

Experiment n°6

Balancing of a hydraulic circuit

Objective

The goal of this experiment is to create a law in order to predict the balancing of an hydraulic circuit.

Description

The HD98B bench is used, pipes n°5, 6, 8 are used for this experiment.

Theories

In a hydraulic circuit (like a water circuit in a building) the higher you are, the lower the flow rate is. In order to prevent this the circuit must be balanced. In order to balance the singular head losses can be adjusted.

Theories for head losses:

Linear head losses (major losses):

Darcy-Weisbach formula: $\Delta P_t = \xi * \frac{L}{D} * \frac{1}{2} * \rho * U m^2$ ξ regular head lose coefficient

Laminar flow: $\xi = \frac{64}{Re}$

Turbulent flow in a smooth pipe: $\xi = \frac{0.316}{\sqrt[4]{Re}}$ (Blasius formula)

Turbulent flow in a rough pipe: $\frac{1}{\sqrt{\xi}} = -2 \log_{10} \left[\frac{\varepsilon}{3.71D} + \frac{2.51}{Re \sqrt{\xi}} \right]$ (Colebrook formula)

Singular head losses (minor losses): $\Delta P_s = K * \frac{1}{2} \rho U m^2$ K singular head losses coefficient

Materials

- Pipes n°5, 6, 8
- Central manometers

Experiment

- a) Check the opening of the exit valve;
- b) Connect the 3 manometers to the bench
- c) Open the pipe n°5;
- d) Start the pump;
- e) Open pipe n°6 and after open the number 8;
- f) Pick up the value in a table;
- g) Establish a law for each balancing systems.
- h) Establish a law for the balancing