



Daffodil
International
University

**STUDIES ON THE PRODUCTION AND QUALITY CONTROL OF FOOD
AND BEVERAGE AT AKIJ FOOD AND BEVERAGE LTD**

AN INTERNSHIP REPORT

BY

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of
B.Sc. in Nutrition and Food Engineering

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APPROVAL

This internship report titled “**Studies on the production and quality control of food and beverage**”, was submitted by **Most. Asma Akhter Ankhi** to the Department of Nutrition and Food Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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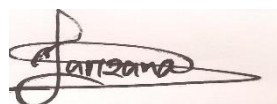
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DECLARATION

I hereby declare that this internship has been completed by me under the supervision of **Farzana Akter, Lecturer, Department of** Nutrition and Food Engineering, Faculty of Health and Life Sciences, Daffodil International University. I also declare that neither this project nor any part of this internship has been submitted elsewhere for the award of any degree or diploma.

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EXECUTIVE SUMMARY

This term paper is a reflection of my hands-on experience at **Akij Food & Beverage Ltd.** Recognized as a prominent production entity in Bangladesh, Akij Food & Beverage Ltd boasts numerous divisions, with a particular emphasis on Human Resource Development (HRD). Notably, AFBL is acknowledged for its commendable HR practices. I was fortunate to delve into the HRD division for this term paper. My report delves into the compensation management practices of Akij Food & Beverage Ltd., aiming to gain insights into how their robust compensation policy enhances efficiency and employee motivation. The primary objective of this term paper is to scrutinize the compensation management practices and policies of AFBL. The report not only provides an overview of these practices but also offers recommendations and conclusions from my perspective. I believe that the implementation of these suggestions could contribute to the enhancement of the bank's compensation policies. Furthermore, this endeavor is expected to be beneficial for our future careers.

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CHAPTER 1

INTRODUCTION

1.1 Company Profile

Akij Food and Beverage Ltd (AFBL) commenced its operations in 2006 and is responsible for the production of a diverse range of snacks and beverages catering to both national and international markets. The project, valued at \$250 million, was initiated by the Akij Group, founded by Sk. Akij Uddin in 1950. As part of the larger Akij Group, AFBL contributes to a conglomerate that has expanded to 26 units, employing over 50,000 individuals and achieving 25 significant national milestones. Sk. Nasir Uddin leads the group, while Sk. Bashir Uddin serves as the Managing Director and Sk. Shamim Uddin holds the position of Director at AFBL. Renowned as one of the prominent Food and Beverage Companies in the country, AFBL specializes in the production of various food and beverage items, including carbonated beverages, fruit drinks, and other products for both local and international markets. With a notable global presence, AFBL exports its products to 26 countries. The company is committed to sustainability, emphasizing the consistent production of high-quality products through empowered and motivated employees, utilizing cutting-edge technology for the benefit of society. AFBL's product range encompasses soft drinks, fruit drinks, energy drinks, malted drinks, drinking water, milk and milk-based products, chips, mango bars, and pickles. Through contract farming, AFBL supports local small and medium-level farmers in Pabna and Raj Shahi for milk and Raj Shahi and Chapa Nawabganj for mangoes. Over the years, AFBL has garnered numerous accolades and certifications, including the Best Brand Award four times. Employing state-of-the-art machinery from renowned brands like Tetra Pak, Krones, Alfa Laval, and Spa, AFBL ensures the production of top-quality food products with both locally sourced and imported raw materials. Guided by values such as Innovation, Teamwork, Integrity, Customer Focus, Trust, and Respect, AFBL aspires to become the most respected food and beverage company in Bangladesh, committed to delivering quality. The company is actively involved in numerous Corporate Social Responsibility (CSR) activities, maintaining a reputable relationship with financial institutions, banks, and government agencies.



1.2 Job description

- Observe all quality control parameters by the guidelines.
- Ensure production quality.
- Gain an understanding of product costing.
- To compile and send the reports that management requests.
- Required to provide daily reports to the authorities regarding production use, costs, quality, etc.
- To create the required production schedule by the production department's timetable.

1.3 Aim of the training

- Internships offer students a chance to connect theoretical knowledge with practical experience, serving as a short-term workforce for agencies committed to the internship program
- The department is dedicated to preparing students for important roles in various sectors, achieving its mission. Weekly discussions cover pertinent professional development topics and workshops.
- Offers students practical, real-world exposure in the public, private, or nonprofit sector.
- Facilitates the development of crucial public administration skills that cannot be effectively taught in a classroom setting. These skills range from working on special projects for the interned agency to understanding the intricacies of human motivation within a complex organization.
- Allows students to compare theoretical concepts learned in the classroom with actual public administration experiences in the workplace.
- Provides students with hands-on experience in a real public, private, or nonprofit agency before entering the job market. This experience enhances job prospects and imparts knowledge about expected professional behavior.
- Allows students to apply technical skills acquired in the classroom to real-world administrative challenges in the public, private, or nonprofit sectors.

1.4 Learning objective

- **Product Knowledge:** Understanding the specifics of the food and beverage products they produce, including ingredients, production processes, and quality standards.
- **Quality Assurance:** Learning about and implementing stringent quality control measures to ensure consistently high-quality products that meet industry standards and customer expectations.
- **Innovation and Research:** Encouraging employees to engage in research and innovation to develop new products, improve existing ones, and stay ahead in a competitive market.
- **Compliance and Safety:** Educating employees about food safety regulations, compliance standards, and best practices to maintain a safe working environment and meet legal requirements.

- **Customer Satisfaction:** Focusing on customer-centric approaches, understanding consumer needs, and delivering products and services that meet or exceed customer expectations.
- **Sales and Marketing Techniques:** Developing skills related to effective sales strategies, marketing campaigns, brand management, and building strong customer relationships.
- **Supply Chain Management:** Understanding supply chain dynamics, optimizing logistics, managing inventory efficiently, and reducing costs while maintaining product availability.
- **Teamwork and Leadership:** Encouraging collaboration, fostering teamwork, and developing leadership skills to ensure effective management and smooth operations within the company.

1.5 Mission

The term "Mission" pertains to the guiding sense of purpose that delineates how an organization actualizes its vision. In alignment with AFBL's mission, it aims to establish a viable economic framework by consistently delivering high-quality products, fostering an engaged and motivated workforce, leveraging cutting-edge technology, and contributing to societal well-being. The commitment to being a sustainable business, as expressed in "We Will Strive to Be A Sustainable Business," underscores AFBL's dedication to achieving enduring growth and profitability through organizational capability and innovation. The emphasis on "Through Consistent Quality Products" highlights AFBL's commitment to introducing robust food products that adhere to international standards. The notion of an "Employee That Is Empowered and Motivated" encapsulates the objective of cultivating and maintaining a workforce that is inspired and dedicated.

1.6 Vision

AFBL envisions establishing itself as the foremost and highly esteemed food and beverage company in Bangladesh. The objective is to secure the position of the preferred and leading choice among both consumers and stakeholders. AFBL is dedicated to earning trust and admiration, upholding elevated industry standards throughout its operations. Central to AFBL's vision is a firm commitment to quality. This entails the consistent delivery of high-quality products and services to consumers, business partners, and all stakeholders, both internal and external. Through an unwavering dedication to maintaining elevated standards, AFBL strives to realize its vision and emerge as a frontrunner in the food and beverage sector.

1.7 Value

"Values" refer to the principles that guide individuals in determining their actions in alignment with their mission, as they progress toward realizing their vision. The values encompassed are:

- Creativity
- Collaboration
- Honesty
- Customer Orientation and Confidence & Formula

1.8 Summary & Objectives

AKIJ GROUP OF INDUSTRIES stands out as one of the long-standing enterprises that continues to thrive with remarkable success and prosperity. The company made its entry into the market over

fifty years ago under the leadership of entrepreneur and founder, the late Mr. Sheikh Akij Uddin. In the 1950s, he launched the business with a sole product, Akij Biri, a cigarette brand. This particular brand has become a renowned component of the Akij Group, standing as one of the oldest and most recognized products both nationally and in a few international markets. In the late 70s, Akij Group experienced a significant milestone when Dhaka Tobacco Industries became part of the conglomerate due to the government's decision to privatize the factory, shifting it from the nationalized sector to the private sector. This marked a pivotal period for Akij Group, leading to diversification across various product lines and eventual peak success. From its humble origins, Akij Group has evolved into one of the leading corporations in Bangladesh, not just in terms of size but also in its unwavering commitment to impeccable quality and exceptional service. The company values its customers as unique individuals, striving to provide products tailored to the distinct needs of each consumer group. Akij Group goes beyond profit-making objectives; it actively contributes to the country's commercial development while also dedicating efforts to environmental and cultural preservation. The company proudly emphasizes its minimal wastage approach, with all factories designed with recycling and environmental considerations. In addition to its commercial ventures, the non-profit arms of Akij Group play a direct role in sustaining Bangladesh's progress. The group serves as a significant employer, treating its workforce as integral members of the AKIJ family.

CHAPTER 2

CHEESE PUFFS

2.1 Introduction

"Cheese Puffs," a highly acclaimed brand under Akij Food & Beverage, is renowned for its irresistibly cheesy taste that captivates both adults and children alike, making it impossible to stop at just one. In a bid to enhance its appeal to consumers, Cheese Puffs is set to unveil a fresh television advertisement. This one-minute commercial will showcase the introduction of the brand's latest offering, the "Baked Cheese Puffs," featuring a delightful new mozzarella flavor. Akij Food & Beverage anticipates that this innovative flavor will replicate the success of their previous products. The company is optimistic that the upcoming commercial will significantly elevate the brand's standing among consumers and television viewers, fostering widespread popularity.



Figure 1: Cheese Puffs

2.2 Ingredients of raw materials

Corn Grits	50 kg
Wheat Flour	3.889 kg
Corn starch	1.667 kg
Talcum powder	0.111 kg
Refined Vegetable Oil	0.389 kg
Water	2.5 L

2.3 Instruments of Cheese Puffs

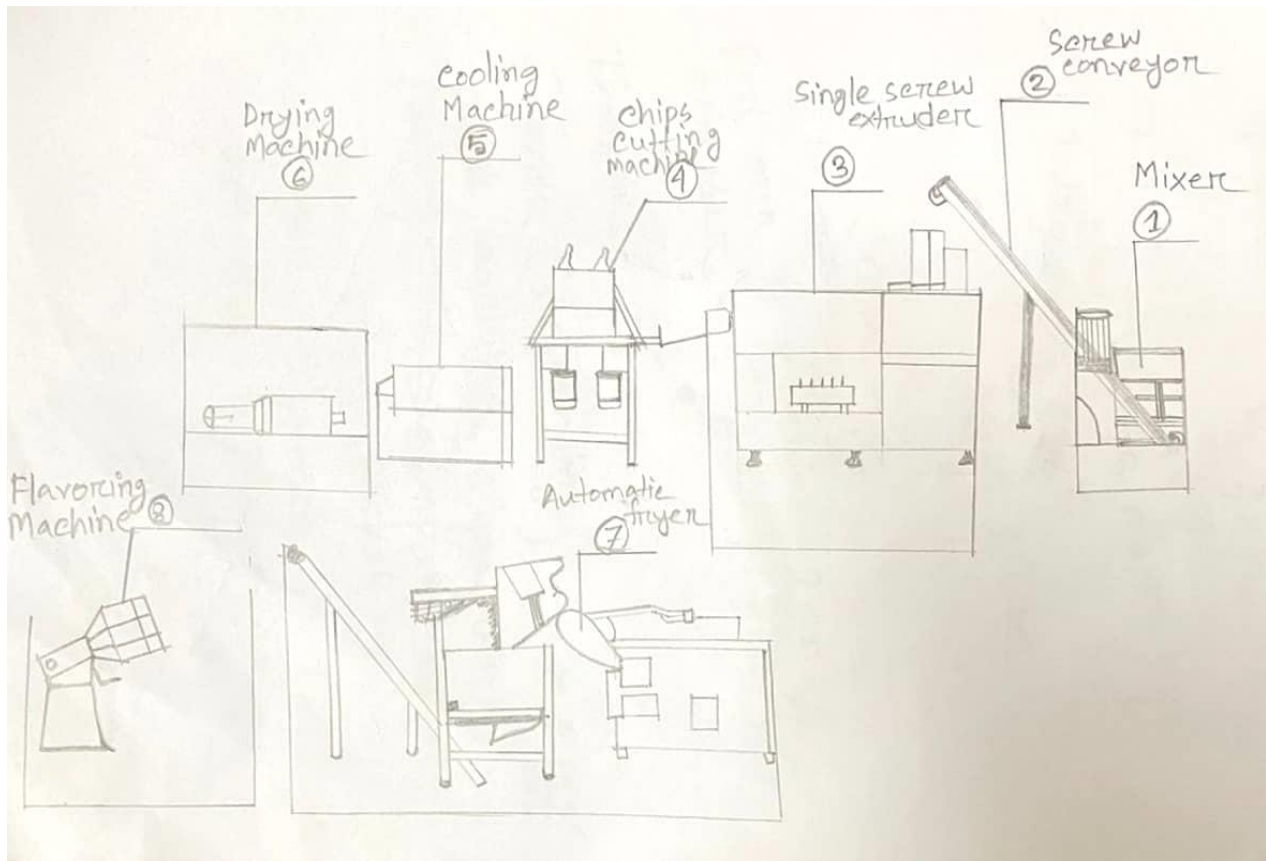


Figure 2: Twin Screw Extruder

2.3.1 Twin Screw Extruder

Zone	Temperature	Speed
1	60°C	Feeder: 11-12.5 RPM
2	100-110°C	Main Motor: 30 RPM
3	120-130°C	Cutter: 13.5- 15 RPM

2.3.2 Dryer

Temperature	Time	RPM
110-125°C	25-30 Min	1000-1400

2.4 Packet and Product information:

2.4.1 Sealing

Types	Temperature
Long seal	162°C
End seal	192°C

2.4.2 Moisture content

Below 2 (BSTI<5%)

2.4.3 Packet Information

Length	200 mm
Width	325 mm
Shelf life	3 months
Price	10 TK
Net weight	17gram
Gross weight	22.6-22.9 gm

Layer	Thickness
PET (Polyethylene Terephthalate)	12µm
PE(Polyethylene)	15µm
MPET (Metallized Polyethylene Terephthalate)	12µm
LLDPE (Linear Low-Density Polyethylene)	37µm

2.4.4 Packaging room

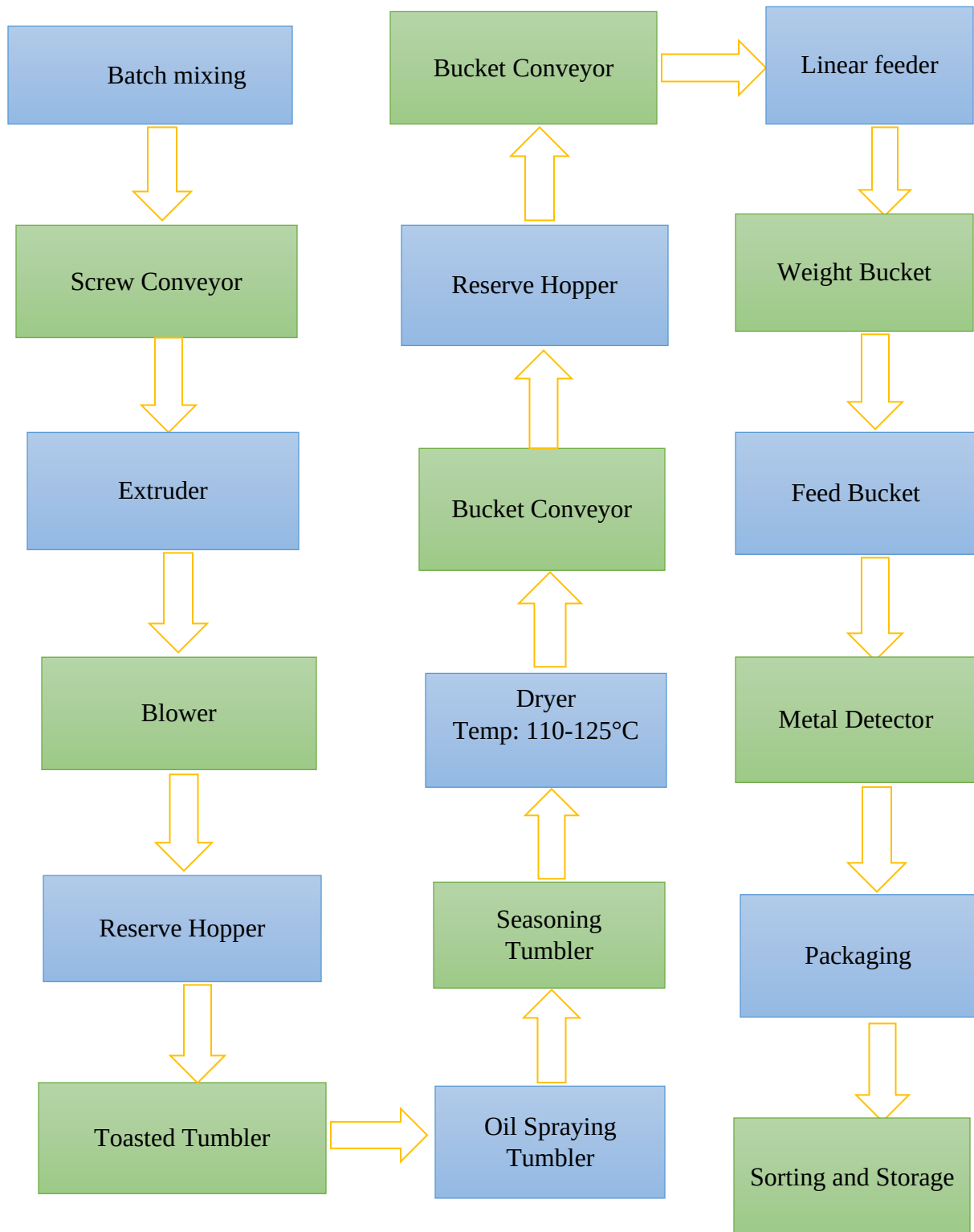
Temperature 18-25°C Humidity 45-55 Foil thickness 81µm Foil weight 5.6 g Three machines six head Vertical and horizontal sealing is 11 mm	Packaging speed 45 pkt/min Counter 0 pkts Drop timing 0.75 second Actual speed 45 pkt/min Delay time 0.5 sec
--	--

2.4.5 Allergens: It contains Milk and Soybeans Products, also it may contain Sulphur dioxide and sulfate.

2.4.6 Daily value percentages are based on a 2000-calorie diet (Amount per 100g)

Energy	485 Kcal
Total fat	19.7 g or 25%
Saturated fat	5.5 g or 28%
Trans fat	0 g
Cholesterol	0 mg
Salt as NaCl	1.66g
Total carbohydrate	70.94 g or 26%
Sugar	7.2 g or 14%
Dietary fiber	0%
Protein	11.1 g or 22%
Vitamin D	0%
Iron	1%
Calcium	5%
Potassium	4%

2.5 Flow Chart of Cheese Puffs



2.6 Lab experiments

2.6.1 Test of Gluten:

2.6.1.1 Objective

The objective of a gluten test is to determine the presence and quantity of gluten in a food product or ingredient. Gluten is a protein found in wheat, barley, rye, and their derivatives, and it can cause health issues for individuals with gluten-related disorders, such as celiac disease and non-celiac gluten sensitivity.

2.6.1.2 Instruments and Ingredients

Instruments	Ingredients:
Bowl Petri dish Electric Balance Beaker Dryer Hot air oven	Water 15 ml Flour 25 g

2.6.1.3 Procedure

Weigh out 25g flour into a plastic coliseum. Add 15 mL water, and mix to get a dough ball. Immerse the dough ball in water for one hour to ensure proper hydration. Wash out the bounce by kneading gently in a gentle sluice of water over a fine sieve. Continue washing till the washed-out liquid is clear. Squeeze the washed water into clean water. However, continue washing, If the water turns cloudy. The cohesive mass attained is called wet gluten. After pressing as dry as possible place in a petri dish containing a small piece of aluminum antipode. The wet gluten so attained is dried in a hot air roaster at 100 °C for 24 hr. Weigh the gluten to a constant weight. The dried gluten is called dry gluten

2.6.1.4 Calculation

Wet basis, Sample weight (Ws) = 25 g Dish weight (W1) = 45.04 g Dish + Gluten weight (W2) = 49.10 g	Gluten (%) = $\{(W2 - W1) \div Ws\} \times 100$ = $\{(49.10 - 45.04) \div 25\} \times 100$ = 16.24 %
--	---

2.6.1.5 Result

16.24 % of gluten in flour.

2.6.1.6 Precaution

- Never touch the petri plates with wet hands.
- The dough ball should be completely immersed in water for one hour.
- The dough ball should be washed till it is completely free of starch.
- Wet gluten to be pressed as dry as possible before taking the weight.
- Wet gluten to be dried to constant weight.

2.6.1.7 Five different products and their Gluten

Product Name	Gluten %
Bread	35-38%
Cookies	32-34.9%
Noodles	28-31.9%
Stick Noodles	24-27%
Cake	32-34.9%

2.6.2 Leakage Test:

2.6.2.1 Objective

The objective of a leakage test in chip packets (or any food packaging) is to ensure that the packaging is sealed properly and does not allow air, moisture, or contaminants to enter or exit the package.

2.6.2.2 Instruments

- Leak tester
- Sample (Chips Pack)

2.6.2.3 Procedure

- Set up the visual inspection area with proper lighting.
- Prepare a sample of chip packets to be tested
- Place the chip packets one by one on the inspection table or conveyor belt.
- The inspector should carefully examine each packet for any visible defects or leaks
- Carefully inspect the seals of the packets to ensure they are properly sealed with no gaps or wrinkles.
- Submerge the chip packet in a container of water and look for air bubbles, which would indicate a leak.
- Use a simple hand pump or compressed air to pressurize the packet slightly, and check for any air escaping through a leak
- If any packets are found to have defects or leaks, the inspector should document the nature and location of the defects.

2.6.2.4 Result

The observation of the leakage test for chips foil revealed no visible leaks or defects, indicating that the foil's integrity is intact and suitable for its intended purpose.

2.6.3 Bursting strength test:

2.6.3.1 Objectives

The bursting strength tester is employed to assess the maximum force needed to cause the collapse of a material under applied force, accomplished by positioning it on a rubber diaphragm. This testing device is utilized to examine the bursting strength of papers and boards utilized in the production of various packaging materials.

2.6.3.2 Instruments

- Bursting Strength Tester
- Chips packet

2.6.3.3 Procedure

- Cut a circular specimen from the chips packet using a cutting die or template. The size of the specimen may be determined based on testing standards or specific requirements.
- Use a caliper or micrometer to measure the thickness of the chip's packet material. This measurement is crucial for calculating the bursting strength.
- Place the prepared specimen between the clamping rings or holders on the bursting strength testing machine.
- Ensure that the specimen is centered and securely held in place
- Calibrate and adjust the testing machine according to the specifications of the chip packet material.
- Gradually increase the pressure on the specimen using the testing machine. The pressure simulates the internal forces that the packaging material would experience during handling and transportation
- Record the pressure at which the chip packet material bursts. This is the bursting strength of the packaging material.
- Some testing machines may automatically record and display the bursting strength
- Perform multiple tests on different specimens to ensure the reliability and consistency of the results.

2.6.3.4 Result

Present the bursting strength results in a clear and organized manner, indicating the ability of the chip packet material to withstand pressure. Always follow any specific testing standards or guidelines provided by relevant organizations, and be sure to adhere to safety precautions while operating the testing equipment.

CHAPTER 3

SUGAR PROCESSING PLANT

3.1 Introduction

The primary goal of establishing a sugar processing facility is to effectively and sustainably cater to the needs of the beverage production industry by producing top-tier sugar syrup. To ensure consistent product quality, maximize manufacturing output, and adhere to industry regulations, the production plant is striving to enhance the sugar extraction, refinement, and crystallization procedures. The facility's objective is to promote the growth of the beverage sector by employing state-of-the-art technology and eco-friendly methods. The plant aims to streamline the production of beverages that meet the preferences of consumers worldwide.



Figure 3: Sugar Syrup

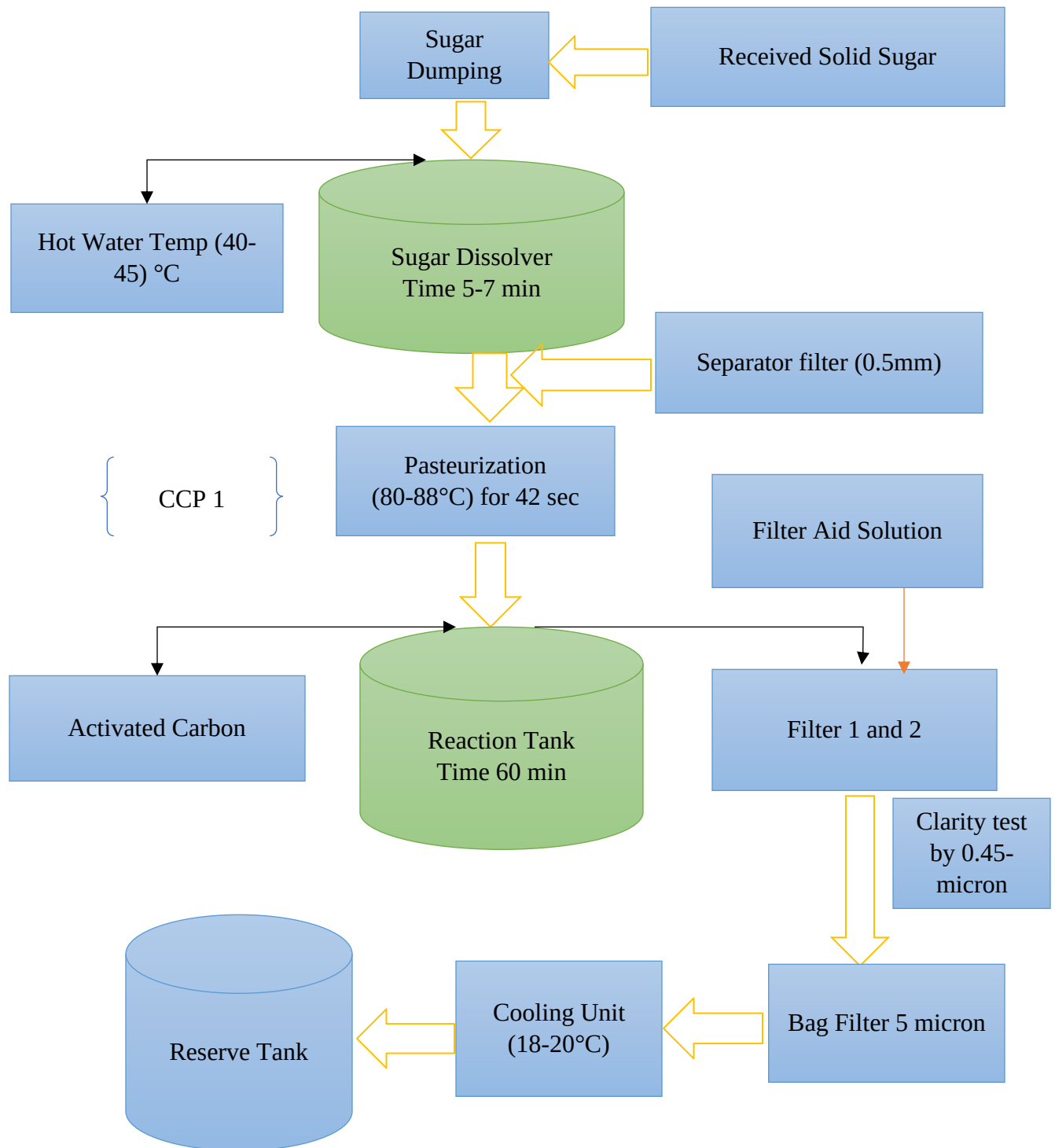
3.2 Types of sugar used for sugar syrup:

- **Raw Sugar:** Raw sugar used in sugar processing plants from various countries. Such as India & Bangladesh. Fresh, Igloo, Tir produced sugar are used among the companies of Bangladesh. Along with this, some Indian companies' sugar such as Parry, Renuuka, and Dhampur are also used in sugar processing plants.
- **Activated Carbon:** Activated carbon is used to remove color compounds from sugar solutions. It adsorbs impurities such as melanoidins, residual colorants, and other organic contaminants, resulting in a clear and colorless sugar solution. Activated carbon helps eliminate any undesirable odors and flavors that may be present in the sugar solution. It adsorbs volatile organic compounds responsible for off-flavors, ensuring that the final sugar product is free from unwanted smells or tastes.
- **Dicamex powder:** Dicamex acts as a flocculant, helping to aggregate fine suspended particles and impurities in sugar juice. This promotes the settling of these impurities to the bottom of tanks or clarifiers, making it easier to separate them from the clear sugar juice.

3.3 Some information about the Sugar Processing Unit

1. Activated Carbon Powder (Filter Aid Powder) • Per bag weight of 20 kg • Import from China • Duration time 1 hour • Reduce the bad smell and flavor • Black color • It absorbs color, dust • 0.1% is used for the new line and 0.075% is used for the old line • Activated carbon used for the new line is 9 kg • Activated carbon is used for old lines is 12 kg 2. Dicamex Powder (Filtering Syrup) • Per bag weight 22 kg • First baked 16 kg per batch • Import from China • Duration time 2 years • Per batch use 60 kg • Dicamex is used for new-line and is 11 kg • Dicamex is used for the old line and is 8 kg 3. Bag filter • Size 5 micrometer • Paper filter 0.45 micrometer • Filter press has 48 plates	4. Daily process of sugar syrup • Daily 25-30 batch production • Sugar per batch 12000 kg • Water use per batch 6500 liter 5. Reserve Tank • Four reserve tanks in the plant • Reserve tank holding time 24 hour • Capacity 35000 liter • Four reserve tanks in this plant 6. Filter Press • Capacity 5000 liter and 48 plates are available for filter press 1 • Capacity 5000 liter and 48 plates are available for filter press 2 • Size 100 micrometer 7. Dissolver Tank • Dissolver tank 1 capacity 1500 liter for new line • Dissolver tank 2 capacity 1700 liter for the old line • Hot Water Temperature (40-45) °C for 5-7 min 8. Reaction Tank • Capacity is 31500 liters • Time 60 min
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3.4 Flow Chart of Sugar Processing Plant:



3.5 Quality Parameters of Sugar Syrup

- °Brix Test
- Clarity Test
- Purity Test

3.5.1 °Brix analysis by Hand Refractometer:

3.5.1.1 Principle

A refractometer is utilized to gauge the concentration of total soluble solids (TSS) by employing the principle of light refraction. When light travels at an angle between different mediums, it undergoes refraction or bending. This bending is a result of variations in the speed of light in different mediums, and it is directly proportional to the density of the solution or the concentration of soluble solids. The refractive index of a medium is specifically defined as the ratio between the sine of the angle of incidence and the sine of the angle of refraction when monochromatic light is refracted from a vacuum (or closely, from air) into the medium. In the context of a Brix refractometer, the refractive index is calibrated to provide readings in degrees Brix (°Brix). Since the refractive index is contingent on the solution's density, measurements must be conducted at a specific temperature (usually 20 °C), or appropriate corrections need to

3.5.1.2 Instruments and Ingredient

- Hand refractometer
- Sugar syrup

3.5.1.3 Procedure

- Acquire a refractometer, exercising caution due to their cost.
- Verify that the surface of the refractometer prism is both clean and dry.
- Apply a small quantity of fresh juice (a few drops are ample) onto the refractometer's prism.
- Direct the prism towards well-lit surroundings (avoiding direct sunlight) and observe through the eyepiece.
- Adjust the focus and note the position on the scale where the base of the blue color is located, recording the percentage of sugar content (% Brix).
- Promptly wipe the refractometer using a moist tissue, and ensure thorough drying.

3.5.1.4 Precaution

- Refractometers must be shielded from damp conditions. Only the prism surface should be moistened with either sugar solution or water.
- After each reading or before storing the refractometer, it is essential to clean the prism thoroughly with water and then ensure it is dry.

3.5.2 Clarity Test:

3.5.2.1 Principle

This objective clarity test is essential for ensuring the quality of sugar syrup, particularly in applications where visual appearance and transparency are critical factors. Regular testing helps maintain consistency and adherence to quality standards.

3.5.2.2 Instruments and Ingredients

- Sugar syrup
- Filter paper

3.5.2.3 Procedure

- Ensure that the sugar syrup sample is at room temperature
- Use a clean and transparent container for holding the sugar syrup
- Place the container with sugar syrup on a flat surface under consistent lighting conditions.
- Observe the sugar syrup visually for any visible particles, cloudiness, or turbidity.
- Check for the presence of any sediment at the bottom of the container.
- Look through the container from different angles to assess the transparency of the sugar syrup.
- Note any haziness or lack of clarity in the syrup.
- Evaluate the color of the sugar syrup. It should be consistent and free from any unusual discoloration.
- Compare the clarity of the sugar syrup against a clear standard, if available
- Record observations, including any deviations from expected clarity.
- If clarity issues are identified, consider repeating the test after necessary adjustments or filtration.
- Clean the container thoroughly before conducting subsequent tests to prevent cross-contamination.
- Summarize the clarity test results, indicating whether the sugar syrup meets the required standards.

3.5.2.4 Precautions

- Refrain from filling the filter excessively.
- Inspect the filter paper thoroughly to ensure the visibility of any suspended particles.
- Utilize flawless filter paper for the process.

3.5.3 Purity Test:

3.5.3.1 Principle

Refractometry is a widely used method where the refractive index of a sugar solution is measured, indicating the sugar concentration. This measurement is then compared to established standards to assess the purity of the sugar. Color examination involves visually inspecting the color of the sugar solution, as unusual discoloration may indicate the presence of impurities. Furthermore, additional tests like polarimetry measure the rotation of polarized light passing through a sugar solution, providing information about the sugar's optical activity and purity. Chromatography can be employed to separate and identify different components within a sugar sample, aiding in the determination of impurities. Ensuring the purity of sugar is essential not only for meeting quality standards but also for maintaining the desired characteristics in end products, such as beverages, confectionery, and other food items. Regular testing and adherence to established protocols contribute to consistent product quality and consumer satisfaction.

3.5.3.2 Instruments and Ingredients

- Beaker
- Weight Balance
- Digital Refractometer
- Raw sugar 20 g
- Water 80 ml

3.5.3.3 Procedure

- Begin by obtaining raw sugar and distilling water to form a 20% sugar solution
- Next, combine 80 ml of distilled water with 20 gm of sugar in a beaker
- Ensure thorough dissolution of sugar and water, employing a Magnetic stirrer for optimal results over 10 minutes
- Subsequently, gather the dissolved solution and introduce a 2/3 drop sample into the Digital Refractometer
- Await the outcome

3.5.3.4 Precautions

- Refrain from filling the filter excessively
- Inspect the filter paper thoroughly to ensure the visibility of any suspended particles.
- Utilize flawless filter paper for the process

CHAPTER 4

EFFLUENT TREATMENT PLANT (ETP)

4.1 Introduction

Water stands as a critical element extensively utilized across diverse industrial sectors, serving various purposes such as washing, cooling, heat exchanging, steam condensation, and more. However, it's noteworthy that the water employed in industrial processes is not consumed; instead, nearly all industries produce wastewater that demands careful attention. Improper disposal of this wastewater can lead to environmental pollution in the local surroundings. In numerous manufacturing industries, by-products, considered as "effluent," must undergo treatment before being discharged into the environment. An effluent treatment plant (ETP) is a facility designed for the treatment of industrial wastewater or effluent before its discharge into the environment or a municipal sewage system. The ETP begins with the reception of influent, which is the untreated wastewater from industrial processes. Primary treatment follows, where solid particles are settled or removed, and the wastewater undergoes physical separation. Biological processes, such as activated sludge treatment or biofiltration, are employed in secondary treatment to break down organic pollutants through the action of microorganisms. Solid waste generated during treatment, known as sludge, is managed separately. It may undergo further treatment, such as dewatering or digestion, before disposal or reuse. In some cases, treated effluent can be reused within industrial processes or for non-potable purposes, promoting sustainability.

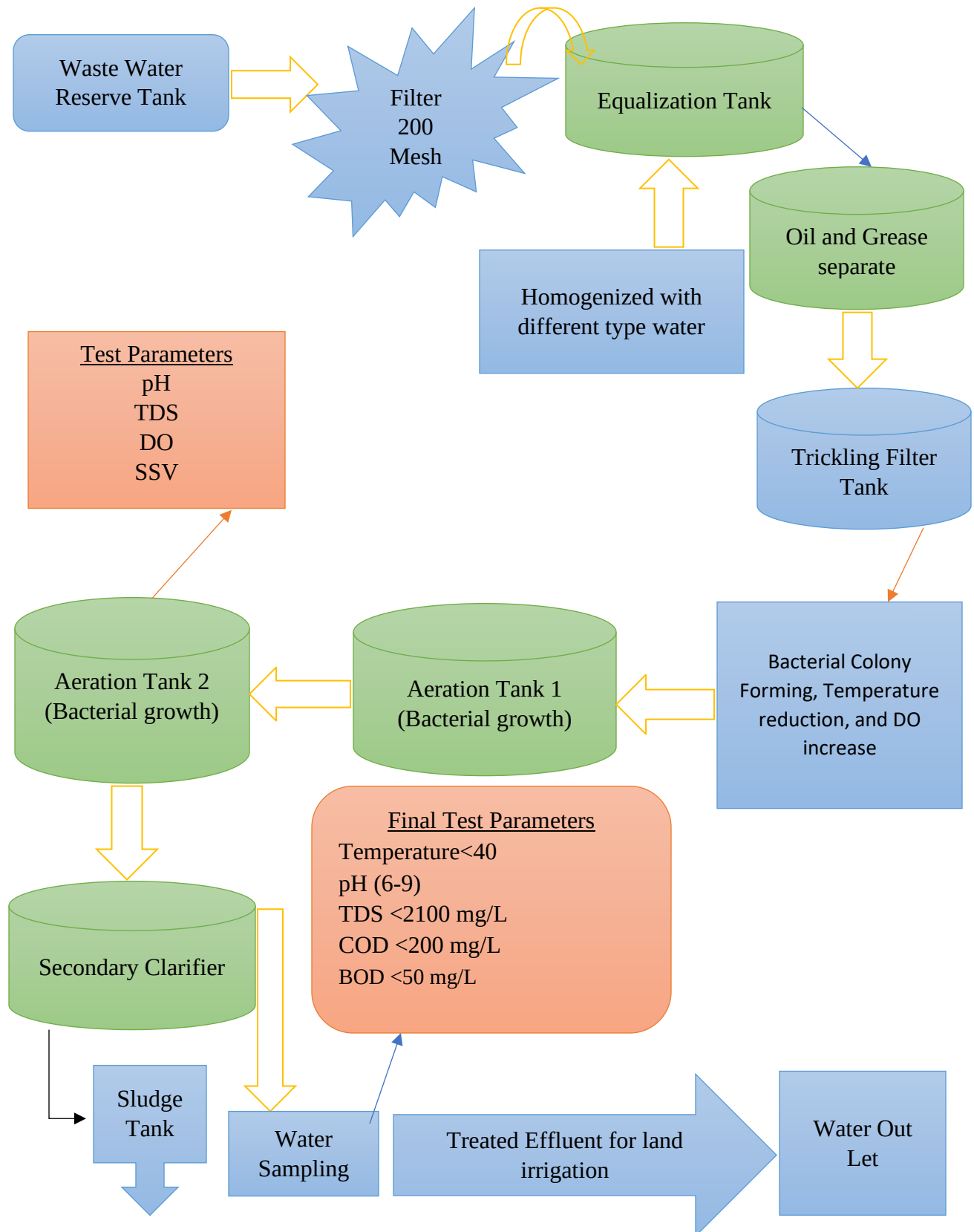


Figure 4: Effluent Treatment Plant (ETP)

4.2 Water quality parameters before and after treatment

Water quality parameters	Unit	Parameters before treatment	Parameters after treatment
Temperature	°C	13	12.5
Suspended matter	Mg/L	7.2	1.024
pH		8	7.96
Bacteria	UFC/1 Ml	505	2
Algae	(algae/Ml)	797	27
Hardness	°F	40.6	40.2
Alkalinity°	°F	16	15.45
Organic matter	MgO/L	2.15	1.38
Iron	Mg/L	0.11	<0.02

4.2 Flow Chart of Effluent Treatment Plant



4.3 QC parameters & Lab experiments

1. Final Test PH Test Total Dissolve Solid Chemical Oxygen Demand Biological Oxygen Demand	2. QC Parameters Temperature<40 pH (6-9) TDS <2100 mg/L COD <200 mg/L BOD <50 mg/L
---	--

4.4.1 Determination of pH:

4.4.1.1 Principle

The term "pH" denotes the assessment of hydrogen ion activity within a solution. As directly gauging pH proves challenging, specialized electrodes are essential for swift and precise pH determination. The pH scale ranges from 0 to 14, where lower values signify heightened H^+ levels (more acidic), and higher values denote diminished H^+ ion activity (less acidic). A pH of 7 is regarded as neutral. Each whole unit alteration in pH signifies a tenfold increase or decrease in hydrogen ion concentration. Typically, natural waters exhibit pH values spanning from 5.0 to 8.5. Rainwater initially holds a pH range of 5.4 to 6.0, which subsequently reacts with soils and minerals, leading to a reduction in H^+ ion concentration in the water.

4.4.1.2 Instruments and Ingredients

- pH electrode filled with KCL solution
- pH meter
- Clean beakers
- Buffer solutions of pH4 and pH 7
- Tissue papers
- Thermometer
- Distilled water

4.4.1.3 Procedure

- Connect the pH meter to a power supply and allow it to warm up for 5 to 10 minutes.
- Rinse the glass electrode with distilled water and gently clean it using a soft tissue.
- Record the water temperature and set the pH meter accordingly.
- Immerse the electrode in a pH 7 buffer solution and adjust the pH meter reading to 7 by using the Calibrate knob.
- Submerge the electrode in the pH 4 buffer solution. Adjust the pH reading on the meter using the Slope switch.
- Repeat the process with pH 7 and pH 4 buffers until an accurate and stable reading is obtained. When moving and cleaning the electrode, set the selector switch to standby mode. Switch to pH mode when recording pH

- Now place the electrode in the water sample whose pH needs determination.
- You can take multiple simultaneous readings for different samples as long as the power is on.

4.4.1.4 Precaution

- Standardizing the pH meter involves measuring the pH of a 7-pH buffer solution or another standard pH solution
- It's essential to adhere to the recommended methods for standardization, which may be provided by the pH meter manufacturer
- When inserting electrodes into water, ensure they don't touch the beaker's bottom to prevent potential damage to the electrodes. Damage may occur if there is direct contact with the bottom.

4.4.2 Determination of TDS:

4.4.2.1 Principle

Water contains various impurities, including suspended, colloidal, and dissolved substances. Depending on these contaminants, water can be broadly categorized as a combination of different solid types within a liquid base. Solids can be further classified as settleable, suspended, dissolved, volatile, and fixed, collectively referred to as total solids. Settleable solids are capable of settling in a quiescent state, while suspended solids, insoluble in water, linger in suspension, causing water turbidity. Dissolved solids contribute color and odor to the water. The total, settleable, suspended, and dissolved solids encompass both volatile and fixed components.

4.4.2.2 Instruments and Ingredients

- Beaker
- Balance
- Measuring Cylinder
- Filter paper/ or Gooch Crucible
- Dropper
- Funnel
- Water

4.4.2.3 Procedure

- Filter the water sample using Whatman Filter paper.
- Collect the filtrate (liquid) and rinse water in a flask.
- Weigh the empty container (ceramic dish/evaporating dish) after ensuring it is thoroughly dried.
- Transfer the filtrate to the container and place the sample in an oven at 103°C for 24 hours. Optionally, if feasible, raise the oven temperature to 180°C and dry the sample for up to 8 hours.

- Carefully cool the container, as it will be very hot. Once out of the drying oven, let the sample cool in a desiccator within a dry air environment for at least 3 to 4 hours.
- After cooling, reweigh the container three or three times.
- Determine the weight gain by deducting the empty container's starting weight (measured in grams) from the weight of the container containing the dried residue.

4.4.2.4 Precautions

- Should the sample cool in a humid setting, its weight will rise due to the absorption of water vapor from the surrounding air.
- Keep in mind that the sample is extremely hot and has the potential to melt the plastic.
- Avoid direct contact with the container using bare hands.

4.4.3 Determination of COD:

4.4.3.1 Principle

An indicator of how much oxygen is needed to chemically oxidize both organic and inorganic materials in a water sample is the Chemical Oxygen Demand (COD) measurement. Numerous organic and inorganic substances can be chemically oxidized by a potent oxidizing agent, which is the basis for the COD principle. Typically, potassium dichromate is used as a powerful oxidizing agent in an acidic medium, and it is mixed with a predetermined quantity of water to perform the COD test. Usually a few hours, the response is given a set amount of time to continue. The organic and inorganic materials in the water undergo chemical oxidation during this time as a result of the oxidizing agent's reactions. According to the organic and inorganic materials involved in this process, the amount of oxygen used.

4.4.3.2 Instruments and Ingredients

- Reflux apparatus
- Pipettes
- Burettes
- Water

4.4.3.3 Procedure

- Pour 50.0 mL of the sample into a 500 mL reflux flask.
- Introduce 1g of mercuric sulfate along with a few glass beads.
- Add sulfuric acid to dissolve the mercuric sulfate, and allow the solution to cool.
- Incorporate 25.0 mL of 0.25 N potassium dichromate solution, ensuring thorough mixing.
- Connect the flask to the condenser and initiate the flow of cooling water.
- Pour the remaining acid reagent (70 mL) through the open end of the condenser and mix well.
- Apply heat and reflux the mixture for a duration of 5 hours.
- After refluxing, cool the mixture and rinse the condenser with distilled water.
- Dilute the mixture to approximately twice its volume and allow it to cool to room temperature.

- Titrate the excess dichromate using standard ferrous ammonium sulfate with a ferroin indicator (2 to 3 drops).
- The endpoint is signaled by a color change from blue-green to reddish.
- Similarly, perform reflux on a blank, consisting of distilled water in an equal volume to that of the sample.

4.4.3.4 Precautions

- Should the sample cool in a humid setting, its weight will rise due to the absorption of water vapor from the surrounding air.
- Keep in mind that the sample is extremely hot and has the potential to melt plastic.
- Avoid direct contact with the container using bare hands.

4.4.4 Determination of BOD:

4.4.4.1 Principle

The Biological Oxygen Demand (BOD) test is a laboratory experiment that measures the amount of dissolved oxygen consumed by microorganisms while decomposing organic matter in a water sample. This test indicates the level of organic pollution in the water.

4.4.4.2 Instruments and Ingredients

- Water sample
- BOD bottles
- Incubator
- Dissolved oxygen (DO) meter or Winkler titration equipment
- BOD incubator

4.4.4.3 Procedure

Collect a representative water sample from the site of interest in a clean, sterile container. Ensure that the sample is free from any contamination during collection. Measure the initial dissolved oxygen (DO) concentration of the water sample using a DO meter or Winkler titration. This represents the initial oxygen content before microorganisms consume it during the incubation period. Transfer a known volume of the water sample (usually 300 mL) into BOD bottles. Add dilution water if the oxygen demand is expected to be too high for accurate measurement.

4.4.4.4 Precautions

- Should the sample cool in a humid setting, its weight will rise due to the absorption of water vapor from the surrounding air.
- Keep in mind that the sample is extremely hot and has the potential to melt plastic.

CHAPTER 5

CARBONATED SOFT DRINKS (CSD)

5.1 Introduction

Soft drink is one that typically consists of water, artificial or natural flavors, and sweetener: Fruit juice, high fructose corn syrup, sugar, sugar substitutes, or any mix of these could be used as the sweetener. Caffeine, colorings, preservatives, and/or other substances may also be present in soft drinks. Soft drinks can be served at room temperature, chilled, or over ice cubes. They can be found in numerous container types, such as plastic bottles, glass bottles, and cans. There are many sizes available for containers. Varying in size from tiny bottles to huge multi-liter receptacles. Carbon dioxide that has been dissolved in liquids is what makes them effervescent or carbonated. When carbon dioxide dissolves in a liquid, fizz or effervescence is produced. High-pressure carbon dioxide is typically used in the procedure. Little bubbles of carbon dioxide are emitted from the solution as the pressure is released. This makes the mixture bubbly, or effervescent. One typical illustration is the dissolution of carbon. Since carbon dioxide dissolves in water only sporadically, it releases pressure and transforms into a gas. Generally speaking, carbonated soft drinks are sugary, non-alcoholic effervescent liquids. AFBL is the manufacturer of several well-known carbonated soft drinks, including Speed, Mojo, Clemons, Twinges, and others. Drinks that have carbon dioxide dissolved in water are known as carbonated beverages. The gas's existence causes the liquid to froth and bubble. Carbonation can happen artificially or naturally underground through applying pressure. Since carbon dioxide readily absorbs into liquids, particularly soft drinks, it is an excellent option for usage in CSD products. Beverages to create small bubbles. Additionally, the CO₂ acts as a safeguard to keep the soft drink fresh and stops bacteria from growing in the liquid while it is being stored.

5.2 Carbonated soft drinks products



Figure 5: Mojo



Figure 6: Clemon



Figure 7: Frutika



Figure 8: Naga mojo

5.3 Speed

Akij Food and Beverage Ltd (AFBL), an entity within the Akij Group, stands as a prominent player in the Food and Beverage industry within the country. The company produces a diverse array of food and beverage items, including carbonated beverages, fruit drinks, and various other food products, catering to both local and international markets. With a robust global presence, AFBL exports its products to 36 countries. Among its notable brands, Speed holds a significant position within Akij Food and Beverage Ltd. Recognized as the leading brand in the carbonated beverage category, Speed has achieved the prestigious Best Brand Award for the third consecutive time. This accolade was bestowed upon the brand at an event organized by Bangladesh Brand Forum (BBF), solidifying its reputation as the top brand in the country within its product category.



Figure 9: Speed

5.4 Ingredients and Machines

1. Ingredients: • Carbonated Water • Refined Sugar • Citric Acid (Acidulant E-330) • Tri Sodium Citrate (Acidity Regulator E-331) • Sodium Benzoate (Preservative E-211) • Caffeine • D-alpha-tocopherol (Vitamin E) • Permitted Food Color (E-102 and E-110) • Flavoring	2. Machines: • Preform (15.25g) • RF1 • Rf2 • -400 • -500 • Closure- Sackme, Angle, High Cape 400
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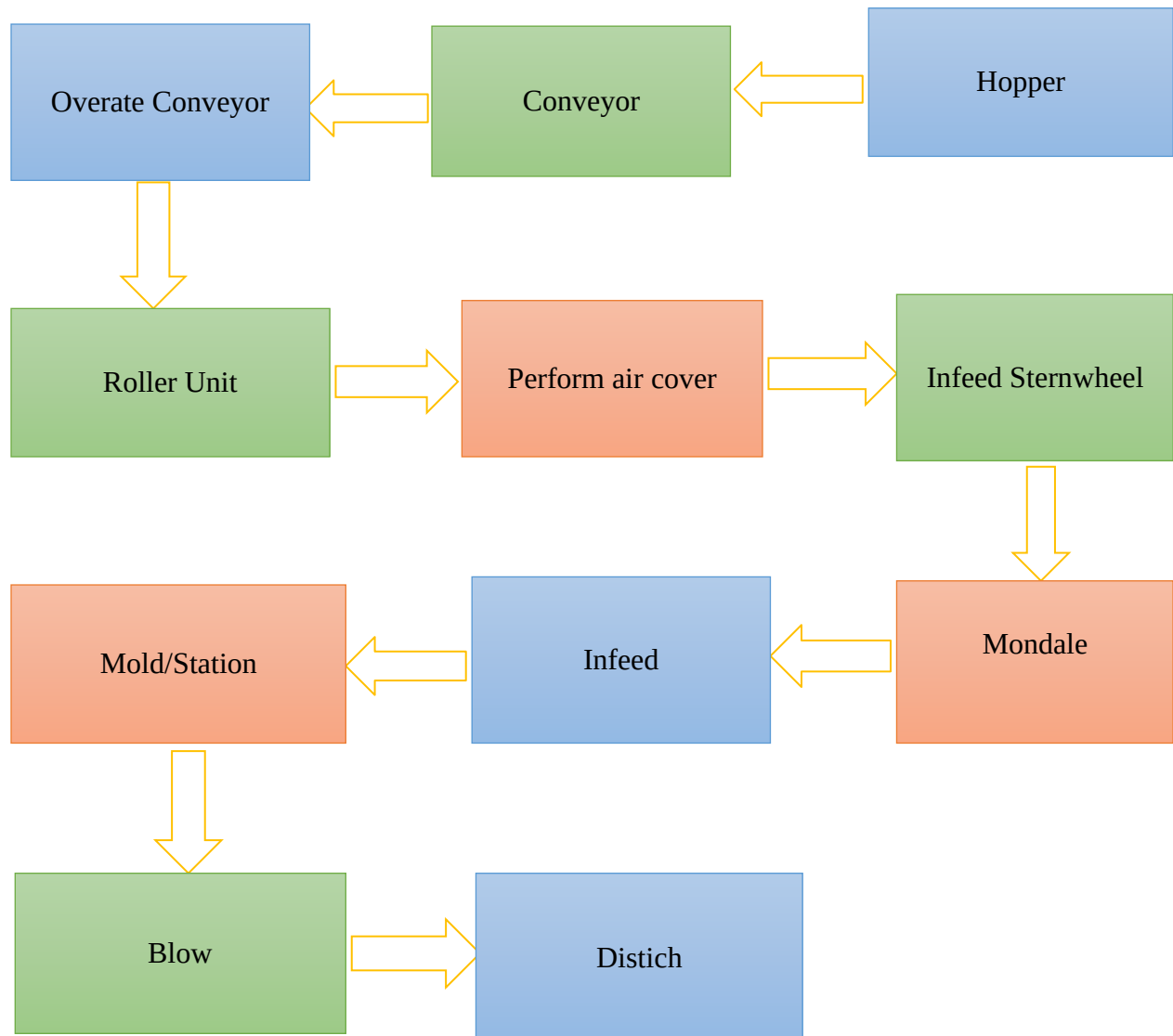
5.5 Nutritional value of speed (per 100 ml)

Energy (Kcal)	71.6
Protein(g)	Trace
Fat(g)	Trace
Saturated fat(g)	Trace
Carbohydrate(g)	17.9
Sugar(g)	17.9
Fiber(g)	Trace
Salt(g)	Trace
Sodium(mg)	18.55
Caffeine(mg)	14.5
Vitamin E(mg)	0.43

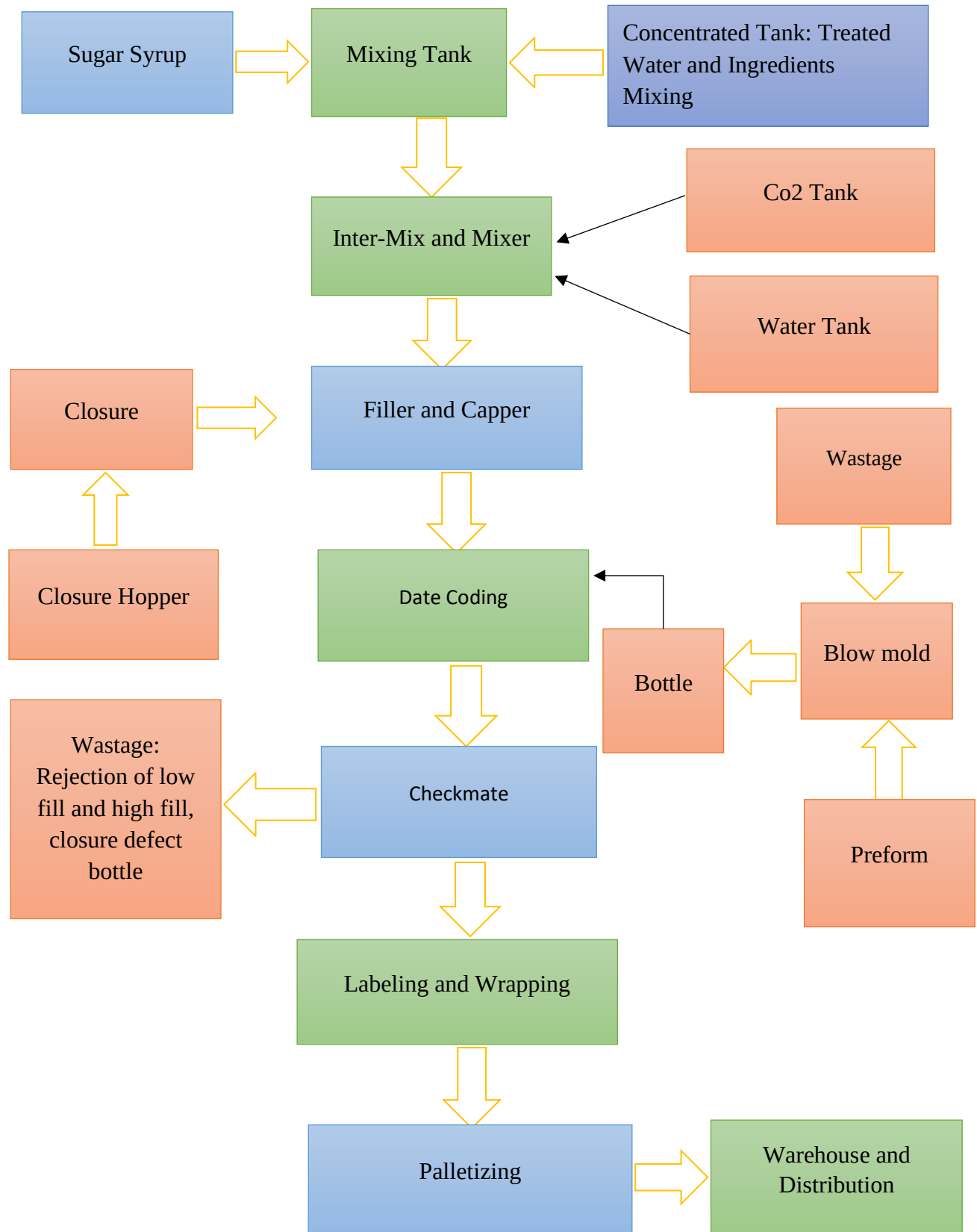
5.6 Pet Process

1. Three steps: • Pre-blow (Pressure 7.5 bar) • Intermediate blow Pressure 13 bar) • Final blow (Pressure 26 bar)	2. Blow mold machine: • Speed 81000 per/hour • Preform temperature 105°C • Oven temperature 65°C • Heater box 30-piece • Graper 19 • Every box 6 lamp • First lamp 3000-watt
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5.6.1 Flow Chart of Pet Process



5.7 Flow Chart of Speed



5.8 QC Parameters and Lab Experiment

1. QC Test • Brix Test • CO₂ Gas Test • Torque Test • PH Test • Secure Seal Test • Gas Volume • Acidity Test • Stress Cracking Test	2. QC Standard Parameters • Brix: (17.9±0.2) • PH: (2.9±0.2) • Gas Volume: (3.1-3.4) • Acidity: (.36±.01) • Torque: (14-22)
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5.8.1 Brix Test:

5.8.1.1 Principle

Brix degrees (symbol °Brix) are a measure of dissolved solids in a liquid and are commonly used to measure the dissolved sugar content of aqueous solutions. One-degree Brix is equivalent to 1 gram of sucrose in 100 grams of solution and indicates the strength of the solution in percent by mass. If the solution contains dissolved solids other than pure sucrose, °Brix will not be approximately equal to the dissolved solids. For example, if equal amounts of salt and sugar are added to the same amount of water, the refractive index (Brix) of the salt solution will increase faster than the refractive index of the sugar solution. °Brix is traditionally used in the wine, sugar, carbonated beverage, fruit juice, fresh produce, maple syrup, and honey industries.

5.8.1.2 Instruments and Ingredients

- Refractometer
- Sample Solution
- Pipette or dropper
- Clean and dry sample containers

5.8.1.3 Procedure

- Ensure that the sample is representative of the entire batch.
- Mix the sample thoroughly to ensure uniformity.
- Calibrate the refractometer using distilled water or a calibration solution with a known Brix value.
- Place a few drops of the calibration solution on the glass surface of the refractometer.
- Close the refractometer cover plate and allow the solution to spread across the glass surface.
- Look through the eyepiece and adjust the calibration screw until the line between light and dark areas aligns with the zero mark.
- Use a pipette or dropper to collect a small amount of the liquid sample.
- Place a few drops of the sample onto the glass surface of the refractometer.
- Close the cover plate gently to spread the liquid sample thinly over the glass surface.

- Hold the refractometer up to a natural light source or an artificial light.
- Look through the eyepiece and focus by adjusting the eyepiece until you see a clear separation between the light and dark areas.
- Hold the refractometer up to a natural light source or an artificial light.
- Look through the eyepiece and focus by adjusting the eyepiece until you see a clear separation between the light and dark areas.
- Hold the refractometer up to a natural light source or an artificial light.
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- Hold the refractometer up to a natural light source or an artificial light.
- Look through the eyepiece and focus by adjusting the eyepiece until you see a clear separation between the light and dark are

5.8.1.4 Precaution

- Ensure that all equipment, including the refractometer, pipettes, and sample containers, is clean and free from any residue from previous measurements
- Temperature can influence Brix readings. Use a refractometer with automatic temperature compensation (ATC) or measure the temperature of the sample and make necessary adjustments to the Brix reading
- Calibrate the refractometer regularly using distilled water or a calibration solution with a known Brix value. Follow the manufacturer's instructions for calibration.
- Ensure that all equipment, including the refractometer, pipettes, and sample containers, is clean and free from any residue from previous measurements
- Temperature can affect Brix values. Use an automatic temperature compensation (ATC) refractometer or measure the temperature of the sample and make the necessary Brix adjustments.
- . Calibrate the refractometer regularly using distilled water or a calibration solution of known Brix value. Follow the manufacturer's instructions to calibrate.

5.8.2Torque test:

5.8.2.1 Principle

The testing procedure is followed before the packaging process is initiated. This is also known as a destructive testing technique in which multiple samples are required to judge the weakness in the torque strength of bottle caps during the process of screwing.

5.8.2.2 Instruments

- Torque tester
- Bottle

5.8.2.3 Procedure

If we want to test the sample in a torque testing machine, then we can easily do this by placing the sample between anti-slip holders for the strong holding of the testing sample. Here you will get accurate and precision-based torque values as well and you will be able to measure the force needed to open PET bottles. In this measurement, we will get an idea about the bottle quality and the force needed when the bottles get subjected to a load under twisting. As we all know PET bottles have been used in various industries. For example, the food industry, beverage bottling industry, packaging industry and many more make use of PET bottles. Therefore, the manufacturers need to determine the force needed to open the bottle caps. Thus, using a torque tester testing instrument will help you evaluate the force needed to open the bottle caps as well as lids.

5.8.3 Secure seal test:

5.8.3.1 Principle

Test the thread and seal integrity of glass or plastic cup holders using the Secure Pak Secure Seal Tester. The PET Bottle Seal Tester is designed with special requirements in mind when sealing cup holders that use a variety of seals, including Examples: aluminum roll-ons, twist crowns, and plastic closures. The Secure Seal Tester provides more sensitive and accurate readings by detecting gas leaks instead of liquids.

5.8.3.2 Instruments and Ingredients

- Secure seal tester
- Sample Bottle

5.8.3.2 Procedure

It operates with a minimum compressed air, nitrogen, or carbon dioxide pressure of 175 psi and can handle pressures up to 3,000 psi. The shaft is made of anodized aluminum, a perfect sword, and plastic hardware. The tester's rugged construction withstands the abuse of the product line while remaining accurate enough for laboratory use. Dimensions: 27"H x 10"W x 14 1/2"D.

5.8.4 Stress Cracking Test (SCT):

5.8.4.1 Principle

A preform comprising an open-concluded mouth forming portion, an intermediate body forming portion, and an unrestricted base forming portion comprising a stress cracking resistant polyester composition comprising poly (ethylene terephthalate) grounded resin and an impact modifier. The preform is blow-moldered to form a matching vessel. Polyester compositions and styles are also borne. The impact modifier improves the stress cracking resistance of low IV PET such that the holders perform also to those made of high IV PE.

5.8.4.2 Instruments and Ingredients

- NaOH
- Dram
- Bottle

5.8.4.3 Procedure

Take 2.04 gm NaOH and mix properly with 1L water in a dram. After finishing the mixing place one round bottle in the dram in such a way that the bottle base area is immersed in the mixing water and keep the bottle in the dram for 5 minutes.

5.8.4.4 Result

If the stress Cracking test fails there will be scratches in the base area of the bottle.
If there is nothing then the bottles are ok for production.

5.8.5 Determination of Gas Volume:

5.8.5.1 Principle

GV (gas volume) is a unit of measurement that indicates the amount of carbon dioxide contained in a drink. Carbonated beverages are products that are filled with carbon dioxide under certain conditions. The carbon dioxide content (at 20°C) of the final product is required, except for beverages that generate carbon dioxide gas through fermentation and hard drinks with a carbon dioxide content of less than 5% and an alcohol content of 0.5% or more. Products for achieving certain volume multiples. Different products require different CO₂ amount multipliers.

5.8.5.2 Instruments and Ingredients

- Carbonation Calculator
- CO₂ Tester

5.8.5.3 Procedure

Sample blown bottle (approximately 40°F±3°F) should be taken from the line after refill. Line samples can be balanced by carefully flipping 15 times in 30 seconds without shaking. At the CO₂ tester, adjust the bottle. To measure just dissolved CO₂, the shifting valve is opened to remove extra air pressure from the headspace. Give it a good shake to get maximum, steady pressure. Consider the pressure gauge reading in psi and the thermometer reading in °F. Use a carbonation calculator to determine the volume of CO₂ based on temperature and pressure.

CHAPTER 6

DAIRY PLANT

6.1 Introduction

Milk, the primary element in dairy products, has been a staple food for humans for innumerable times. These correspond to dairy-predicated goods like adulation, ice cream, kefir, rubbish, and yogurt. We may find milk from cows throughout the world, as well as milk from other mammals like goats and angels. The nutrients in dairy products analogous to milk, rubbish, and yogurt — are essential for your health. For each case, all three include protein, calcium, and vitamin B12, which support the development and conservation of strong bones and teeth, the form and revamping of the muscular kerchief, and the health of your nervous system, singly. Every mug of milk also contains protein, zinc, selenium, and vitamins A and D, all of which promote a strong vulnerable system.

6.2 Farm Fresh Milk

A month-long crusade called "Khamar theke glass e noise e noise eiashe" has been launched by Farm Fresh, the well-known dairy brand of Akij Food and Beverages Ltd (AFBL), promising to produce and distribute decoration pasteurized liquid milk. On November 4th, the month-long crusade got underway. Through this crusade, consumers will be able to learn how pasteurized milk of the loftiest quality is prepared." Farm Fresh" collects milk directly from growers and uses its laboratory to conduct contamination and microbiological testing to guarantee quality. The milk is collected, cooled in its advanced nipping center, and also tinkered to the plant at a destined temperature. It also passes another quality test before being delivered to the factory. The milk is prepared in the most advanced way possible using a Swedish outfit and ends in a three-league pack. When the pasteurized milk packets are being transported to each store for distribution, their temperature is maintained at 4 degrees or lower. The crusade raises mindfulness about relating quality milk in the request and provides ranch Fresh brand consumers with a complete view of their processing process." To guarantee the loftiest quality of milk, Akij Food and Beverages Limited nearly monitors the milk's quality at every stage of processing and distribution, from the ranch to the request. In addition to furnishing consumers with advanced- quality products, we've been working lifelessly with the growers to encourage the product of high- quality milk for dairy growers. The nation's dairy granges give growers a wide range of advantages, similar as long- term interest-free loans, low- cost cattle feed, expert advice on rearing cows, and medical care," added.

6.3 Composition of milk

Elements	Percentage
Carbohydrate	4.8%
Fat	3.5%
Protein	3.8%
Water	87.1%
Mineral	0.8%

6.4 Farm Fresh milk products



Figure 10: Farm Fresh UHT milk



Figure 11: Mango flavor milk



Figure 12: Alachi



Figure 13: Chocolate flavor



Figure 14: Kheer Shake



Figure 15: Yogurt

6.5 Milk Receiving Unit:

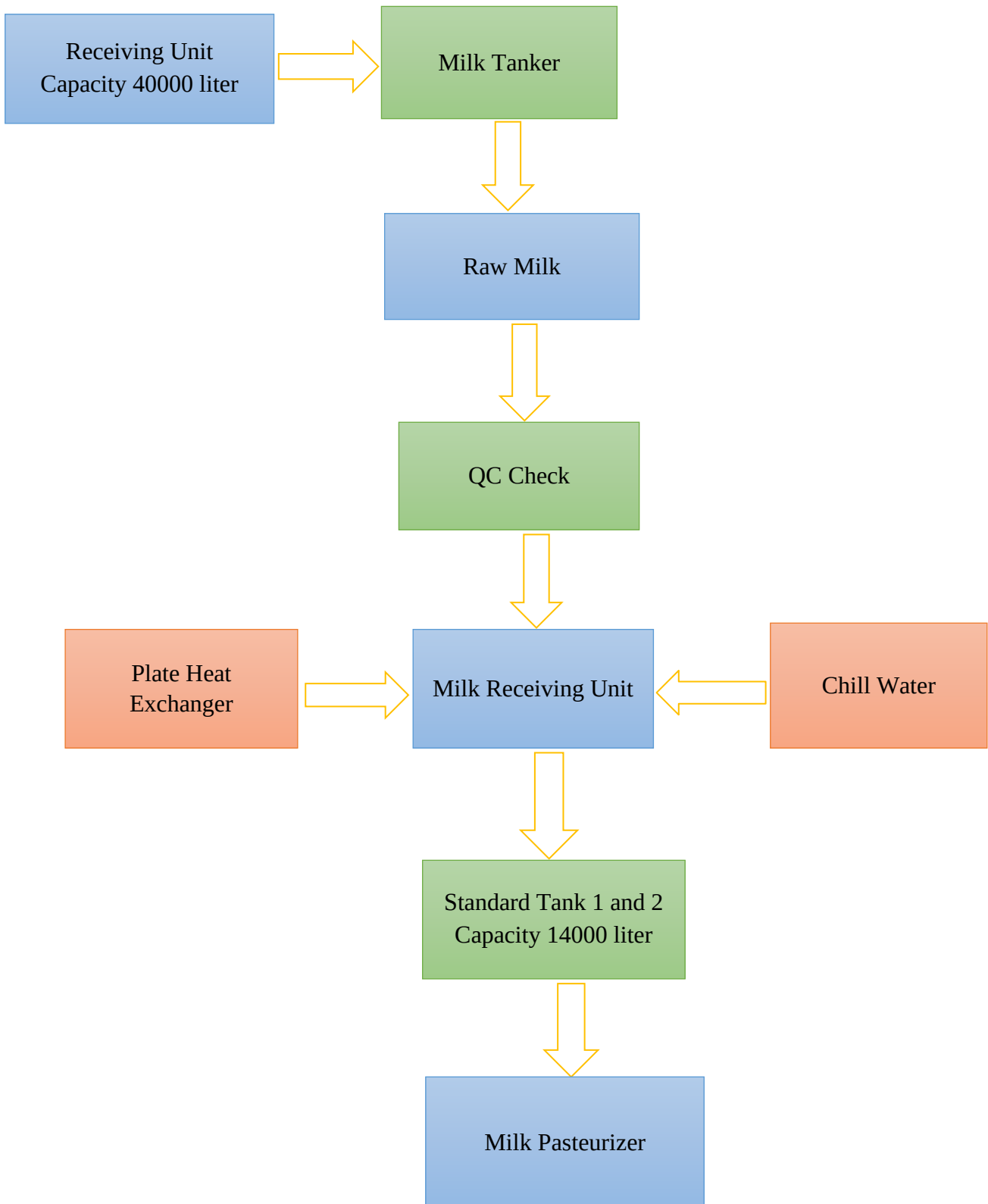
Milk comes from three places that is Chapai, Jessore, and Pabna. Every day 70000 liters of milk is received.

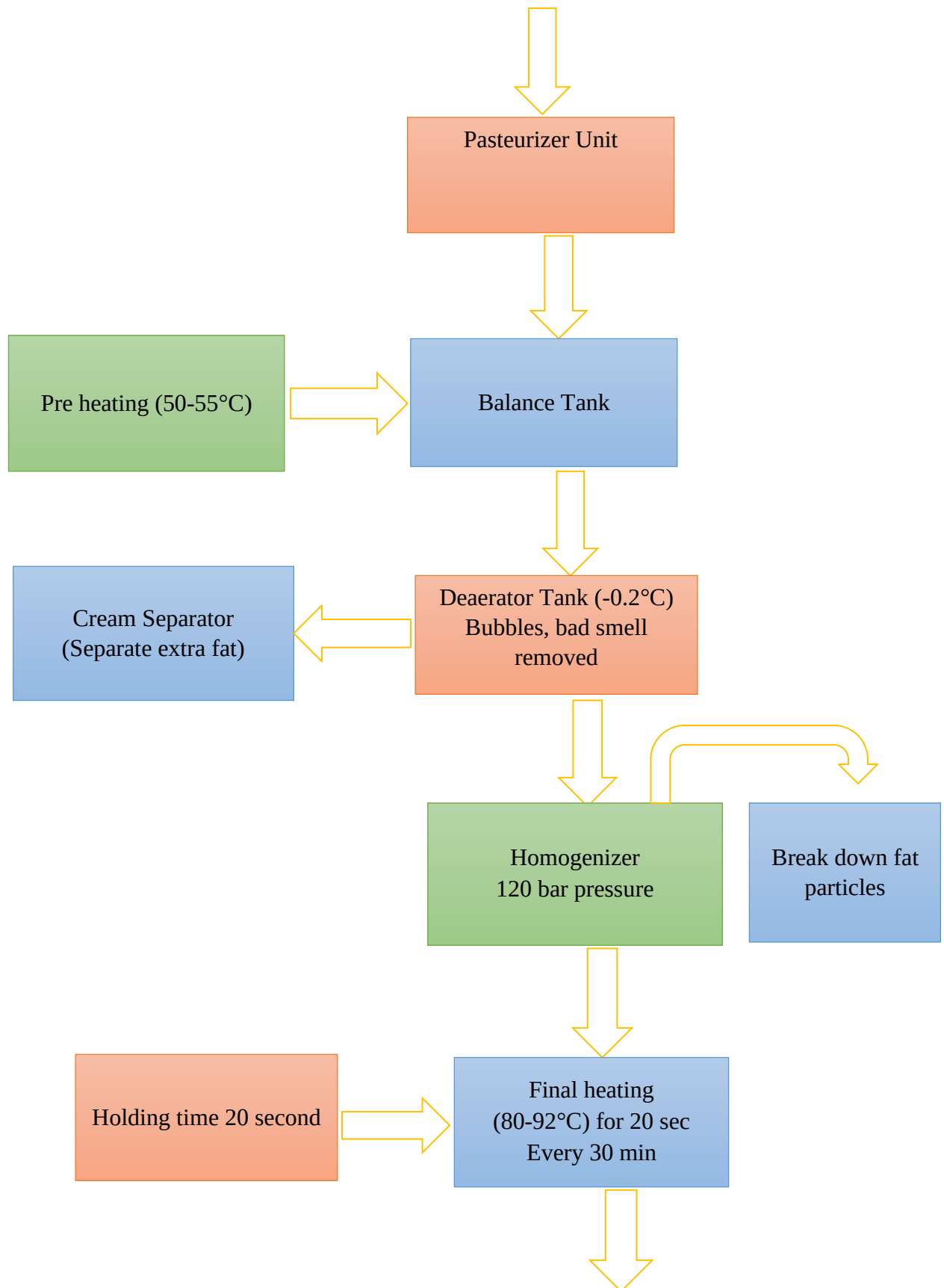
1. Big Tank has an 11000-liter capacity and three chambers: • Front Chamber (high temperature) • Middle Chamber (low temperature) • Reverse Chamber (high temperature)	2. The Small Tank has a 6000-liter capacity and two chambers: • Front Chamber (high temperature) • Reverse Chamber (high temperature)
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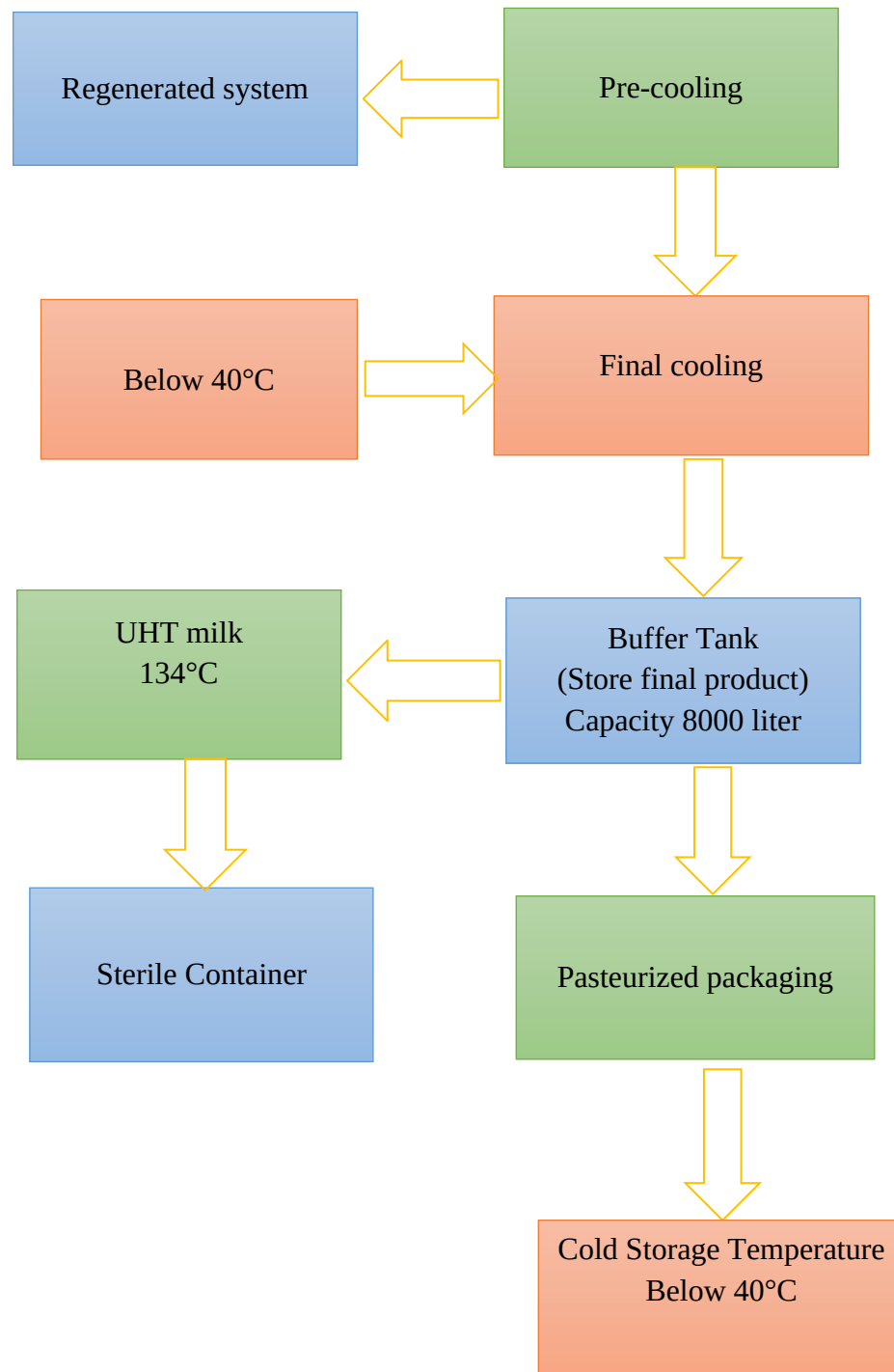
6.6 Process of milk

- From the Chilling Center's first collect the raw milk
- The Platform Principle test and the adulteration test are applied to the collected raw milk.
- A storage vat is used to chill the passed milk, keeping it at 4°C or lower.
- Retention Recombining milk with other milk or full-cream milk to keep the fat percentage at 3.5% As stated by BSTI
- The percentage of fat in raw milk is higher than in standard milk (Modulating Cream Separation and SNF)
- Milk is pasteurized for 15 seconds at 80–88°C.
- A milk homogenizer homogenizes pasteurized milk.
- The milk is cooled to 4C and stored in a tank.
- Next, the packing machine is used to take the cooled milk and Vat of Storage.

6.7 Flow diagram of farm fresh pasteurized milk and UHT milk







6.8 Lab Experiments of Dairy Products

- CLR Test
- Alcohol Test
- Sugar Test
- Salt Test
- pH Test
- Fat% Test
- Specific gravity test
- Acidity Test
- COB (Clot on Boiling)
- SMP test
- Formalin Test
- Hydrogen peroxide test
- Soda Test
- Starch Test

6.8.1 CLR test of milk:

6.8.1.1 principle

In situations where there are dishonest farm laborers, milk transporters, and avaricious milk vendors, adding water to milk can be a major issue. A few farmers might become the targets of this unlawful activity as well. Therefore, every person who buys milk should ensure that the product is pure and has not been tampered with. There is specific gravity to milk. The density of milk changes from normal to abnormal when it is tampered with, adulterated with water, or other materials are added. The purpose of the lactometer test is to identify changes in the density of milk that has been tampered with. When combined with the Gerber butterfat test, it allows the milk processor to determine the milk's solids not fat (SNF) and total solids (% TS). The Bangladesh Standards and Testing Institution, or BSTI, states that the SNF in normal milk should not be less than 8%. At 15.6°C, the average CLR of cow milk is 28 to 30. It is suspected that adding water to milk if the CLR is less than 26.

6.8.1.2 Instruments and Ingredients

- °C thermometer
- Measuring cylinder (300-500)
- Zeal's Lactometer (Cowbell®) was used at 29°C calibration temperature

6.8.1.3 Procedure

The milk sample was carefully combined and then poured into a measuring cylinder. Slowly, the lactometer sank into the milk. The final Lactometer degree (°L) that was slightly above the milk's surface was measured and noted. The temperature correction was computed if the milk's temperature deviated from the lactometer's calibration temperature (29 °C). Amounts of 0.2°L were added for every °C above the calibration temperature and deducted from the recorded lactometer

reading for every °C below it. Visual observation and farmer interviews were used to determine how cattle should be fed. Cattle breeds were identified by their phenotypic traits.

6.8.2 Sensory test of milk:

6.8.2.1 Principle

Most consumers are interested in the quality of the dairy products they buy, which they usually determine primarily through their senses, i.e. sensory evaluation. This is something that dairy. It is also useful to check the quality of other producers' dairy products from time to time. Only such a comparison provides a good basis for objectively evaluating the quality of one's products.

6.8.2.2 Instruments and Ingredients

- No chemicals are required for this test.

6.8.2.3 Procedure

Milk is tested by sensory or chemical methods.

6.8.2.4 Results

If milk contains a bad smell, is discolored and the test is not good then the milk must be rejected.

6.8.3 Alcohol test of milk:

6.8.3.1 Principle

When testing fresh milk, the alcohol test is used to determine whether the milk will clot when heated. The production of UHT milk, evaporated milk, and milk powders depends heavily on this test. Compared to the Clot-on-Boiling (COB) test, this one is more sensitive. It is predicated on the propensity of milk protein to become unstable due to disruptions in the mineral composition of milk. When alcohol is introduced, milk with high-developed acidity or higher than normal levels of calcium and magnesium components will coagulate. A positive test may also be caused by elevated albumen (colostrum milk) and salt concentrations (mastitis).

6.8.3.2 Instruments and Ingredients

- Ethyl alcohol
- Test tube

6.8.3.3 Procedure

First, fill a test tube with 2 mL of milk and mix thoroughly after adding 2 mL of ethyl alcohol.

6.8.3.4 Result

A test tube is considered to be alcohol-negative if the solution becomes homogeneous and does not adsorb on its inside surface.

6.8.4 PH test of milk:

6.8.4.1 Principle

One crucial factor to consider when evaluating the quality of milk is the pH level of milk and milk products. For instance, fresh milk should have a pH of between 6.6 and 6.8. A cow with mastitis is indicated by a higher pH value, and the sample is likely to be acidified if the pH is less than 6.5. Test strips are a quick and simple approach to determining the pH of milk and milk products.

6.8.4.2 Instruments and Ingredients

- Beaker
- PH meter

6.8.4.3 Procedure

First, pour 100 ml of milk into a beaker and insert the pH meter deep into it. Then record the reading.

6.8.4.4 Result

The pH meter of the reading is the pH of the sample.

6.8.5 Clot on Boiling (COB) test of milk:

6.8.5.1 Principle

The milk will have more acidity after boiling in the test if it is kept longer at room temperature; this is referred to as developed acidity. It is the acidity that is increased by more than 0.2%, the coagulation brought on by heat therapy, and the outcome of the separation of "calcium caseinate salt. Thus, they discuss the experiments conducted on milk that has been given an increased acidity on a boiling material.

6.8.5.2 Instruments and Ingredients

- Spirit Lamp
- Test tube

6.8.5.3 Procedure

First, pour 5 ml of milk into a test tube and heated the test tube for 2.5 minutes under spirit lamp

6.8.5.4 Result

- If the solution is heterogeneous and adsorb on the interior surface of the test tube then the milk is COB positive.

6.8.6 Soda Test of milk:

6.8.6.1 Principle

Alizarin, a compound used as a fabric dye, is derived from the madder plant's root. In Asia Minor, alizarin was first used in the tenth century. The bright red color of the madder root was also used by the Greeks, Romans, and Egyptians in ancient times. Alizarin can additionally serve as a pH indicator. Alizarin was first produced in a laboratory by chemists Grebe and Liebermann in 1868, even though it had been extracted from the madder plant's root for many centuries prior. As a result, there was no longer any need to cultivate madder roots, and the industry that had grown the plants was destroyed.

6.8.6.2 Instruments and Ingredients

- Alizarin
- Milk sample

6.8.6.3 Procedure

In a test tube, add 5 ml of milk, 5 ml of alcohol, and 2–3 drops of alizarin and give it a good shake.

6.8.6.4 Result

When milk turns a pinkish-red color, it is assumed that sodium carbonate or sodium bicarbonate has been added, making the milk unsafe for human consumption.

6.8.7 Salt test of milk:

6.8.7.1 Principle

The process of determining salt involves observing how silver nitrate reacts with sodium chloride when potassium chromate is present as an indicator.

6.8.7.2 Instruments and Ingredients

- Silver Nitrate Solution
- Dropper
- Potassium Dichromate Solution
- Test tube

6.8.7.3 Procedure

Fill a test tube with 1 milliliter of milk. Pour in 5 milliliters of the silver nitrate solution. Shake thoroughly after adding 2/3 of a drop of potassium dichromate solution.

6.8.7.4 Result

The milk is salt-positive if its color turns yellow.

6.8.8 Sugar test of milk:

6.8.8.1 Principle

Typically, sugar is added to milk to raise its solids content rather than its fat content, or to raise the lactometer reading of the milk after it has already been diluted with water.

6.8.8.2 Instruments and Ingredients

- Conc. Hydrochloric acid
- Resorcinol
- Test tube
- Water bath

6.8.8.3 Procedure

Fill a test tube with 10 ml of milk. Then 5 ml of concentrated hydrochloric acid should be added. Give it a good shake after adding 1 ml of resorcinol. Next, submerge the test tube in a water bath for five minutes.

6.8.8.4 Result

The solution has been tampered with sugar if the color turns red.

6.8.9 Fat test of milk:

6.8.9.1 Principle

Since fat determines the price at which milk is purchased and sold, it is the most significant component of milk. It aids in the detection of milk adulteration such as watering and skimming. The Gerber method is widely used in India and Europe. In this experiment, milk serum's specific gravity is increased with H_2SO_4 , which increases the difference between milk serum and fat globules. Additionally, it eliminates stickiness in milk by completely dissolving SNF. Following the application of centrifugal force to this mixture and the heat generated by the mixing of acid and milk, which causes the melting of fat, the free fat globules rise to the surface. It makes it easier for the fat particles to rise to the surface. Acid milk mixtures have a specific gravity of 1.43 and fat has a specific gravity of 0.9. When the right centrifugal force is used, this condition encourages total fat separation. The remaining, heavier serum portion is thrown toward the periphery, and lighter substances, such as butter fat, are thrown toward the center due to the application of centrifugal force. Amyl alcohol is added to the milk acid mixture to aid in the separation of fat and to stop H_2SO_4 from charging fat and sugar.

6.8.9.2 Instruments and Ingredients

- Sample bottle of milk.
- A 10 ml H_2SO_4 automatic tilt measure.
- Automatic tilt gauge for amyl alcohol, 1 ml.

- A milk pipette with a 10.75 ml capacity.
- Floating thermometer made of dairy.
- A water bath with a thermostat.
- The centrifuge made by Gerber (1100 rpm).
- Gradients on a plain neck Gerber's butyrometer
- Butyrometer support.
- A rubber stoppers.

6.8.9.3 Procedure

- Using an open mouth upwards, place the dry and clean butyrometer in a butyrometer stand
- Use the tilt measure in the butyrometer to run 10 milliliters of sulfuric acid.
- Using a pipette, carefully remove 10.75 ml of the milk sample, which should be between 15 and 21 degrees Celsius, from the butyrometer.
- Use a tilt measure to pour 1 ml of amyl alcohol.
- Use a lock stopper and a regulating or guiding pin to stop the butyrometer.
- Shake the tube thoroughly until a mahogany red color is achieved. After the butyrometer reaches 15 to 21 degrees Celsius, keep it in a hot water bath. Then, centrifuge it for four minutes at 1100 rpm.
- Remove the butyrometer by holding it upright and pointing the stopper downward.
- For a while, leave the butyrometer in a hot water bath set at 65 degrees Celsius.
- Take note of the passage. On the scale, readings should be made from the lower border of the meniscus to the bottom of the fat column.

6.8.9.4 Result

The upper level scale of the butyrometer displays the fat reading.

CHAPTER 7

CONCLUSION

7.1 Conclusion

I am elevated/animated to reminisce about my internship at **AKIJ FOOD AND BEVERAGE** Unit. Being one of the industry pioneers in our country, their unwavering dedication to production quality truly ignites my inspiration. During my tenure with the company's production and quality control teams, I had the privilege of delving deeply into various facets of their operations. This experience provided me with comprehensive insights into the food and carbonated soft drinks manufacturing process and the intricacies of maintaining quality standards. The entire staff was exceptionally courteous and supportive, and my internship mentors exhibited an unwavering commitment to ensuring my success. This invaluable experience has instilled in me the confidence to tackle future challenges in this field. I am excited to put the knowledge and skills I've acquired during this internship into my future endeavors. Beyond their commitment to production and quality control, I'm equally impressed by AFBL snacks and the aseptic Unit's dedication to sustainability and ethical business practices. Their use of locally sourced ingredients and efforts to minimize production waste showcase their commitment to making a positive impact on the environment and the local community. I was also struck by the company's emphasis on employee safety and professional development. Regularly conducted training sessions and opportunities for career growth not only benefit individual employees but also contribute to the company's overall success. Overall, my internship experience at Akij Food and Beverage Limited Unit was incredibly rewarding. I count it a blessing that I was able to collaborate and work with such a dedicated and innovative company, and I am confident that the skills and knowledge I've gained will serve me well in my future pursuits.

7.2 Learning Outcomes

- **Understanding the food and beverage industry:** Learning about industry trends, market analysis, consumer behavior, and competitors.
- **Product knowledge:** Gaining a comprehensive understanding of the company's products, their ingredients, manufacturing processes, and quality standards.
- **Operational skills:** Developing skills in production management, supply chain logistics, quality control, and efficient manufacturing processes.
- **Marketing and sales techniques:** Learning about brand promotion, sales strategies, customer relationship management, and market expansion tactics.
- **Teamwork and leadership:** Enhancing collaboration skills, teamwork abilities, and leadership qualities to effectively work within teams or lead them.
- **Compliance and regulations:** Understanding food safety standards, regulatory compliance, and maintaining a safe working environment.



Figure 16: Internship day's

STUDIES ON THE PRODUCTION AND QUALITY CONTROL OF FOOD AND BEVERAGE AT AKIJ FOOD AND BEVERAGE LTD

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