**Pelton Wheel Lab**

ME 436 Aerothermal Fluids Laboratory

Jeremy Maniago

Experiment #5

10/6/2023

Mechanical Engineering Dept.

The City College of New York, USA

# Abstract

In this experiment, we investigate the working principle of the Pelton Wheel, a type of impulse turbine and also the most commonly used. The goal of this experiment is to analyze the performance of the Pelton Wheel for different flow rates and rotational speeds by changing certain parameters of the contraption. This is achieved by changing the friction brake load on the wheel shaft and position of the nozzle regulating spear independently. The necessary data, which can be done by measuring the resultant flow rate, spring load, and turbine wheel rotational speeds, is then used to apply the mathematical analysis and plot visual results through MATLAB. What we observe from post-analysis is a decrease in efficiency when the wheel speed increases. It is concluded that although higher flow rates mean higher wheel speeds, the efficiency will decrease as both of those parameters increase.

# Introduction

In the Pelton Wheel contraption, a jet of water that is controlled by nozzle position is directed onto the Pelton Wheel’s buckets. The impinging of water jets onto the wheel cause jet stream directed sideways and outwards which produces a force on the bucket which then is converted into a torque on the shaft of the wheel. The objective is to analyze the efficiency change in relation to the wheel speeds. The data that we need is the mass on the brake load (W), the spring force (S), the wheel speed (N) via tachometer, the pressure (P), the brake wheel radius (r), and the volume flow rate (W), which is calculated from

|  |  |  |
| --- | --- | --- |
|  |  | *(1)* |

With these variables, we can then calculate the torque from the equation

|  |  |  |
| --- | --- | --- |
|  |  | *(2)* |

The power input and the power output can be calculated from the following equations

|  |  |  |
| --- | --- | --- |
|  |  | *(3)* |
|  |  |  |
|  |  | *(4)* |

Finally, the efficiency is found through

|  |  |  |
| --- | --- | --- |
|  |  | *(5)* |

# Experimental Setup and Procedure

The contraption is made up of the Pelton Wheel, the nozzle jet, a sink, a tank, and a compressor.

# Results

# Conclusions

# List of References

# Appendix A

# Appendix B

# Appendix C

# Appendix D