

**FINAL YEAR PROJECT REPORT
DIPLOMA IN MECHANICAL ENGINEERING**

**TITLE:
STUDY OF WATERJET PROPULSION IN JET PUMP SYSTEM
ON JET SKI**

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1. Introduction

1.1. Introduction to waterjet propulsion.

The concept of waterjet propulsion dates back to 1661. Toogood and Hayes proposed this form of propulsion. Its use as a basis to manoeuvre small high speed craft. It is only in recent years that the waterjet has been considered for large high speed craft. Waterjet propulsion units offer a further dimension to the range of propulsion alternatives. It is tend to use where other propulsion from are rejected for some reason as typical reason of efficiency, caviatation extent, noise or imersion and draught consequently, it can be seen the potential for waterjet application offer optimum performance propulsion. Refers this concept, the pump system in jet ski has been used.

1.2. Introduction to jet skiing.

Jet skiing is one of the most watersport popular recently. Most of available equipment may replace that watersport can be a fast growing recreation sport in this country, Malaysia. Jet ski as known as a small recreation craft. Manoeuvring this thing more comfortable and safe. The availability and capability of area to manoeuvre jet ski likes offshore and lakes helps this trend growing rapidly. There are many gigantic company likes Sea Ray, Suzuki, Yamaha involved in Jet ski researching and development. Even the principle of the jet ski has been known as waterjet propulsion, the propulsion that offer a high effective efficiency system.

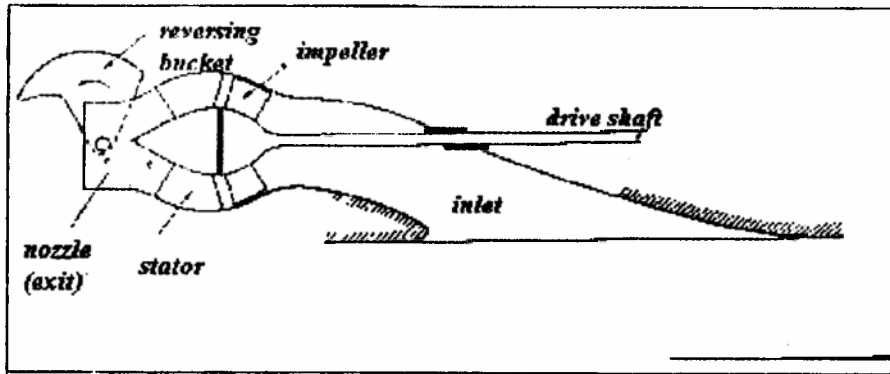


Figure 1.1. Typical waterjet general arrangement

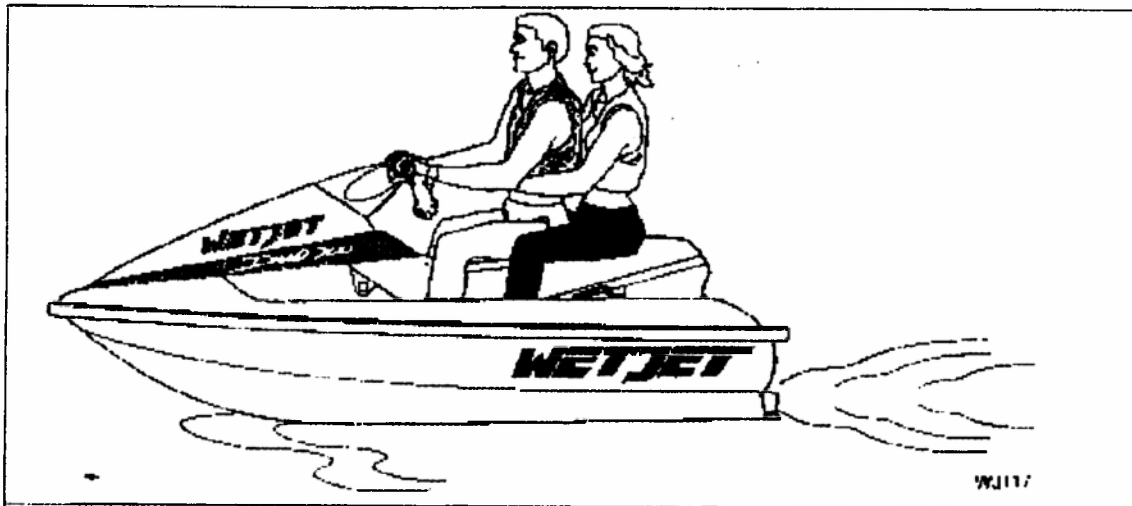


Figure 1.2. Common jet ski

2. Basic principle

2.1. Basic principle of waterjet propulsion

As a basis of Jet Ski movement reference should be made to figure 2.1. This figure shows an idealised waterjet system. Based on this figure: The water enters the system with velocity, V_1 leaves with a different velocity, V_2 means of nozzle area, A_2 .

The mass flow of water is given by:

$$\dot{m} = \rho A_2 V_2$$

where ρ = The density of the water

The increasing in the rate of change of momentum passing through the waterjet is given by $\rho A_2 V_2 (V_2 - V_1)$.

The thrust produced by the system:

$$T = \rho A_2 V_2 (V_2 - V_1).$$

Then, the useful propulsion power, P_T is given by :

$$P_T = TV_S = \dot{m} V_S (V_2 - V_1) \quad \dots\dots\dots(2.1)$$

where: V_S = The speed of vessel

Application of fluid mechanics :

The general energy equation:

$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + H_P = \frac{P_2}{\rho g} + \frac{V_2^2}{2g} + \Delta h + h_{\text{loss}} \quad \dots\dots\dots(2.2)$$