HYDRAULICS IRRIGATION AND DRAINAGE

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ABSTRACT

The study and understanding of fluids is relevant to the extent that we understand that they are present in almost all situations in our day-to-day lives and understand and have a real notion of the characteristics of fluids, such as density, which is the ratio of the proportion of the mass of a fluid in relation to its volume, We also seek to understand how a fluid can influence bodies through buoyancy, which is characterized as a vertical force that acts on the object immersed in a fluid, known as Archimedes' Principle, can allow us to use them in the best possible way in our favor and in our daily activities.

Keywords: Fluids. Density. Buoyancy.

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INTRODUCTION

Fluids are substances or products that have the ability to deform and take on the shape of their respective containers or when subjected to shear stresses, even if such stress does not reach proportions of great magnitudes,

The study of the behavior of fluids acquires its maximum relevance when we start from the principle that by knowing its characteristics, such as specific mass, knowing its viscosity, we can come to understand how a fluid starts to behave in situations where it is exposed to an energy coefficient, whether in free conduits or penstocks (GIANINI 2015).

In agriculture, knowing the properties and behaviors of fluids can be the difference between using water rationally, making the best use of it, using it in the right place and time as a way to maximize results within agricultural production

Understanding how we can make the best use of the knowledge that we can assimilate in the face of study to understand the behavior of fluids in the most varied situations and applications, can be a watershed, which leads us to success and total failure in the development of an activity, in this case, understanding how a fluid behaves within our field of action, which is agronomy, allows us to understand how to act in order to greatly enhance the best use of water, as well as we can also understand how to use other types of fluids in a positive way.

GENERAL OBJECTIVE

The objective of this experiment was to understand how different types of fluids behave when subjected to different situations, in this case water and vegetable oil, ascertaining the reactions and changes in them when subjected to heating and what is the reaction in a situation of immersion of different bodies, analyzing items such as density of the bodies and buoyancy suffered by them when immersed.

Objective 01

The objective of experiment 01 was to verify changes in density in an oil column when subjected to a temperature of 90 degrees, observing how much temperature changes influence the characteristics and properties of the fluids.

Objective 02

The objective of experiment 03 was to ascertain the influence that the density of different bodies exerts when such bodies are exposed to the same fluid and the degree of buoyancy that acts after these bodies in a given fluid

THEORETICAL FRAMEWORK

DENSITY

The interaction of the density and/or density/viscosity ratio of a fluid is very relevant to determine how each fluid behaves in free conduits or penstocks, (GEANINI. 2015)

Also for Geanini (2015), "the specific mass (ρ) of a fluid is defined as its mass per unit of its volume. Specific mass is a quantity dimensioned in (ML-3), usually expressed in kg.m-3 in SI or g.cm-3 in CGS".

The representation of the specific mass equation of water can be represented by the following equation

$$\text{Example: } =1000\frac{(t-4)^2}{150}$$

This formula allows us to measure the density of a substance when it is subjected to a certain temperature

Where ρ is the mass, density of the water in (kg/m , $^{-3}$ and t is the temperature in (°C).

It can also be calculated by the formula below in situations where the temperature variable is not involved.

$\rho = \frac{M}{V}$, where we can calculate the ratio of the proportion of the mass by the volume occupied by it.

Each and every pure substance is characterized by its density, that is, what differentiates it from another or from other pure substances, is the ratio of the mass proportion of each substance in relation to its volume, (PAOLI, et al. 2018);

Also for PAOLI (2018), "density is an important physical property and can be used to distinguish a pure material from an impure one (or alloys of this metal), as the density of materials that are not pure (mixtures) is a function of their composition"

Ramalho, (2007) states, "in determining the density, it is necessary to take into account all the factors that can influence the result, such as atmospheric pressure and ambient temperature"

THRUST

Buoyancy is a vertical force that acts on every object immersed in a fluid. This force is known as Archimedes' Principle, (YOUNG and FREEDMAN. 2015)

When an object is totally or partially immersed in any fluid, a force called buoyancy will arise on the object, which is exerted by the fluid and has a vertical direction and upward direction, (SILVA, 2016)

Buoyancy corresponds to the weight of the volume of liquid displaced by the body immersed in a fluid. Knowing that weight is the result of the product of the mass by gravity and calling the mass of displaced liquid mDES, we have:

$E = mDES \cdot g$

MATERIALS AND METHODS

EXPERIMENT 1

Density

Objective: To determine the heated oil density.

Materials:

Figure 01 - U-shaped tube

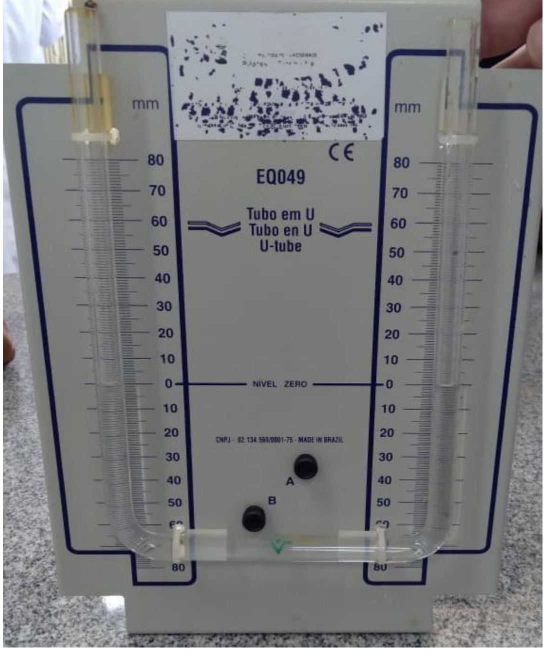

Figure 02 - Heating plate

Figure 03 - Beaker with oil

Figure 04 – Pipeta

Figure 05 - Mercury thermometer

Procedure

1° Heating the oil to 90°C 2° Cooling the oil to 60°C

3° Put the oil on one side of the U-tube

EXPERIMENT 2

Thrust

Objective: To measure the value of buoyancy in bodies

Materials

Figure 06 - Metal cylinder

Figure 07 - Polymer cylinder

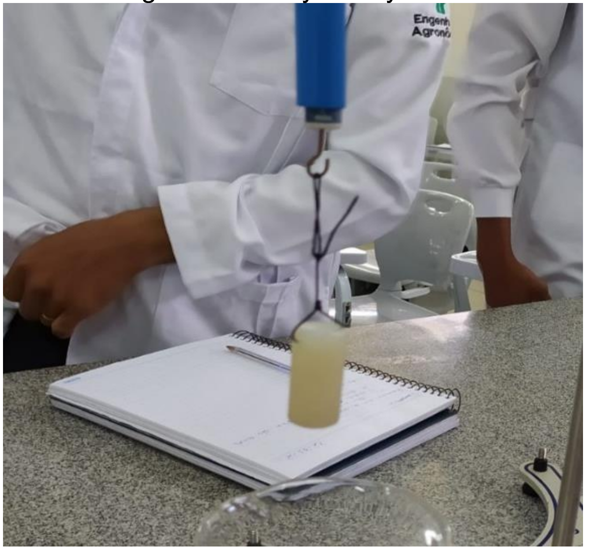

Figure 08 - Beaker with water

Figure 08 – Haste

Procedure

1° Placing the dynamometer

2° Measure the weight of the cylinders before water 3° Measure the weight of the cylinders after water

RESULTS AND DISCUSSION

DENSITY FORMULAS, AND THE RESULTS OBTAINED IN THE U-TUBE EXPERIMENT

$$P1=P2P1=P2$$

P_0 →pressure*Atmospheric* =(1.05x10^5)

$P_0+ \rho.g.h1 = P_0+ \rho.g.h1 =$

$P_0+\rho.g.h2\ P_0+\rho.g.h2$

The height of the water was 0.096 meters and the height of the oil was 0.1 meters, so:

$P=(1.05x10^5)+1000*9.81*0.096=(1.05x105)+1000* 9.81*0.1$

$P=1000*9.81*0.096=1000*9.81*0.1P=1000*9.81*0$

$,096=1000*9.81*0.1$

$P=941.76=981P=941.76=981$

P=981941.76=>1.041 kg/m³P=981941.76=>1.041 kg/m³

The value found in the U-shaped tube was 1 (one) point 0 (zero) 4 (four) 1 (one) kg/m³, where the values were made by measurement with a measurement meter (in centimeters and millimeters), and each measurement was noted, being replaced in the formula for problem solving.

THRUST FORMULAS, AND CALCULATIONS OF POLYMER CYLINDER RESULTS, AND METAL CYLINDER

P. apparent=P.real=EP.apparent=P. real=E

↓

E=−P.apparent+P.real=−P.apparent+P.real

- Polymer.

The actual weight of the polymer was 0.1 N and the apparent weight was equal to 0 N, so we have:

E=0−0.1=N→E= −0+0.1=0.1 NE=0−0.1=N→E=−0+0.1=0.1 N

As the polymer is less dense than water, the polymer will float, and its weight is light, so the force that the polymer will present is very small.

- Metal Cylinder.

The actual weight of the metal cylinder was 0.81 N and the apparent weight was 0.71 N, so we have:

E=0.71−0.81=N→E= − 0.71+0.81=0.10 NE=0.71−0.81=N→E= − 0.71+0.81=0.10 N

The metal is denser than water, so it will be submerged making a force of **0.10 N.**

The experiments that were carried out with both objects presented different results, the objects were similar but of different properties, which resulted in different data.

CONCLUSIONS

Each material has a different density, as the property of these materials is very specific, even though they have very similar characteristics, they will present different results. There is a simple question asked by some people, which is heavier 1 kg of lead or 1 kg of cotton? Many answer that it is lead, for the simple fact that lead is heavier, the answer is that the two have the same weight, plus the volume of cotton will be much larger to reach 1 kg, because its density is lower than that of lead.

Buoyancy is a force that every object experiences when plunged, this force is directed vertically (upwards), the object tends to become lighter.

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