

# Jet Pump Equation

Kaelin Ellis

February 2024

## 1 Introduction

A jet pump is made up of four different components. The jet pump components are a nozzle, entrance, throat and diffuser. The starting point for three of the four equations is the differential form of the energy equation.

$$dE = \frac{dP}{\rho} + VdV + g dz \quad (1)$$

In a jetpump the difference in height is negligible and the term can be omitted.

$$dE = \frac{dP}{\rho} + VdV \quad (2)$$

For the differential energy equation to have physical meaning, the difference in energy term must equal zero. Any number other than zero is a violation of the law of conservation of energy. For the jet pump entrance the  $dE_{te}$  term is calculated at different conditions in an attempt to solve the jet pump equations.

## 2 Nozzle

The nozzle is the easiest component to analytically find the solution for. Traditionally water is used as the power fluid, which is an incompressible fluid.

$$\int \frac{dP}{\rho} + \int VdV = 0 \quad (3)$$

$$\int_{ni}^{nz} \frac{dP}{\rho} + \int_{ni}^{nz} VdV = 0 \quad (4)$$