

APPLY FLUID MECHANICS PRINCIPLES

UNIT CODE: ENG/OS/WEF/CC/04/6/A

UNIT DESCRIPTION

This unit describes the competencies required by a 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 These describe the key outcomes which make up workplace function. | PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. <i>Bold and italicized terms are elaborated in the Range.</i> |
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| 1. Understand flow of fluids | 1.1 Flow rate in pipes is measured 1.2 Losses in pipes are determined 1.3 <i>Causes of losses</i> in pipes are determined 1.4 Flow losses equations are applied in problem solving |
| 2. Demonstrate knowledge in viscous flow | 2.1 Viscous flow between parallel surfaces are explained 2.2 Viscous flow equations between parallel surfaces are derived and applied 2.3 Viscous flow equations in circular pipes are derived and applied in problem solving |
| 3. Perform dimensional analysis | 3.1 Dimensional analysis is explained 3.2 Principle of dimensional homogeneity is explained 3.3 Fundamental dimensions are stated 3.4 Dimensional units are defined 3.5 <i>Physical quantities</i> are identified 3.6 Dimensional analysis is <i>applied</i> in problem solving |
| 4. Operate fluid pumps | 4.1 <i>Principle of operation</i> of pumps is described 4.2 <i>Reciprocating pump equation is derived</i> 4.3 <i>Centrifugal pump equation is derived</i> |

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| | 4.4 Pump equations are applied in problem solving |

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 |
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| 1. Causes of losses may include but not limited to: | <ul style="list-style-type: none"> • Friction • Enlargement/reduction in cross-sectional areas |
| 2. Physical quantities may include but not limited to: | <ul style="list-style-type: none"> • Mass • Force • Density • Velocity • Acceleration |
| 3. Applied may include but not limited to: | <ul style="list-style-type: none"> • Reynolds number • Mach number • Froude number |
| 4. Principle of operation may include but not limited to: | <ul style="list-style-type: none"> • Reciprocating • Centrifugal |
| 5. Reciprocating pump equation is derived may include but not limited to: | <ul style="list-style-type: none"> • Coefficient of discharge • Percentage slip • Work done • Acceleration head • Pressure head in the cylinder |
| 6. Centrifugal pump equation is derived may include but not limited to: | <ul style="list-style-type: none"> • Effective head • Manometric head • Manometric efficiency • Mechanical efficiency • Discharge |

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| | <ul style="list-style-type: none">• Torque• Work done unit weight• Specific speed |
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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.

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| 1 Critical aspects of Competency | Assessment requires evidence that the candidate: <ul style="list-style-type: none"> 1.1 Identified Principles of mechanical science 1.2 Performed mechanical calculations of a system 1.3 Identified types of forces on a system 1.4 Calculated resultant forces on plane framework 1.5 Identified application of forces on the production flow 1.6 Tested mechanical properties of a materials 1.7 Identified tools and equipment for measuring system parameters 1.8 Recorded and interpreted measured parameters. 1.9 Operated Power transmission systems |
| 2. Resource Implications | The following resources should be provided: <ul style="list-style-type: none"> 2.4 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.5 Measuring tools and equipment 2.6 Sample materials to be tested |
| 3. Methods of Assessment | Competency in this unit may be assessed through: <ul style="list-style-type: none"> 3.1 Observation 3.2 Oral questioning 3.3 Written test 3.4 Portfolio of Evidence 3.5 Interview 3.6 Third party report |
| Context of Assessment | Competency may be assessed <ul style="list-style-type: none"> 4.1 On job 4.2 Off job |

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| | 4.3 During industrial attachment |
| Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

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