

PERFORM PROCESS CONTROL AND OPTIMIZATION

UNIT CODE: ENG/OS/CE/CR/3/6

UNIT DESCRIPTION

This unit covers the knowledge, understanding and skills required for a Chemical Engineering Technician to manage process utilities during operations in a workplace where chemical production activities are performed. It includes checking measuring instruments functionality, monitoring utilities consumptions, identifying and fixing utilities losses, and implement energy saving initiatives.

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>
1. Confirm measuring instruments functionality	1.1 <i>Measuring instruments</i> are checked and recorded before and during process to obtain optimum performance according to <i>Standard Operating Procedures (SOP)</i> 1.2 Defective measuring instruments are identified, isolated and replaced according to SOP 1.3 Measuring instruments are calibrated periodically according to SOP 1.4 The accuracy of measuring instruments is verified using reference standards/materials according to SOP.
2. Monitor utilities consumption	2.1 The <i>critical parameters</i> are set according to SOP 2.2 <i>Utilities</i> are recorded and monitored during process to obtain optimum performance according to SOP 2.3 Maintenance teams are coordinated for preventive maintenance according to SOP
3. Identify utility losses	3.1 Check utility functionality according to SOP. 3.2 Check utility performance according to SOP 3.3 Identify utility losses according to manufacturer's index.
4. Eliminate utility losses	4.1 Immediate actions are taken to correct faults in utilities according to SOP 4.2 Maintenance teams are coordinated to fix defective units according to SOP
5. Optimize Energy	5.1 Energy saving utilities are identified according to

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consumptions	SOP's 5.2 Implement and standardize the <i>energy saving initiatives</i> 5.3 The use of utilities is optimized according to SOP 5.4 Utilities bills are analyzed to determine energy performance parameters according to ISO 50001 (Energy management systems)

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
1. Measuring instruments include but not limited to:	1.1 Flow meter 1.2 Level indicator 1.3 Level sensors 1.4 Thermometer 1.5 Pressure gauges 1.6 Hygrometer 1.7 Safety and Miscellaneous Sensors 1.8 Analytical Instruments 1.9 Viscometers 1.10 Vacuum gauges 1.11 Respective transmitters
2. Standard Operating Procedures (SOP) include but not limited to:	2.1 Sampling instructions 2.2 Operation manuals 2.3 Testing procedures 2.4 Data record format 2.5 Handling of non-conformities 2.6 Packaging specification 2.7 Exposure limits
3. Critical parameters include but not limited to:	3.1 Temperature 3.2 Pressure 3.3 pH 3.4 Cooling rate
4. Utilities include but not	4.1 Compressed air

Variable	Range																																
limited to:	4.2 Inert Gas 4.3 Fuel 4.4 Water (Process water, Potable water, Cooling water, Hot water, Boiler feed water, fire hydrant, and waste water). 4.5 Steam (Low pressure, High pressure) 4.6 Electricity 4.7 Natural gas 4.8 Manufactured gas 4.9 Refrigerants 4.10 Thermal Fluids																																
5. Various pipe colours include but not limited to:	<table border="0"> <tr> <td>5.1 Compressed air</td> <td>Blue</td> </tr> <tr> <td>5.2 Inert Gas</td> <td>light blue + Yellow.</td> </tr> <tr> <td>5.3 CO2</td> <td>Black</td> </tr> <tr> <td>5.4 Fuel</td> <td>Yellow + White.</td> </tr> <tr> <td>5.5 Cooling water</td> <td>Dark green+ Light green</td> </tr> <tr> <td>5.6 Process water</td> <td>Black + Blue</td> </tr> <tr> <td>5.7 Potable water</td> <td>Blue + White</td> </tr> <tr> <td>5.8 Fire hydrant</td> <td>Red</td> </tr> <tr> <td>5.9 Waste water</td> <td>Green + Black</td> </tr> <tr> <td>5.10 Utility water</td> <td>Dark green + White</td> </tr> <tr> <td>5.11 Steam</td> <td>Silver</td> </tr> <tr> <td>5.12 Electricity</td> <td>Red</td> </tr> <tr> <td>5.13 Natural gas</td> <td>Yellow</td> </tr> <tr> <td>5.14 Manufactured gas</td> <td>Yellow</td> </tr> <tr> <td>5.15 Refrigerants</td> <td>Blue</td> </tr> <tr> <td>5.16 Thermal Fluids</td> <td>Red</td> </tr> </table>	5.1 Compressed air	Blue	5.2 Inert Gas	light blue + Yellow.	5.3 CO2	Black	5.4 Fuel	Yellow + White.	5.5 Cooling water	Dark green+ Light green	5.6 Process water	Black + Blue	5.7 Potable water	Blue + White	5.8 Fire hydrant	Red	5.9 Waste water	Green + Black	5.10 Utility water	Dark green + White	5.11 Steam	Silver	5.12 Electricity	Red	5.13 Natural gas	Yellow	5.14 Manufactured gas	Yellow	5.15 Refrigerants	Blue	5.16 Thermal Fluids	Red
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6. Energy saving initiatives include but not limited to:	6.1 Use of Energy saving bulbs 6.2 Use of Electronic timers are used according to energy saving instructions 6.3 Switching off unused equipment 6.4 Sealing of leakages 6.5 Correcting faults 6.6 Pinch technology																																

REQUIRED KNOWLEDGE AND UNDERSTANDING

The individual needs to demonstrate knowledge and understanding of:

1. Organizational Context (Knowledge of the Company/Organization and its processes)

The individual on the job needs to know and understand:

1.1	Organization's vision and strategy
1.2	Knowledge of company instructions and the SOP
1.3	Different quality management systems (ISO-9000, ISO-14001, OHSAS-18000 etc.).
1.4	Documentation
1.5	Escalation protocol for reporting identified issues during checks
1.6	Standard Operating Procedures
2. Technical Knowledge	
The individual on the job needs to know and understand:	
2.1	Monitoring, measuring and testing instruments e.g. diagnosis, calibration, routine maintenance operation
2.2	Knowledge of process parameters
2.3	Common causes of variation and corrective action required
2.4	Basic operation of equipment used to generate utilities eg boilers, chillers, compressors, cooling towers, air compressors
2.5	Concepts of energy management systems
2.6	Occupational hazards and safety precautions of the work
2.7	Various pipe colours
2.8	Knowledge primary sensing elements

FOUNDATION SKILLS

<i>The individual needs to demonstrate the following foundation skills:</i>	
<ul style="list-style-type: none"> • Management • Observation • Troubleshooting • Team work 	<ul style="list-style-type: none"> • Communication • Analytical Thinking • Computer Proficiency

EVIDENCE GUIDE

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

1. Critical Aspects of Competency	<p><i>Assessment requires evidence that the learner:</i></p> <p>1.1 Checked and calibrated measuring instrument and recorded it in appropriate format according to SOP.</p> <p>1.2 Monitored utilities consumptions and recording according to SOP</p> <p>1.3 Identified and fixed utility losses</p> <p>1.4 Implemented energy saving initiatives</p> <p>1.5</p>
2. Resource Implications	<p><i>The following resources must be provided:</i></p> <p>2.1 Equipment used for generating utilities e.g. boilers, chillers, compressors, cooling towers, air compressors</p> <p>2.2 Measuring and testing instruments</p>

	2.3 Calibration standard
3. Methods of Assessment	<p>Competency may be assessed through:</p> <p>3.1 Observation with the use of checklists</p> <p>3.2 Interviewing to test knowledge</p> <p>3.3 Written tests</p> <p>3.4 Portfolio Assessment</p> <p>3.5 Interview</p> <p>3.6 Situation Analysis</p> <p>3.7 Demonstration and oral questioning</p>
4. Context of Assessment	Competency may be assessed individually in an actual workplace or in work-simulated conditions within accredited institutions.
5. Guidance information for assessment	This unit may be assessed on an integrated basis with others within this occupational sector.

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