidity.

Anodized aluminum structure and panels of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.

Suction system, including: water circuit, water tank (capacity: 5 l.), water pump, water jet pump, pressure sensor, flow sensor.

Soil container, including: filter, transparent circular tank for filling with sand (capacity: 15 l.), 4 soil sample retaining rings (capacity of each one: 0.3 l.), 4 water volume sensors (humidity), pressure sensor, air inlet (pressure inlet).

② PAHSC/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

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

Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 400 x 500 x 1200 mm. Weight: 90 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PAHSC.pdf

PRACTICAL POSSIBILITIES

1.- To understand the relationship between water retentivity and soil.
2.- To understand the basic principles of water retentivity in terms of soil suction.
3.- Derive soil moisture characteristic curves for several soils.
4.- Effect of the atmospheric pressure.

Other possible practices:

5.- Sensors calibration.
6-24.- Practices with PLC.

✱ **Non computer controlled version available too.**

PL. **Demonstration Lysimeter**

SPECIFICATIONS SUMMARY

Unit designed for the measurement of evapotranspiration by water-balance method.

The Demonstration Lysimeter (PL) consists of containers in which may be placed any soil type and several crop types grown.

Anodized aluminum structure and panel of painted steel.

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

2 Bases and 2 inner discs to support soil filled recipients and plants.

2 Hydraulic sensing devices located in the bases, connected to the graduated water columns.

2 Graduated water columns , mounted above the lysimeters.

Two 300 mm. approx. diameter containers. Each container can then in turn be placed on a hydraulically mounted plate which is used to monitor system weight changes arising for evapotranspiration.

Set of calibration weights.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.) = 1000 x 700 x 1300 mm. Weight: 60 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PL.pdf

PRACTICAL POSSIBILITIES

1.- Study of the measurement of evapotranspiration by water-balance method.

2.- To use lysimeter unit.

3.- To determine plant water usage.

4.- To understand the relationship between reference maximum and actual transpiration.

PPD. **Drain Permeameter**

SPECIFICATIONS SUMMARY

Unit designed for the study and laboratory investigation of field drain filter materials.

This drain permeameter is suited for use both as a teaching and demonstration unit and for laboratory testing and research.

Anodized aluminum structure and panel of painted steel.

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

Transparent acrylic column of 100 mm. diameter, supported on a stand, which may be filled with any soil type.

Removable test section at the base of the column to house the filter medium to be tested.

3 different metallic filters.

Constant head supply device. This is an adjustable water input tank, which allows to regulate the pressure.

Feed tank, capacity: 20 l. approx.

Permeating water and soil collected tank, capacity: 20 l. approx.

Water centrifugal pump.

Drain valves, located in the tanks.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.) = 500 x 700 x 1500 mm. Weight: 40 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PPD.pdf

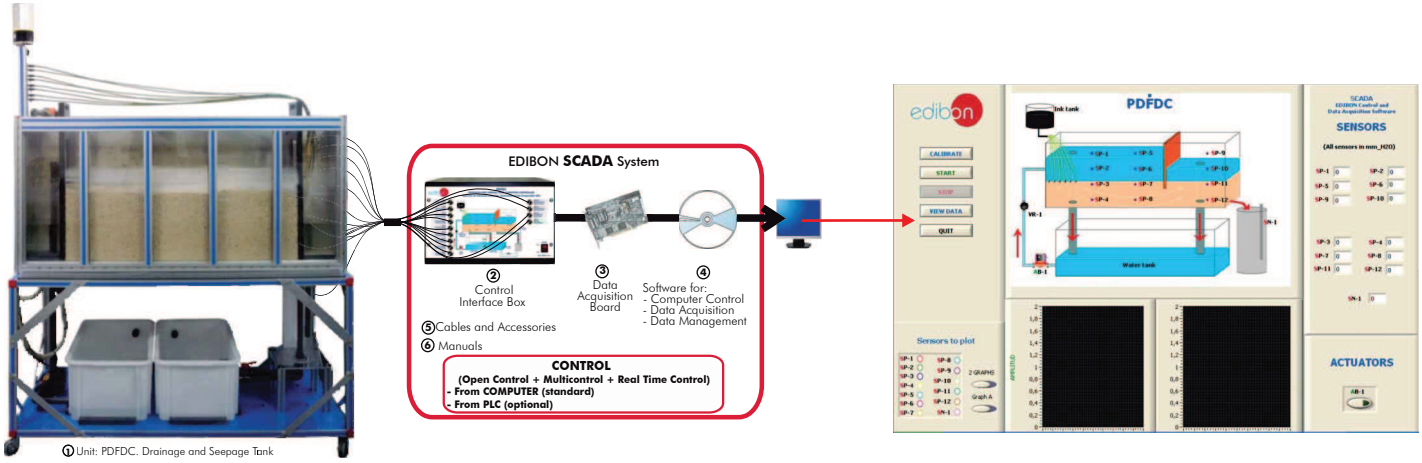
PRACTICAL POSSIBILITIES

1.- Investigation of drain filter materials.

2.- To select optimum filter/soil combinations.

3.- To determine relative efficiencies of drain filter materials.

PDFDC. Computer Controlled **Drainage and Seepage Tank** ✱



① Unit: PDFDC. Drainage and Seepage Tank

SPECIFICATIONS SUMMARY

Items supplied as standard

① PDFDC. Unit:

This unit has been designed for the practical demonstration, visualization and experimental study of the flow through permeable media and flows in subsoil.

Mobile bench.

Anodized aluminum structure and panels of painted steel.

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

Rectangular tank (soils container), with front side in methacrylate and back side in aluminum, to contain the sand. (Sand not included).

2 Overflow pipes in the tank.

12 Pressure sensors.

Feed water tank (capacity: 75 l.).

Water pump, computer controlled.

Control valve to regulate the water flow.

Water collection tank (capacity: 75 l.); this tank is connected to the feed water tank.

Samples collection tank; it includes a level sensor and a valve to control the emptying process.

Dye injection system: with dye vessel, with 8 dye injection needles and regulation valve.

Set of typical models:

1 Sheet pile wall.

2 Mesh gates.

1 Mobile accessory for pressure measurement.

② PDFDC/CIB. Control Interface Box :

With process diagram in the front panel.

The unit control elements are permanently computer controlled.

Simultaneous visualization in the computer of all parameters involved in the process.

Calibration of all sensors involved in the process.

Real time curves representation.

All the actuators' values can be changed at any time from the keyboard.

Shield and filtered signals to avoid external interferences.

Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process.

3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

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

Flexible, open and multicontrol software.

Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second).

It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) =Unit: 1500 x 700 x 2000 mm. Weight: 200 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PDFDC.pdf

PRACTICAL POSSIBILITIES

1.- Flow net construction.

2.- Flow line visualisation.

3.- Verification of Darcy´s Law.

4.- Comparison of experimental results with analytical solutions.

5.- To determine seepage rates.

6.- Seepage through an earth dam.

7.- Seepage underneath a sheet pile wall.

8.- Control of seepage through permeable soils by sub-soil drainage.

9.- To reduce uplift pressure and lateral thrust by drainage.

10.- Distribution of uplift pressure on hydraulic structures.

11.- Behaviour and formation of "quicksands".

12.- To drain an excavation site using wells.

13.- Stability of an earth dam.

14.- Comparison of permeability according to the grain size.

15.- Sheet pile wall:

- Study of the soil permeability.
- Flow lines visualization.
- Calculation of the equipotential lines.
- Pressures distribution.

16.- Permeability of the phreatic layer:

- Study of the soil permeability.
- Flow lines visualization.
- Calculation of the equipotential lines.
- Measurement of the infiltration speed.
- Verification of the Law of Darcy.

17.- Flow through an earth dam:

- Study of the soil permeability.
- Flow lines visualization.
- Calculation of the equipotential lines.
- Pressures distribution.
- Effects of the layer inclination.

Other possible practices:

18.- Sensors calibration.

19-37.- Practices with PLC.

✱ Non computer controlled version available too.

PEIF. **Filterability Index Unit**

SPECIFICATIONS SUMMARY

The PEIF is an unit for demonstrating the filtering process through a porous media. It enables a water quality test to be made on a suspension to be filtered through sand or similar granular media.

This unit utilises a bed of granular material, normally sand, which can be chosen by the student to suit his own purposes. The measurements taken with this unit enable a filterability index to be calculated which has significance in deep bed filter performance.

Anodized aluminum structure and panel of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.

Feeding tank of 1 l. capacity.

Filtration unit, with porous bed filter, removable:

Height of the filter: 70 mm. Test filter cell diameter: 44 mm. The filter unit can be dismounted to change the sand.

A regulation valve controls the flow, which is observed on a flow meter.

Water flow meter, range: 0-550 cc/min.

Differential manometer of 500 mm, to measure the head loss.

Accessories included with the unit:

Thermometer. Stopwatch. Graduated test tube. Glass beaker (to collect filtrate). Air pump for purging the manometer.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.) = 600 x 400 x 800 mm. Weight: 25 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PEIF.pdf

PRACTICAL POSSIBILITIES

1.- Study of the filtration operation principles.
2.- Filtration procedure.
3.- Flowmeter calibration.
4.- Calculation of Filterability Index from measurements taken.
5.- Flow through permeable layers.
6.- Deep bed filtration of suspensions with different particle layers.
7.- Practice of sand filter cleaning.

ESED. **Sedimentation Study Unit**

SPECIFICATIONS SUMMARY

The sedimentation is a process widely used in the classification, water clarification and wastewater treatment.

"ESED" unit provides a facility for studying the basic physical process involved in sedimentation, which the applications cover fields like chemical engineering, water treatment and other industrial processes.

Anodized aluminum structure and panels of painted steel.

Five sedimentation graduated cylinders of methacrylate (1m x 50mm approx.) mounted vertically on a panel, illuminated from behind, and with the possibility of being removable for cleaning.

Light diffuser screen and two fluorescent lamps.

Stopwatch.

Three beakers.

Specific gravity bottle.

Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = 550 x 400 x 1300 mm. Weight: 35 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/ESED.pdf

PRACTICAL POSSIBILITIES

1.- Variation of the sedimentation characteristics with the concentration and suspension height.
2.- Effect of initial concentration on sedimentation characteristics.
3.- Effect of initial suspension height on sedimentation characteristics.
4.- Construction of settling rate curves against concentration form a single batch test.
5.- Effect of particle size distribution.
6.- Identification of the different sedimentation regimes.
7.- Use of flocculating additives.
8.- Construction of settling rate curves.
9.- Visualization of the retarded sedimentation.
10.- Study of the differences between a clarifier and a classifier.
11.- Study and visualization of the differential sedimentation.
12.- Study of the methods of sinking and floating.

PEDI. **Demonstration Infiltration Unit**

SPECIFICATIONS SUMMARY

The Demonstration Infiltration Unit (PEDI) is a small scale unit designed to demonstrate infiltration processes and to understand the effects of soil texture and structure on infiltration and the effects of existing moisture conditions of the soil on infiltration.

Anodized aluminum structure and panel made of painted steel.

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

Three transparent graduated cylinders. These cylinders have a permeable perforated plate at the bottom, where a filter to disable the soil introduced to be swept by the water is placed.

A tank to collect the water and the smaller soil particles under study.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.) = 500 x 400 x 900 mm. Weight: 50 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PEDI.pdf

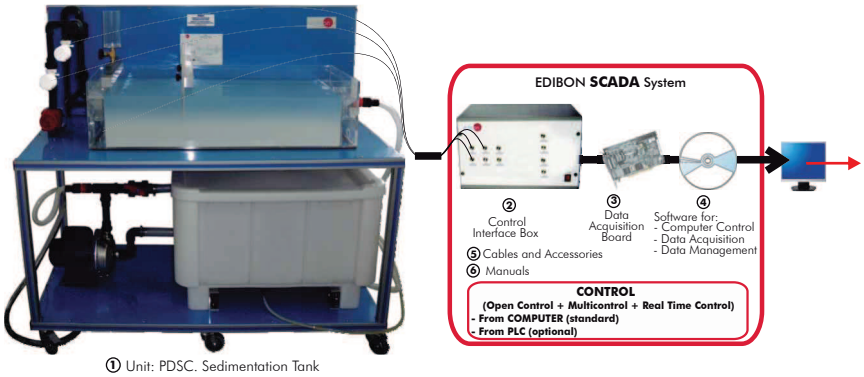
PRACTICAL POSSIBILITIES

1.- Determination of the principles of the relationship between the type of soil and infiltration and penetration rates.
2.- Comparison of the cumulative infiltration, infiltration rate and penetration depth as a function of time in different types of soil.
3.- Study of the empirical equations as an approximation of infiltration rate.
4.- Visualization of the effect of crusting on infiltration.
5.- Visualization of the effect of soil particle size on infiltration.

Additional practical possibilities:

6.- Study of the effect of organic matter content on the infiltration and penetration rate.
7.- Study of the effect of non-homogeneous soil strata on infiltration and penetration rates.
8.- Study of the effect of moisture content on the infiltration and penetration rate.
9.- Study of the effect of straw mulch on infiltration rate.
10.- Study of the effect of soil texture and structure on infiltration.
11.- Study of the effect of surface on infiltration.

PDSC. Computer Controlled **Sedimentation Tank** ✱



① Unit: PDSC. Sedimentation Tank

SPECIFICATIONS SUMMARY

Items supplied as standard

① PDSC. Unit:

PDSC is a unit to demonstrate the sedimentation process and to familiarize with the settling principle of discrete or floculated particles settling into a tank. It will also allow to study the hydraulic characteristics of a rectangular sedimentation tank which works in continuous.

Anodized aluminum structure and panels of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.

Sedimentation tank, made in transparent methacrylate, length: 1000 mm; width: 400 mm; height: 250 mm.

Suspended solids installation, composed of: suspended solids tank of 140 l., centrifugal pump (computer controlled), flow regulation valve and flow sensor.

Clean water installation, composed of: flow regulation valve and flow sensor.

Dye injection and tracer system, which allows to study the fluid current lines into the sedimentation tank.

2 Baffle plates, adjustable in height, what makes easier for the student the possibility of changing the flow lines direction and its study.

Accessories included: 2 Imhoff cones of 1000 ml., to measure the solids concentrations and graduated test tube of 1 l.

② PDSC/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

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

Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.)= Unit: 1400 x 700 x 1300 mm. Weight: 150 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PDSC.pdf

PRACTICAL POSSIBILITIES

1.- Study of the basic principles of solids in suspension separation.

2.- Efficiency of the separation by sedimentation process.

3.- Study of the current lines.

4.- Study of the effect of flow rate, inlet water temperature and baffle position on dispersion.

5.- Measuring sediment removal efficiencies and relating these to the hydraulic characteristics.

6.- To measure the flow short-circuiting and dead space using a tracer.

7.- Comparison of real flow regimes with idealised flow models.

Other possible practices:

8.- Sensors calibration.

9-27.- Practices with PLC.

PEFP. **Permeability/Fluidisation Studies Unit**

SPECIFICATIONS SUMMARY

The EDIBON Permeability/ Fluidisation Studies Unit is designed for student to measure and understand the characteristics of flow through a bed of particles. Such flows occur both naturally and in process plant designs. This unit can also be used for a part of the studying of media for water and wastewater filtration. This unit verifies Darcy's Law, examines Kozeny's equation and observes liquid fluidisation behaviour of a granular bed.

Anodized aluminum structure and panel of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.

Permeameter: transparent acrylic cylinder of 50 mm. diameter, 500 mm. length.

2 Filter metallic disks.

4 Piezometer taps located along the vertical axis of the cylinder.

Piezometric taking collector.

Piezometer or Manometer of water: 500 mm. length.

2 Manometers, Bourdon type.

Constant head supply device: max. height variation: 500 mm.

Flowmeter.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.) = 850 x 400 x 1200 mm. Weight: 70 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PEFP.pdf

PRACTICAL POSSIBILITIES

1.- Pressure drop measurements and correlations for flow through packed beds.

2.- To calculate the density of each specimen.

3.- To calculate the relative density of specimen mixing.

4.- Study and verification of Carman-Kozeny´s equation.

5.- Calculation the void ratio.

6.- To determine the permeability constant (Darcy´s Law).

7.- Observation of a liquid fluidised bed.

8.- Characteristic of a liquid fluidised bed.

9.- Attrition test.

10.- Measurement of permeability of selected solids.

✱ Non computer controlled version available too.

HVFLM-2. **Mobile Bed and Flow Visualisation Unit** (working section: 2000 mm x 610 mm)

SPECIFICATIONS SUMMARY

The Mobile Bed and Flow Visualization Unit (HVFLM-2) is a particularly useful unit to demonstrate the fluidization phenomenon in engineering. It makes it possible to study different situations of flow and mobile bed visualization related to civil engineering structures.

This unit may be used mainly in two study fields. The first one is the investigation of mobile beds, which are related to water courses and civil engineering structures. The second one is related to the visualization of the flow in two dimensions.

The Mobile Bed and Flow Visualization Unit (HVFLM-2) is mounted on a metallic structure with wheels, rigid and resistance enough to support the weight of water and sand without suffering any deformation.

This unit is divided into three sections: inlet tank, working section (channel) and discharge tank.

Stainless steel inlet tank, with adjustable hermetic overshot. It is supplied with a control at the upper side of the tank which makes it possible to change the slope of such overshot. The tank includes two perforated distributors and a perforated plate to spread the flow evenly across the width of the tank.

Flow channel, made of stainless steel, including two main rails along the working section with millimeter rulers (longitudinal crosspiece). An instruments carrier which has a sub-rail (transverse crosspiece) is supported on the rails and allow to put a gauge. Two sand traps can be coupled to both ends of the working section. Dimensions: 2000 mm x 710mm x 350 mm. The working section is 2000mm x 610 mm, and max. water depth is 120 mm. approx.

Discharge tank, made of stainless steel, with overflow. It is divided into two parts, the one closer to the channel enables the sedimentation of sand, using a trap, whereas the second part enables the removal of the water which overflows from the first part.

Instrumentation:

An instruments carrier, which can be positioned over any point of the working section.

A gauge designed to be mounted on the instruments carrier. It is provided with a stainless steel hook and a point, and a Vernier scale.

The practical exercises with this unit are carried out by using water and sand. Ink is included for the two dimension flow visualization, to carry out flow studies around the models and to demonstrate the boundary layer, without the need of assembling any accessory.

Two water storage tanks. It has a filter at the pump inlet to retain possible residues, a butterfly valve and an overflow that connects the storage tanks.

Centrifugal pump with flow regulation.

Electromagnetic flow meter with display for the measurement and the reading of the flow.

Membrane valve.

Two different size gates to simulate an overflow and an obstacle in the working section.

A set of models included:

Bridge piers models:

2 rectangular models.

4 cylindrical models.

4 square models.

2 profiled rectangular models.

2 rectangular models with rounded ends.

Triangular model.

Asymmetrical aerofoil model.

Six baffles to direct the water flow during the experimental tests.

A set of 12 "L" shaped profiles.

Three pairs of different angles to build additional models

Electronic console, including:

Motor-pump starter for the centrifugal pump.

Flow controller for the centrifugal pump.

Cables and Accessories, for normal operation.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.) = Unit: 3350 x 710 x 1200 mm. Weight: 550 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/HVFLM-2.pdf

PRACTICAL POSSIBILITIES

1.- Observation of the flow around model engineering structures.

2.- Mobile bed experiments.

3.- Study of the meandering water courses characteristics.

4.- Visualization of the behaviour of boundary layers.

5.- Demonstration of boundary layer suction.

6.- Studies of erosion.

7.- Studies of deposition.

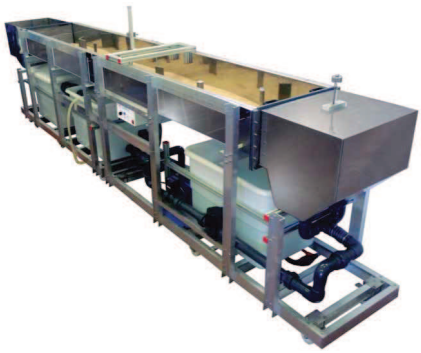
8.- Studies of velocity distribution in duct flow.

9.- Studies with engineering structures.

10.- Two dimensional flow visualization.

11.- Study of the hydraulic analogy to compressible flow.

HVFLM-4. **Mobile Bed and Flow Visualisation Unit** (working section: 4000 mm x 610 mm)



SPECIFICATIONS SUMMARY

The Mobile Bed and Flow Visualization Unit (HVFLM-4) is a particularly useful unit to demonstrate the fluidization phenomenon in engineering. It makes it possible to study different situations of flow and mobile bed visualization related to civil engineering structures.

This unit may be used mainly in two study fields. The first one is the investigation of mobile beds, which are related to water courses and civil engineering structures. The second one is related to the visualization of the flow in two dimensions.

The Mobile Bed and Flow Visualization Unit (HVFLM-4) is mounted on a metallic structure with wheels, rigid and resistance enough to support the weight of water and sand without suffering any deformation.

This unit is divided into three sections: inlet tank, working section (channel) and discharge tank.

Stainless steel inlet tank, with adjustable hermetic overshot. It is supplied with a control at the upper side of the tank which makes it possible to change the slope of such overshot. The tank includes two perforated distributors and a perforated plate to spread the flow evenly across the width of the tank.

Flow channel, made of stainless steel, including two main rails along the working section with millimeter rulers (longitudinal crosspiece). An instruments carrier which has a sub-rail (transverse crosspiece) is supported on the rails and allow to put a gauge. Two sand traps can be coupled to both ends of the working section. Dimensions: 4000 mm x 710mm x 350 mm. The working section is 4000mm x 610 mm, and max. water depth is 120 mm. approx.

Discharge tank, made of stainless steel, with overflow. It is divided into two parts, the one closer to the channel enables the sedimentation of sand, using a trap, whereas the second part enables the removal of the water which overflows from the first part.

Instrumentation:

An instruments carrier, which can be positioned over any point of the working section.

A gauge designed to be mounted on the instruments carrier. It is provided with a stainless steel hook and a point, and a Vernier scale.

The practical exercises with this unit are carried out by using water and sand. Ink is included for the two dimension flow visualization, to carry out flow studies around the models and to demonstrate the boundary layer, without the need of assembling any accessory.

Three water storage tanks. It has a filter at the pump inlet to retain possible residues, a butterfly valve and an overflow that connects the storage tanks.

Centrifugal pump with flow regulation.

Electromagnetic flow meter with display for the measurement and the reading of the flow.

Membrane valve.

Two different size gates to simulate an overflow and an obstacle in the working section.

A set of models included:

Bridge piers models:

2 rectangular models.

4 cylindrical models.

4 square models.

2 profiled rectangular models.

2 rectangular models with rounded ends.

Triangular model.

Asymmetrical aerofoil model.

Six baffles to direct the water flow during the experimental tests.

A set of 12 "L" shaped profiles.

Three pairs of different angles to build additional models

Electronic console, including:

Motor-pump starter for the centrifugal pump.

Flow controller for the centrifugal pump.

Cables and Accessories, for normal operation.

Manual: This unit is supplied 8 Manuals.

Dimensions (approx.)= Unit: 5350 x 710 x 1200 mm. Weight: 750 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/HVFLM-4.pdf

PRACTICAL POSSIBILITIES

1.- Observation of the flow around model engineering structures.

2.- Mobile bed experiments.

3.- Study of the meandering water courses characteristics.

4.- Visualization of the behaviour of boundary layers.

5.- Demonstration of boundary layer suction.

6.- Studies of erosion.

7.- Studies of deposition.

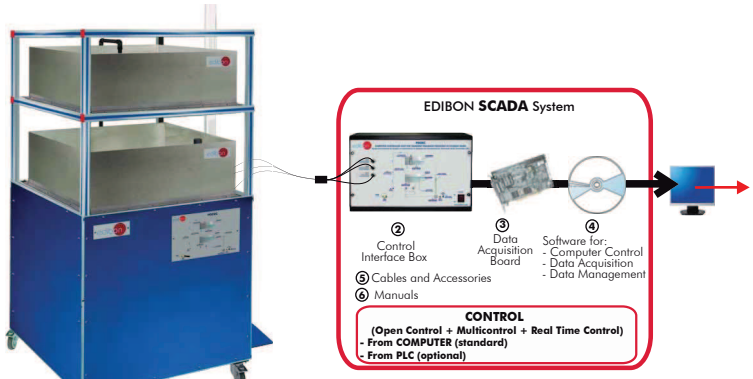
8.- Studies of velocity distribution in duct flow.

9.- Studies with engineering structures.

10.- Two dimensional flow visualization.

11.- Study of the hydraulic analogy to compressible flow.

PDDRC. Computer Controlled **Unit for Transient Drainage Processes in Storage Reservoirs**



① Unit: PDDRC. Unit for Transient Drainage Processes in Storage Reservoir

SPECIFICATIONS SUMMARY
Items supplied as standard

① PDDRC. Unit:

The Computer Controlled Unit for Transient Drainage Processes in Storage Reservoirs (PDDRC), allows to simulate transient drainage processes between storage reservoirs and the operation of a surge chamber. This unit allows to investigate transient drainage processes in storage reservoirs, to simulate a rainwater retention basin and to study the operation of a surge chamber.

Metallic structure and panels in painted steel.

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

Upper reservoir (of stainless steel):

Dimensions: 1000 x 1000 x 350 mm.

It includes an adjustable rectangular weir, which can be used as a gate or as an overfall weir; gate opening: 1.6 mm; weir height: 225 mm.

Lower reservoir (of stainless steel):

Dimensions: 1000 x 1000 x 350 mm.

It includes an overflow and a drainage line.

Surge chamber (of PMMA):

Inner diameter: 64 mm.

Height: 2000 mm.

Computer controlled pump.

Four valves: one to regulate the inlet flow, two in the drainage line of the lower reservoir and the last one in the drainage line of the surge chamber.

One gate in the drainage line of the surge chamber to generate water hammers.

One protective cover to prevent spillages.

Flow sensor to measure the water inlet flow.

Pressure sensors:

Two sensors to measure the water levels in the reservoirs.

One sensor to measure the water level fluctuations in the surge chamber.

② PDDRC/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled.

Simultaneous visualization in the PC of all parameters involved in the process.

Calibration of all sensors involved in the process.

Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences.

Real time control with flexibility of modifications from the PC keyboard of the parameters, at any moment during the process.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process.

3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot.

16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

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

Flexible, open and multicontrol software. Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 1300 x 1300 x 2100 mm. Weight: 135 Kg.
Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/waterhandling/PDDRC.pdf

PRACTICAL POSSIBILITIES

1.- Study of the main drainage processes between storage reservoirs.

2.- Demonstration of transient drainage processes in two consecutive storage reservoirs.

3.- Determination of discharge in two consecutive storage reservoirs.

4.- Demonstration of transient drainage processes in a rainwater retention basin.

5.- Measure of the oscillations of the surge chamber.

6.- Measure of the natural frequency of the surge chamber.

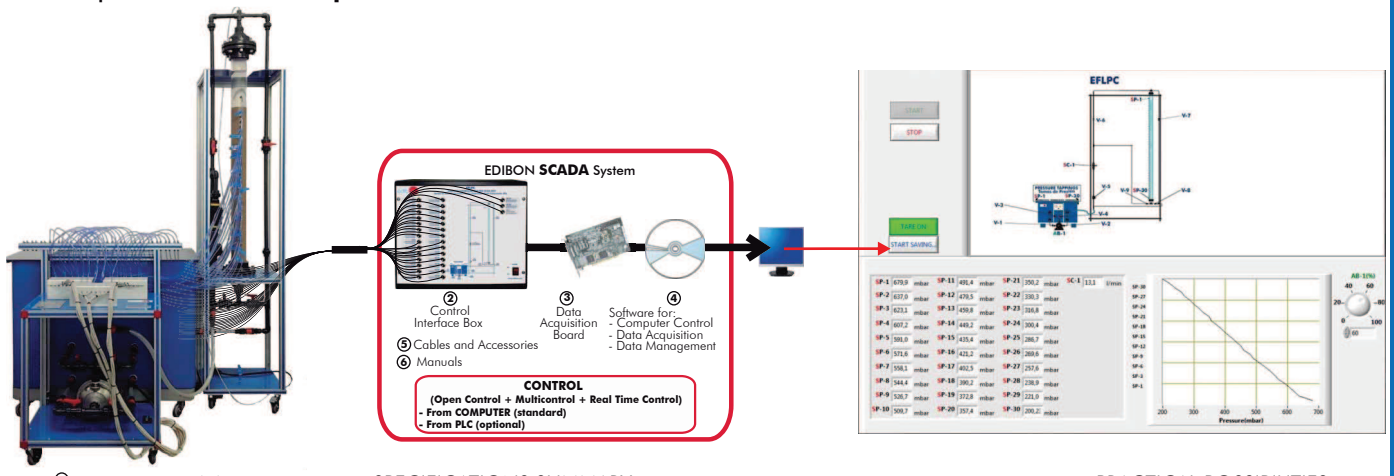
7.- Measure of the water level fluctuations.

Other possible practices:

8.- Sensors calibration.

9-27.- Practices with PLC.

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



① Unit: EFLPC. Deep Bed Filter Unit

SPECIFICATIONS SUMMARY

Items supplied as standard

① EFLPC. Unit:

The Computer Controlled Deep Bed Filter Unit (EFLPC) enables to study filtration in open and closed circuit, as well as to visualize the bed washing process. This 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.

Anodized aluminum structure and panels of painted steel.

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

Filter column, where the porous media is formed:

It includes the following elements:

Transparent PMMA tube of circular section (column height: 1300 mm), with removable top and bottom covers. Support filter of the porous bed. Filtering bed. 30 Sample capturing takings. 30 Pressure sensors.

Tank:

Its objective is to prepare the suspension for being filtered. There is a tank with two reservoirs:

Reservoir 1 = 350 l. Reservoir 2 = 350 l. Total capacity: 700 l. Both reservoirs have water heigh level.

Pump:

Centrifugal pump, computer controlled.

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 valves system to establish several circuits and regulate the flows.

Flow sensor.

② EFLPC/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

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

Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.)=Unit: 1600 x 1500 x 2500 mm. Weight: 250 Kg. Control Interface Box: 490 x 450 x 470 mm. Weight: 20 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/EFLPC.pdf

PRACTICAL POSSIBILITIES

1.- Determination of the initial head loss of a deep bed.

2.- Evolution through time of the head loss of the deep bed.

3.- Measuring pressure drop profiles through the bed.

4.- Demonstration of reversed flow and backwashing fluidisation.

5.- Filtering in open and closed circuit.

Additional practical possibilities:

6.- Sensors calibration.

7.- The column may be readily adapted for absorption and ion exchange studies.

8.- Measuring suspension concentration profiles through the filter bed.

9.- Filtration efficiency. Clarification.

Other possible practices:

10-28.- Practices with PLC.

EII. **Ion Exchange Unit**

SPECIFICATIONS SUMMARY

Self-contained unit either single bed water softening or double bed system for demineralisation.

Anodized aluminum structure and panel of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.

Exchange capacity of the different materials, as resins and used reagents, as well as the problem water.

Use of simple or double bed for demineralisation.

4 Tanks (treated water, demineralized water, hydrochloric acid and sodium hydroxide).

Pump diaphragm type.

Flow meter,resistant to hydrochloric acid.

2 Transparent vertical columns for the anionic and cationic resins. 1 spare column.

Valves and pipes circuit.

Conductivity meter (with conductivity cell).

Typical commercial anionic and cationic resins.

Switch board.

Cables and accessories, for normal operation.

Manuals: This unit is supplied 8 Manuals.

Dimensions (approx.) = 1200 x 500 x 1000 mm. Weight: 50 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/EII.pdf

PRACTICAL POSSIBILITIES

1.- Study of general techniques of ion exchange.

2.- Familiarization with the operation modes of column ionic exchange.

3.- The exchange capabilities of different resins materials.

4.- Water softening using a cationic resin.

5.- Hard water softening (H^+).

6.- Hard water softening (OH^-).

7.- Resin regeneration efficiency (H^+).

8.- Demineralisation.

9.- Demineralisation efficiency.

10.- Determination of saline ions concentration.

11.- Separation of Ni^{2+}, Zn^{2+}.

12.- Hard water softening (sodic resin).

13.- Resin regeneration efficiency (Na^+).

14.- How to operate the conductivity meter.

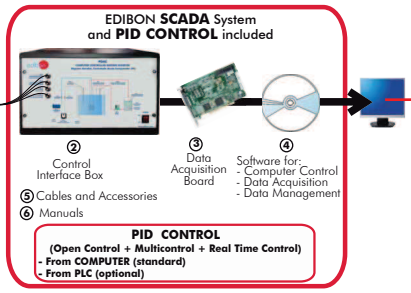
15.- Regeneration efficiency of a softening system.

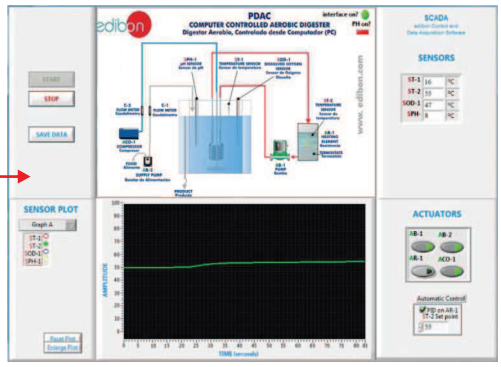
16.- Demineralisation using two-bed exchange.

✱ Non computer controlled version available too.

PDAC. Computer Controlled **Aerobic Digester** ✱

① Unit: PDAC. Aerobic Digester





SPECIFICATIONS SUMMARY
Items supplied as standard

① PDAC. Unit:
The objective of this unit is to study and understand aerobic digestion processes and to analyze their main parameters. Anodized aluminum structure and panels of painted steel. Diagram in the front panel.
Reactor vessel with a tubular membrane inside. Heating or cooling coil. Lid for the reactor with a manual valve and the respective holes. Thermostatic bath (up to 60° C), computer controlled (PID control). Sensor to obtain the temperature in the thermostatic bath. Pump for hot water circulation of the thermostatic bath, computer controlled. Air compressor, computer controlled. Diffusion plate for the air inlet. Air flow meter. Peristaltic pump, computer controlled. Water flow meter. Membrane, muds separation. Overflow for the outlet of filtered water. Valve on the bottom for mud extraction. To monitor the digestion: 1 temperature sensor, 1 pH sensor and 1 dissolved oxygen sensor.

② PDAC/CIB. Control Interface Box :
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the PC of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time PID control with flexibility of modifications from the PC keyboard of the PID parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PDAC/CCSOF. PID Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 800 x 600 x 700 mm. Weight: 50 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

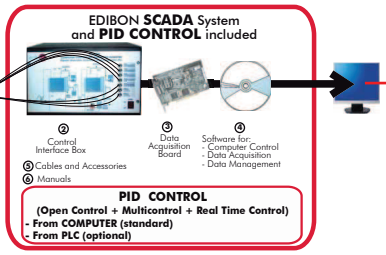
More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PDAC.pdf

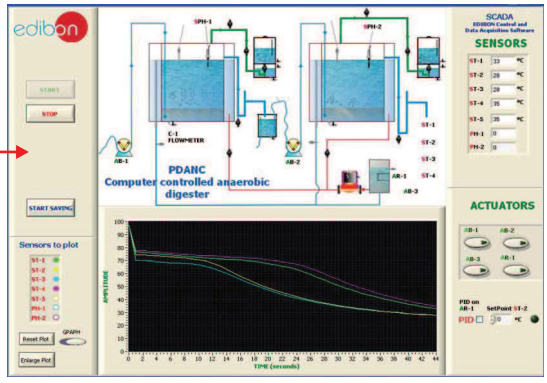
PRACTICAL POSSIBILITIES

1.- Acclimation of biological samples.
2.- Study of the temperature effect on the effluent quality.
3.- Study of the detention time effect on the effluent quality.
4.- Study of the aireation effect on the effluent quality.
5.- Study of the pH effect on the effluent quality.
6.- Study of the mass load effect on the effluent quality.
7.- Study of the nutrients effect on the effluent quality.
8.- Study of the recirculation effect on the effluent quality.
9.- Establishing the stoichiometry of aerobic processes.
10.- Establishing the kinetics of aerobic processes.
11.- Gas/liquid mass transfer.
12.- Residence time distributions.
13.- Measurement of MLSS and COD changes as criteria of performance.
Other possible practices:
14.- Sensors calibration.
15-33.- Practices with PLC.

PDANC. Computer Controlled **Anaerobic Digester** ✱

①Unit: PDANC. Anaerobic Digester





SPECIFICATIONS SUMMARY
Items supplied as standard

① PDANC. Unit:
The aim of this unit is to allow the survey and the comprehension of the anaerobic digestion process. Anaerobic Digestion is a biological process that happens naturally in which micro-organisms break down biodegradable material (organic matter) in environments with no oxygen.
Anodized aluminum structure and panels of painted steel. Diagram in the front panel.
2 Packed reactors (anaerobic digesters) that may be operated in series or parallel flow arrangement. Each reactor has 5 l. capacity. Reactor packing: Bio-balls. For each reactor: heating jacket with PID control. 2 Feed pumps, computer controlled. 2 Volumetric tanks, for collecting and measurement of the volume of gas produced. Temperature control. 5 Temperature sensors. 2 pH sensors. 2 Water flow meters. Thermostatic bath (heating element, computer controlled), up to 90°C. Water circulation pump, computer controlled, for the thermostatic bath. Buffer vessel.

② PDANC/CIB. Control Interface Box :
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the PC of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time PID control with flexibility of modifications from the PC keyboard of the PID parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PDANC/CCSOF. PID Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 1000 x 800 x 1000 mm. Weight: 80 Kg.
Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PDANC.pdf

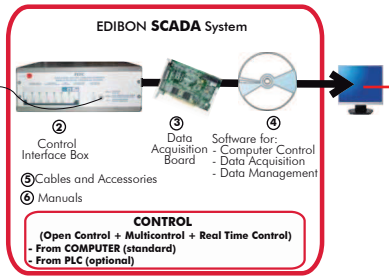
✱ Non computer controlled version available too.

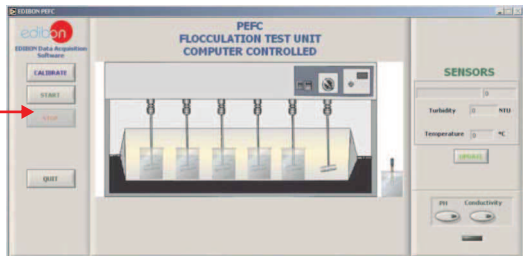
PRACTICAL POSSIBILITIES

1.- Stabilization process study.
2.- Effect of temperature in the purification.
3.- Effect of the effluent pH in the digestion.
4.- Survey of the feeding rate in the purification.
5.- Study of the effluent strength.
6.- Study of the relation between the nutrient concentration in the effluent and purification.
7.- Study of the effect of the hydraulic charge in the purification.
8.- Study of the influence of the inhibitors to the anaerobic digestion.
9.- Comparison between mesophilic and thermophilic anaerobic digestion.
10.- Determination of the optimal working temperature.
11.- Determination of the optimal feeding rate.
12.- Determination of the optimal solids/water ratio.
13.- Determination of the optimal degradable/ non-degradable solids ratio.
14.- Demonstration of the multistage nature of anaerobic digestion.
15.- Kinematics determination.
16.- Carbon balance.
17.- Solids Balance.
18.- Biogas Balance.
19.- Study of the effect of pH.
20.- Influent nutrient concentration.
21.- Preparation, warming and acclimation of an anaerobic reactor.
22.- Effluent treatability studies, including solids, carbon and biogas balances for determining the purification (COD-BOD).
23.- Study of the effects on purification performance of:
Feed ratios.
Hydraulic loading.
Temperature.
Influent strength.
Nutrient deficiency.
Other possible practices:
24.- Sensors calibration.
25-43.- Practices with PLC.

PEFC. Computer Controlled **Flocculation Test Unit** ∗

① Unit: PEFC. Flocculation Test Unit





SPECIFICATIONS SUMMARY
Items supplied as standard

① PEFC. Unit:
Anodized aluminum and steel structure. Diagram in the front panel with similar distribution to the elements in the real unit. Flocculation test unit illuminated in the base or in back part. Six stirrers with stainless steel paddles. Agitation speed regulation. Six flocculating graduated vessels. Sample volume of each vessel: 1 l. Timer. Lamp switch. R.p.m. regulator and r.p.m. display. pH sensor. Conductivity sensor. Temperature sensor. Turbidity meter.

② PEFC/CIB. Control Interface Box:
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PEFC/CCSOF. Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 1000 x 250 x 520 mm. Weight: 40 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PEFC.pdf

PRACTICAL POSSIBILITIES

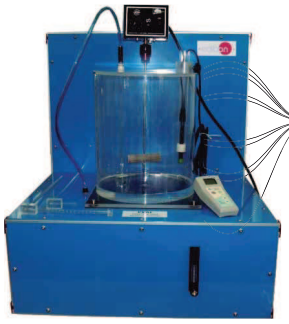
1.- Determination of optimum coagulant dosage.
2.- Study of coagula formation regarding to the mixing time and the agitation speed.
3.- Determination of optimum pH.
4.- Coagulation tests in conjunction with activated carbon.

Other possible practices:

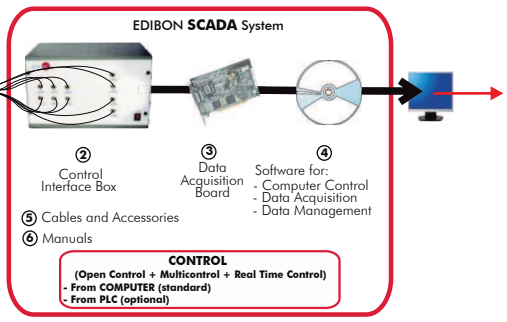
5.- Sensors calibration.

6-24.- Practices with PLC.

PEAIC. Computer Controlled **Aeration Unit** ∗



① Unit: PEAIC. Aeration Unit



SPECIFICATIONS SUMMARY
Items supplied as standard

① PEAIC. Unit:
This unit permits the study of the oxygen transfer characteristics of diffused air systems, and to study the physical and chemical parameters which influence their oxygenation capacity.
The "PEAIC" unit demonstrates the water aeration process which, mainly, eliminates smell and taste from water.
Anodized aluminum structure and panels of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.
Open tank of 28 l. capacity. Air injection pipe. Air injection control. Flow sensor. Paddle stirrer with variable speed control. Air pump. Oxygen sensor and oxygen probe (300 mm. length). Three diffusers: sparger tube, disk airstone and single airstone. Temperature sensor.

② PEAIC/CIB. Control Interface Box :
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PEAIC/CCSOF. Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 600 x 700 x 850 mm. Weight: 50 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PEAIC.pdf

PRACTICAL POSSIBILITIES

1.- Aeration necessity determination.
2.- To measure the absorption coefficient K_s and the oxygenation capacity R.
3.- Influence of the injected oxygen volume.
4.- Study of the effect on K_s and R of:
- Water temperature.
- Degree of fluid mixing.
- Gas flow rate.
- Diffuser arrangement.
- Depth of water.
- Water composition.

5.- Influence of the stirrer turn speed.
6.- Aeration with air injection and agitation.
7.- Influence of the temperature in the process.
8.- Influence of liquid level in the tank.
9.- Effects of oxygen transfer under non-steady state conditions.

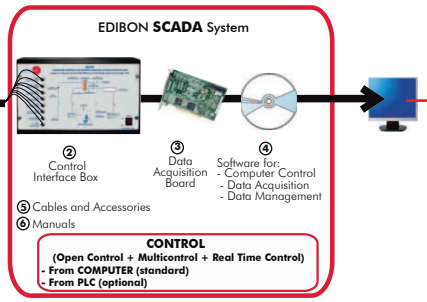
Other possible practices:

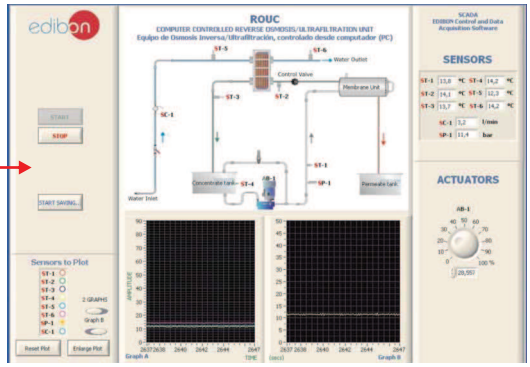
10.- Sensors calibration.
11-29.- Practices with PLC.

∗ Non computer controlled version available too.

ROUC. Computer Controlled **Reverse Osmosis/Ultrafiltration Unit**

① Unit: ROUC. Reverse Osmosis/Ultrafiltration Unit





SPECIFICATIONS SUMMARY

Items supplied as standard

① ROUC. Unit:
Laboratory Scale Computer Controlled Reverse Osmosis/Ultrafiltration Unit designed to study and to provide practical training in these downstream processing techniques. As well as the processing of the whey, the membranes can be also used to demonstrate, for example: clarification and concentration of fruit juices, potabilization of water, pre-concentration of milk for cheese manufacturing, etc.
Anodized aluminum structure and panels of painted steel. Diagram in the front panel with similar distribution to the elements in the real unit. Stainless steel feed tank. Three head positive displacement feed pump, used to feed product to the membrane module, flow and pressure adjustable, variable speed control.
Frequency variator that controls the pump motor. Membrane module: two tubular membranes conected in series. Two regulation valves to control the water flow and the effluent flow. Plates heat exchanger for the concentrate. Permeate stainless steel collecting tank. 6 Temperature sensors, "J" type. Pressure sensor. Flow sensor (water inlet). Different models of membranes are supplied. Rapid changeover from Reverse Osmosis to Ultrafiltration and back.

② ROUC/CIB. Control Interface Box :
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the PC of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the PC keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ ROUC/CCSOF. Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) =Unit: 800 x 800 x 1000 mm. Weight: 165 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/ROUC.pdf

PRACTICAL POSSIBILITIES

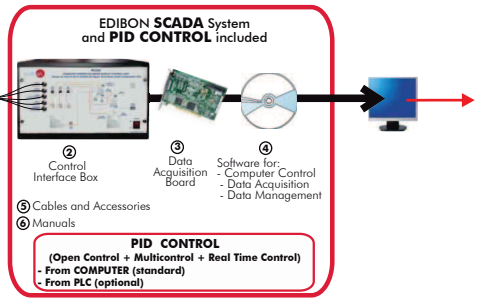
1.- Practical training in ultrafiltration an reverse osmosis processing techniques.
2.- Protein standardisation in the production of fermented milk products such as concentration of skimmed milk for yoghurt production.
3.- Pre-concentration of milk for cheese manufacture.
4.- Concentration of fruit juices.
5.- Clarification of fruit juices.
6.- Water potabilization.
7.- Demonstration of the effect of varying the following process parameters on separation performance:
- Process pressure.
- Product flow rate.
- Process temperature.

Additional practical possibilities:
8.- Sensors calibration.
9.- Applications of concentration, clarification, fractionation and standardization of milk, fruit juices, vegetables juices, etc.
10.- Treatment of effluent.
11.- Membrane cleaning and maintenance.
12.- Enzime, antibiotics and organic acids recovery in permeate.

Other possible practices:
13-31.- Practices with PLC.

PPTAC. Computer Controlled **Water Quality Control Unit**

① Unit: PPTAC. Water Quality Control Unit



SPECIFICATIONS SUMMARY

Items supplied as standard

① PCCAC. Unit:
The main physical and chemical characteristic parameters related to the water quality can be controlled and regulated: conductivity, pH, oxygen concentration and redox potential with the PCCAC unit.
Anodized aluminum structure and panels made of painted steel. Supply tank. Computer controlled pump, to impel the water to be treated from the supply tank. 2 Intermediate transparent tanks: first tank, including: computer controlled stirrer, conductivity sensor; in this tank the conductivity is controlled; second tank, including: pH sensor, dissolved oxygen sensor; in this tank the pH and oxygen concentration is controlled. Computer controlled compressor, to inject air into the second tank. 3 Tanks for the chemical reagents. 3 Computer controlled pumps to add chemicals reagents. Collection tank, including: pH sensor, redox potential sensor, in this tank the redox potential is controlled.

② PCCAC/CIB. Control Interface Box :
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the PC of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time PID control with flexibility of modifications from the PC keyboard of the PID parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PCCAC/CCSOF. PID Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) =Unit: 1700 x 700 x 1900 mm. Weight: 160 Kg. Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

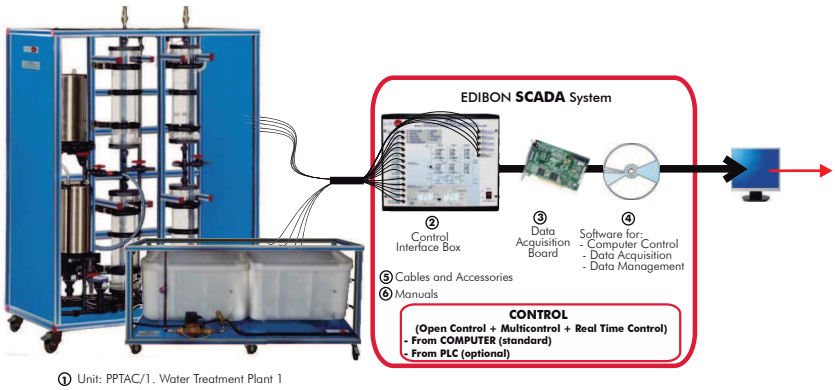
More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PCCAC.pdf

PRACTICAL POSSIBILITIES

1.- Study and influence of the main physical-chemical parameters on the water quality.
2.- Analysis of the conductivity, pH, oxygen concentration and redox potential of water.
3.- Influence of caustic soda on the electric conductivity of water.
4.- Influence of caustic soda on the water pH.
5.- Influence of sulfuric acid on the water pH.
6.- Influence of air injection on the water oxygen concentration.
7.- Influence of iodine on the water redox potential.
8.- Analysis and study of different types of control P, PD, PI, PID.

Other possible practices:
9.- Sensors calibration.
10-28.- Practices with PLC.

PPTAC/1. Computer Controlled **Water Treatment Plant 1**



① Unit: PPTAC/1. Water Treatment Plant 1

SPECIFICATIONS SUMMARY

Items supplied as standard

① PPTAC/1. Unit:

The Computer Controlled Water Treatment Plant 1 (PPTAC/1) allows to study the main principle of the critical operations in the water treatment. These operations are: depth filtration, adsorption and ion exchange.

Metallic structure and panels of painted steel.

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

Supply unit:

Computer controlled pump.

Storage tanks: two storage tanks that supply the raw water required to the Water Treatment Unit and store the treated water obtained in the Water Treatment Unit.

The raw water tank includes a line to introduce air optionally with an external compressed air supply (not included).

The treated water tank has three lines to connect the outlet water of the different processes of the water treatment.

Four level sensors: two sensors to indicate the maximum level and two sensors to indicate the minimum level.

Water Treatment Unit:

Two transparent filters:

The filters have connections that allows samples to be taken, to drain the effluent and backwash the filters.

The upper filter contains gravel and the lower filter contains sand.

They include two differential pressure sensors.

Two transparent adsorbers:

The filters have connections that allows samples to be taken and to drain the effluent.

The upper adsorber contains aluminium oxide and the lower adsorber contains activated carbon.

Two exchangers:

The filters have connections that allows samples to be taken and to drain the effluent.

The lower exchanger contains a mixed bed with cations and anions, and the upper exchanger contains cations.

The raw water line to the gravel filter includes a pressure sensor, a magneto-inductive flow sensor, a "J" type temperature sensor and a conductivity sensor.

The water inlet line to the aluminum oxide adsorber, the water inlet line to the cation exchanger and the water outlet line from the mixed bed ion exchanger include a "J" type temperature sensor and a conductivity sensor.

The water inlet line to the aluminum oxide adsorber and the water inlet line to the cation exchanger include a pressure sensor.

A manometer in the base of the gravel filter and other in the base of the sand filter.

The unit includes valves to regulate the flows of the unit, to take the samples at all relevant points of the unit, to allow the backwash the filters, to drain the water in the different processes in the water treatment and to deviate the flows.

For safety, all upper vessels (filter, adsorber and exchanger) have relief valves.

② PPTAC/1/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled.

Simultaneous visualization in the PC of all parameters involved in the process.

Calibration of all sensors involved in the process.

Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences.

Real time control with flexibility of modifications from the PC keyboard of the parameters, at any moment during the process.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process.

3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PPTAC/1/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Supply unit: 1500 x 800 x 1000 mm. Weight: 60 Kg.
Water Treatment Unit: 1700 x 900 x 2000 mm. Weight: 240 Kg.
Control Interface Box: 490 x 450 x 470 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PPTAC-1.pdf

PRACTICAL POSSIBILITIES

1.- Study the main principle of the water treatment plant.

2.- Study the main principle of the water treatment plant operations: depth filtration, adsorption and ion exchange.

3.- Determination of the pressure drop in depth filtration.

4.- Study of the pressure drop and solid concentration in filtrate with the time.

5.- Study of the breakthrough curves (adsorbate concentrations at the outlet of an adsorber over time) in the adsorption step.

6.- Comparision of various adsorption materials.

7.- Familiarisation with the fundamental principle of ion exchange.

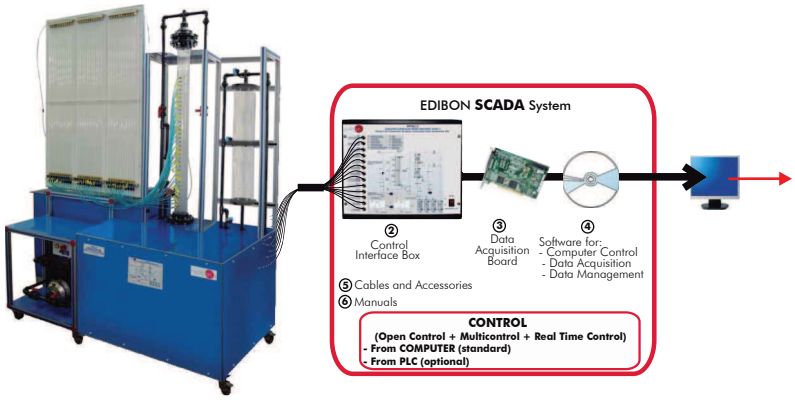
8.- Study of the relationship between solid concentration and sedimentable solids for the solids used.

Other possible practices:

9.- Sensors calibration.

10-28.- Practices with PLC.

PPTAC/2. Computer Controlled **Water Treatment Plant 2**



① Unit: PPTAC/2. Water Treatment Plant 2

SPECIFICATIONS SUMMARY

Items supplied as standard

① PPTAC/2. Unit:

The Computer Controlled Water Treatment Plant 2 (PPTAC/2) allows to study the main principle of the basic operations in the water treatment. These operations are: depth filtration and ion exchange.

Metallic structure and panels of painted steel.

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

This unit includes wheels for its mobility.

Supply unit:

Computer controlled pump.

Storage tanks: Two storage tanks that supply to the Water Treatment Unit the raw water required and store the treated water obtained in the Water Treatment Unit.

The treated water tank has two lines to connect the outlet water of the different processes of the water treatment and one computer controlled pump to backwash the filter.

Two level sensors to indicate the minimum level in the two tanks.

The supply unit includes two valves to regulate the inlet flow from the raw water tank to the filter (allowing an adjustable filter velocity) and to change the inlet to the filter (treated water or backwashed solution).

Water Treatment Unit:

A transparent filter:

The filter has connections used to take samples and to measure the pressure along the filter with a water multi-manometer panel. For safety, the filter has a relief valve.

The filter contains sand.

It includes a differential pressure sensor.

Two exchangers:

The filters have connections used to take samples to be taken and to drain the effluent. It includes a solenoid valve to discharge the treated water to the treated water tank.

The upper exchanger contains anion exchange resin, and the lower exchanger contains cation exchange resin.

Acid/caustic circuit to regenerate the ion exchangers:

Three storage tanks to contain the distilled water, caustic solution and hydrochloric acid solution to regenerate the ion exchangers.

One storage tank where the final solution after the regeneration of the ion exchangers is collected.

One computer controlled pump to regenerate the ion exchangers.

A flow sensor to measure the solution flow.

Seven solenoid valves to divert the flows and circulate the different solutions.

The unit is equipped with a water multi-manometer panel (30 water tube manometers) to measure the pressures in the filter.

The raw water line to the filter includes a pressure sensor, a "J" type temperature sensor, a conductivity sensor and a magneto-inductive flow sensor.

The water inlet line to the anion exchanger and the water outlet line from the cation exchanger include a "J" type temperature sensor and a conductivity sensor each one.

The water inlet line to the anion exchanger includes a pressure sensor.

The unit includes valves to regulate the flow rates, to take samples at all relevant points, to allow the backwash of the filter and the ion exchangers, to drain the water in the different processes of the water treatment and to deviate the flows.

② PPTAC/2/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled.

Simultaneous visualization in the PC of all parameters involved in the process.

Calibration of all sensors involved in the process.

Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences.

Real time control with flexibility of modifications from the PC keyboard of the parameters, at any moment during the process.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process.

3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ PPTAC/2/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) =Unit: 2500 x 1500 x 2300 mm. Weight: 260 Kg. Control Interface Box: 490 x 450 x 470 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/PPTAC-2.pdf

PRACTICAL POSSIBILITIES

1.- Study the main principle of the water treatment plant.

2.- Study the main principle of the water treatment plant operations: depth filtration and ion exchange.

3.- Observation and determination of the pressure loss in a sand filter.

4.- Study and plot of Micheau diagrams.

5.- Study of the principle of backwash.

6.- Study of the pressure loss and solid concentration in filtrate with the time.

7.- Familiarization with the fundamental principle of ion exchange.

8.- Identification of the different modes of operation of cation and anion exchangers.

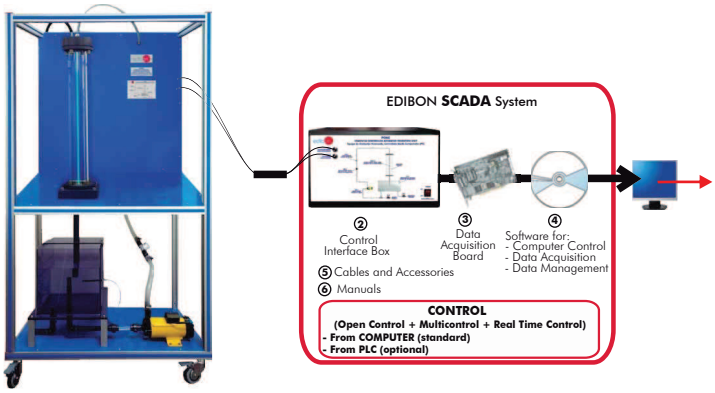
9.- Study of the regeneration of ion exchangers.

Other possible practices:

10.- Sensors calibration.

11-29.- Practices with PLC.

POAC. Computer Controlled **Advanced Oxidation Unit**



① Unit: POAC. Advanced Oxidation Unit

SPECIFICATIONS SUMMARY

Items supplied as standard

① POAC. Unit:

The Computer Controlled Advanced Oxidation Unit (POAC) allows to study advanced oxidation as a method to remove organic substances.

Anodized aluminum frame and panels of painted steel.

Main metallic elements in stainless steel.

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

Reactor (falling film reactor):

Glass tube:

Height: 1000 mm.

Diameter: 150 mm.

Manifolds at its upper side.

UV light lamp. Protection device against UV radiation.

Transparent tank (capacity: 15 l.), with drain valve.

Computer controlled pump to impel the raw water in closed circuit.

Flow rate adjustable.

Temperature sensor in the tank to measure the temperature in the closed circuit.

Raw water flow sensor.

2 Beakers (1 l. each one) to take samples.

② POAC/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled.

Simultaneous visualization in the PC of all parameters involved in the process.

Calibration of all sensors involved in the process.

Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences.

Real time control with flexibility of modifications from the PC keyboard of the parameters, at any moment during the process.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process.

3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Express Data acquisition National Instruments board to be placed in a computer slot.

16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

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

Flexible, open and multicontrol software. Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second). It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 1100 x 700 x 1900 mm. Weight: 140 Kg.

Control Interface Box: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/environment/watertreatment/POAC.pdf

PRACTICAL POSSIBILITIES

1.- Study of advanced oxidation process for wastewater treatment.

2.- Study of advanced oxidation with hydrogen peroxide and UV light.

3.- Influence of the amount of hydrogen peroxide in the oxidation process.

4.- Analysis of the reaction kinetics.

Other possible practices:

5.- Sensors calibration.

6-24.- Practices with PLC.