

Qualification Pack



Junior Operator - 2G Ethanol Plant

QP Code: HYC/Q4301

NSQF Level: 3

Hydrocarbon Sector Skill Council
Second Floor - OIBB Bhawan,
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HYC/Q4301 Junior Operator – 2G Ethanol Plant

Brief Job Description

Individual at this job is responsible for performing operational skills for various work profiles involved in 2G ethanol production. The person will gain in-depth knowledge and practical expertise in the process of Fermentation, Distillation, Feedstock Preparation, Utilities, Quality Control, and Packaging and Warehouse. The person aims to enhance the understanding of key responsibilities and to contribute effectively to the efficient and quality-driven operation of a 2G ethanol production plant.

Personal Attributes

The individual should have good sense of responsibility, a good organizer and time keeper. The person should have the ability to work in a team.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. HYC/N4301 Assist in performing 2G Ethanol plant operations
2. HYC/N9301 Working effectively in a team
3. HYC/N9302 Maintain health, safety and security procedures
4. [DGT/VSQ/N0101: Employability Skills \(30 Hours\)](#)

Qualification Pack (QP) Parameters

Sector	Hydrocarbon
Sub-Sector	Downstream
Occupation	Bio Ethanol Plant Operations & Maintenance
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	NCO/ 2015 3134
Minimum Educational Qualification & Experience	8th Grade pass plus 2-years of NTC OR 10th Grade Pass OR 9th Grade Pass with 1-year of relevant experience OR 8th Grade Pass with 2-year of relevant experience OR 5th Grade Pass with 5-year of relevant experience OR Previous relevant qualification of NSQF Level 2.5 with 1.5 years of experience OR Previous relevant qualification of NSQF Level 2 with 3 years of experience

Qualification Pack

Minimum Level of Education	NA
Minimum Job Entry Age	18 years
Last Reviewed On	23-06-2023
Next Review Date	22-06-2026
NSQC Approval Date	23-06-2023
Version	1.0

HYC/N4301 Assist in performing 2G Ethanol plant operations

Description

This unit is about assisting in performing 2G Ethanol plant operations. Process operations from receiving the feedstock, Fermenting, Distillating, Filling, Storing and conducting other safety and maintenance operation as per the SOP.

Scope

This unit/task covers the following:

- Biomass/Feedstock Storage and Handling
- Monitoring and controlling the fermentation process
- Handling Distillation and dehydration process
- Ethanol Purification and Treatment
- Safety and security

Elements and Performance Criteria

Biomass/Feedstock Storage and Handling

To be competent, the user/individual on the job must be able to;

- PC1.** Assist in checking and finalizing appropriate biomass/feedstock materials based on availability and suitability
- PC2.** Assist in implement pre-treatment procedures such as grinding, milling, or other methods to prepare the feedstock for fermentation.
- PC3.** ensure the continual working of Feed Stock Handling System such as conveying the feed stock, de-stoning and screening, magnetic particle separation, intermediate storage, necessary safety controls and instrumentation for automatic operation, weighing system, vibratory screen system with rated capacity as per layout and parameters mentioned in the specifications
- PC4.** Provide assistance in carrying out wet washing procedures effectively
- PC5.** Assist in operating M.C.C (motor control center) panel safely and efficiently
- PC6.** Ensure proper handling and storage of feedstock to maintain quality and prevent contamination

Monitoring and controlling the fermentation process

To be competent, the user/individual on the job must be able to;

- PC7.** Assist in performing Enzymatic Hydrolysis as pre-treatment process of biomass/feedstock materials
- PC8.** Assist in maintaining optimal conditions during co-fermentation process like temperature, pH, nutrient levels etc. for microbial activity and ethanol production.
- PC9.** Assist in monitoring and adjust fermentation parameters to maximize ethanol yield and minimize by-products.
- PC10.** Troubleshoot fermentation issues and implementing corrective actions to ensure process stability

Handling Distillation and dehydration process

To be competent, the user/individual on the job must be able to;

- PC11.** Assist in operating distillation and dehydration equipment to achieve efficient separation of ethanol from the fermentation broth.

- PC12.** monitor and control temperature, pressure, and flow rates during distillation for optimal separation.
- PC13.** ensure the purity of the distilled ethanol through appropriate purification processes

Ethanol Purification and Treatment

To be competent, the user/individual on the job must be able to;

- PC14.** Assist in implementing purification techniques such as molecular sieves, adsorption etc. to remove impurities and contaminants from the ethanol
- PC15.** Assist in conducting required treatments such as dehydration, denaturing to meet regulatory and market requirements
- PC16.** ensure compliance with quality standards for the final ethanol product

Environmental Safety and security

To be competent, the user/individual on the job must be able to;

- PC17.** adhere to environmental regulations and implementing measures as defined by plant leadership to minimize the impact of the production process on the environment.
- PC18.** ensure the safety of personnel and facilities through proper training, hazard identification, and risk management as per sop

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** feedstock characteristics and selection
- KU2.** principles of bioethanol production and fermentation processes
- KU3.** Functioning of Utilities such as Water Treatment Plant, Cooling Tower, Air Compressor, Electrical System, Control System- DCS, Utility Blow down treatment plant
- KU4.** functions and maintenance of equipment used in the production process
- KU5.** The process parameters and their impact on ethanol production
- KU6.** The safety protocols and procedures in a plant environment
- KU7.** The quality control measures and testing methods
- KU8.** environmental regulations and sustainability practices
- KU9.** plant utilities and their role in the production process
- KU10.** potential operational issues and troubleshooting techniques
- KU11.** documentation and record-keeping requirements
- KU12.** relevant regulations and compliance standards in the bioethanol industry

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and interpret process drawings
- GS2.** measure and scale the weight of quality of Feedstock
- GS3.** assess complexity and criticality of task
- GS4.** communicate effectively with team members
- GS5.** complete tasks efficiently and accurately within stipulated time
- GS6.** work with supervisors/team members to carry out work related tasks
- GS7.** perform basic mathematical calculation
- GS8.** plan and organize the marketing activity

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Biomass/Feedstock Storage and Handling</i>	9	13		
PC1. Assist in Checking and finalizing appropriate biomass/feedstock materials based on availability and suitability	1	2		
PC2. Assist in Implementing pre-treatment procedures such as grinding, milling, or other methods to prepare the feedstock for fermentation.	2	3		
PC3. ensure the continual working of Feed Stock Handling System such as conveying the feed stock, de-stoning and screening, magnetic particle separation, intermediate storage, necessary safety controls and instrumentation for automatic operation, weighing system, vibratory screen system with rated capacity as per layout and parameters mentioned in the specifications	2	3		
PC4. Assist in carrying out wet washing procedures effectively	1	2		
PC5. Assist in operating M.C.C (motor control centre) panel safely and efficiently	2	2		
PC6. Ensure proper handling and storage of feedstock to maintain quality and prevent contamination	1	1		
<i>Monitoring and controlling the fermentation process</i>	7	12		
PC7. Assist in Performing Enzymatic Hydrolysis as pre-treatment process of biomass/feedstock materials	2	3		
PC8. Maintain optimal conditions during co-fermentation process like temperature, pH, nutrient levels etc. for microbial activity and ethanol production.	2	3		
PC9. Monitor and adjust fermentation parameters to maximize ethanol yield and minimize by-products.	2	3		
PC10. Troubleshoot fermentation issues and implementing corrective actions to ensure process stability	1	3		
<i>Handling Distillation and dehydration process</i>	4	7		
PC11. Assist in operating distillation and dehydration equipment to achieve efficient separation of ethanol from the fermentation broth	2	3		
PC12. monitor and control temperature, pressure, and flow rates during distillation for optimal separation.	2	3		

PC13. ensure the purity of the distilled ethanol through appropriate purification processes (e.g., rectification)	0	1		
<i>Ethanol Purification and Treatment</i>	3	5		
PC14. Assist in implementing purification techniques such as molecular sieves, adsorption to remove impurities and contaminants from the ethanol.	1	2		
PC15. Assist in conducting required treatments such as dehydration, denaturing to meet regulatory and market requirements.	1	2		
PC16. ensure compliance with quality standards for the final ethanol product	1	1		
<i>Environmental Safety and security</i>	2	3		
PC17. adhere to environmental regulations and implementing measures as defined by plant leadership to minimize the impact of the production process on the environment.	1	1		
PC18. ensure the safety of personnel and facilities through proper training, hazard identification, and risk management as per sop	1	2		
NOS Total	25	40	-	-

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N4301
NOS Name	Assist in performing 2G Ethanol plant operations
Sector	Hydrocarbon
Sub-Sector	Downstream
Occupation	Bio Ethanol Plant Operations & Maintenance
NSQF Level	3
Credits	8
Version	1.0
Last Reviewed Date	23-06-2023
Next Review Date	22-06-2026
NSQC Clearance Date	23-06-2023

HYC/N9301 Working effectively in a team

Description

This unit covers basic practices that improve effectiveness of working in a team in an organizational set-up

Scope

This unit/task covers the following:

- Effective team work

Elements and Performance Criteria

Effective team work

To be competent, the user/individual on the job must be able to:

- PC1. maintain clear communication with colleagues
- PC2. pass on information to colleagues in line with organizational requirements
- PC3. work in a team and support the team members
- PC4. work in ways that show respect to colleagues
- PC5. fulfil commitments made to colleagues
- PC6. inform team members timely, if timelines can't be met
- PC7. take the necessary initiatives to resolve the issues while working in team

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the organization's policies and procedures related to team work in workplace
- KU2. the importance of effective communication and establishing good working relationships with colleagues
- KU3. Knowledge of gender concepts, issues & legislation
- KU4. the importance of creating an environment of trust and mutual respect
- KU5. the implications of own work on the work and schedule of others
- KU6. the standard practice in organization w.r.t communication at various levels
- KU7. the instructions at individual level or at group level
- KU8. individual work responsibility and corrective measures required to complete task in time
- KU9. the importance of personal qualities like discipline and confidence to achieve success in work assigned

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. communicate effectively in writing
- GS2. read instructions, guidelines/procedures
- GS3. communicate information effectively
- GS4. make decisions on a suitable course of action or response keeping in view resource utilization while meeting commitments
- GS5. how to plan the work to meet the deadline
- GS6. the importance of consistent and reliable services for customer satisfaction

- GS7. apply problem solving approaches in different situations
- GS8. apply balanced judgments to different situations

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Effective teamwork</i>	20	30		
PC1. maintain clear communication with colleagues	2	4	-	-
PC2. pass on information to colleagues in line with organisational requirements	3	5	-	-
PC3. work in a team and support the team members	3	4	-	-
PC4. work in ways that show respect to colleagues	3	4	-	-
PC5. fulfil commitments made to colleagues	3	5	-	-
PC6. inform team members timely, if timelines can't be met	3	4	-	-
PC7. take the necessary initiatives to resolve the issues while working in team	3	4	-	-
NOS Total	20	30	-	-

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N9301
NOS Name	Working effectively in a team
Sector	Hydrocarbon
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	2
Version	1.0
Last Reviewed Date	23-06-2023
Next Review Date	22-06-2026
NSQC Clearance Date	23-06-2023

HYC/N9302: Maintain health, safety and security procedures

Description

This unit covers maintaining health, safety and security procedures at the workplace. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment

Scope

This unit/task covers the following:

- Practice health and safety measures
- Follow fire safety procedures
- Follow emergencies, rescue and first-aid procedures

Elements and Performance Criteria

Practice health and safety measures

To be competent, the user/individual on the job must be able to:

- PC1. use protective clothing/equipment for specific tasks and work conditions
- PC2. identify documents, location and people responsible for health and safety in the workplace
- PC3. identify possible causes of risk or accident in the workplace
- PC4. carry out safe working practices while dealing with hazards to ensure the safety of self and others
- PC5. lift heavy objects safely using correct procedures
- PC6. identify common safety signs, displayed in various areas

Follow fire safety procedures

To be competent, the user/individual on the job must be able to:

- PC7. use the various appropriate fire extinguishers on different types of fires correctly
- PC8. follow rescue techniques applied during fire hazard
- PC9. follow good housekeeping practice in order to prevent fire hazards
- PC10. list issues concerning the safety in work place
- PC11. inform fire safety department about any near-miss incidents in the work place
- PC12. follow the applicable laws, regulations and codes as per safety standard
- PC13. prepare written accident/incident report and share with the concerned officer/department

Follow emergencies, rescue and first-aid procedures

To be competent, the user/individual on the job must be able to:

- PC14. provide appropriate first aid to victims in emergency situation
- PC15. demonstrate basic techniques of bandaging
- PC16. respond promptly and appropriately to an accident
- PC17. perform rescue activity during an accident in real or simulated environments
- PC18. demonstrate correct method to rescue injured people and others during an emergency

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. company's policies on personnel management and duty reporting procedure
- KU2. reporting structure within organization
- KU3. how to escalate problem

- KU4. concept of “hazards” and “risks”
- KU5. health and safety hazards commonly affecting the work environment and related precautions
- KU6. preventative and remedial actions to be taken in the case of exposure to toxic materials
- KU7. importance of using protective clothing/equipment while working
- KU8. various causes of fire
- KU9. techniques of using different types of fire extinguishers
- KU10. different materials used for extinguishing fire
- KU11. various types of safety signs and their significance

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. communicate by writing
- GS2. read instructions, guidelines/procedures and reports
- GS3. communicate effectively and share the information efficiently
- GS4. identify and report potential sources of danger
- GS5. how to plan the work to meet the deadline
- GS6. the importance of on time services
- GS7. apply problem solving approaches in different situations
- GS8. apply balanced judgments to different situations

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Practice health and safety measures</i>	9	15		
PC1. use protective clothing/equipment for specific tasks and work conditions	1	4	-	-
PC2. identify documents, location and people responsible for health and safety in the workplace	2	1	-	-
PC3. identify possible causes of risk or accident in the workplace	1	3	-	-
PC4. carry out safe working practices while dealing with hazards to ensure the safety of self and others	2	2	-	-
PC5. lift heavy objects safely using correct procedures	1	3	-	-
PC6. identify common safety signs, displayed in various areas	2	2	-	-
<i>Follow fire safety procedures</i>	12	16		
PC7. use the various appropriate fire extinguishers on different types of fires correctly	2	2	-	-
PC8. follow rescue techniques applied during fire hazard	2	2	-	-
PC9. follow good housekeeping practice in order to prevent fire hazards	2	2	-	-
PC10. list issues concerning the safety in work place	1	3	-	-
PC11. inform fire safety department about any near-miss incidents in the work place	2	2	-	-
PC12. follow the applicable laws, regulations and codes as per safety standard	1	3	-	-
PC13. prepare written accident/incident report and share with the concerned officer/department	2	2	-	-
<i>Follow emergencies, rescue and first-aid procedures</i>	4	19		
PC14. provide appropriate first aid to victims in emergency situation	1	4	-	-

PC15. demonstrate basic techniques of bandaging	1	4	-	-
PC16. respond promptly and appropriately to an accident	0	3	-	-
PC17. perform rescue activity during an accident in real or simulated environments	1	4	-	-
PC18. demonstrate correct method to rescue injured people and others during an emergency	1	4	-	-
NOS Total	25	50		

National Occupational Standards (NOS) Parameters

NOS Code	HYC/N9302
NOS Name	Maintain health, safety and security procedures
Sector	Hydrocarbon
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	2
Version	3.0
Last Reviewed Date	23-06-2023
Next Review Date	22-06-2026
NSQC Clearance Date	23-06-2023

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on the knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for the theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score a minimum of 50% of aggregate marks to successfully clear the assessment.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Recommended Pass % aggregate for QP: 50

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
HYC/N4301 Assist in performing 2G Ethanol plant operations	25	40	-	-	65	60
HYC/N9301 Working effectively in a team	20	30	-	-	50	20
HYC/N9302 Maintain health, safety and security procedures	25	50			75	20
Total	70	120	-	-	190	100

Acronyms

NOS – National Occupational Standard(s)

OS – Occupational Standard(s)

NSQF – National Skills Qualifications Framework

QP – Qualifications Pack

KU – Knowledge and Understanding

GS – Generic Skills

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements that together specify the technical, generic, professional and organisational specific knowledge that an individual need in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. In the context of the OS, these include communication-related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributed to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.