



# CORN PROCESSING PROCESSING TECHNICANI P. CODE: FIC/Q1009 NSQF LEVEL 4

NOTIONAL HOURS: 520

## Corn Processing Technician

Electives: Corn Oil / Corn Syrup/ Corn Starch / Corn Flakes

QP Code:

Version: 1.0

NSQF Level: 4

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## **Qualification Pack**



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## 2152

## **Brief Job Description**

A Corn Processing Technician is responsible for producing corn starch through wet and dry milling, following the organization standards for production.

#### **Personal Attributes**

A Corn Processing Technician must have the ability to plan, organize, prioritize the work. The individual must possess reading, writing, communication and problem-solving skills. In addition, the individual must be able to basic mathematical calculations, handle pressure, practice personal and professional hygiene.

## Applicable National Occupational Standards (NOS)

#### **Compulsory NOS:**

- 1. FIC/N9026: Prepare for production
- 2. FIC/N1031: Carry out corn production
- 3. FIC/N9901: Implement health and safety practices at the workplace
- 4. FIC/N9902: Work effectively in an organisation
- 5. SGJ/N1702: Optimize resource utilization at workplace

**Electives**(mandatory to select at least one):

Elective 1: Corn Oil

This elective is about production on corn oil.

1. FIC/N1032: Produce Corn Oil

#### Elective 2: Corn Syrup

This elective is about production of corn syrup.

1. FIC/N1033: Produce Corn Syrup

#### Elective 3: Corn Starch

This elective is about producing corn starch.

1. FIC/N1034: Produce Corn Starch





#### Elective 4: Corn Flakes

This elective is about producing corn flakes

1. FIC/N1035: Produce Corn Flakes

## **Qualification Pack (QP) Parameters**

Sector	Food Processing
Sub-Sector	Food Grain Milling
Occupation	
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/ 8131.3800
Minimum Educational Qualification & Experience	12th Class OR 10th Class with 2 Years of experience relevant experience OR 8th Class with 3 Years of experience relevant experience
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	NA
NSQC Approval Date	
Version	1.0





## FIC/N9026: Prepare for production

## Description

This NOS unit is about performing various tasks prior to production in the food processing industry.

#### Scope

The scope covers the following :

- Plan for production
- Clean and maintain work area, machineries, and tools for production
- Organize for production

#### **Elements and Performance Criteria**

#### Plan for production

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

- **PC1.** identify work requirements by obtaining instructions from the supervisor. Instructions: process chart, product flow chart, formulation, chart, etc.
- PC2. plan and prioritize tasks as per work schedule.Tasks: inspect, clean, maintain, verify, etc.
- **PC3.** estimate manpower and material requirements as per work requirement. Material: raw materials and packaging materials
- **PC4.** ensure required quantity of raw materials, packaging materials, equipment, and manpower for production
- **PC5.** plan capacity utilization of machinery with respect to the processing time, production order, and batch size for each product

#### Clean and maintain work area, machineries, and tools for production

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

- PC6. clean and maintain the work area as per organizational procedures
- **PC7.** clean and maintain the machines and tools and sanitize them as per the organization's specifications and standards
- **PC8.** dispose of the waste material at designated place safely. Waste material: hazardous waste, food waste, packaging waste, etc.
- PC9. inspect the tools, equipment, and machinery to ascertain suitability for use
- PC10. report information such as faulty tools and equipment to the concerned authority

#### Organize for production

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

- PC11. organize tools and equipment
- **PC12.** receive and organize production materials appropriately. Production materials: raw materials, packaging materials, etc.
- **PC13.** allot responsibilities/work to the assistants and helpers

#### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

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- **KU1.** production planning process
- KU2. analysis and interpretation of various process charts, product flow charts, etc.
- **KU3.** resource management process
- KU4. procedure to estimate manpower and raw material
- KU5. capacity utilization calculation
- KU6. organizational policies and SOP on cleanliness
- KU7. operating procedure and general maintenance of food production machineries
- KU8. waste management procedures
- KU9. methods to inspect tools, equipment and machinery
- KU10. procedure to allot work or responsibility to the team

## **Generic Skills (GS)**

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

- **GS1.** read and interpret organizational policies, SOP, production charts, etc.
- GS2. communicate effectively with subordinates as well as supervisors
- GS3. plan and prioritize various tasks
- GS4. be always punctual and courteous
- GS5. organize all process/equipment manuals to access information easily
- GS6. discuss task lists, schedules, and activities with the senior/supervisor





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Plan for production	11	25	-	-
<b>PC1.</b> identify work requirements by obtaining instructions from the supervisor. Instructions: process chart, product flow chart, formulation, chart, etc.	3	6	-	-
<b>PC2.</b> plan and prioritize tasks as per work schedule.Tasks: inspect, clean, maintain, verify, etc.	2	5	-	-
<b>PC3.</b> estimate manpower and material requirements as per work requirement. Material: raw materials and packaging materials	2	4	-	-
<b>PC4.</b> ensure required quantity of raw materials, packaging materials, equipment, and manpower for production	2	5	-	-
<b>PC5.</b> plan capacity utilization of machinery with respect to the processing time, production order, and batch size for each product	2	5	-	-
Clean and maintain work area, machineries, and tools for production	14	32	-	-
<b>PC6.</b> clean and maintain the work area as per organizational procedures	3	7	-	-
<b>PC7.</b> clean and maintain the machines and tools and sanitize them as per the organization's specifications and standards	3	7	-	-
<b>PC8.</b> dispose of the waste material at designated place safely. Waste material: hazardous waste, food waste, packaging waste, etc.	3	7	-	-
<b>PC9.</b> inspect the tools, equipment, and machinery to ascertain suitability for use	3	6	-	-
<b>PC10.</b> report information such as faulty tools and equipment to the concerned authority	2	5	_	-
Organize for production	5	13	-	-
PC11. organize tools and equipment	2	7	-	-





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC12.</b> receive and organize production materials appropriately. Production materials: raw materials, packaging materials, etc.	2	4	-	-
<b>PC13.</b> allot responsibilities/work to the assistants and helpers	1	2	-	-
NOS Total	30	70	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N9026
NOS Name	Prepare for production
Sector	Food Processing
Sub-Sector	Generic
Occupation	Production
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	24/02/2022
Next Review Date	24/02/2024
NSQC Clearance Date	24/02/2022





## FIC/N1031: Carry out corn production

## Description

This unit is about processing corn through wet and dry milling using various machineries as per the specifications and standards of the organization.

## Scope

The scope covers the following :

- Clean the ingredients for production
- Carry out wet milling of corn
- Carry out non degerming method of dry milling of corn
- Carry out tempering and degerming method of dry milling
- Packaging of milled corn
- Carry out post-production cleaning and regular maintenance of equipment

#### **Elements and Performance Criteria**

#### Clean the ingredients for production

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

- PC1. monitor destoner screens, bucket elevators and screw conveyors before running production
- **PC2.** vet the moisture level of corn as per specification
- PC3. ensure corn is put in dumping pit/hopper and transferred to silo through bucket elevator
- **PC4.** set the value of batch size for cleaning the grains appropriately
- **PC5.** manages to transfer corn to remove impurities and collect grains into coarse screen to remove impurities bigger than corn Machines: de-stoner, magnetic separators Impurities: stones, metal, sticks and straw, corn cob particles
- **PC6.** feed the corn grains into screw conveyor to remove the smaller dust particles after eliminating the lighter impurities through centrifugal sedimentation
- **PC7.** adjust controls of water bath for conditioning the corn grains Controls: water level, temp, inflow rate etc.

#### Carry out wet milling of corn

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

- **PC8.** ensure corn is conditioned with water in steeping tank and steeping liquid is prepared with or without sulphur-di-oxide as per the requirement
- **PC9.** affirm that conditioning softens corn kernel and prevent bacterial growth intending to separate the kernel's and various component from corn
- PC10. regulate conveyor speed and transfer cleaned corn into steeping tank from the elevator
- **PC11.** ensure corn is soaked at specific temperature for specified time per organizational procedures
- **PC12.** examine stationary teeth and attrition mill's rotatory plate and regulate desired speed of attrition mill before passing product through it
- PC13. facilitate shredding of soft kernels to make them germ free by moving them in attrition mill





- **PC14.** expedite preparation of corn slurry and whole germ mixture by adding adequate water to the mill
- **PC15.** examine corn slurry containing starch-gluten-fiber is separated from lighter germ and whole germ Machine used: hydrocyclone separator machine
- PC16. ensure to break starch from fiber and reduce the size of starch through grinding mill
- **PC17.** examine speed and pressure of washing screens and allow starch slurry to pass through screens to separate fiber from starch-gluten suspension
- PC18. transfer starch slurry into centrifuge/disc separators
   Separators: separate gluten from corn starch and recover concentrated protein (corn gluten meal) fraction
- **PC19.** administer formulation of unmodified starch by de-humidifying starch slurry through vacuum filters/centrifuge, flash dryers
- **PC20.** ensure unmodified starch is transferred to co-products processing area for production of modified starch or for packaging as unmodified starch
  - modified starch: dextrin, glucose, corn syrup, corn sugar, industrial starch

#### Carry out non degerming method of dry milling of corn

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

- PC21. facilitate grinding of corn by passing corn (with germ) through stone grinder
- PC22. coordinate to remove germ and hull from grinded corn by using sifter
- **PC23.** ensure quality of final product as per organizational specification

#### Carry out tempering and degerming method of dry milling

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

- **PC24.** ensure corn is conditioned by adding controlled amount of moisture and temper it for moisture equilibration
- PC25. administer removal of germ and bran from corn through degerminator machine
- **PC26.** attune controls of gravity tables, to completely remove corn germ from endosperm
- PC27. review dry corn obtained from degermer through rotatory steam tube
- **PC28.** coordinate to dry degermed corn to a specific moisture percentage as per organizational standard
- PC29. ensure corn is cooled by using appropriate cooler machine
- **PC30.** evaluate fineness of corn by loading corn into roller mills and adjusting clearance between reduction rolls
- PC31. assess speed of sifter and allow corn grits/flour from reduction rollers to pass through series of sieves to obtain corn products
  - corn products: corn grits, corn flour etc
- **PC32.** inspect the quality of finished products passing out of machines to ensure its specification to organisation standards
- **PC33.** deliver sample of the finished product to concerned personnel for quality analysis as per production requirements Analysis: physical, chemical, biological, sensory, shelf life etc.

#### Packaging of milled corn

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

- **PC34.** assess the quality of finished product(s) by checking the sample and transfer it to quality lab for analysis
- PC35. transfer finished products to packing machine and start the conveyors and elevators safely





- **PC36.** load appropriate labels in packaging machine and accurate information for packing finished product while following food laws and regulations
- **PC37.** operate packaging/bagging machinery by setting controls Controls: batch code, date coding and filling quantity, printing mark, sealer temp and pressure etc.
- **PC38.** inspect the weight of the packed/bagged product to ensure its conformance to standards

Carry out post- production cleaning and regular maintenance of equipment

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

- **PC39.** clean work area, machineries, equipment, and tools using industry approved cleaning procedures Cleaning Procedures: dismantling of machine, Cleaning out of Place, dry air, soft hammering
- PC40. attend minor repairs/faults (if any) of all components and machines
- PC41. follow organizational procedure for disposal of waste

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. organizational policies and procedures to be followed in the job
- **KU2.** documentation and reporting procedure followed in the organization
- **KU3.** how to operate machinery used for corn starch milling such as de-stoner, bucket elevator, steep tank, screw conveyor, attrition mill, degerminator machine, grinding mill, sifter, roller mill, rotatory steam tube dryer, vertical or fluidized bed dryer, etc.
- KU4. process of removing impurities like stones, metal, sticks, straw, corn cob and dust particles
- KU5. process of conditioning the corn grains
- **KU6.** steeping process and how to prepare steeping liquid in wet milling
- **KU7.** importance of steeping process to reduce the germ density and softens the kernel to make milling easy
- **KU8.** role of washing screens in separating fiber from starch gluten
- KU9. process of removal of gluten from corn starch
- **KU10.** extraction of modified starch from unmodified starch
- KU11. removal of corn germ from endosperm using gravity tables in dry milling
- **KU12.** steps involved in getting the fine flour using roller mills, sifter, and grinder mills
- KU13. department concerned for quality analysis
- KU14. packaging machineries used and information to be put on the packet labels
- KU15. food laws and regulations on product packaging and labelling
- **KU16.** how to use sanitizers, disinfectants, and its storing methods
- KU17. techniques of minor fault repairing
- **KU18.** organizational procedure for disposal of waste
- **KU19.** importance of following relevant FSSAI regulations for milling corn
- KU20. workplace safety requirements, and hazard handling procedures
- **KU21.** fundamentals of Good Manufacturing Practices in the food processing industry

#### **Generic Skills (GS)**





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

- **GS1.** read and interpret organizational policies, Standard Operating Procedure, Process manuals, etc.
- **GS2.** communicate with others effectively
- GS3. plan and prioritize tasks to maximize productivity
- **GS4.** basic arithmetic operations
- GS5. be punctual and courteous
- **GS6.** read equipment manuals and process documents to understand the equipment operation and process requirement





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Clean the ingredients for production	6	10	-	-
<b>PC1.</b> monitor destoner screens, bucket elevators and screw conveyors before running production	-	-	-	-
<b>PC2.</b> vet the moisture level of corn as per specification	-	-	-	-
<b>PC3.</b> ensure corn is put in dumping pit/hopper and transferred to silo through bucket elevator	-	-	-	-
<b>PC4.</b> set the value of batch size for cleaning the grains appropriately	-	-	-	-
<b>PC5.</b> manages to transfer corn to remove impurities and collect grains into coarse screen to remove impurities bigger than corn Machines: de-stoner, magnetic separators Impurities: stones, metal, sticks and straw, corn cob particles	-	-	-	_
<b>PC6.</b> feed the corn grains into screw conveyor to remove the smaller dust particles after eliminating the lighter impurities through centrifugal sedimentation	-	-	-	-
<b>PC7.</b> adjust controls of water bath for conditioning the corn grains Controls: water level, temp, inflow rate etc.	-	-	-	-
Carry out wet milling of corn	12.5	22	-	-
<b>PC8.</b> ensure corn is conditioned with water in steeping tank and steeping liquid is prepared with or without sulphur-di-oxide as per the requirement	-	-	-	-
<b>PC9.</b> affirm that conditioning softens corn kernel and prevent bacterial growth intending to separate the kernel's and various component from corn	-	-	-	-
<b>PC10.</b> regulate conveyor speed and transfer cleaned corn into steeping tank from the elevator	-	-	-	-
<b>PC11.</b> ensure corn is soaked at specific temperature for specified time per organizational procedures	-	-	-	_





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC12.</b> examine stationary teeth and attrition mill's rotatory plate and regulate desired speed of attrition mill before passing product through it	-	-	-	-
<b>PC13.</b> facilitate shredding of soft kernels to make them germ free by moving them in attrition mill	-	-	-	-
<b>PC14.</b> expedite preparation of corn slurry and whole germ mixture by adding adequate water to the mill	-	-	-	-
<b>PC15.</b> examine corn slurry containing starch-gluten- fiber is separated from lighter germ and whole germ Machine used: hydrocyclone separator machine	-	-	-	-
<b>PC16.</b> ensure to break starch from fiber and reduce the size of starch through grinding mill	-	-	-	-
<b>PC17.</b> examine speed and pressure of washing screens and allow starch slurry to pass through screens to separate fiber from starch-gluten suspension	_	-	-	_
<ul> <li>PC18.</li> <li>transfer starch slurry into centrifuge/disc separators</li> <li>Separators: separate gluten from corn starch and recover concentrated protein (corn gluten meal) fraction</li> </ul>	-	-	-	-
<b>PC19.</b> administer formulation of unmodified starch by de-humidifying starch slurry through vacuum filters/centrifuge, flash dryers	-	-	-	-
<ul> <li>PC20.</li> <li>ensure unmodified starch is transferred to coproducts processing area for production of modified starch or for packaging as unmodified starch</li> <li>modified starch: dextrin, glucose, corn syrup, corn sugar, industrial starch</li> </ul>	-	-	-	-
Carry out non degerming method of dry milling of corn	2	5	-	-
<b>PC21.</b> facilitate grinding of corn by passing corn (with germ) through stone grinder	-	-	-	-
<b>PC22.</b> coordinate to remove germ and hull from grinded corn by using sifter	-	-	-	-
<b>PC23.</b> ensure quality of final product as per organizational specification	-	-	-	-





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Carry out tempering and degerming method of dry milling</i>	9.5	19	-	-
<b>PC24.</b> ensure corn is conditioned by adding controlled amount of moisture and temper it for moisture equilibration	-	-	-	-
<b>PC25.</b> administer removal of germ and bran from corn through degerminator machine	-	-	-	-
<b>PC26.</b> attune controls of gravity tables, to completely remove corn germ from endosperm	-	-	-	-
<b>PC27.</b> review dry corn obtained from degermer through rotatory steam tube	-	-	-	-
<b>PC28.</b> coordinate to dry degermed corn to a specific moisture percentage as per organizational standard	-	-	-	-
<b>PC29.</b> ensure corn is cooled by using appropriate cooler machine	-	-	-	-
<b>PC30.</b> evaluate fineness of corn by loading corn into roller mills and adjusting clearance between reduction rolls	-	-	_	_
<ul> <li>PC31.</li> <li>assess speed of sifter and allow corn grits/flour from reduction rollers to pass through series of sieves to obtain corn products</li> <li>corn products: corn grits, corn flour etc</li> </ul>	-	-	-	-
<b>PC32.</b> inspect the quality of finished products passing out of machines to ensure its specification to organisation standards	-	-	-	-
<b>PC33.</b> deliver sample of the finished product to concerned personnel for quality analysis as per production requirements Analysis: physical, chemical, biological, sensory, shelf life etc.	-	-	-	-
Packaging of milled corn	3.5	6	-	-
<b>PC34.</b> assess the quality of finished product(s) by checking the sample and transfer it to quality lab for analysis	-	-	_	-
<b>PC35.</b> transfer finished products to packing machine and start the conveyors and elevators safely	-	-	-	_





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC36.</b> load appropriate labels in packaging machine and accurate information for packing finished product while following food laws and regulations	-	-	-	-
<b>PC37.</b> operate packaging/bagging machinery by setting controls Controls: batch code, date coding and filling quantity, printing mark, sealer temp and pressure etc.	-	-	-	-
<b>PC38.</b> inspect the weight of the packed/bagged product to ensure its conformance to standards	-	-	-	-
<i>Carry out post- production cleaning and regular maintenance of equipment</i>	1.5	3	-	-
<b>PC39.</b> clean work area, machineries, equipment, and tools using industry approved cleaning procedures Cleaning Procedures: dismantling of machine, Cleaning out of Place, dry air, soft hammering	-	-	-	-
<b>PC40.</b> attend minor repairs/faults (if any) of all components and machines	-	-	-	-
<b>PC41.</b> follow organizational procedure for disposal of waste	-	-	-	-
NOS Total	35	65	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N1031
NOS Name	Carry out corn production
Sector	Food Processing
Sub-Sector	Food Grain Milling
Occupation	Processing-Food Grain Milling (including oilseeds)
NSQF Level	4
Credits	TBD
Version	1.0
Next Review Date	NA





## FIC/N9901: Implement health and safety practices at the workplace

## Description

This unit is about following health and safety procedures at the workplace.

#### Scope

The scope covers the following :

- Ensure food safety and personal hygiene
- Follow safety measures to avoid accidents
- Follow emergency procedures
- Manage infection control

#### **Elements and Performance Criteria**

#### Ensure food safety and personal hygiene

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

- **PC1.** follow relevant practices to avoid cross contamination at all stages of food processing operations
- PC2. follow organisational procedures for handling items that may cause allergic reactions
- **PC3.** follow Good Manufacturing Practices (GMP) at the workplace. Good Manufacturing Practices: location and layout (ergonomics), cleaning and sanitation, equipment and containers, pest control, facilities (lighting, water supply, drainage and waste disposal, air quality and ventilation), food storage, transportation, and distribution (Source: Schedule IV, FSSAI Licensing and Registration, 2011)
- **PC4.** follow Good Hygiene Practices (GHP) at the workplace appropriately. Good Hygiene Practices: use of gloves, hairnets, masks, ear plugs, goggles, shoes etc; washing hands regularly; treating injuries such as cuts, boils, skin infections and grazes; preventive health check-ups; getting vaccinated whenever required. (Source: Schedule IV, FSSAI Licensing and Registration, 2011)

#### Follow safety measures to avoid accidents

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

- PC5. use protective clothing/equipment for specific tasks and work conditions
- PC6. identify job-site hazardous work and possible causes of risk or accident at the workplace
- **PC7.** deal with hazards safely and appropriately to ensure safety of self and others as per organisational protocol
- PC8. use various types of fire extinguishers effectively
- PC9. respond promptly and appropriately to an accident situation or medical emergency
- PC10. provide cardio-pulmonary resuscitation (CPR) as per the requirement (e.g. cardiac arrest)

#### Follow emergency procedures

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

- PC11. follow workplace emergency and evacuation procedures
- PC12. use safe methods to free a person from electrocution





**PC13.** administer appropriate first aid to victims in case of cuts, bleeding, burns, choking, electric shock, poisoning etc.

#### Manage infection control

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

- **PC14.** use appropriate disinfectants to disinfect the work area and equipment as per organisational protocol
- **PC15.** ensure personal hygiene by washing hands regularly using alcohol based sanitisers and wearing personal protective equipment (PPE)
- PC16. report illness of self and others to the supervisor or concerned authority

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. meaning of hazards and risks
- KU2. possible causes of risk, hazard or accident in the workplace
- KU3. where to find all the general health and safety equipment in the workplace
- KU4. health and safety policy and procedures of the organization
- **KU5.** health and safety hazards commonly present in the work environment
- **KU6.** work practices and precautions used to control and prevent risks, hazards and accidents
- KU7. applicable standards and regulations as listed in The Food Safety and Standards Act, 2006
- **KU8.** importance of each personal protective equipment used such as eye protection, hard hats, gloves apron, rubber boots, etc.
- **KU9.** importance of ensuring personal hygiene at the workplace
- KU10. ways to prevent cross contamination at the workplace
- KU11. importance of storing food at specified temperatures
- KU12. various dangers associated with the use of electrical and other equipment
- KU13. preventive and remedial actions to be taken in the case of exposure to toxic materials
- KU14. various causes of fire and the ways to prevent them
- KU15. techniques of using the different fire extinguishers
- **KU16.** procedure followed for providing cardio-pulmonary resuscitation (CPR) to the affected
- KU17. rescue techniques applied during a fire hazard
- **KU18.** various types of safety signs and what they mean
- KU19. workplace emergency and evacuation procedures
- **KU20.** appropriate basic first aid treatment relevant to the condition e.g. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
- KU21. potential injuries and ill health conditions associated with incorrect manual handing
- KU22. safe lifting and carrying practices
- KU23. safe practices to be followed for ensuring sanitisation of self and work area
- KU24. procedure for storing the sanitising materials appropriately

#### **Generic Skills (GS)**





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

- GS1. write an accident/incident report in local language or English
- **GS2.** read and comprehend basic content to read labels, charts, signages, symbols and product manuals
- GS3. communicate with coworkers appropriately in order to clarify instructions and other issues
- **GS4.** make appropriate decisions pertaining to the concerned area of work regarding the work objective, span of authority, responsibility, laid down procedure and guidelines
- **GS5.** plan and organize the work schedule, work area, tools, equipment and materials for improved productivity
- GS6. identify probable solutions to the problems in hand and evaluate them
- **GS7.** seek official and authorised sources of help and guidance to resolve problems that cannot be solved at one's level of authority





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Ensure food safety and personal hygiene	7	19	-	-
<b>PC1.</b> follow relevant practices to avoid cross contamination at all stages of food processing operations	1	4	-	-
<b>PC2.</b> follow organisational procedures for handling items that may cause allergic reactions	1	4	-	-
<b>PC3.</b> follow Good Manufacturing Practices (GMP) at the workplace. Good Manufacturing Practices: location and layout (ergonomics), cleaning and sanitation, equipment and containers, pest control, facilities (lighting, water supply, drainage and waste disposal, air quality and ventilation), food storage, transportation, and distribution (Source: Schedule IV, FSSAI Licensing and Registration, 2011)	3	7	-	-
<b>PC4.</b> follow Good Hygiene Practices (GHP) at the workplace appropriately. Good Hygiene Practices: use of gloves, hairnets, masks, ear plugs, goggles, shoes etc; washing hands regularly; treating injuries such as cuts, boils, skin infections and grazes; preventive health check-ups ; getting vaccinated whenever required. (Source: Schedule IV, FSSAI Licensing and Registration, 2011)	2	4	-	_
Follow safety measures to avoid accidents	11	24	-	-
<b>PC5.</b> use protective clothing/equipment for specific tasks and work conditions	2	4	_	-
<b>PC6.</b> identify job-site hazardous work and possible causes of risk or accident at the workplace	2	4	-	-
<b>PC7.</b> deal with hazards safely and appropriately to ensure safety of self and others as per organisational protocol	2	4	_	_
<b>PC8.</b> use various types of fire extinguishers effectively	2	4	_	-
<b>PC9.</b> respond promptly and appropriately to an accident situation or medical emergency	1	4	_	_





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC10.</b> provide cardio-pulmonary resuscitation (CPR) as per the requirement (e.g. cardiac arrest)	2	4	-	-
Follow emergency procedures	6	12	-	-
<b>PC11.</b> follow workplace emergency and evacuation procedures	2	4	-	-
<b>PC12.</b> use safe methods to free a person from electrocution	2	4	-	-
<b>PC13.</b> administer appropriate first aid to victims in case of cuts, bleeding, burns, choking, electric shock, poisoning etc.	2	4	-	-
Manage infection control	6	15	-	-
<b>PC14.</b> use appropriate disinfectants to disinfect the work area and equipment as per organisational protocol	3	7	-	-
<b>PC15.</b> ensure personal hygiene by washing hands regularly using alcohol based sanitisers and wearing personal protective equipment (PPE)	1	4	-	-
<b>PC16.</b> report illness of self and others to the supervisor or concerned authority	2	4	-	-
NOS Total	30	70	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N9901
NOS Name	Implement health and safety practices at the workplace
Sector	Food Processing
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	24/02/2022
Next Review Date	24/02/2024
NSQC Clearance Date	24/02/2022





## FIC/N9902: Work effectively in an organisation

## Description

This unit is about working effectively with others.

#### Scope

The scope covers the following :

- Communicate effectively
- Work in a team effectively
- Respect diversity

## **Elements and Performance Criteria**

#### Communicate effectively

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

- PC1. obtain complete information and instructions from designated personnel
- PC2. reciprocate understanding and seek clarifications whenever required
- PC3. provide information accurately and clearly
- **PC4.** use inclusive language (verbal, non-verbal and written) that is gender, disability and culturally sensitive

#### Work in a team effectively

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

- PC5. plan tasks to be performed as per priority and need
- PC6. consult with and assist others to maximize effectiveness and efficiency at work
- **PC7.** escalate problems and grievances beyond own scope to the concerned authority
- PC8. take appropriate action to resolve conflicts at the workplace

#### Respect diversity

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

- **PC9.** maintain a gender-neutral behaviour with everyone at the workplace
- PC10. empathise with People with Disabilities (PwD) and offer help, if required
- PC11. recognise and report incidents of harassment and discrimination to appropriate authority

#### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. organizational quality procedures and processes associated with work
- **KU2.** standards, policies, and procedures followed in the organization relevant to employment, harassment, discrimination and performance conditions
- **KU3.** reporting structure, inter-dependent functions, lines, and procedures applicable at the workplace





- **KU4.** different types of harassment and discrimination based on gender, disability, caste, religion, and culture
- KU5. components of effective communication and its importance
- KU6. importance of teamwork in organizational and individual success
- KU7. importance of ethics and discipline for professional success
- KU8. how to express and address grievances appropriately and effectively
- KU9. importance and ways of managing interpersonal conflict effectively
- **KU10.** different types of disabilities and the challenges faced by persons with disability (PwD)
- KU11. laws, acts and provisions defined for PwD
- KU12. importance of gender sensitivity and equality
- **KU13.** legislations, grievance redressal mechanisms, and penalties against harassment in the workplace

## **Generic Skills (GS)**

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

- **GS1.** communicate information, doubts and concerns about work related matters in local language or Hindi/English
- GS2. read and interpret information given in local language or Hindi/English
- GS3. establish priorities and deadlines in consultation with other and record them
- **GS4.** be punctual
- GS5. listen to others concerns and doubts carefully and address them
- **GS6.** be courteous





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Communicate effectively	8	13	-	-
<b>PC1.</b> obtain complete information and instructions from designated personnel	2	3	-	-
<b>PC2.</b> reciprocate understanding and seek clarifications whenever required	2	3	-	-
<b>PC3.</b> provide information accurately and clearly	2	3	-	-
<b>PC4.</b> use inclusive language (verbal, non- verbal and written) that is gender, disability and culturally sensitive	2	4	-	-
Work in a team effectively	8	14	-	-
<b>PC5.</b> plan tasks to be performed as per priority and need	2	4	-	-
<b>PC6.</b> consult with and assist others to maximize effectiveness and efficiency at work	2	3	-	-
<b>PC7.</b> escalate problems and grievances beyond own scope to the concerned authority	2	3	-	-
<b>PC8.</b> take appropriate action to resolve conflicts at the workplace	2	4	-	-
Respect diversity	6	12	-	-
<b>PC9.</b> maintain a gender-neutral behaviour with everyone at the workplace	2	4	-	-
<b>PC10.</b> empathise with People with Disabilities (PwD) and offer help, if required	2	4	-	-
<b>PC11.</b> recognise and report incidents of harassment and discrimination to appropriate authority	2	4	-	-
NOS Total	22	39	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N9902
NOS Name	Work effectively in an organisation
Sector	Food Processing
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	24/02/2022
Next Review Date	18/06/2026
NSQC Clearance Date	24/02/2022





## SGJ/N1702: Optimize resource utilization at workplace

## Description

This unit is about adopting sustainable practices and optimizing use of resources, especially material, energy and waste, in day-to-day operations at work

## Scope

The scope covers the following :

- Material conservation practices
- Energy/electricity conservation practices
- Effective waste management/recycling practices

#### **Elements and Performance Criteria**

#### Material conservation practices

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

- **PC1.** identify ways to optimize usage of material including water in various tasks/activities/processes
- PC2. check for spills/leakages in various tasks/activities/processes
- PC3. plug spills/leakages and escalate to appropriate authority if unable to rectify
- PC4. carry out routine cleaning of tools, machines and equipment

Energy/electricity conservation practices

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

- **PC5.** identify ways to optimize usage of electricity/energy in various tasks/activities/processes
- **PC6.** check if the equipment/machine is functioning normally before commencing work and rectify wherever required
- **PC7.** report malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment
- **PC8.** ensure electrical equipment and appliances are properly connected and turned off when not in use

#### Effective waste management/recycling practices

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

- PC9. identify recyclable and non-recyclable, and hazardous waste generated
- PC10. segregate waste into different categories
- PC11. dispose non-recyclable waste appropriately
- PC12. deposit recyclable and reusable material at identified location
- PC13. follow processes specified for disposal of hazardous waste

#### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:



## **Qualification Pack**



- **KU1.** potential hazards, risks and threats based on the nature of work
- KU2. layout of the workstation and electrical and thermal equipment used
- KU3. organizations procedures for minimizing waste
- KU4. efficient and inefficient utilization of material and water
- KU5. ways of efficiently managing material and water in the process
- KU6. basics of electricity and prevalent energy efficient devices
- KU7. ways to recognize common electrical problems
- KU8. common practices of conserving electricity
- **KU9.** usage of different colours of dustbins
- **KU10.** categorization of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics
- KU11. waste management and methods of waste disposal
- KU12. common sources of pollution and ways to minimize it

## **Generic Skills (GS)**

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

- GS1. record data on waste disposal at workplace
- GS2. complete statutory documents relevant to safety and hygiene
- GS3. read Standard Operating Practices (SOP) documents
- **GS4.** communicate with colleagues on the significance of greening of jobs
- GS5. make timely decisions for efficient utilization of resources
- **GS6.** complete tasks efficiently and accurately within stipulated time
- GS7. work with supervisors/team members to carry out work related tasks
- GS8. identify cause and effect of greening of jobs





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Material conservation practices	4	8	-	-
<b>PC1.</b> identify ways to optimize usage of material including water in various tasks/activities/processes	1	2	-	-
<b>PC2.</b> check for spills/leakages in various tasks/activities/processes	1	2	-	-
<b>PC3.</b> plug spills/leakages and escalate to appropriate authority if unable to rectify	1	2	-	-
<b>PC4.</b> carry out routine cleaning of tools, machines and equipment	1	2	-	-
Energy/electricity conservation practices	4	8	-	-
<b>PC5.</b> identify ways to optimize usage of electricity/energy in various tasks/activities/processes	1	2	-	-
<b>PC6.</b> check if the equipment/machine is functioning normally before commencing work and rectify wherever required	1	2	-	-
<b>PC7.</b> report malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment	1	2	-	-
<b>PC8.</b> ensure electrical equipment and appliances are properly connected and turned off when not in use	1	2	-	-
Effective waste management/recycling practices	5	10	-	-
<b>PC9.</b> identify recyclable and non-recyclable, and hazardous waste generated	1	2	-	-
PC10. segregate waste into different categories	1	2	-	-
PC11. dispose non-recyclable waste appropriately	1	2	-	-
<b>PC12.</b> deposit recyclable and reusable material at identified location	1	2	-	-
<b>PC13.</b> follow processes specified for disposal of hazardous waste	1	2	_	-
NOS Total	13	26	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	SGJ/N1702
NOS Name	Optimize resource utilization at workplace
Sector	Green Jobs
Sub-Sector	Other Green Jobs
Occupation	Resource Optimization
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	24/02/2022
Next Review Date	24/02/2026
NSQC Clearance Date	24/02/2022





## FIC/N1032: Produce Corn Oil

## Description

This unit is about production of corn oil using various processes and machineries as per the specifications and standards of the organization.

#### Scope

The scope covers the following :

- Extraction of corn oil
- Refining and packaging of corn oil
- Post-production cleaning and regular maintenance of equipment

#### **Elements and Performance Criteria**

#### Extraction of corn oil

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

- PC1. ground the stripped seeds into coarse meal to provide more surface area for pressing
- **PC2.** carry out crushing of material to proper consistency
  - Machines used: mechanized grooved rollers or hammer mills
- **PC3.** make sure meal is then heated to facilitate the extraction of edible oil
- PC4. assure heated meal is fed continuously into screw press to pass through a slotted barrel
- **PC5.** follow solvent extraction process using hexane or other solvents to wash the corn oil from the prepared flakes or press cake
  - Hexane: volatile hydrocarbon
- **PC6.** ensure solvent passes through matter to be collected at bottom which is periodically dumped and replaced
- PC7. administer that remaining oil is retrieved with the use of stripping column
   Remaining Oil: left after the evaporation of the ninety percent of oil
- **PC8.** carry out boiling of oil by steam and lighter hexane floats upward and condensed for collection

#### Refining and packaging of corn oil

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

- PC9. put oil through heating and mix alkaline substance with it
- PC10. monitor the heating parameters of oil
  - Heating parameters: between 107- and 188-degrees Fahrenheit (40 and 85 degrees Celsius)
  - Alkaline substance: sodium hydroxide or sodium carbonate
- **PC11.** perform centrifuge process to remove soap forms, gums, and the dregs from certain substances
  - Substances: undesired fatty acids, alkaline additive and phosphatides
- **PC12.** ensure the oil is further washed and degummed to remove traces of soap and then dried
- PC13. undertake bleaching of heated oil by filtering it to absorb pigmented material from the oil
  Pigmented material: fuller's earth, activated carbon, activated clays
- PC14. conversely ensure refrigerated oil is winterized to remove waxes





- **PC15.** administer deodorized process by passing steam over hot oil in a vacuum allowing the volatile taste and odour components to distil from the oil
- **PC16.** ensure to add citric acid after deodorization to inactivate trace metals
- PC17. measure completely processed oil and pour into clean containers
   clean containers: plastic bottles for domestic oils, glass bottles cans, plastic containers
- PC18. send the sample to quality lab for analysis

#### Post-production cleaning and regular maintenance of equipment

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

- PC19. clean work area (cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)
- **PC20.** respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse
- **PC21.** ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual
- **PC22.** follow safety regulations while handling and operating equipment

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. ingredients used in producing corn oil
- KU2. operating procedure for producing corn oil
- KU3. various types of solvents used (i.e., ethanol, methylene, chloride, etc.)
- KU4. procedure to operate packaging machine
- KU5. SOP to load labels in labelling machine
- **KU6.** procedure to set date coding machine for batch number, date of manufacture, date of expiry, etc.
- **KU7.** food safety and hygiene as per organisational policies
- KU8. major food uses of corn oil in cooking, salad oil, margarines, and spreads
- **KU9.** process of hexane extraction or mechanical prepressing followed by hexane extraction
- **KU10.** transfer process of finished product to clean containers
- KU11. SOP to wash bottle/plastic containers to fill measured quantity of finished products
- **KU12.** post-production cleaning and regular maintenance procedures of the equipment

#### **Generic Skills (GS)**

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

**GS1.** note down the information communicated by the senior/supervisor, raw materials used for production and the finished products produced, readings of the process parameters and provide necessary information to fill the process chart, down observations (if any) related to the process





- **GS2.** read and interpret equipment manuals and process documents to understand the equipments operation and process requirement, and internal information documents sent by internal teams, etc.
- GS3. write information documents to internal departments/internal teams
- GS4. plan, prioritize, and sequence work operations
- **GS5.** communicate effectively with the team members, senior/supervisor, and other departments
- GS6. discuss task lists, schedules, and activities with the senior/supervisor





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Extraction of corn oil	14	28	-	-
<b>PC1.</b> ground the stripped seeds into coarse meal to provide more surface area for pressing	-	-	-	-
<ul> <li>PC2.</li> <li>carry out crushing of material to proper consistency</li> <li>Machines used: mechanized grooved rollers or hammer mills</li> </ul>	-	-	-	_
<b>PC3.</b> make sure meal is then heated to facilitate the extraction of edible oil	-	-	-	-
<b>PC4.</b> assure heated meal is fed continuously into screw press to pass through a slotted barrel	-	-	-	-
<ul> <li>PC5.</li> <li>follow solvent extraction process using hexane or other solvents to wash the corn oil from the prepared flakes or press cake</li> <li>Hexane: volatile hydrocarbon</li> </ul>	-	-	-	-
<b>PC6.</b> ensure solvent passes through matter to be collected at bottom which is periodically dumped and replaced	-	-	-	-
<ul> <li>PC7.</li> <li>administer that remaining oil is retrieved with the use of stripping column</li> <li>Remaining Oil: left after the evaporation of the ninety percent of oil</li> </ul>	-	-	-	-
<b>PC8.</b> carry out boiling of oil by steam and lighter hexane floats upward and condensed for collection	-	-	-	-
Refining and packaging of corn oil	15	31	-	-
<b>PC9.</b> put oil through heating and mix alkaline substance with it	-	-	-	-
<ul> <li>PC10.</li> <li>monitor the heating parameters of oil</li> <li>Heating parameters: between 107- and 188-degrees</li> <li>Fahrenheit (40 and 85 degrees Celsius)</li> <li>Alkaline substance: sodium hydroxide or sodium carbonate</li> </ul>	_	_	_	-





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<ul> <li>PC11.</li> <li>perform centrifuge process to remove soap forms, gums, and the dregs from certain substances</li> <li>Substances: undesired fatty acids, alkaline additive and phosphatides</li> </ul>	-	-	-	-
<b>PC12.</b> ensure the oil is further washed and degummed to remove traces of soap and then dried	-	-	-	-
<ul> <li>PC13.</li> <li>undertake bleaching of heated oil by filtering it to absorb pigmented material from the oil</li> <li>Pigmented material: fuller's earth, activated carbon, activated clays</li> </ul>	-	-	-	-
<b>PC14.</b> conversely ensure refrigerated oil is winterized to remove waxes	-	-	-	-
<b>PC15.</b> administer deodorized process by passing steam over hot oil in a vacuum allowing the volatile taste and odour components to distil from the oil	-	-	-	-
<b>PC16.</b> ensure to add citric acid after deodorization to inactivate trace metals	-	-	-	-
<ul> <li>PC17.</li> <li>measure completely processed oil and pour into clean containers</li> <li>clean containers: plastic bottles for domestic oils, glass bottles cans, plastic containers</li> </ul>	-	-	-	-
PC18. send the sample to quality lab for analysis	-	-	-	-
<i>Post-production cleaning and regular maintenance of equipment</i>	4	8	-	-
<b>PC19.</b> clean work area (cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)	-	-	-	-
<b>PC20.</b> respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse	-	-	-	-





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC21.</b> ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual	-	-	-	-
<b>PC22.</b> follow safety regulations while handling and operating equipment	-	-	-	-
NOS Total	33	67	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N1032
NOS Name	Produce Corn Oil
Sector	Food Processing
Sub-Sector	Food Grain Milling
Occupation	Processing-Food Grain Milling (including oilseeds)
NSQF Level	4
Credits	TBD
Version	1.0
Next Review Date	NA





## FIC/N1033: Produce Corn Syrup

## Description

This unit is about production of corn syrup using various processes and machineries as per the specifications and standards of the organization.

## Scope

The scope covers the following :

- Converting corn starch into corn syrup
- Converting corn syrup into high fructose corn syrup
- Post-production cleaning and regular maintenance of equipment

#### **Elements and Performance Criteria**

#### Converting corn starch into corn syrup

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

- PC1. carry out conversion of corn starch into ordinary corn syrup by acid hydrolysis method
- **PC2.** observe hydrochloric acid and heat break down starch molecules and convert them into sugar
- **PC3.** ensure hydrolysis is interrupted at different key points to produce corn syrups of varying sweetness
- **PC4.** administer syrup is then filtered or otherwise clarified to remove any objectionable flavor or color
- PC5. ensure the syrup is further refined and evaporated to reduce the amount of water
- **PC6.** undertake to produce corn syrup powder/solids by passing liquid corn syrup through drum or spray dryer to remove excess water

#### Converting corn syrup into high fructose corn syrup

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

- **PC7.** ensure that dextrose sugars in syrup are converted into sweeter fructose sugars by action of an enzyme under controlled parameters
  - Parameters: temperature, pressure, acidity
- **PC8.** administer high fructose corn syrup is used in canned fruits and condiments
  - High fructose: 42% fructose content
- **PC9.** put through fructose corn syrup to a series of fractionation columns to separate and hold the fructose content
  - Fructose content: fructose level above 50%
- PC10. ensure separated portion is flushed from columns with deionized water
- **PC11.** conserve portion to use in "light" foods where only a small amount of liquid sweetener is needed
- **PC12.** carry out blending of remainder with other 42% fructose syrup to produce a 55% fructose syrup, used in soft drinks, ice cream, and frozen desserts
- **PC13.** induce evaporation of water to produce powdered high fructose corn syrups from syrup and encapsulating powder grains





- **PC14.** effectuate processing of 80-90% fructose syrup to obtain pure fructose crystals which can be used in cake mixes and other food products where highly concentrated, dry sweetener is desired
- PC15. transfer to quality lab for further analysis

Post-production cleaning and regular maintenance of equipment

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

- **PC16.** clean work area ( cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)
- **PC17.** respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse
- **PC18.** ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual
- **PC19.** follow safety regulations while handling and operating equipment

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- **KU1.** ingredients used in producing corn syrup
- **KU2.** operating procedure for converting corn starch into syrup and syrup to high fructose corn syrup
- **KU3.** acid hydrolysis process and its relevance
- KU4. functioning of drum or spray dryer
- **KU5.** use of corn syrup in foods to soften texture, add volume, prevent crystallization of sugar, and enhance flavor
- **KU6.** corn syrup is distinct from high-fructose corn syrup created when corn fructose syrup, syrup undergoes enzymatic processing that produces a sweeter compound containing higher levels of fructose
- KU7. food safety and hygiene as per organisational policies
- **KU8.** viscosity and sweetness of the syrup depends on the extent to which the hydrolysis reaction has been carried out
- KU9. transfer process of finished product to clean containers
- KU10. post-production cleaning and regular maintenance procedures of the equipment

#### **Generic Skills (GS)**

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

- **GS1.** note down the information communicated by the senior/supervisor, raw materials used for production and the finished products produced, readings of the process parameters and provide necessary information to fill the process chart, down observations (if any) related to the process
- **GS2.** read and interpret equipment manuals and process documents to understand the equipments operation and process requirement, and internal information documents sent by internal teams, etc.





- GS3. write information documents to internal departments/internal teams
- GS4. plan, prioritize, and sequence work operations
- GS5. communicate effectively with the team members, senior/supervisor, and other departments
- GS6. discuss task lists, schedules, and activities with the senior/supervisor





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Converting corn starch into corn syrup	12	24	-	-
<b>PC1.</b> carry out conversion of corn starch into ordinary corn syrup by acid hydrolysis method	-	-	-	-
<b>PC2.</b> observe hydrochloric acid and heat break down starch molecules and convert them into sugar	-	-	-	-
<b>PC3.</b> ensure hydrolysis is interrupted at different key points to produce corn syrups of varying sweetness	-	-	-	-
<b>PC4.</b> administer syrup is then filtered or otherwise clarified to remove any objectionable flavor or color	-	-	-	-
<b>PC5.</b> ensure the syrup is further refined and evaporated to reduce the amount of water	-	-	-	-
<b>PC6.</b> undertake to produce corn syrup powder/solids by passing liquid corn syrup through drum or spray dryer to remove excess water	-	-	-	_
Converting corn syrup into high fructose corn syrup	17	35	-	-
<ul> <li>PC7.</li> <li>ensure that dextrose sugars in syrup are converted into sweeter fructose sugars by action of an enzyme under controlled parameters</li> <li>Parameters: temperature, pressure, acidity</li> </ul>	-	_	-	-
<ul> <li>PC8.</li> <li>administer high fructose corn syrup is used in canned fruits and condiments</li> <li>High fructose: 42% fructose content</li> </ul>	-	-	-	-
<ul> <li>PC9.</li> <li>put through fructose corn syrup to a series of fractionation columns to separate and hold the fructose content</li> <li>Fructose content: fructose level above 50%</li> </ul>	-	-	-	-
<b>PC10.</b> ensure separated portion is flushed from columns with deionized water	-	-	-	-
<b>PC11.</b> conserve portion to use in "light" foods where only a small amount of liquid sweetener is needed	_	_	_	_



## **Qualification Pack**



Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC12.</b> carry out blending of remainder with other 42% fructose syrup to produce a 55% fructose syrup, used in soft drinks, ice cream, and frozen desserts	-	-	-	-
<b>PC13.</b> induce evaporation of water to produce powdered high fructose corn syrups from syrup and encapsulating powder grains	-	-	-	-
<b>PC14.</b> effectuate processing of 80-90% fructose syrup to obtain pure fructose crystals which can be used in cake mixes and other food products where highly concentrated, dry sweetener is desired	-	-	-	-
PC15. transfer to quality lab for further analysis	-	-	-	-
<i>Post-production cleaning and regular maintenance of equipment</i>	4	8	-	-
<b>PC16.</b> clean work area ( cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)	-	-	-	-
<b>PC17.</b> respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse	-	-	-	-
<b>PC18.</b> ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual	_	_	-	-
<b>PC19.</b> follow safety regulations while handling and operating equipment	-	-	-	-
NOS Total	33	67	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N1033
NOS Name	Produce Corn Syrup
Sector	Food Processing
Sub-Sector	Food Grain Milling
Occupation	Processing-Food Grain Milling (including oilseeds)
NSQF Level	4
Credits	TBD
Version	1.0
Next Review Date	NA





## FIC/N1034: Produce Corn Starch

## Description

This unit is about production of corn starch using various processes and machineries as per the specifications and standards of the organization.

## Scope

The scope covers the following :

- Cleaning and steeping of corn
- Coarse grinding and degermination of corn
- Separation of gluten
- Refining, dehydration and drying of starch
- Post-production cleaning and regular maintenance of equipment

## **Elements and Performance Criteria**

#### Cleaning and steeping of corn

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

- PC1. inspect the supplied corn to check whether it meets organization specifications
- **PC2.** carry out coarse sieving to separate contaminations
- Contaminations: stones, cobs, dust particles, foreign material, and fine material
- PC3. ensure corn kernels are stored post cleaning process and conveyed into steeping tanks
- **PC4.** administer that purified corn kernels are transferred into a battery of large tank containing steep water

• Steep water: corn is soaked in hot water for 30 to 48 hours to begin breaking starch and protein bonds

- PC5. observe growth of lactic acid bacteria which suppresses unwanted microorganisms
  - Unwanted microorganisms: yeasts, molds, and other bacteria

#### Coarse grinding and degermination of corn

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

- PC6. conduct mashing the corn kernels and remove the skin
- **PC7.** administer that soften kernels are coarsely grounded in attrition mills to loosen hull and break bonds between germs and endosperm
- PC8. ensure water is added to assist wet milling process
- PC9. observe grinding is conducted with care to avoid oil leakage out of the germs
- **PC10.** facilitate lightweight germs are separated from ground slurry by hydro cyclones in a two-step separation in between
  - Two-step separation: regrinding and degermination
- **PC11.** ensure fine grinding is implemented in an impact mill to completely disrupt the cells of endosperm and release starch granules
- **PC12.** put through resulting suspension over bend green cascades, for separation from fibre and other corn components. The starch milk, which contains the protein fraction, so-called gluten, passes through





- **PC13.** ensure following counter flow principle for complete washing out of the starch and separation of the fibres. Additionally, washing water is added to the last process stage
- **PC14.** administer surface water is removed from germs by tapered screw press and dewatered and clean germs are fed to a rotary steam bundle dryer and dried
  - Drying parameter: dried to approximate 4% moisture to improve shelf life
- **PC15.** examine germs are cooled and pneumatically transported to germ silo ready for bagging or oil extract

#### Separation of gluten

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

- **PC16.** prepare to separate dissolved proteins, called gluten, from crude starch milk by means of two successive nozzles type continuous centrifugal separator a gluten thickener
- **PC17.** observe gluten separator splits gluten fraction in two streams process water overflow and gluten underflow
- PC18. ensure gluten underflow is discharges to gluten dewatering section
   Gluten underflow: mainly protein and a small amount of starch
- **PC19.** employ vacuum belt filter or decanter to dewater gluten slurry by adjusting strictly pHadjustment to iso-electrical point of gluten
- **PC20.** observe dewatering splits the gluten stream in Process water and Gluten (moist). The dewatered gluten is dried in a rotary steam tube bundle dryer to approximately 10% moisture and disintegrated in a hammer mill. Drying is facilitated by powder recycling

#### Refining, dehydration and drying of starch

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

- **PC21.** ensure use of hydrocyclones to reduce fibre and solubles including soluble protein to low levels with a minimum of fresh water
- PC22. plan to save water by implementing counter currently
- **PC23.** integrate middling separator to refine the overflow from the starch refining hydrocyclones into Process water Overflow and Starch Underflow
- **PC24.** observe that in strong gravitational fields of a hydrocyclones and a centrifuge, the starch settles quickly
- **PC25.** ensure purified starch milk is discharged to peeler centrifuge for dewatering and further peeler filtrate is recycled to starch refining
- **PC26.** prepare batch-wise dewatered starch to be peeled off and discharged by gravity to the moist starch hopper
- **PC27.** arrange to transfer the starch from the moist starch hopper, fed by a metering screw conveyor, into flash dryer and dried in hot air
- **PC28.** administer dried starch is pneumatically transported to starch silo ready for screening and bagging
  - Dried starch: moisture of corn starch after drying should be normally 12-13%
- **PC29.** carry out screening of starch before delivery on fine sieve to remove any scale formed in screw conveyors etc.

Post-production cleaning and regular maintenance of equipment

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

PC30. clean work area ( cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)





- **PC31.** respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse
- **PC32.** ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual
- PC33. follow safety regulations while handling and operating equipment

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- **KU1.** ingredients, machines, and tools used in producing corn starch
- **KU2.** operating procedure for cleaning, steeping, degermination, refining, dehydration and drying of corn to produce corn starch for optimal steeping conditions steep water is kept at pH 4 steep-water by addition of sulphuric acid or hydrochloric acid and treated with sulphur acid dioxide
- **KU3.** conditions required for optimal water absorption of the corn kernel, controlled fermentation by lactic acid bacteria and loosening of the protein matrix
- **KU4.** steep water causes the softening of the kernels and the release of solubles
- **KU5.** growth of lactic acid bacteria suppresses unwanted microorganisms such as yeasts, molds and other bacteria. During steeping the size of kernels nearly doubles and the water content increases
- **KU6.** steeping is a controlled fermentation. Sulphur dioxide improves the fermentation by enhancing growth of favourable micro-organisms, preferably lactobacillus, while suppressing detrimental bacteria, moulds, fungi, and yeast
- KU7. kernel swells to more than double size and increases its moisture content
- **KU8.** hydro-cyclone plants have become accepted for starch refining for their high performance, their low water consumption, and their low maintenance efforts
- KU9. food safety and hygiene as per organisational policies
- KU10. post-production cleaning and regular maintenance procedures of the equipment

#### **Generic Skills (GS)**

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

- **GS1.** note down the information communicated by the senior/supervisor, raw materials used for production and the finished products produced, readings of the process parameters and provide necessary information to fill the process chart, down observations (if any) related to the process
- **GS2.** read and interpret equipment manuals and process documents to understand the equipments operation and process requirement, and internal information documents sent by internal teams, etc.
- GS3. write information documents to internal departments/internal teams
- GS4. plan, prioritize, and sequence work operations
- **GS5.** communicate effectively with the team members, senior/supervisor, and other departments
- **GS6.** discuss task lists, schedules, and activities with the senior/supervisor





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Cleaning and steeping of corn	5	10	-	-
<b>PC1.</b> inspect the supplied corn to check whether it meets organization specifications	-	-	-	-
<ul> <li>PC2.</li> <li>carry out coarse sieving to separate contaminations</li> <li>Contaminations: stones, cobs, dust particles, foreign material, and fine material</li> </ul>	-	-	-	-
<b>PC3.</b> ensure corn kernels are stored post cleaning process and conveyed into steeping tanks	-	-	-	-
<ul> <li>PC4.</li> <li>administer that purified corn kernels are transferred into a battery of large tank containing steep water</li> <li>Steep water: corn is soaked in hot water for 30 to 48 hours to begin breaking starch and protein bonds</li> </ul>	-	-	-	-
<ul> <li>PC5.</li> <li>observe growth of lactic acid bacteria which suppresses unwanted microorganisms</li> <li>Unwanted microorganisms: yeasts, molds, and other bacteria</li> </ul>	-	-	-	-
Coarse grinding and degermination of corn	10	21	-	-
<b>PC6.</b> conduct mashing the corn kernels and remove the skin	-	-	-	-
<b>PC7.</b> administer that soften kernels are coarsely grounded in attrition mills to loosen hull and break bonds between germs and endosperm	-	-	-	-
<b>PC8.</b> ensure water is added to assist wet milling process	-	-	-	-
<b>PC9.</b> observe grinding is conducted with care to avoid oil leakage out of the germs	-	-	-	-
<ul> <li>PC10.</li> <li>facilitate lightweight germs are separated from ground slurry by hydro cyclones in a two-step separation in between</li> <li>Two-step separation: regrinding and degermination</li> </ul>	-	_	-	-



## **Qualification Pack**



Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC11.</b> ensure fine grinding is implemented in an impact mill to completely disrupt the cells of endosperm and release starch granules	-	-	-	-
<b>PC12.</b> put through resulting suspension over bend green cascades, for separation from fibre and other corn components. The starch milk, which contains the protein fraction, so-called gluten, passes through	-	-	-	-
<b>PC13.</b> ensure following counter flow principle for complete washing out of the starch and separation of the fibres. Additionally, washing water is added to the last process stage	-	-	-	-
<ul> <li>PC14.</li> <li>administer surface water is removed from germs by tapered screw press and dewatered and clean germs are fed to a rotary steam bundle dryer and dried</li> <li>Drying parameter: dried to approximate 4% moisture to improve shelf life</li> </ul>	-	-	-	-
<b>PC15.</b> examine germs are cooled and pneumatically transported to germ silo ready for bagging or oil extract	-	-	-	-
Separation of gluten	5	10	-	-
<b>PC16.</b> prepare to separate dissolved proteins, called gluten, from crude starch milk by means of two successive nozzles type continuous centrifugal separator – a gluten thickener	-	-	-	-
<b>PC17.</b> observe gluten separator splits gluten fraction in two streams - process water overflow and gluten underflow	-	-	-	-
<ul> <li>PC18.</li> <li>ensure gluten underflow is discharges to gluten dewatering section</li> <li>Gluten underflow: mainly protein and a small amount of starch</li> </ul>	-	-	-	-
<b>PC19.</b> employ vacuum belt filter or decanter to dewater gluten slurry by adjusting strictly pH-adjustment to iso-electrical point of gluten	_	-	-	_





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC20.</b> observe dewatering splits the gluten stream in - Process water and Gluten (moist). The dewatered gluten is dried in a rotary steam tube bundle dryer to approximately 10% moisture and disintegrated in a hammer mill. Drying is facilitated by powder recycling	-	-	-	-
Refining, dehydration and drying of starch	9	18	-	-
<b>PC21.</b> ensure use of hydrocyclones to reduce fibre and solubles including soluble protein to low levels with a minimum of fresh water	-	-	-	-
<b>PC22.</b> plan to save water by implementing counter currently	-	-	-	-
<b>PC23.</b> integrate middling separator to refine the overflow from the starch refining hydrocyclones into - Process water Overflow and Starch Underflow	-	-	-	-
<b>PC24.</b> observe that in strong gravitational fields of a hydrocyclones and a centrifuge, the starch settles quickly	-	-	-	-
<b>PC25.</b> ensure purified starch milk is discharged to peeler centrifuge for dewatering and further peeler filtrate is recycled to starch refining	-	-	-	-
<b>PC26.</b> prepare batch-wise dewatered starch to be peeled off and discharged by gravity to the moist starch hopper	-	-	-	-
<b>PC27.</b> arrange to transfer the starch from the moist starch hopper, fed by a metering screw conveyor, into flash dryer and dried in hot air	-	-	-	-
<ul> <li>PC28.</li> <li>administer dried starch is pneumatically transported to starch silo ready for screening and bagging</li> <li>Dried starch: moisture of corn starch after drying should be normally 12-13%</li> </ul>	_	_	-	-
<b>PC29.</b> carry out screening of starch before delivery on fine sieve to remove any scale formed in screw conveyors etc.	-	-	_	-
<i>Post-production cleaning and regular maintenance of equipment</i>	4	8	-	-



## **Qualification Pack**



Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC30.</b> clean work area ( cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)	-	-	-	-
<b>PC31.</b> respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse	-	-	-	-
<b>PC32.</b> ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual	-	-	-	-
<b>PC33.</b> follow safety regulations while handling and operating equipment	-	-	-	-
NOS Total	33	67	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N1034
NOS Name	Produce Corn Starch
Sector	Food Processing
Sub-Sector	Food Grain Milling
Occupation	Processing-Food Grain Milling (including oilseeds)
NSQF Level	4
Credits	TBD
Version	1.0
Next Review Date	NA





## FIC/N1035: Produce Corn Flakes

## Description

This unit is about production of corn flakes using various processes and machineries as per the specifications and standards of the organization.

## Scope

The scope covers the following :

- Identifying raw material and preparing grain
- Making flaked cereals and adding coatings
- Packaging corn flakes
- Post-production cleaning and regular maintenance of equipment

## **Elements and Performance Criteria**

#### Identifying raw material and preparing grain

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

- PC1. identify raw material to make cereal
  - Raw material: maize, salt, yeast, sweeteners, flavoring agents, coloring agents, vitamins, minerals, and preservatives
  - Sweeteners: malt (obtained from barley), white sugar, brown sugar, and corn syrup or natural sweeteners
- PC2. define variety of flavors and improvements to flavor
  - Flavors: chocolate, cinnamon and other spices, and fruit flavors
  - Improvements: nuts, dried fruit, and marshmallows
- **PC3.** identify antioxidants BHA and BHT, preservatives which are added to breakfast cereals to prevent them from becoming stale and rancid
- **PC4.** ensure maize is cleaned, polished, and milled to remove the germ and bran
- **PC5.** prepare to cook whole grain or partial grain with additions, steamed on the interior of the rotary steam cooker Partial grain: corn grits
  - Additions: flavoring agents, vitamins, minerals, sweeteners, salt, and water
  - Treatment: Hydrothermal Treatment
- **PC6.** set parameters per the type of grain being cooked
  - Parameters: time, temperature, and speed of rotation
- **PC7.** plan to move cooked grain to conveyor belt, which passes through a drying oven
- **PC8.** observe cooked materials having moisture content thus pre heated air is blown to result in a soft, solid mass to be shaped as needed
  - Moisture content: up to 33% need to be reduced to about 15% to 20%

#### Making flaked cereals and adding coatings

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

- **PC9.** ensure cooked grains are allowed to cool for several hours, stabilizing moisture content of each grain (process is known as tempering)
- **PC10.** arrange flatten tempered grains between large metal rollers under tons of pressure
- **PC11.** prepare to convey resulting flakes to ovens where they are tossed in blast of very hot air to remove remaining moisture and to toast them to desirable color and flavor





PC12. • ensure frosting of cereal coated with vitamins, minerals, sweeteners, flavors
• Flavors: fruit juices, food colors, or preservatives

#### Packaging corn flakes

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

- **PC13.** assess roasted flakes are graded and packed in polythene containers or other suitable packaging materials
- **PC14.** ensure packaging material to be moisture proof and attractive as it assist in preserving and storing product safely

#### Post-production cleaning and regular maintenance of equipment

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

- **PC15.** clean work area ( cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)
- **PC16.** respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse
- **PC17.** ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual
- PC18. follow safety regulations while handling and operating equipment

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. ingredients, machines, and tools used in producing corn flakes
- KU2. operating procedure for hydrothermal, pre-drying, flaking, roasting and cooling
- **KU3.** vitamins and minerals added to breakfast cereals to replace those lost during cooking
- **KU4.** how to manage high hydraulic compacting pressure and a precise roller setting create cornflakes with a consistently high quality
- **KU5.** roasting procedure as here the cornflakes get their typical crunch through the formation of blisters
- **KU6.** cooking-laminating process under which starch of the grains is transformed into less complex substances such as dextrins and sugars (chemical heat-pressure effect) and the starch grains lose their crystalline structure, giving rise to the phenomenon of gelatinization (physical effect)
- **KU7.** the advantage of eliminating bacteria and eventually development of toxins that can appear in prolonged storage conditions
- KU8. type of coating added depending on the recipe and manufacturers choice
- **KU9.** packaging is automated to reduce contact with workers and assure good quality control
- KU10. food safety and hygiene as per organisational policies
- KU11. post-production cleaning and regular maintenance procedures of the equipment

#### **Generic Skills (GS)**

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





- **GS1.** note down the information communicated by the senior/supervisor, raw materials used for production and the finished products produced, readings of the process parameters and provide necessary information to fill the process chart, down observations (if any) related to the process
- **GS2.** read and interpret equipment manuals and process documents to understand the equipments operation and process requirement, and internal information documents sent by internal teams, etc.
- **GS3.** write information documents to internal departments/internal teams
- GS4. plan, prioritize, and sequence work operations
- **GS5.** communicate effectively with the team members, senior/supervisor, and other departments
- GS6. discuss task lists, schedules, and activities with the senior/supervisor





## **Assessment Criteria**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Identifying raw material and preparing grain	16	35	-	-
<ul> <li>PC1.</li> <li>identify raw material to make cereal</li> <li>Raw material: maize, salt, yeast, sweeteners, flavoring agents, coloring agents, vitamins, minerals, and preservatives</li> <li>Sweeteners: malt (obtained from barley), white sugar, brown sugar, and corn syrup or natural sweeteners</li> </ul>	-	-	-	-
<ul> <li>PC2.</li> <li>define variety of flavors and improvements to flavor</li> <li>Flavors: chocolate, cinnamon and other spices, and fruit flavors</li> <li>Improvements: nuts, dried fruit, and marshmallows</li> </ul>	-	-	_	-
<b>PC3.</b> identify antioxidants BHA and BHT, preservatives which are added to breakfast cereals to prevent them from becoming stale and rancid	-	-	_	-
<b>PC4.</b> ensure maize is cleaned, polished, and milled to remove the germ and bran	-	-	-	-
<ul> <li>PC5.</li> <li>prepare to cook whole grain or partial grain with additions, steamed on the interior of the rotary steam cooker Partial grain: corn grits</li> <li>Additions: flavoring agents, vitamins, minerals, sweeteners, salt, and water</li> <li>Treatment: Hydrothermal Treatment</li> </ul>	_	_	_	-
<ul><li>PC6.</li><li>set parameters per the type of grain being cooked</li><li>Parameters: time, temperature, and speed of rotation</li></ul>	-	-	-	-
<b>PC7.</b> plan to move cooked grain to conveyor belt, which passes through a drying oven	-	-	_	-
<ul> <li>PC8.</li> <li>observe cooked materials having moisture content thus pre heated air is blown to result in a soft, solid mass to be shaped as needed</li> <li>Moisture content: up to 33% need to be reduced to about 15% to 20%</li> </ul>	_	-	-	-
Making flaked cereals and adding coatings	8	17	-	-





Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>PC9.</b> ensure cooked grains are allowed to cool for several hours, stabilizing moisture content of each grain (process is known as tempering)	-	-	-	-
<b>PC10.</b> arrange flatten tempered grains between large metal rollers under tons of pressure	-	-	-	-
<b>PC11.</b> prepare to convey resulting flakes to ovens where they are tossed in blast of very hot air to remove remaining moisture and to toast them to desirable color and flavor	-	-	-	-
<ul> <li>PC12.</li> <li>ensure frosting of cereal coated with vitamins, minerals, sweeteners, flavors</li> <li>Flavors: fruit juices, food colors, or preservatives</li> </ul>	-	-	-	-
Packaging corn flakes	4	8	-	-
<b>PC13.</b> assess roasted flakes are graded and packed in polythene containers or other suitable packaging materials	-	-	_	-
<b>PC14.</b> ensure packaging material to be moisture proof and attractive as it assist in preserving and storing product safely	-	-	_	-
<i>Post-production cleaning and regular maintenance of equipment</i>	4	8	-	-
<b>PC15.</b> clean work area ( cleaning agent and sanitizers); machineries, equipment and tools using industry approved cleaning procedures (such as dismantling, hammering, pressurised dry air cleaning, Cleaning out of Place)	-	-	-	-
<b>PC16.</b> respond quickly to malfunctions, seek assistance as needed to ensure equipment is completely operational to reuse	-	-	-	-
<b>PC17.</b> ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the SOP or following suppliers' instruction/manual	_	-	_	-
<b>PC18.</b> follow safety regulations while handling and operating equipment	-	-	_	-
NOS Total	32	68	-	-





## **National Occupational Standards (NOS) Parameters**

NOS Code	FIC/N1035
NOS Name	Produce Corn Flakes
Sector	Food Processing
Sub-Sector	Food Grain Milling
Occupation	Processing-Food Grain Milling (including oilseeds)
NSQF Level	4
Credits	TBD
Version	1.0
Next Review Date	NA

## 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 proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on 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 theory part for each candidate at each examination/training centre (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.

6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.

7. In case of unsuccessful completion, the trainee may seek reassessment on the

Qualification Pack.

#### Minimum Aggregate Passing % at QP Level : 70





(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

## **Assessment Weightage**

**Compulsory NOS** 

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
FIC/N9026.Prepare for production	30	70	-	-	100	10
FIC/N1031.Carry out corn production	35	65	-	-	100	25
FIC/N9901.Implement health and safety practices at the workplace	30	70	-	-	100	10
FIC/N9902.Work effectively in an organisation	22	39	-	-	61	10
SGJ/N1702.Optimize resource utilization at workplace	13	26	_	-	39	5
Total	130	270	-	-	400	60

Elective: 1 Corn Oil

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
FIC/N1032.Produce Corn Oil	33	67	-	-	100	10
Total	33	67	-	-	100	10

Elective: 2 Corn Syrup



## **Qualification Pack**



National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
FIC/N1033.Produce Corn Syrup	33	67	-	-	100	10
Total	33	67	-	-	100	10

## Elective: 3 Corn Starch

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
FIC/N1034.Produce Corn Starch	33	67	-	-	100	10
Total	33	67	-	-	100	10

#### Elective: 4 Corn Flakes

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
FIC/N1035.Produce Corn Flakes	32	68	-	-	100	10
Total	32	68	-	-	100	10





## Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training





## 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' $% \left( {{\left( {{{\left( {{{{\left( {{{{\left( {{{{\left( {{{{}}}}}} \right)}}}}\right.$	
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 which together specify the technical, generic, professional and organisational specific knowledge that an individual needs 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. These skills are typically needed in any work environment. In the context of the OS, these includ communication related skills that are applicable to most job roles.	
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive 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.	