



## LEARN AND WORK ASSIGNMENT (LWA)



<b>NOSS (CODE NOSS)</b>	<b>INDUSTRIAL MAINTENANCE OPERATION (MC-010-3:2012)</b>		
<b>Competency Unit Title (CU CODE)</b>	<b>MACHINE TOOL MAINTENANCE (MECHANICAL) MC-010-3:2012-C02</b>	<b>LEVEL</b>	<b>3</b>
<b>Competency Unit Descriptor</b>	<p>Machine tool maintenance (mechanical) is a necessity for retaining equipments, machines and system to the specified operable condition and maximize lifespan. It covers corrective, preventive and predictive maintenance.</p> <p>The person who is competent in this CU shall be able to Select machine tool to be maintained, Select maintenance requirement, Perform mechanical power transmission's maintenance, Perform Cooling system maintenance, perform machine functionality test and Produce machine tool maintenance report.</p> <p>The outcome of this competency is to provide excellence machine tool (mechanical) maintenance according to Standard Operation Procedures (SOP) and machine technical manual as per company's policy, rules and regulation.</p>		
<b>Candidate Name</b>			
<b>Candidate I/C Number</b>			
<b>Company's Name</b>			

**CU WORK ACTIVITY STATEMENT:****PERFORM MACHINE TOOL MAINTENANCE (MECHANICAL) ACTIVITIES****DURATION: 284 Hours****A. SETTING GOAL**

You are required to perform machine tool maintenance (mechanical) activities based on performance criteria below:

- 1.1 Determine types of machine to be maintained in accordance to machine maintenance schedule.
  - 1.1.1 Milling.
  - 1.1.2 Drilling.
  - 1.1.3 Lathe.
  - 1.1.4 Other type of machine.
- 1.2 Interpret job order in accordance to the company's policy, rules and regulation.
- 1.3 Determine type of maintenance.
  - 1.3.1 Preventive
  - 1.3.2 Corrective
  - 1.3.3 Predictive
- 1.4 Interpret maintenance schedule.
- 1.5 Interpret assembly drawing.
- 1.6 Interpret machine tool (mechanical) maintenance technical manual.
- 1.7 Prepare maintenance requirement for machine tool maintenance (mechanical).
- 1.8 Identify machine tool (mechanical) maintenance components.
  - 1.8.1 Gear
  - 1.8.2 Pulley
  - 1.8.3 Belting
  - 1.8.4 Chain
  - 1.8.5 Bearing
  - 1.8.6 Bush
  - 1.8.7 Clutch
  - 1.8.8 Shaft
- 1.9 Identify machine tool (mechanical) maintenance components activity in accordance with illustrated breakdown diagram/picture and Standard Operation Procedures.
  - 1.9.1 Dismantle
  - 1.9.2 Oil/coolant level indicator
  - 1.9.3 Troubleshoot
  - 1.9.4 Replace
  - 1.9.5 Repair
  - 1.9.6 Assemble
- 1.10 Identify functionality of the machine
  - 1.10.1 Check
  - 1.10.2 Test run
    - With load
    - Without load
  - 1.10.3 Functionality

- Leakage
- Stability
- Vibration
- Smooth
- Noise
- Accuracy
- Etc.

1.10.4 Confirm

- 1.11 Identify machine tool maintenance (mechanical) report format.
- 1.12 Identify submission documentations to person in charge.

## **B. PLANNING**

You are required to plan activities in performing machine tool maintenance (mechanical) to achieve setting goal by using resources listed below:

2.1 Identify tools, equipment & materials.

ITEMS	RATIO (TEM : Trainees)
1. Machine's Manual / S.O.P.	1:1
2. Measuring instruments	1:5
3. Testing equipment	1:25
4. Measuring and testing Instrument storage (cabinet)	1:25
5. Measuring Instrument and testing charts and posters	1:25
6. Technical drawing	1:5
7. Milling machine, accessories	1:10
8. Drilling machine and accessories	1:10
9. Lathe machine and accessories	1:10
10. Check sheet	1:1
11. Tool box	1:1
12. Hand tool set	1:1
13. Power tools	1:5
14. Personal Protective Equipment (PPE)	1:1
15. Work piece (for test cut)	1:1
16. cutting tools (for test cut)	1:1
17. Consumable item	1:1

2.2 Perform machine tool maintenance (mechanical) workflow.

2.3 Identify machine tool maintenance (mechanical) procedures, flow chart and correct sequence.

2.4 Plan duration/time of machine tool maintenance (mechanical) procedures.

2.5 Identify manpower in performing machine tool maintenance (mechanical) activities.

2.6 You may review references as guidelines in performing this activity.

#### REFERENCES

1. Zakaria Saad, (2002), Mekanik Industri Teori dan teknologi, Golden Books center Sdn. Bhd ISBN: 983-72-0503-2.
2. Mohd Ramzan Mainal, (2005). Lukisan Kejuruteraan Asas (Edisi Kedua), Universiti Teknologi Malaysia ISBN 983-99502-2-3
3. Ibrahim Che Muda, N Ramudaram, (2004) Teknologi Bengkel Mesin Dewan Bahasa dan Pustaka, Kementerian Pendidikan Malaysia, Kuala Lumpur ISBN 983-62-1233-7
4. Raymond S Beebe (Author) (April, 2004) Predictive Maintenance of Pumps Using Condition Monitoring, Elsevier Science ISBN-13: 978-1856174084
5. Nicholas P. Cheremisinoff, Paul N. Cheremisinoff (1992) Pumps and Pumping Operations, Prentice Hall ISBN 0-13-739319-9

## **C. DECISION MAKING**

You are required to get coach approval before performing machine tool maintenance (mechanical) activities.

## **D. EXECUTING & MONITORING**

You are required to perform machine tool maintenance (mechanical) activities according to the steps below:

- 3.1 Adhere to Safety procedures and Standard Operation Procedures.
- 3.2 Select machine tool to be maintained (single function machine)
  - 3.2.1 Interpret machine's maintenance schedule
  - 3.2.2 Identify types of machines tool
  - 3.2.3 Interpret Job order instructions/ maintenance checklist
  - 3.2.4 Determine company's policy, rules and regulation
- 3.3 Differentiate types of maintenance
  - 3.3.1 Preventive
  - 3.3.2 Corrective
  - 3.3.3 Predictive
- 3.4 Perform Mechanical power transmission maintenance
  - 3.4.1 Interpret Machine tool (mechanical) maintenance technical manual
    - Milling
    - Drilling
    - Lathe
  - 3.4.2 Interpret Technical drawing
    - Symbol
    - Dimension
    - Project View
  - 3.4.3 Prepare Tools for maintenance (mechanical)
    - Hand Tools
    - Power Tools
    - Special Tools
  - 3.4.4 Check mechanical power transmission components for maintenance activity
    - Gear
    - Pulley
    - Belting
    - Chain
    - Bearing
    - Bush
    - Clutch
    - Shaft

- 3.4.5 Dismantle and replace or repair accordingly to SOP mechanical power transmission components for maintenance activity
- 3.4.6 Perform mechanical power transmission assembly
- 3.4.7 Change or refill lubricant for mechanical power transmission components
- 3.4.8 Execute troubleshooting mechanical power transmission activity
- 3.4.9 Decide mechanical power transmission component problem by repair or replace
- 3.5 Perform cooling system maintenance
  - 3.5.1 Identify types and functions of cooling system
    - Liquid
    - Air
    - Coolant
  - 3.5.2 Identify types of cooling system components
    - Oil filter
    - Pipe/hose
    - Strainer
    - Pump
    - Blower Fan
    - Coolant Level
  - 3.5.3 Troubleshooting of component failure
    - Check cooling system components
    - Confirm cooling system components to be repaired, replace or cleaned
  - 3.5.4 Replace, clean or refill cooling system components

- 3.6 Perform machine functionality test
  - 3.6.1 Comply to machine tools safety features according to Standard Operation Procedure (SOP)
    - Maintenance procedure (Repair, service, replacement, etc)
    - Installation procedure (Dismantle, install, etc)
    - Standard Operation Procedure (SOP)
  - 3.6.2 Perform test run method and procedures of the machine tools under condition without load and with load using
    - Visual
    - Vibration
    - Noise
    - Heat
  - 3.6.3 Confirm functionality of machine tools
    - Milling
    - Drilling
    - Lathe
  - 3.6.4 Utilize testing equipment
    - Leakage
    - Stability
    - Smooth
    - Noise
    - Accuracy
- 3.7 Produce machine tool maintenance report
  - 3.7.1 Collect maintenance technical Data
  - 3.7.2 Interpret maintenance technical Data
  - 3.7.3 Confirm maintenance technical Data
  - 3.7.4 Fill-up checklist
  - 3.7.5 Write maintenance technical report
  - 3.7.6 Update maintenance schedule



3.8 Comply with attitude, safety and environment listed below when performing this activity.

ATTITUDE	SAFETY	ENVIRONMENTAL
i. Meticulous in selecting machine tool	i. Adhere to safety requirement	i. Adhere to DOE requirements
ii. Meticulous in selecting machine tool	ii. Use appropriate PPE	ii. Handle waste properly
iii. Meticulous in maintenance works	iii. Use appropriate Personal Protective Equipment (PPE)	iii. Comply to environment act
iv. Responsible to organisation	iv. Perform safe work practices	iv. Handle waste properly
v. Cleanliness at work area		v. Comply to environment act
vi. Accountable to work		
vii. Meticulous in writing report		
viii. Cleanliness at work area		
ix. 5S compliance		

3.9 Apply core activities listed below when performing this activity.

Social Skills	Core Abilities
Communication skills	L1-CA01-01 Apply working language appropriately (English/ national language etc). L1-CA01-02 Apply oral communication and speak reasonably. L1-CA01-03 Understand reading material. L2-CA01-01 Apply two-way communication L2-CA01-02 Disseminate information electronically L2-CA01-03 Disseminate information manually L3-CA01-01 Demonstrate communication practice
Problem solving skills	L1-CA02-01 Demonstrate honesty and integrity L1-CA02-02 Adopt work punctuality L1-CA02-03 Demonstrate team cooperation L2-CA02-01 Demonstrate responsibility at workplace L2-CA02-02 Apply teamwork cooperation concept L2-CA02-03 Initiate problem solving at workplace

	L2-CA02-04 Demonstrate work performance awareness
Leadership skill	L3-CA02-01 Demonstrate counselling ability L3-CA02-02 Demonstrate responsibility & authority L3-CA02-03 Demonstrate teamwork ability L3-CA02-04 Demonstrate emotional intelligence L3-CA02-05 Apply work knowledge in identifying clients needs L3-CA02-06 Monitor work performance delivery L2-CA01-04 Apply information confidentiality L3-CA01-02 Apply basic negotiation skills L3-CA06-03 Implement workforce practices L3-CA03-01 Apply cultural requirement at workplace L3-CA03-02 Handle situations that require attention
Teamwork	L1-CA03-01 Respond to instructions L1-CA03-02 Demonstrate discipline at workplace L2-CA03-01 Apply practice work culture L2-CA03-02 Respond appropriately to unusual situations L2-CA03-03 Demonstrate initiative and flexibility L2-CA04-01 Demonstrate health compliance L2-CA04-02 Demonstrate safety compliance L2-CA04-03 Demonstrate environment compliance L3-CA04-01 Execute health consciousness L3-CA04-02 Execute safety consciousness L3-CA04-03 Execute environment compliance
Multitasking and prioritizing	L1-CA04-01 Adhere to health awareness activity L1-CA04-02 Adhere to safety awareness activity L1-CA04-03 Adhere to environmental awareness activity L3-CA05-01 Demonstrate Technology update awareness L3-CA05-02 Demonstrate Information technology regulatory Awareness L3-CA06-01 Demonstrate work asset usage awareness L3-CA06-02 Negotiate acceptance and delivery of products and/or services

## E. EVALUATING

You are required to evaluate machine tool maintenance (mechanical) activities using the checklist below.

A	ASSESSMENT CRITERIA (60%)	MARKS GIVEN BY APPRENTICE					MARKS GIVEN BY COACH				
		0	1-2	3-4	5-6	7	0	1-2	3-4	5-6	7
1	Machine tool maintenance (Mechanical) manual interpreted										
2	Job order Interpreted										
3	Machine tool (Mechanical) to be maintained selected										
4	Type of maintenance selected										
5	Technical drawing interpreted										
6	Tools for maintenance selected										
7	Machine tool dismantle repair and replace performed										
8	Machine tool assembly performed										
9	Troubleshooting machine tool activity performed										
10	Test run method and procedures of the machine tools performed										
11	Machine tool maintenance data recorded										
	<b>SUBTOTAL</b>	<b>A<sub>1</sub></b>					<b>A<sub>2</sub></b>				
	<b>FULL MARKS</b>	<b>77</b>					<b>77</b>				

<b>B</b>	<b>ATTITUDE/SAFETY/ ENVIRONMENT (20%)</b>	<b>MARKS GIVEN BY APPRENTICE</b>					<b>MARKS GIVEN BY COACH</b>				
		<b>0</b>	<b>1-2</b>	<b>3-4</b>	<b>5-6</b>	<b>7</b>	<b>0</b>	<b>1-2</b>	<b>3-4</b>	<b>5-6</b>	<b>7</b>
1	Attitude										
2.	Safety										
3	Environmental										
		<b>B<sub>1</sub></b>					<b>B<sub>2</sub></b>				
		<b>21</b>					<b>21</b>				
<b>C</b>	<b>EMPLOYABILITY SKILLS (SOCIAL SKILLS) (20%)</b>	<b>MARKS GIVEN BY APPRENTICE</b>					<b>MARKS GIVEN BY COACH</b>				
		<b>0</b>	<b>1-2</b>	<b>3-4</b>	<b>5-6</b>	<b>7</b>	<b>0</b>	<b>1-2</b>	<b>3-4</b>	<b>5-6</b>	<b>7</b>
1	Communication skills										
2	Problem solving skills										
3	Leadership skill										
4	Teamwork										
5	Multitasking and prioritizing										
		<b>C<sub>1</sub></b>					<b>C<sub>2</sub></b>				
	<b>FULL MARKS</b>	<b>35</b>					<b>35</b>				

## CALCULATION TABLE

	MARKS GIVEN BY APPRENTICE	MARKS GIVEN BY COACH	WEIGHTED MARKS GIVEN BY APPRENTICE	WEIGHTED MARKS GIVEN BY COACH
ASSESSMENT CRITERIA	$A_1$	$A_2$	$A_1 / 77 \times 60$	$A_2 / 77 \times 60$
ATTITUDE, SAFETY & ENVIRONMENT	$B_1$	$B_2$	$B_1 / 21 \times 20$	$B_2 / 21 \times 20$
EMPLOYABILITY SKILLS (SOCIAL SKILLS)	$C_1$	$C_2$	$C_1 / 35 \times 20$	$C_2 / 35 \times 20$
Total			X	Y
Ratio of Percentage (Apprentice: Coach)			P%	Q%
Grand Total			$(P/100 \times X) + (Q/100 \times Y)$	

COMMENTS/ RECOMMENDATIONS BY COACH

\_\_\_\_\_  
COACH:  
DATE:

\_\_\_\_\_  
APPRENTICE:  
DATE: