

## APPLY FLUID MECHANICS PRINCIPLES

**UNIT CODE: ENG/OS/MC/CC/07/6/A**

### Unit description

This unit describes the competencies required by a mechatronic technician in order to apply a wide range of fluid mechanics principles in their work. It includes understanding flow of fluids, demonstrating knowledge in viscous flow, performing dimensional analysis and operating fluid pumps

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range.</b></i>
1. Understand flow of fluids	1.1 Flow rate in pipes is measured according to work requirements 1.2 Losses in pipes are determined according to work requirements 1.3 <i><b>Causes of losses</b></i> in pipes are determined according to work requirements 1.4 Flow losses equations are applied in problem solving according to prescribed fluid principles
2. Demonstrate knowledge in viscous flow	2.1 Viscous flow between parallel surfaces are explained according to prescribed fluid principles 2.2 Viscous flow equations between parallel surfaces are derived and applied according to prescribed fluid principles 2.3 Viscous flow equations in circular pipes are derived and applied in problem solving according to prescribed fluid principles
3. Perform dimensional analysis	3.1 Dimensional analysis is explained according to prescribed fluid principles 3.2 Principle of dimensional homogeneity is explained according to prescribed fluid principles 3.3 Fundamental dimensions are stated according to prescribed fluid principles 3.4 Dimensional units are defined according to prescribed fluid principles 3.5 <i><b>Physical quantities</b></i> are identified according to prescribed fluid principles

	3.6 Dimensional analysis is applied in problem solving according to prescribed fluid principles
4. Operate fluid pumps	<p>4.1 <b>Principle of operation</b> of pumps is described according to prescribed fluid principles</p> <p>4.2 Reciprocating pump equation is derived according to prescribed fluid principles</p> <p>4.3 Centrifugal pump equation is derived according to prescribed fluid principles</p> <p>4.4 Pump equations are applied in problem solving according to prescribed fluid principles</p>

### RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
Causes of losses may include but is not limited to:	<ul style="list-style-type: none"> <li>• Friction</li> <li>• Enlargement/reduction in cross-sectional areas</li> </ul>
Physical quantities may include but is not limited to:	<ul style="list-style-type: none"> <li>• Mass</li> <li>• Force</li> <li>• Density</li> <li>• Velocity</li> <li>• Acceleration</li> </ul>
Principle of operation may include but is not limited to:	<ul style="list-style-type: none"> <li>• Reciprocating</li> <li>• Centrifugal</li> </ul>

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

#### Required Skills

The individual needs to demonstrate the following skills:

- Apply basic mechanical formulas
- Use of basic mechanical machines
- Perform various unit conversions of mechanical quantities
- Basic mechanical systems design
- Mechanical machine operation
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs

- Using different measuring tools

### Required knowledge

The individual needs to demonstrate knowledge of:

- Newton's law
- Levers
- Gear trains
- Laws of conservation of energy
- Laws of friction
- Type of forces
- Thermodynamics
- Calculation of fluid pressure and flow rate
- Mechanical advantage and efficiency calculations
- Gas laws
- SI units of mechanical energy.
- Power transmission systems
- Parameters of fluid system
- Operation of mechanical machines
- Mechanical calculation of power, energy, work done, torque and safety factor
- Units of measurement, conversions and abbreviations

### EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1 Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified Principles of mechanical science</li> <li>1.2 Performed mechanical calculations of a system</li> <li>1.3 Identified types of forces on a system</li> <li>1.4 Calculated resultant forces on plane framework</li> <li>1.5 Identified application of forces on the production flow</li> <li>1.6 Tested mechanical properties of a materials</li> <li>1.7 Identified tools and equipment for measuring system parameters</li> <li>1.8 Recorded and interpreted measured parameters.</li> <li>1.9 Operated Power transmission systems</li> </ul>
<p>2 Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place</li> <li>2.2 Measuring tools and equipment</li> <li>2.3 Sample materials to be tested</li> </ul>

3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Case studies 3.4 Written tests
4 Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
5 Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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