

1. Title	Startup of steam turbine and its auxiliaries	
2. Code	EMPEOM326A	
3. Range	Perform startup of steam turbine and its auxiliaries in general industrial plants, power plants or other places.	
4. Level	3	
5. Credits	9	
6. Competency	<p style="text-align: center;"><u>Performance Requirements</u></p> <p>6.1 Startup principles for steam turbine and its auxiliaries</p> <ul style="list-style-type: none"> <li>◆ Understand the startup method and principle of cold, warm and hot states</li> <li>◆ Understand the impact of violent acceleration of pressure and heating on steam turbine parts <ul style="list-style-type: none"> <li>• Thermal stress and metal fatigue</li> <li>• differential expansion of rotor and cylinder</li> <li>• hot deformation and turbine unit vibration</li> </ul> </li> <li>◆ Understand the acceptable rate of temperature increase for steam turbine</li> </ul> <p>6.2 Startup methods and procedures for steam turbine and its auxiliaries</p> <ul style="list-style-type: none"> <li>◆ Know the classification of cold, warm and hot states</li> <li>◆ Know when to prohibit the startup of steam turbine</li> <li>◆ Know the preparations for startup</li> <li>◆ Know the operations before boiler ignition</li> <li>◆ Know the operations of pressure and temperature raise after boiler ignition</li> <li>◆ Know how to reset the turbine protection system</li> <li>◆ Know how to preheat turbine pipes and valves</li> <li>◆ Know how to speed-up</li> <li>◆ Know how to avoid critical speed so as to reduce the impact on steam turbine vibration</li> <li>◆ Know how to check differential expansion and vibration</li> <li>◆ Know how to check the status of high pressure cylinder</li> <li>◆ Know how to accelerate the speed after warming up the steam turbine</li> <li>◆ Know the operation before grid connection of generator</li> <li>◆ Know the operation after grid connection of generator and after switching of hydraulic valves</li> <li>◆ Know switching and load increase of hydraulic valves gear</li> <li>◆ Know how to increase unit load</li> </ul>	

	<ul style="list-style-type: none"> <li>◆ Know different methods to start up steam turbine <ul style="list-style-type: none"> <li>• Classify by steam parameters <ul style="list-style-type: none"> <li>▶ Rated parameter startup</li> <li>▶ Slip parameter startup</li> <li>▶ Sliding pressure startup</li> </ul> </li> <li>• Classify by steam entering method during speed up <ul style="list-style-type: none"> <li>▶ Joint startup of HP and IP cylinders</li> <li>▶ IP pressure startup</li> <li>▶ HP startup as primary and IP pressure startup as secondary</li> </ul> </li> <li>• Classify by turbine metal temperature <ul style="list-style-type: none"> <li>▶ Cold startup</li> <li>▶ Warm startup</li> <li>▶ Hot startup</li> </ul> </li> <li>• Classify by valves controlling the entering of steam <ul style="list-style-type: none"> <li>▶ Regulating valve startup</li> <li>▶ Startup of bypass valve of electric main valve</li> </ul> </li> </ul> </li> <li>◆ Know how to start up steam turbine according to specified methods and procedures</li> </ul> <p>6.3 Professionalism in startup of steam turbine and its auxiliaries</p> <ul style="list-style-type: none"> <li>◆ Follow manufacturer’s instructions and procedures of operation to perform the startup of steam turbine and its auxiliaries</li> <li>◆ Perform the cold, warm and cold startup in compliance with the code of safety and codes of practice</li> </ul>
7. Assessment Criteria	<p>The integrated outcome requirements of this unit of competency are:</p> <ul style="list-style-type: none"> <li>(i) Capable to clearly explain the cold, warm and cold startup procedures for steam turbine and its auxiliaries;</li> <li>(ii) Capable to perform the startup of steam turbine and its auxiliaries independently according to procedures;</li> <li>(iii) Capable to complete simple report on steam turbine and its auxiliaries startup; and</li> <li>(iv) Capable to clearly report the status of the cold, warm and hot startup of steam turbine and its auxiliaries.</li> </ul>
8. Remarks	<p>The credit value of this unit of competency is set on the presumption that the person already possesses basic knowledge of steam turbine and its auxiliaries.</p>