Recycle Loops Unit

TRLB

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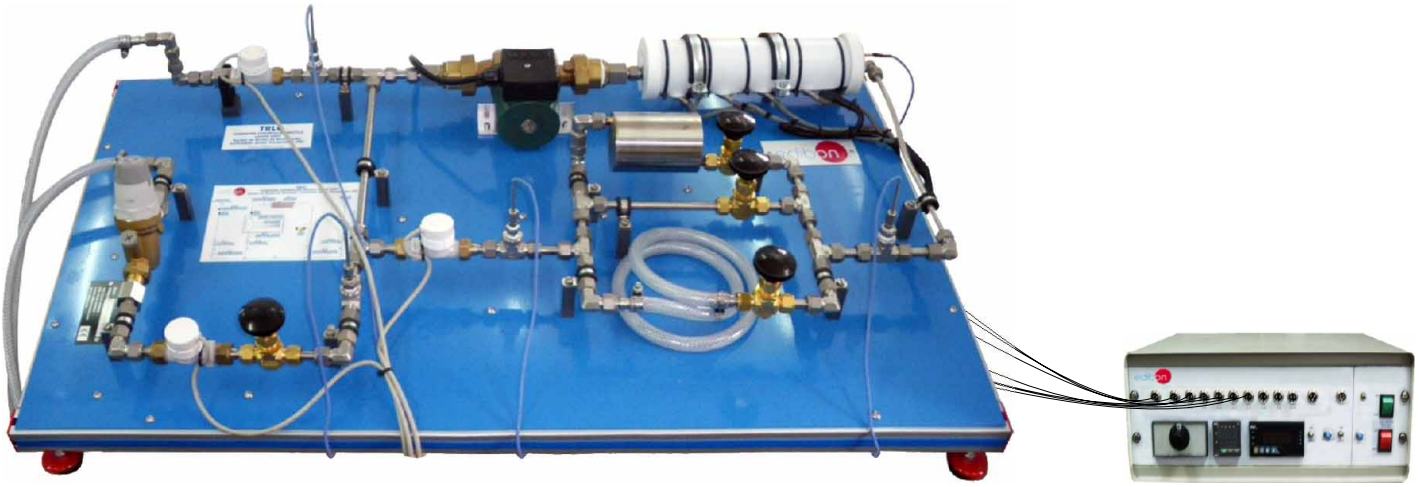

Electronic Console

DESCRIPTION

TRLB unit developed by EDIBON has been designed to demonstrate, both visually and experimentally, how a recycle loop works. It has a lot of teaching applications of which the carried out of mass and energy balances under steady and unsteady state conditions is emphasized.

In this unit an inlet water flow is thermally conditioned through a recycle loop to obtain an outlet water flow in the desired terms.

The hot water recycle loop is a type of application used in several chemical and industrial installations, to control the outlet temperature from the variations inside the loop.

The unit consists of a through pipe conveying water from a cold water supply to a suitable drain with a loop of pipework connected between the supply and drain connections. This recycle loop incorporates a circulating pump and a heater (heating resistance) to raise the temperature of the water in the loop. Every pipe and connection are made in stainless steel.

Different volumes in the recycle loop can be simply selected by opening the appropriate valve. With this, the residence time of each configuration can be studied. The loop flow variation has significant teaching properties. By means of this variation the recycle loop is regulated.

Water temperatures at the inlet, outlet and within the recycle loop are measured using temperature sensors. Water flowrates at the corresponding points are measured using flow sensors.

SPECIFICATIONS

Bench-top unit.
Anodized aluminium structure and panel in painted steel (epoxy paint).
Main metallic elements in stainless steel.
Diagram in the front panel with similar distribution to the elements in the real unit.
Water inlet pipe, which incorporates a temperature sensor "J" type and a flow sensor (0 to 6.5 l./min).
Water inlet flow regulation valve to the circuit (pressure: 0-3 bar).
Pressure regulation valve, which avoids producing overpressures along all the circuit.
Recycle loop, composed of:
- Recirculation pump:
  - hot water impulsion centrifugal pump, with speed regulation.
- Heating resistance (2000 W).
- Protection thermostat for the heating resistance.
- Water control valve, located in a recirculating line. It is useful to regulate the water flow inside the loop.
- 3 Temperature sensors "J" type.
- Flow sensor (0 to 6.5 l./min).

Water outlet pipe, which incorporates a temperature sensor "J" type and a flow sensor (0 to 6.5 l./min).
Different volumes of recycle loop, usable without having to be dismounted.
With the different temperature and flow sensors we can know the unit thermal and mass balances and also the heat transfers.
Electronic Console:
- Metallic box.
- Temperature sensors connections.
- Digital display for the temperature sensors.
- Selector for temperature sensors.
- Pump controller.
- Heating resistance controller, with PID over the heating resistance temperature.
- Digital display for the flow sensors.

Cables and Accessories, for normal operation.
Manuals: This unit is **supplied with following manuals:** Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Understanding the meaning of recycle.
Steady state mass balances: (2)
2.- Demonstrating that whatever the recycle rate, the inlet flow rate always equals the outlet flow rate.
Unsteady state heat balances: (3-6)
3.- Determining the unit response when the electrical heater is switched on at different through flow rates.
4.- Determining the effect of a changes in the inlet flow.
5.- Determining the response when the electrical heater is switched off at different through flow rates.
6.- Determining the effect of recycle with no through flow.
Steady state heat balances: (7-8)
7.- With the electrical heater switched on and at a fixed water flow rate at the inlet we can check that different reclycled flow incites a variation in the outlet temperature.
8.- With the electrical heater switched on, the difference between inlet temperature and outlet temperature can be used to determine the heat quantity absorbed in the recycle loop.
9.- Use of the steady flow energy equation for the overall system.
10.- Use of the steady flow energy equation for the mixing process.
11.- Effects on response rates to parameter changes in recycle flow.
12.- Effects on response rates to parameter changes in through flow.
13.- Effects on response rates to parameter changes in loop volume.
14.- Effects on response rates to parameter changes in heater power.

REQUIRED SERVICES

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

Water supply and drainage.

DIMENSIONS & WEIGHTS

TRLB:

Unit:	-Dimensions: 1110 x 630 x 300 mm. approx.
	-Weight: 40 Kg. approx.
Electronic Console:	-Dimensions: 490 x 330 x 310 mm. approx.
	-Weight: 10 Kg. approx.

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

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REPRESENTATIVE: