FLUID MILK PROCESSING

ISCED UNIT CODE: 0721 351 02A

TVET CDACC UNIT CODE: DA/CU/PM/CR/02/4/MA

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Process Fluid Milk Products

Duration: 180 Hours

Unit Description

This unit specifies the competencies required by a Dairy Plant Technician Level 6 to process fluid milk products. It involves processing Pasteurized milk, Ultra Heat-Treated milk and Extended Shelf-Life milk.

Summary of Learning Outcomes

By the end of this unit, the learner should be able to:

s/no	Learning Outcomes	Time (hours)
1.	Process pasteurized milk	45
2.	Process ultra-high temperature milk	45
3.	Process lactose free milk	45
4.	Process milk substitutes products	45
		180

Learning Outcomes, Content, and Suggested Assessment Methods

Learning Outcomes	Content	Suggested Assessment Methods
1. Process pasteurized milk.	**Theory** 1.1 Pasteurized milk processing 1.1.1 Definition of pasteurization 1.1.2 Importance of pasteurization	• Written tests • Interviews/ Oral questions • Practical

	1.1.3 Milk biosynthesis 1.1.3.1 Duct and milk secretory systems. 1.1.3.2 Hormonal control in milk synthesis and let-down 1.1.4 Anti-microbial systems in raw milk 1.2 Raw milk Sampling 1.2.1 Definition of term 1.2.1.1 Sample 1.2.1.2 Sampling 1.2.1.3 population 1.2.2 Sampling methods 1.2.3 Sampling procedures 1.3 Raw milk quality Analysis 1.3.1 Raw milk quality tests 1.3.1.1 Organoleptic 1.3.1.2 Clot On Boiling 1.3.1.3 Compositional test 1.3.1.4 Resazurin test 1.3.1.5 Alcohol test 1.3.1.6 Lactometer test 1.3.1.7 Antibiotic test 1.3.1.8 pH test 1.4 Pasteurization equipment and materials 1.4.1 Pasteurization Materials 1.4.1.1 Raw milk	• Individual/group assignments • Case Studies • Third party report

	1.4.1.2 Milk powder 1.4.1.3 Anhydrous fat 1.4.1.4 Packaging material 1.4.2 Pasteurization tools and equipment 1.4.2.1 Blender 1.4.2.2 Cream separator 1.4.2.3 Homogenizer 1.4.2.4 Pasteurizer 1.4.2.5 Milk silo tank 1.4.2.6 Packaging machine 1.4.2.7 A.I 1.5 Milk standardization 1.5.1 Definition of standardization 1.5.2 Determination of milk composition 1.5.2.1 Gerber fat test 1.5.3 Standardization methods 1.5.3.1 Pearson's square method 1.5.3.2 Mass Balance method 1.5.4 Importance of standardization 1.6 Milk homogenization 1.6.1 Definition of homogenization 1.6.2 Homogenization equipment 1.6.3 Homogenization principles 1.6.4 Factors influencing homogenization	

	1.6.5 Homogenisation efficiency 1.6.6 Importance of Homogenization 1.7 Pasteurization process 1.7.1 Pasteurization equipment 1.7.2 Principles of milk pasteurization 1.7.3 Types of Pasteurization 1.7.4 Pasteurization methods 1.8 Evaluation of pasteurization efficiency 1.8.1 Phosphatase test 1.8.2 Coliform test 1.9 Shelf life of pasteurised milk 1.9.1 Factors influencing Shelf life 1.10 Packaging of Fluid milk products 1.10.1 Packaging machines 1.10.2 Packaging materials 1.10.3 Packaging methods 1.10.3.1 Aseptic packaging 1.10.3.2 Hermetic packaging 1.10.4 Importance of Packaging 1.11 Storage of fluid milk products 1.11.1 Storage requirements 1.11.2 Storage principles 1.11.3 Storage equipment 1.12 Hygiene and sanitation of pasteurization equipment 1.12.1 Cleaning procedures	

	1.12.2 Sanitization methods 1.13 Waste disposal 1.13.1 Methods of waste disposal 1.13.2 Importance of waste disposal 1.14 Record-keeping 1.14.1 Types of records 1.14.2 Importance 1.15 Smart and Sustainable Systems 1.15.1 AI application 1.15.2 Sustainable packaging options 1.15.3 Sustainable waste disposal	
2. Produce UHT milk	2.1 UHT Milk Processing **2.1.1** Terminologies used in thermal processing 2.1.1.1 Decimal reduction time (D-value) 2.1.1.2 The Z-value 2.1.1.3 Thermal Death Time (TDT) 2.1.2 Heating methods 2.1.2.1 Sterilization 2.1.2.2 UHT 2.1.2.3 2.2 Sterilization equipment and materials 2.2.1 Sterilization Materials 2.2.1.1 Raw milk	• Written tests • Interviews/ Oral questions • Practical • Individual/group assignments • Case Studies • Third party report

	2.2.1.2 Milk powder 2.2.1.3 Anhydrous fat 2.2.1.4 Packaging material 2.2.2 Tool and equipment 2.2.2.1 Blender 2.2.2.2 Cream separator 2.2.2.3 Homogenizer 2.2.2.4 Pasteurizer 2.2.2.5 Milk silo tank 2.2.2.6 Packaging machine 2.2.2.7 A.I 2.3 Heat Sterilization process 2.3.1 Definition of terms 2.3.2 Sterilization conditions 2.3.3 Sterilization process 2.3.4 Importance /advantages 2.3.5 Effect of sterilization on milk quality 2.4 Evaluation of sterilization efficiency 2.4.1 Peroxidase 2.4.2 Catalase test 2.5 Packaging of UHT milk products 2.5.1 Definition of terms 2.5.2 Packaging machines 2.5.3 Packaging materials 2.5.4 Packaging methods 2.5.4.1 Aseptic packaging	

	2.5.4.2 Hermetic packaging 2.5.5 Importance of Packaging 2.6 Storage of UHT milk products 2.6.1 Definition of terms 2.6.2 Storage conditions 2.6.3 Storage principles; FIFO 2.6.4 Storage equipment 2.7 Hygiene and sanitation of pasteurization equipment 2.7.1 Cleaning procedures 2.7.2 Sanitization methods 2.8 Waste disposal 2.8.1 Methods of waste disposal 2.8.2 Importance of waste disposal 2.9 Record keeping 2.9.1 Types of records 2.9.2 Importance 2.10 Smart and Sustainable Systems 2.10.1 AI application 2.10.2 Sustainable packaging options 2.10.3 Sustainable waste disposal	
3. Process lactose free milk	3.1 Lactose Free milk production 3.1.1 Definition of terms 3.1.1.1 Enzyme treatment 3.1.1.2 Enzyme	• Written tests • Practical • Interviews/ Oral questions • Third party report

	3.2 Lactose free milk processing equipment and materials 3.2.1 Materials 3.2.1.1 Pasteurized milk 3.2.1.2 Milk powder 3.2.1.3 Lactase enzyme 3.2.1.4 Packaging material 3.2.2 Tool and Equipment 3.2.2.1 Blender 3.2.2.2 Cream separator 3.2.2.3 Homogenizer 3.2.2.4 Pasteurizer 3.2.2.5 Milk silo tank 3.2.2.6 Packaging machine 3.2.2.7 A.I 3.3 Lactase –enzyme treatment 3.3.1 Concept of enzyme treatment 3.3.2 Process of enzyme treatment 3.3.3 Importance 3.4 Packaging of lactose free milk products 3.4.1 Definition of terms 3.4.2 Packaging machines 3.4.3 Packaging materials 3.4.4 Packaging methods 3.4.4.1 Aseptic packaging 3.4.4.2 Hermetic packaging 3.4.5 Importance of Packaging	• Individual/group assignments • Case Studies

	3.5 Storage of lactose free milk products 3.5.1 Definition of terms 3.5.2 Storage conditions 3.5.3 Storage principles; FIFO 3.5.4 Storage equipment 3.6 Hygiene and sanitation of pasteurization equipment 3.6.1 Cleaning procedures 3.6.2 Sanitization methods 3.7 Waste disposal 3.7.1 Methods of waste disposal 3.7.2 Importance of waste disposal 3.8 Record keeping 3.8.1 Types of records 3.8.2 Importance Record -keeping 3.9 Smart and Sustainable Systems 3.9.1 AI application 3.9.2 Sustainable packaging options 3.9.3 Sustainable waste disposal	
4. Process milk substitutes products	4.1 Types of milk substitute products 4.1.1 Soy Milk 4.1.2 Almond Milk 4.1.3 Coconut Milk 4.1.4 Oat Milk 4.1.5 Rice Milk 4.1.6 Cashew Milk	• Written tests • Practical • Interviews/ Oral questions • Third party report • Individual/group assignments • Case Studies

	4.2 Milk substitute processing materials 4.2.1 Base ingredients 4.3 Milk substitute processing 4.3.1 Heat treatment 4.4 Packaging of milk substitute products 4.4.1 Definition of terms 4.4.2 Packaging machines 4.4.3 Packaging materials 4.4.4 Packaging methods 4.4.4.1 Aseptic packaging 4.4.4.2 Hermetic packaging 4.4.4.3 Importance of Packaging 4.5 Storage of milk substitute products 4.5.1 Definition of terms 4.5.2 Storage conditions 4.5.3 Storage principles; FIFO 4.5.4 Storage equipment 4.6 Hygiene and sanitation of processing equipment 4.6.1 Cleaning procedures 4.6.2 Sanitization methods 4.7 Waste disposal 4.7.1 Methods of waste disposal 4.7.2 Importance of waste disposal 4.8 Record keeping	

	4.8.1 Types of records 4.8.2 Importance Record -keeping 4.9 Smart and Sustainable Systems 4.9.1 AI application 4.9.2 Sustainable packaging options 4.9.3 Sustainable waste disposal 4.9.4 Sustainable packaging options 4.9.5 Sustainable waste disposal	

Suggested Methods of Instruction

- Demonstrations
- Group discussion
- Direct instruction
- Role Play

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	**Learning Materials**			
1.	Textbooks		5 pcs	1:5
2.	Production Manuals		5	1;5
3.	PowerPoint presentations	For trainer's use		
4.	Projector		1	1;25
5.	Assorted Flash Cards		5	1;5
6.	Whiteboard		1	1;25
7.	Rolls flip charts		1	1;25
8.	Assorted color of whiteboard markers	For trainers Use		

B	**Learning Facilities & infrastructure**			
1.	Lecture/theory room		1	1:25
2.	Workshop		1	1:25
3.	Laboratory		1	1:25
4.	Site/industry		1	1:25
C	**Consumable materials**			
1.	Raw milk		1ltr	1:5
2.	Pasteurized milk		10mls	10:5
3.	Lactase enzyme		1	1;5
4.	Flavour		10 mls	10;5
5.	Skimmed milk powder		500ml	500mls:5
6.	Live culture		-	-
D	**Tools and Equipment**			
1.	Alcohol gun		5 pcs	1:5
2.	Lactometer		5pcs	1;5
3.	Thermometer		1 pcs	1:5
4.	Centrifuge		5 pcs	1:25
5.	Clarifier		5pcs	5:5
6.	Lovi bond Comparator		1 pcs	1:25
7.	Refrigerator/cold room		1 pcs	1:25
8.	Stop watch		5pcs	1:5