The objective of the task was to calculate the coefficient of velocity 𝐶𝑣 of two different heads and for the two different diameters of orifice thus giving four readings in total, all of which had different variables. The orifices consisted of 3mm and 6mm diameters and the head of water was classified into two separate categories (High and Low). An orifice is an opening vessel where fluid flows from and is usually used to measure the discharge of fluids such as liquids. A jet is a stream issuing from an orifice and is not enclosed by solid boundary walls but is surrounded by a fluid whose velocity is less than its own. A free jet is a stream of liquid surrounded by gas and is therefore directly under the influence of gravity. The Vena contractor is the point in a fluid stream where the diameter of the stream and cross – sectional area is at its minimum whilst the fluid velocity is at its peak. There are many applications to orifice and free jet flow and they vary from measuring the speed of air outside a plane to measuring the rate of flow of chemical in pipes. There are distinct types of orifice and it depends upon their shape, the nature of discharge and size.

The velocity of a free jet flow through an orifice can be achieved through Bernoulli’s Equation which states that:

𝑃1 𝜌𝑔 + 𝑉1 2 2𝑔 + 𝑍1 = 𝑃2 𝜌𝑔 + 𝑉2 2 2𝑔 + 𝑍2

This simplifies to:

𝑉2 = √2𝑔ℎ ℎ = 𝐻𝑒𝑎𝑑 (𝑍1 − 𝑍2)

Where the theoretical velocity calculated assumes ideal conditions, which means that there are no losses accounted for in the equation. A leading example would be the friction losses due to the viscous effects.

However, in practice Bernoulli’s Equation is not sufficient enough or needs slight adjustments/rearrangement to get an experimental value of the velocity that accounts for those losses, which is:

𝑉2 = 𝐶𝑣√2𝑔ℎ Considering the trajectory of the free jet, we can use the SUVAT equation 𝑆 = 𝑢𝑡 + 1 2 𝑎𝑡 2 in view of both the x and y directions to get 2 equations:

𝑥 = 𝑣𝑡 𝑦 = (𝑔𝑡^2)/ 2

We can substitute these 2 equations into 𝑉2 = 𝐶𝑣√2𝑔ℎ to get an equation that determines the velocity by the coordinate points laid out over the trajectory of the free jet flow.