THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

OCCUPATIONAL STANDARDS

OCCUPATION: PETROCHEMICAL ENGINEERING TECHNICIAN

LEVEL: NTA LEVEL 5

FEBRUARY 2024

TABLE OF CONTENTS

ABBREVIATIONS

CBET	-	Competency-Based Education and Training
DCS	-	Distributed Control System
NACTVET	-	National Council for Technical and Vocational Education and Training
NOS	-	National Occupational Standards
OS	-	Occupational Standards
TET	-	Technical Education and Training
TVET	-	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross-cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.

Task Analysis:	The process of analyzing each task to determine the steps, related knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.
Occupational Competence:	The application and performance of knowledge and skills to perform consistently to that consistently meet the standards required by in the work context.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status, with a high level of human development. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in application across all public and private institutions.

However, it must be noted that Occupational Standards are different from Training /Education Standards. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs troubleshooting in electrical circuits, etc.), and are usually defined by Employers following procedures as agreed upon by all the stakeholders. On the other hand, Training and Education Standards are developed from the activities defined in the occupational standards, and they specify learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him/her to function at an agreed level in an occupation. Training and Education Standards are used to define curricula in training institutions. It is critical, however, to establish a direct link between the occupational standards and the training standards for both of them to respond collaboratively to the demands of the labour market.

For the purpose of TET delivery, Tanzania has adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus

the starting point for developing competency-based training (CBET) programmes. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training.

The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026).* NACTVET labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplaces, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR PETROCHEMICAL ENGINEERING TECHNICIAN

The standards cover a broad range of duties and tasks that can be performed by a Petrochemical Engineering Technician. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Petrochemical Engineering Technician may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

Petrochemical engineering technicians shall complete the start-up and shutdown of heating furnace, reactor, fixed bed reactor, and filter unit, as well as adjust relatively complex process parameters and maintain pumps and pipelines under the supervision of engineers. Generally, the Petrochemical Engineering Technician performs the following duties:

a) Carry out material handling
b) Conduct material heat exchange
c) Conduct material heating
d) Material reaction
e) Perform material separation
f) Carry out maintenance of pump and pipeline
g) Conduct material compression
h) Perform material separation
i) Identify faults and fix the process equipment
g) Carry out maintenance of process equipment

The Occupational standards have been clustered into NTA qualification levels i.e. NTA Level 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0 OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR PETROCHEMICAL ENGINEERING TECHNICIAN - NTA LEVEL 5

<table>
<tr><td>OCCUPATION</td><td>PETROCHEMICAL ENGINEERING TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>CARRY OUT MATERIAL HEATING</td><td>DUTY NO.</td><td>501</td></tr>
<tr><td>TASK TITLE</td><td>START-UP HEATING FURNACE</td><td>TASK NO.</td><td>5011</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to start up the heating furnace according to technical requirements and operation manual.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include:
1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc.;
2. Fuel oil storage tank;
3. Fuel gas separation tank;
4. Tubular heating furnace;
5. Fuel oil pump;
6. Walkie-talkie;
7. Toolkit (wrench and pipe tongs);
8. Instrument system;
9. DCS operation system.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENTS</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Wear labour protection appliance neatly while performing tasks;
2. Inspect utilities;
3. Supply power for operating equipment;
4. Fully open the flue baffle of the heating furnace and use steam to purge the combustible gas inside the hearth;
5. Open the fuel gas control valve and fill the fuel gas separation tank with fuel gas;
6. Open the control valve on the fuel gas line to introduce fuel gas into the heating furnace nozzle, and use the control valve to control the fuel gas volume to control the heating rate;
7. Introduce process materials into</td><td colspan="2">Detailed knowledge about:
1.0. Methods
The person performing this task must be able to explain how to:
1.1 Purge the combustible gas in the hearth;
1.2 Start the fuel oil system;
1.3 Fill the fuel gas separation tank with fuel gas;
1.4 Adjust the temperature of heating furnace to normal level.

2.0. Principles
The person performing this task must be able to explain the following principles:
2.1 Characteristics of tubular heating furnace equipment;
2.2 Structure of tubular heating furnace;
2.3 Operating principles of control valve.

3.0. Theories
The person performing this task must be able to explain the following:</td></tr>
</table>

the heating furnace; 8. Start the fuel oil system; 9. Adjust the temperature of heating furnace to normal level; 10. Perform equipment maintenance. 11. Observe health, occupational and environmental safety rules and regulations.	3.1 Start-up steps of heating furnace; 3.2 Process flow of heating furnace; 3.3 Maintenance content of heating furnace. **4.0. Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The heating furnace is started according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT MATERIAL HEATING	**DUTY NO.**	501
TASK TITLE	ADJUST AND OPERATE THE HEATING FURNACE	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to adjust and operate the process parameters of the heating furnace according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Fuel oil storage tank; 3. Fuel gas separation tank; 4. Tubular heating furnace; 5. Fuel oil pump; 6. Walkie-talkie; 7. Toolkit (wrench and pipe tongs); 8. Instrument system. 9. DCS operation system.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear labour protection appliance neatly while performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Monitor furnace outlet temperature; 5. Monitor hearth temperature; 6. Monitor the temperature of flue gas; 7. Adjust the oxygen content in the flue; 8. Adjust the negative pressure of hearth; 9. Adjust the amount of process materials; 10. Adjusting the heating water flow; 11. Monitor the pressure of the fuel gas separation tank; 12. Adjust the pressure difference of atomizing steam. 13. Observe health, occupational and	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Control the furnace outlet temperature of process materials; 1.2 Adjust the temperature of hearth and flue gas; 1.3 Adjust the pressure of hearth and fuel oil; 1.4 Adjust the oxygen content in the flue gas. **2.0. Principle** The person performing this task must be able to explain the following principles: 2.1 Basis for setting instrument parameters such as temperature, flow, and pressure; 2.2 Instrument adjustment basis. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Adjustment of heating furnace process indicators. **4.0. Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills;

environmental safety rules and regulations.	4.4 Safety protection skills; 4.5 Operation record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The process parameters of the heating furnace are adjusted and operated according to the technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instruments; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT MATERIAL HEATING	**DUTY NO.**	501
TASK TITLE	SHUT DOWN HEATING FURNACE	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to shut down the heating furnace according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Fuel oil storage tank; 3. Fuel gas separation tank; 4. Tubular heating furnace; 5. Fuel oil pump; 6. Walkie-talkie; 7. Toolkit (wrench and pipe tongs); 8. Instrument system. 9. DCS operation system.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear labour protection appliance neatly while performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Remove interlocking system; 5. Reduce the amount of process materials; 6. Gradually reduce fuel oil pressure or fuel gas flow; 7. Gradually reduce the flow of heating water; 8. Adjust the damper and baffle properly to maintain the oxygen content in the flue gas and the negative pressure in the hearth; 9. Reduce fuel oil pressure and temperature; 10. Gradually close the fuel oil control valve and then shut down the fuel pump; 11. Reduce the atomizing steam flow rate and finally close the atomizing steam control valve;	Detailed knowledge about: **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Stop fuel gas and process materials; 1.2 Cool down and stop fuel oil system; 1.3 Reduce volume; 1.4 Purge hearth. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of hearth purging; **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Removal steps of interlocking system; 3.2 Cooling method for tubular heating furnace. **4.0. Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.

12. Close the fuel gas inlet control valve of the fuel gas separation tank and stop supplying fuel gas to the fuel gas separation tank; 13. Close the fuel gas control valve; 14. Turn off the root valve of the ever-burning lamp and extinguish the fire; 15. Stop process feeding and heating water; 16. Purge hearth; 17. Power off the instrument; 18. Turn off main power supply. 19. Observe health, occupational and environmental safety rules and regulations.	
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The heating furnace is shut down according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM MATERIAL REACTION	**DUTY NO.**	502
TASK TITLE	START UP THE TANK REACTOR	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person performing this task must be able to start up the tank reactor according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Batch reactor; 3. Measuring tank; 4. Precipitation tank; 5. Centrifugal pump; 6. Instrument system; 7. DCS operation system; 8. Walkie-talkie; 9. Toolkit (wrench and pipe tongs);		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure personal safety protection and wear labour protection appliance neatly before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Check the operating status of the device: each measuring tank, reactor, and precipitation tank are in a normal temperature and pressure state; all kinds of materials are ready; most valves and pumps are in a shutdown state. Check the opening of the vent valve; 6. Open the material preparation valve to feed the precipitation tank and then close the material preparation valve after reaching the liquid level; 7. Open the material preparation	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Inspect equipment valve; 1.2 Prepare materials; 1.3 Feed materials; 1.4 Adjust the parameters of flow, temperature and pressure gauges. **2.0. Principle** The person performing this task must be able to explain the following principles: 2.1 Operating principles of the reactor; 2.2 Operation principles of the reactor. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Process flow of reactor; 3.2 Start-up steps of reactor; 3.3 Structure and function of reactor. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.

valve to feed the measuring pipe and then close the material preparation valve after reaching the liquid level; 8. Start the feed pump; 9. Shut down feed pump after reaching the liquid level; 10. Close the vent valve; 11. Start the mixer motor of reactor; 12. Open the jacket steam heating valve; 13. Monitor temperature, pressure, and feed quantity of reactor; 14. Control the reaction temperature until the reaction ends. 15. Observe health, occupational and environmental safety rules and regulations.	
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The tank reactor is started according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM MATERIAL REACTION	**DUTY NO.**	502
TASK TITLE	ADJUST AND OPERATE THE PROCESS PARAMETERS OF THE TANK REACTOR	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to adjust and operate the process parameters of the tank reactor according to the technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Batch reactor; 3. Measuring tank; 4. Precipitation tank; 5. Centrifugal pump; 6. Instrument system; 7. DCS operation system; 8. Walkie-talkie; 9. Toolkit (wrench and pipe tongs);		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure personal safety protection and wear labour protection appliance neatly before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Check the operating status of the device: each measuring tank, reactor, and precipitation tank are in a normal temperature and pressure state; all kinds of materials are ready; most valves and pumps are in a shutdown state. Check the opening of the vent valve; 6. Start preparing materials; 7. Start feeding materials;	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 View process production indicators; 1.2 Adjust the temperature of tank reactor; 1.3 Adjust the pressure of tank reactor; **2.0. Principle** The person performing this task must be able to explain the following principles: 2.1 Structure of reactor heat transfer device; 2.2 Operating principles of control valve. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Methods for setting tank rector parameters such as temperature and pressure; 3.2 Methods for adjusting tank rector parameters such as temperature and pressure. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills;

8. Start reactor mixer and heating; 9. Stop introducing stream for heating; 10. Open the cooling water valve; 11. Open the high-pressure water valve and close the mixer to slow down the reaction; 12. Slightly open the vent valve to reduce air pressure; 13. Open high-pressure cooling water valve, close mixer, close heating steam valve under over temperature, over pressure, and interlocking start-up conditions; 14. Open reactor safety valve under over pressure conditions; 15. Observe health, occupational and environmental safety rules and regulations.	4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Operation record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The process parameters of the tank reactor are adjusted and operated according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM MATERIAL REACTION	**DUTY NO.**	502
TASK TITLE	SHUT DOWN THE TANK REACTOR	**TASK NO.**	5023
PERFORMANCE CRITERIA	The person performing this task must be able to shut down the tank reactor according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Batch reactor; 3. Measuring tank; 4. Precipitation tank; 5. Centrifugal pump; 6. Instrument system; 7. DCS operation system; 8. Walkie-talkie; 9. Toolkit (wrench and pipe tongs);		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure personal safety protection and wear labour protection appliance neatly before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Identify shutdown conditions; 6. Open the vent valve; 7. Inject pressurized steam into the reactor; 8. Open the steam preheating valve for a moment; 9. Open the discharge valve for discharging; 10. Purge after discharge; 11. Close the discharge valve; 12 Close the steam valve. 13. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Identify shutdown conditions; 1.2 Discharge; 1.3 Replace materials; 1.4 Purge equipment; **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Composition of reactor mixing device; 2.2 Operating principles of control valve. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Shutdown procedures for reactor; 3.2 Temperature valve adjustment method. **4.0. Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills;

	4.5 Shutdown record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The tank reactor is shut down according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM MATERIAL REACTION	**DUTY NO.**	502
TASK TITLE	START UP THE FIXED BED REACTOR	**TASK NO.**	5024
PERFORMANCE CRITERIA	The person performing this task must be able to start up the fixed bed reactor according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Feed gas/reaction gas heat exchanger; 3. Feed gas preheater; 4. Steam condenser; 5. Flash tank; 6. Hydrogenation reactor; 7. Instrument system; 8. DCS operation system; 9. Walkie-talkie; 10. Toolkit (wrench and pipe tongs).		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure personal safety protection and wear labour protection appliance neatly before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Check the operating status of the device: the equipment is in a normal temperature and pressure state; valves and pumps are in a shutdown state. Check the opening of the vent valve; 6. Stamp and replace Nitrogen; 7. Turn on the flash evaporator to maintain pressure; 8. Open the front and rear valves of the return valve; 9. Fill flash evaporator with cooling water; 10. Open the feed valve of the flash	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Check start-up; 1.2 Fill in coolant; 1.3 Stamp and replace reactor. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Structure and function of fixed bed; 2.2 Stamping principle of fixed bed. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Start-up steps of fixed bed reactor. **4.0. Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.

evaporator to set the opening degree; 11. Close the feed valve of flash evaporator; 12. Open the coolant valve and finish flushing; 13. Open the shell side valve of the reactor; 14. Open steam feed control valve; 15. Open feedstock feed control valve; 16. Slightly open the bottom discharge valve of the reactor to charge pressure; 17. Discharge pressure until pressure balance; 18. Set automatic control mode for feedstock feeding; 19. Open the hydrogen feed valve; 20. Monitor the temperature, pressure, and hydrogen feed quantity of reactor. 21. Observe health, occupational and environmental safety rules and regulations.	
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The fixed bed reactor is started according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM MATERIAL REACTION	**DUTY NO.**	502
TASK TITLE	ADJUST AND OPERATE THE FIXED BED REACTOR	**TASK NO.**	5025
PERFORMANCE CRITERIA	The person performing this task must be able to adjust and operate the process parameters of the fixed bed reactor according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Feed gas/reaction gas heat exchanger; 3. Feed gas preheater; 4. Steam condenser; 5. Flash tank; 6. Hydrogenation reactor; 7. Instrument system; 8. DCS operation system; 9. Walkie-talkie; 10. Toolkit (wrench and pipe tongs).		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure personal safety protection and wear labour protection appliance neatly before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Check the operating status of the device: the equipment is in a normal temperature and pressure state; valves and pumps are in a shutdown state. Check the opening of the vent valve; 6. Fill flash evaporator with coolant; 7. Fill rector with coolant; 8. Stamp and replace reactor; 9. Stabilize reactor inlet temperature; 10. Open the hydrogen distribution	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Describe process production indicators; 1.2 Start the fixed bed. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Operating principles of control valve. 2.2 Heat exchange principle of fixed bed. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Requirements for setting the parameters of fixed bed instruments; 3.2 Requirements for adjusting the parameters of fixed bed instruments. **4.0 Essential Skills** 4.1 Communication skills;

valve; 11. Set automatic control mode after the hydrogen feeding is stabilized; 12. Observe the change of reactor temperature; 13. Set manual mode after the hydrogen quantity is stabilized; 14. Slowly increase the amount of hydrogen and observe the change of reactor temperature; 15. Set cascade control mode for the reactor temperature when the hydrogen quantity is maximum. 16. Observe health, occupational and environmental safety rules and regulations.	4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The fixed bed reactor is adjusted and operated according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	PERFORM MATERIAL REACTION	**DUTY NO.**	502
TASK TITLE	SHUT DOWN FIXED BED REACTOR	**TASK NO.**	5026
PERFORMANCE CRITERIA	The person performing this task must be able to shut down the fixed bed reactor according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Feed gas/reaction gas heat exchanger; 3. Feed gas preheater; 4. Steam condenser; 5. Flash tank; 6. Hydrogenation reactor; 7. Instrument system; 8. DCS operation system; 9. Walkie-talkie; 10. Toolkit (wrench and pipe tongs).		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Ensure personal safety protection and wear labour protection appliance neatly before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Close the hydrogen valve; 6. Close the steam valve of the heater; 7. Fully open the condensation return valve of flash evaporator; 8. Reduce feedstock feeding; 9. Open the cooling water feed valve of the reactor; 10. Gradually reduce the temperature and pressure of the reactor to normal temperature and pressure; 11. Gradually reduce the temperature and pressure of the flash evaporator to normal temperature	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Identify shutdown conditions; 1.2 Stop feeding; 1.3 View operation manual; 1.4 Conduct shutdown of fixed bed. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Cooling principle of fixed bed; 2.2 Depressurization principle of fixed bed. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Shutdown steps of fixed bed. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills;

and pressure. 12. Observe health, occupational and environmental safety rules and regulations.	4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The fixed bed reactor is shut down according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT MATERIAL SEPARATION	**DUTY NO.**	503
TASK TITLE	START UP FILTER UNIT	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to start up the filter unit according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Filter cloth; 3. Plate-and-frame filter; 4. Centrifugal pump; 5. Air compressor; 6. Walkie-talkie; 7. Toolkit (wrench and pipe tongs); 8. Instrument system. 9. DCS operation system.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear labour protection appliance before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Inspect utilities; 4. Supply power for operating equipment; 5. Check lubrication system; 6. Check the installation sequence of plate; 7. Check the status of the filter cloth; 8. Check the opening and closing status of pipeline valves; 9. Press the compression button to compress the plate; 10. Turn off the motor when the rated upper pressure is reached; 11. Automatically maintain pressure of filter press; 12. Open the inlet valve of the slurry pump; 13. Start the slurry pump and transport the slurry; 14. Open the outlet valve of the slurry pump; 15. Adjust the feed rate of the slurry to form a stable filter cake; 16. Open the filtrate outlet valve; 17. Introduce the filtrate into the filtrate tank;	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Check start-up; 1.2 Pressurize and maintain the filtration system; 1.3 Adjust the parameters of flow and pressure gauges. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of pressure filtration; 2.2 Basic equation for filtering operation; 2.3 Improvement measures for filtration operation; 2.4 Structure of plate-and-frame filter press; 2.5 Operating principles of plate-and-frame filter press. **3.0. Theories** The person performing this task must be able to explain the following theories**:** 3.1 Process flow of filter unit; 3.2 Start-up operation method of plate-

18. Perform pressure filtration operation. 19. Observe health, occupational and environmental safety rules and regulations.	and-frame filter press; 3.3 Installation method of plate; 3.4 Adjustment method of feeding rate; 3.5 Washing method of filter cake. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The filter unit is started up according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT MATERIAL SEPARATION	**DUTY NO.**	503
TASK TITLE	OPERATE AND ADJUST THE FILTER UNIT	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to operate and adjust the filter unit according to the process parameters of central control as specified in the technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Filter cloth; 3. Plate-and-frame filter; 4. Centrifugal pump; 5. Air compressor; 6. Walkie-talkie; 7. Toolkit (wrench and pipe tongs); 8. Instrument system. 9. DCS operation system.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear labour protection appliance before performing tasks; 1. Select appropriate tools and equipment for this task; 2. Check the instrument circuit system; 3. Adopt instrument interlocking; 4. Identify equipment instrument control points; 5. Operate the distributed control system; 6. Control filtration pressure and rate; 7. Adjust the filtration pressure and rate; 8. Record equipment operating parameters. 9. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 View process flow diagrams and safe operating procedures; 1.2 View process production indicators; 1.3 Adjust the filtration pressure; 1.4 Adjust the filtration rate. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Safe operation of plate-and-frame filter press; 2.2 Operating principles of plate-and-frame filter press; 2.3 Filtering medium; 2.4 Factors affecting filtration. **3.0. Theories** The person performing this task must be able to explain the following principles:

	3.1 Instrument alarm interlocking; 3.2 Measuring range of instruments and meters; 3.3 Remote computer monitoring; 3.4 Process parameter adjustment method. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The filter unit is operated and adjusted according to the process parameters of central control as specified in the operation technical manual
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MATERIAL SEPARATION	**DUTY NO.**	503
TASK TITLE	SHUT DOWN FILTER UNIT	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to shut down the filter unit according to the technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed in the production equipment under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. 2. Filter cloth; 3. Plate-and-frame filter; 4. Centrifugal pump; 5. Air compressor; 6. Walkie-talkie; 7. Toolkit (wrench and pipe tongs); 8. Instrument system. 9. DCS operation system.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear labour protection appliance before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Close the outlet valve of the slurry pump; 4. Turn off the slurry pump and stop feeding the slurry; 5. Close the inlet valve of the slurry pump; 6. Close the filtrate outlet valve and stop the filtrate discharge; 7. Turn on the washing water system and wash the filter cake; 8. Gradually reduce the pressure of the filtration system to normal pressure; 9. Activate the return button and release the plate; 10. Remove the plate and frame, and then remove the filter cake; 11. Clean the plate and frame with water; 12. Clean the workplace; 13. Store tools safely. 14. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 View process flow diagrams and safe operating procedures; 1.2 Choose/Wear safety protection equipment; 1.3 Identify shutdown conditions; 1.4 Release system pressure; 1.5 Deactivate the filtration system. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Principle of pressure filtration; 2.2 Basic equation for filtering operation; 2.3 Improvement measures for filtration operation; 2.4 Structure of plate-and-frame filter press; 2.5 Operating principles of plate-and-frame filter press; **3.0. Theories**

	The person performing this task must be able to explain the following principles: 3.1 Normal shutdown procedure of plate-and-frame filter press; 3.2 Pressure relief operation method of plate-and-frame filter press; 3.3 Emergency shutdown operation method of plate-and-frame filter press; 3.4 Normal shutdown operation method of plate-and-frame filter press; 3.5 Disassembly method of plate and frame. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The filter unit is shut down according to the approved operating technical regulations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of electrical instrument; 4. Computer operation knowledge; 5. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF PUMP AND PIPELINE	**DUTY NO.**	504
TASK TITLE	DRAIN AND CLEAN THE PUMP	**TASK NO.**	5041
PERFORMANCE CRITERIA	The person performing this task must be able to drain and clean the pump according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed on-site in the pump room under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, safety belt, protective gloves, safety glasses, etc. 2. Pump; 3. Jack; 4. Air compressor; 5. High pressure vehicle cleaning machine; 6. Gasoline; 7. Lubricating oil; 8. Machine oil; 9. Priming funnel; 10. Oil can; 11. Scaffold and movable frame, etc.; 12. Walkie-talkie; 13. Toolkit (wrench and pipe tongs).		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Wear labour protection appliance before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Check the oil level of the pump oil tank; 4. Check lubrication system; 5. Remove the oil drain plug; 6. Discharge pump oil; 7. Disassemble the coupling; 8. Remove impeller; 9. Remove the pump cover and shaft sleeve; 10. Clean the impeller and sealing ring; 11. Clean the water pump housing; 12. Clean the bearing bush and bearing; 13. Clean the workplace; 14. Store tools safely. 15. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Check the pump assembly diagram and safety maintenance procedures; 1.2 Check the oil level of the pump oil tank and lubrication system; 1.3 Develop a pump maintenance plan; 1.4 Perform pump maintenance. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Structure of the pump; 2.2 Operating principles of pump; 2.3 Classification and function of lubricating oil;

	2.4 Performance requirements for lubricating oil. **3.0. Theories** The person performing this task must be able to explain the following principles: 3.1 Steps and standards for disassembly and assembly of pump; 3.2 Pump drain method; 3.3 Pump cleaning method; 3.4 Chemical cleaning methods; 3.5 Mechanical cleaning methods. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The pump is drained and cleaned according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of equipment structure diagram reading; 4. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT THE MAINTENANCE OF PUMP AND PIPELINE	**DUTY NO.**	504
TASK TITLE	FILTER PUMP LUBRICATING OIL	**TASK NO.**	5042
PERFORMANCE CRITERIA	The person performing this task must be able to filter the pump lubricating oil according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed on-site in the pump room under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, safety belt, protective gloves, safety glasses, etc. 2. Pump; 3. Jack; 4. Air compressor; 5. High pressure vehicle cleaning machine; 6. Gasoline; 7. Lubricating oil; 8. Machine oil; 9. Priming funnel; 10. Oil can; 11. Filter screen; 12. Scaffold and movable frame, etc.; 13. Walkie-talkie; 14. Toolkit (wrench and pipe tongs).		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to: 1. Wear labour protection appliance before performing tasks; 2. Select appropriate tools and equipment for this task; 3. Check the lubricating oil status; 4. Comply with the lubricating oil filling principle; 5. Place a 60-mesh filter screen in the primary filtration oil drum; 6. Pump the lubricating oil from the large bucket in the warehouse into the primary filter oil drum for filtration; 7. Place an 80-mesh filter screen inside the secondary filtration oil can; 8. Add lubricating oil in the primary filter oil drum to the secondary filtration oil can through the oil drain valve for filtration; 9. Place a 100-mesh filter screen in the three-	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Check the pump assembly diagram and safety maintenance procedures; 1.2 Check the lubricating oil status; 1.3 Perform three-stage filtration of lubricating oil. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Structure of the pump; 2.2 Operating principles of pump; 2.3 Classification and function of lubricating oil;

stage filter funnel; 10. Add the lubricating oil from the filtration oil can to the lubricating oil points of each pump through a three-stage filter funnel for refuelling; 11. Clean the workplace; 12. Store tools safely. 13. Observe health, occupational and environmental safety rules and regulations.	2.4 Performance requirements for lubricating oil. **3.0. Theories** The person performing this task must be able to explain the following: 3.1 Primary filtration methods and standards for lubricating oil of pump; 3.2 Secondary filtration methods and standards for lubricating oil of pump; 3.3 Three-stage filtration methods and standards for lubricating oil of pump. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The pump lubricating oil is filtered according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of equipment structure diagram reading; 4. Knowledge of environmental protection.

OCCUPATION	PETROCHEMICAL ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT THE MAINTENANCE OF PUMP AND PIPELINE	**DUTY NO.**	504
TASK TITLE	PERFORM INSULATION, ANTI-FREEZING, ANTI-CONDENSATION, AND ANTI-CORROSION OF PUMPS AND PIPELINES	**TASK NO.**	5043
PERFORMANCE CRITERIA	The person performing this task must be able to conduct the insulation, anti-freezing, anti-condensation, and anti-corrosion of the pump and pipeline according to technical requirements and operation manual.		
RANGE STATEMENT	The task can be performed on-site in the pump room under the supervision of senior technicians and petrochemical engineering process engineers. The equipment and tools to be used include: 1. PPE, such as work clothes, safety shoes, helmet, safety belt, protective gloves, safety glasses, etc. 2. Pump and pipeline; 3. Jack; 4. Electric hand drill, abrader; 5. Oil paints; 6. Insulation blanket; 7. Insulation outer protective layer (iron sheet, PVC sheet, etc.); 8. Scaffold and movable frame, etc.; 9. Walkie-talkie; 10. Toolkit (wrench and pipe tongs).		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to: 1. Observe health and safety precautions when performing tasks; 2. Select appropriate tools and equipment for this task; 3. Implement insulation, antifreeze, and anti-condensation measures for pumps in use; 4. Implement insulation, antifreeze, and anti-condensation measures for standby pumps; 5. Implement insulation, antifreeze, and anti-condensation measures for deactivated pumps; 6. Check the corrosion of the pump; 7. Conduct anti-corrosion treatment for pumps; 8. Check the status of pipelines; 9. Implement insulation, antifreeze, and anti-condensation measures for	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Check the pump assembly diagram and safety maintenance procedures; 1.2 Perform pump maintenance; 1.3 Perform pipeline maintenance. **2.0. Principles** The person performing this task must be able to explain the following principles: 2.1 Heat transmission principle; 2.2 Metal corrosion principle; 2.3 Metal anti-corrosion principle; 2.4 Structure of the pump; 2.5 Operating principles of pump; **3.0. Theories** The person performing this task must be able to explain the following:

pipelines; 10. Conduct anti-corrosion treatment for pipelines; 11. Clean the workplace; 12. Store tools safely. 13. Observe health, occupational and environmental safety rules and regulations.	3.1 Insulation, antifreeze, and anti-condensation measures for pumps; 3.2 Insulation, antifreeze, and anti-condensation measures for pipelines; 3.3 Paint protection standards; 3.4 Equipment anti-corrosion methods. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Autonomous learning skills; 4.4 Safety protection skills; 4.5 Record filling skills.
DESCRIPTION ON THE END ENGINEERINGS / SERVICE	The insulation, anti-freezing, anti-condensation, and anti-corrosion of the pump and pipeline are conducted according to technical requirements and operation manual.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Equipment maintenance knowledge; 3. Knowledge of equipment structure diagram reading; 4. Knowledge of environmental protection.

APPENDIX: DACUM CHARTS FOR PETROCHEMICAL ENGINEERING TECHNICIAN - NTA LEVEL 5

DUTIES	TASKS	ENABLERS
1.0 Carry out material heating	1.1 Start up heating furnace 1.2 Adjust and operate the heating furnace 1.3 Shut down heating furnace	**General skills and knowledge** • Cooperate with others using communication skills and report to the superiors • Operating procedures for using heating furnaces • Knowledge and skills in heating furnace systems • Skills and knowledge in chemical production safety, equipment operation, and equipment maintenance • Read process flow diagrams • Knowledge of DCS central control system operation • Interpretation of structure diagram of reactor equipment **Tools and equipment** • PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, etc. • Fuel oil storage tank • Fuel gas separation tank • Tubular heating furnace • Instrument system • □□□ operation system • Fuel oil□ pump • Fuel oil□ pump • Walkie-talkie • Toolkit (wrench and pipe tongs) **Materials** Steam, air, fuel oil, fuel gas, heating water, petroleum **Requirements for employees** Teamwork spirit, integrity, time management, keeping promises, environmental awareness, and safety operation awareness
2.0 Perform material reaction	2.1 Start up tank reactor 2.2 Adjust and operate the process parameters of the tank reactor 2.3 Shut down the tank reactor 2.4 Start up fixed bed reactor	**General skills and knowledge** • Cooperate with others using communication skills and report to the superiors • Operating procedures for using different equipment

DUTIES	TASKS	ENABLERS
	2.5 Adjust and operate the fixed bed reactor 2.6 Shut down fixed bed reactor	• Knowledge and skills in operating the reactor system • Knowledge and skills in fixed bed systems • Knowledge and skills in chemical production safety, equipment operation, and equipment maintenance • Read process flow diagrams • Knowledge of DCS central control system operation • Interpretation of structure diagram of reactor equipment • Interpretation of structure diagram of fixed bed equipment **Tools and equipment** • PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, etc. • Batch reactor • Measuring tank • Precipitation tank • Centrifugal pump • Instrument system • DCS operation system • Feed gas /reaction gas heat exchanger • Feed gas preheater • Steam condenser • Flash tank • Hydrogenation reactor • Toolkit (wrench and pipe tongs) **Materials** Steam, water, sodium polysulfide, o-nitro chlorobenzene, carbon disulphide, hydrogen, ethane, acetylene **Requirements for employees** Teamwork spirit, integrity, time management, keeping promises, environmental awareness, and safety operation awareness
3.0 Conduct material separation	3.1 Start up filter unit 3.1 Operate and adjust the filter unit 3.3 Shut down filter unit	**General skills and knowledge** • Cooperate with others using communication skills and report to the superiors

DUTIES	TASKS	ENABLERS
		• Operating procedures for start-up and shutdown of filter unit • Knowledge and skills of filtering systems • Knowledge and skills in chemical production safety, equipment operation, and equipment maintenance • Read process flow diagrams • DCS central control system operation • Interpretation of structure diagram of filtrating equipment **Tools and equipment** • PPE, such as work clothes, safety shoes, helmet, gloves, safety glasses, earplugs, etc. • Filter cloth • Plate-and-frame filter • Centrifugal pump • Air compressor • Walkie-talkie • Toolkit (wrench and pipe tongs) • Instrument system • DCS operation system **Materials** Steam, water, nitrogen, compressed air, lubricating oil, lubricating grease **Requirements for employees** Teamwork spirit, integrity, time management, keeping promises, environmental awareness, and safety operation awareness
4.0 Carry out maintenance of pump and pipeline	4.1 Drain and clean the pump 4.2 Filter pump lubricating oil 4.3 Perform insulation, anti-freezing, anti-condensation, and anti-corrosion of pumps and pipelines	**General skills and knowledge** • Cooperate with others using communication skills and report to the superiors • Knowledge and skills in pump maintenance • Knowledge and skills in pipeline maintenance • Knowledge and skills of filtering systems • Knowledge and skills in chemical production safety, equipment operation, and

DUTIES	TASKS	ENABLERS
		equipment maintenance • Read process flow diagrams • Knowledge of DCS central control system operation • Interpretation of structure diagram of pump equipment **Tools and equipment** • PPE, such as work clothes, safety shoes, helmet, safety belt, protective gloves, safety glasses, etc. • Pump • Jack • Air compressor • High pressure vehicle cleaning machine • Gasoline • Lubricating oil • Machine oil • Priming funnel • Oil can • Scaffold and movable frame, etc. • Walkie-talkie • Toolkit (wrench and pipe tongs) • Electric hand drill, abrader • Oil paints • Insulation blanket • Insulation outer protective layer (iron sheet, PVC sheet, etc.) **Materials** Bearing, seal, Teflon tape, gasket, lubricating oil, lubricating grease, shaft sleeve, oil cup, oil sight window **Requirements for employees** Teamwork spirit, integrity, time management, keeping promises, environmental awareness, and safety operation awareness