Energies, fluids & processes – Laboratory HSLU, Semester 2

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Contents

1 Introduction to energies, fluids, and processes

Energy exists in different forms and can neither be destroyed nor generated, but only transformed.

1.1 Energy forms

- Potential energy: $E = mgh$
- Kinetic energy: $E = \frac{1}{2}mv^2$
- Thermal energy: $E = mc_p\Delta T$
- Light energy: $E = h\nu$

- Chemical energy: $E = mH$
- Electrical energy: $E = k\frac{q_1 q_2}{r}$
- Nuclear energy: $E = \Delta mc^2$
- Pressure energy (acoustic): $E = \dfrac{mp}{\rho}$

1.1.1 Important forms of energy for fluid motion

2 Fluids as energy carriers

2.1 Fluid definition

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2.1.1 Properties of a fluid

Density ρ
Densitiy is a measure of working potential of a fluid:

$$\boxed{\rho \triangleq \frac{m}{V} \quad \left[\frac{kg}{m^3}\right]}$$
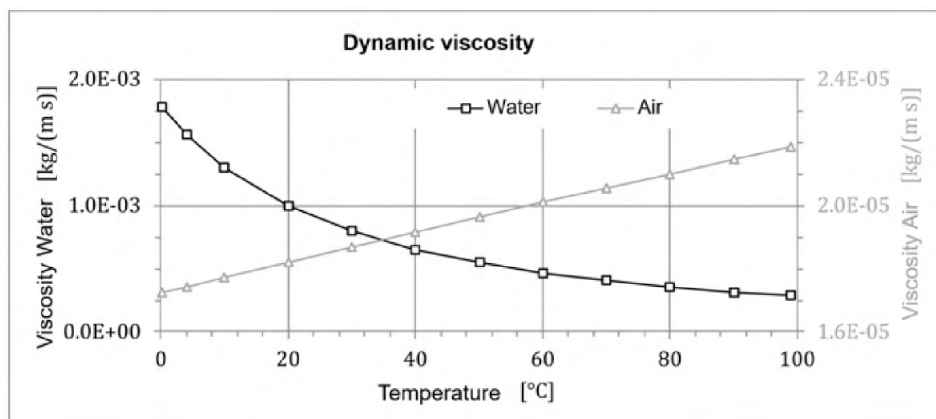
where:

- m = mass;
- V = volume.

Kinematic viscosity ν
Viscosity is a measure of the specific loss capacity of a fluid:

$$\boxed{\nu \triangleq \frac{\mu}{\rho} \quad \left[\frac{N \cdot s}{m^2} = Pa \cdot s\right]}$$

where:

- μ = dynamic viscosity
- ρ = density

Remark: $\nu \propto \dfrac{1}{T}$