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HAZARD ANALYSIS AND CRITICAL CONTROL POINT OF ORANGE JUICE MANUFACTURING

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ABSTRACT

The Hazard Analysis Critical Control Points (HACCP) systematises the process of identifying, evaluating, and controlling risks. To be effective, HACCP must take into account all risks, including chemical, microbiological, and physical ones. However, up until this point, the majority of "in-place" HACCP processes have tended to concentrate on the control of physical and microbiological food hazards. Typically, the HACCP procedures' chemical component is either disregarded or restricted to applied chemicals, such as food additives and pesticides. Using organic chemical pollutants as examples, we explore the use of HACCP for orange juice and its chemical risks in this essay, as well as the issues that are likely to develop in the food manufacturing industry. Many of the benefits previously mentioned for microbiological HACCP processes are expected to be achieved with chemical HACCP procedures: more productive, affordable, and effective than traditional end-point testing techniques. However, chemical HACCP is unlikely to become as efficient as microbiological HACCP due to the high costs of analytical monitoring of chemical contaminants and a lack of knowledge about formulation and process optimisation as means of managing chemical contamination of foods.

Keywords: Hazard Analysis Critical Control Point, Orange Juice, Chemical, And Physical Hazards.

I. INTRODUCTION

Hazard analysis and critical control point, or HACCP, is a methodical methodology of discovering, assessing, and controlling risks to food safety. Biological, chemical, or physical substances that are reasonably expected to result in illness or injury in the absence of their control are considered food safety concerns. A HACCP system controls hazards preventively rather than reactively. Potential issues with food safety are intended to be avoided through HACCP systems. This is accomplished by identifying the inherent risks associated with a certain product or process, figuring out how to control those risks, and putting active managerial control methods in place to make sure the risks are reduced or eliminated.

HACCP is essentially a system for identifying and keeping track of specific foodborne hazards, such as those with biological, chemical, or physical characteristics that may compromise the safety of a food product. Critical control points are established based on this hazard analysis (CCPs). CCPs define the process steps that need to be under control to guarantee the food's safety. Additionally, crucial limits that outline the necessary conditions that must be met at each CCP are created. Again, the system includes monitoring and verification procedures to guarantee that any risks are minimised. A HACCP plan contains the critical control points, critical limits, monitoring, and verification procedures. Seven guidelines have been devised to help in the creation of a successful HACCP plan.

II. METHODOLOGY

• The flow chart has been created with a number assigned to each stage.

• The approach utilised to establish CCP's within this HACCP Plan has been based on the relevance of each hazard as established by the Risk Analysis Table. All stages that are repeated throughout the process have been given the same number, to avoid repetition in the Risk Analysis Table.

• The HACCP Table does not include hazards that can be managed, avoided, or completely eliminated by the use of good hygiene practises (GHP).

• As a result, these risks have been noted in the Risk Analysis Table and are not considered Critical Control Points (CCPs) in the HACCP Table. The Risk Analysis Table's definition of all additional hazards that are not

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managed by GHP as extremely significant has been carried over to the HACCP Table as a CCP. All of these risks are observed, and a log of that action is kept.

• Risk Analysis Table hazards that are deemed to be less than significant are not transferred to the HACCP Table and are not required to be monitored or documented.

TABLE: Total assessed risk = Likelihood x Severity

Likelihood	
1 = Improbable event: Once every five years	1 = Negligible: no impact or not detectable
2 = Remote possibility: Once per year	2 = Marginal impact: only internal company tarqet levels effected
3 = Occasional event: Once per month	3 = Siqnificant: impact on critical limits
4 = Probable even: Once per week	4 = Major: impact on customers (not necessarily the public)
5 = Frequent event: Once per day	5 = Critical: public health risk, public product recall.

TABLE Likelihood x Severity

Likelihood	**Severity** 1 2 3 4 5
1	1 2 3 4 5
2	2 4 **6** **8** **10**
3	3 **6** **9** **12** **15**
4	4 **8** **12** **16** **20**
5	5 **10** **15** **20** **25**

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III. MODELING AND ANALYSIS

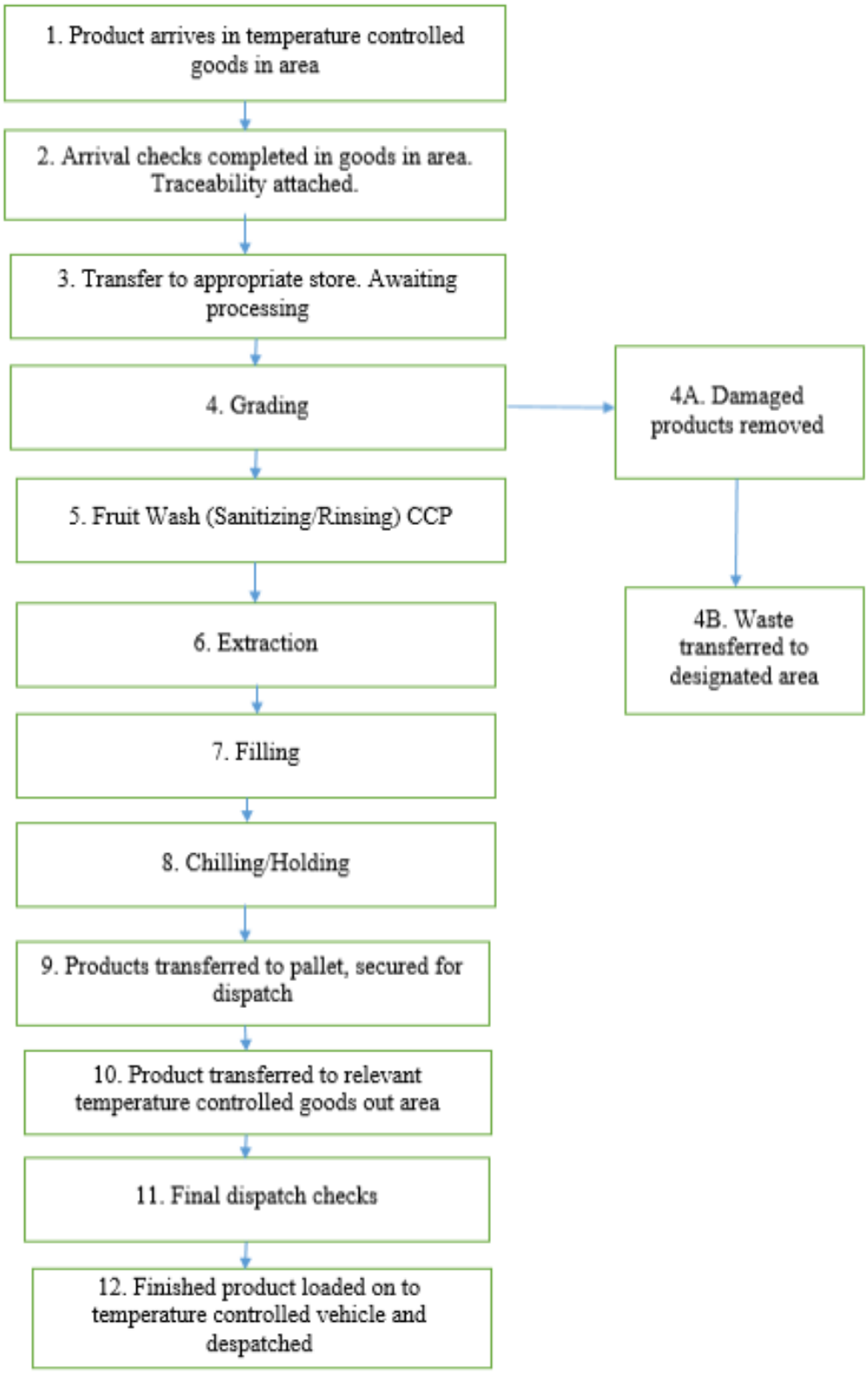

Figure 1: process chart

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IV. RESULTS AND DISCUSSION

Process Step	Hazard & Source/Cause	Likely Occurrence (High / Medium / Low)	Adverse Health Effects (H/M/L)	Control Measures
1. Product arrives in temperature controlled goods in area.	**Physical Hazards** - External contamination from rain water, bird droppings, vermin/rodents and flying insects during in loading process. - Glass contamination from internal light sources. - Pests/rodents and or Flying insects due to poor hygiene/debris build up - Physical risks from straps/thermocouples/ staples/foreign bodies found on pallets on intake. **Chemical Hazards** Chemical contamination from Chemical/ Pesticide at source of origin. **Microbiological Hazards** Microbiological contamination during process at the source of origin	Low Low Low	Medium Medium Low	Curtains/cushions fitted to all loading bays to prevent external contamination. Prerequisite programmes in place to control all named hazards, include; Daily hygiene schedules and cleaning programmes, glass policy and daily audits. External and internal Pest control programmes. EFKs in place in intake areas. All light fittings covered. Supplier Q.A.S systems and HACCP in place and verified/audited by the Technical Department to eliminate/reduce potential foreign body or Microbiological contamination. Intake inspections to identify foreign body contamination on arrival Chemical/pesticide used at source in conjunction with E.E.C/Local regulations Supplier Q.A.S in place and regularly audited: validation by way of Chemical MRL testing programme, records retained Supplier Q.A.S systems and HACCP in place and verified/audited by the Technical Department to eliminate/reduce

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				potential foreign body or Microbiological contamination.
2. Arrival checks completed & traceability attached	- **Physical Hazards** Physical contamination from Quality Inspectors - Foreign Bodies found within product and /or packaging from source of origin or during transportation.	Low	Medium	-Warehouse operatives trained in Food safety/hygiene programmes with records of training maintained and held on personnel files. Any foreign body contamination identified escalated to Management, positive release system in place and adhered to by all teams.
3. Transfer to cold store awaiting processing.	**Physical Hazards** Physical contamination from Warehouse operatives. Glass contamination from internal light sources. Pests/rodents and or Flying insects due to poor hygiene/debris build up	Low	Medium	Prerequisites in place to control named hazards include; Daily hygiene schedules and cleaning programmes, Glass policy and weekly glass audits, Pest control programmes and EFKs in intake areas maintained by external contractor, Staff awareness/training programmes in place with records of training retained/filed.
4. Grading	**Physical Hazards** Physical contamination from operator - Foreign body/Dust contamination from production environment.	Low	Low	Staff hygiene policy/programmes in place with all site staff trained and records of training maintained and retained on personnel files.
4A. Waste removed	**Physical Hazards** Physical contamination from operator - Foreign body/Dust contamination from warehouse environment.	Low	Low	Staff hygiene policy/programmes in place with all site staff trained and records of training maintained and retained on personnel files.
5. Fruit Wash (Sanitizing/Rinsing) **CCP**	**Chemical Hazards** Chemical contamination from Chemical/ Pesticide at source of origin.	Medium Medium	High High	Wash 200 PPM chlorine or Manufacturer's equivalent of like product The critical limit is established at 200 PPM or

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	Microbiological Hazards Microbiological contamination during process at the source of origin			equivalent by the appropriate manufacturer's recommendation. Monitoring: at start and every two hours by the operator and then reviewed daily by the appropriate supervisor. Corrective action: Re: Sanitize Oranges & adjust fruit Wash, minimum strength required 200 PPM or >. Staff trained of CCP procedure CCP records and training records maintained
6. Extraction	**Physical Hazards** Physical contamination from operator - Foreign body/Dust contamination from production environment.	Low	Low	Staff hygiene policy/programmes in place with all site staff trained and records of training maintained and retained on personnel files. Controlled by sanitizing
7. Filling	**Physical Hazards** Physical contamination from operator - Foreign body/Dust contamination from production environment.	Low	Low	Staff hygiene policy/programmes in place with all site staff trained and records of training maintained and retained on personnel files. Controlled by sanitising
8. Chilling and Holding	**Microbiological Hazards** Microbiological growth due to breakdown of refrigeration unit **Physical Hazards** Physical contamination from Warehouse operatives.	Low Low	High Low	Equipment inspected on daily intervals and during manufacture All staff trained in correct substance control/usage. Procedures for maintenance, refrigeration breakdown, and daily temperature checks, computerised and alarmed monitoring of refrigeration units. Since the high acidity of the juice can retard the

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				growth of bacteria, the pH will be monitored to insure it remains at a low level. Corrective actions are initiated to adjust the pH of the product when there is a deviation. Personnel hygiene policies and procedures in place with all staff aware/trained with records of training
9. Products transferred on to pallet.	**Physical Hazards** Physical contamination from warehouse operatives. Glass contamination from internal light sources. Pests/rodents and or Flying insects due to poor hygiene/debris build up	Low	Low	- At this stage of the process the product is bagged and sealed and the risk of contamination is highly unlikely.
10.Product transferred to temperature controlled goods out area.	**Physical Hazards** Physical contamination from Warehouse operatives. Glass contamination from internal light sources. Pests/rodents and or Flying insects due to poor hygiene/debris build up **Microbiological Hazards** Microbiological growth due to breakdown of refrigeration units.	Low Low	Low Low	At this stage of the process the product is bagged and sealed and the risk of contamination is highly unlikely. Prerequisites in place to control named hazards include; Procedures for maintenance, refrigeration breakdown, and daily temperature checks, computerised and alarmed monitoring of refrigeration units.
10A. Waste transferred to designated area	**Physical Hazards** Physical contamination from Warehouse operatives. Glass contamination from internal light sources. Pests/rodents and or Flying insects due to poor hygiene/debris build up	Low	Low	Personnel hygiene policies and procedures in place with all staff aware/trained with records of training
11. Finish dispatch checks	**Physical Hazards** Physical contamination from operative - Glass	Low	Low	All bay doors fitted with curtains/cushions to prevent external

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	contamination from internal light sources. Pests/rodents and or Flying insects due to poor hygiene/debris build up			contamination. Hygiene programmes in place, trailers cleaned and sanitised at regular intervals by external contractor, records retained Trailer hygiene monitored during despatch procedures
12. Products loaded on to temperature controlled vehicle and despatched.	**Physical Hazards** External contamination from bird droppings and / or rain water. **Physical / Chemical / Microbiological Hazard** Cross Contamination or Taint of finished product due to poor trailer hygiene. - **Microbiological Hazards** Microbiological growth due to breakdown of refrigeration unit on truck	Low Low Low	Low Low Low	All bay doors fitted with curtains/cushions to prevent external contamination. Hygiene programmes in place, trailers cleaned and sanitised at regular intervals by external contractor, records retained - Trailer hygiene monitored during despatch procedures Prerequisites in place to control named hazards include; Procedures for maintenance, refrigeration breakdown procedure

V. CONCLUSION

Drinks, Soft Industries that produce beverages have proven their dedication and accountability to enhancing and meeting the standards for food safety. Additionally, the successful application of HACCP benefits the manufacturer, the consumer, and the government by building a higher level of confidence and giving them more clout when it comes to completing safety assessments for new varieties of soft drinks. The goal of implementing HACCP in the facility under investigation was to produce safe food for customers while exceeding regulatory criteria. The evaluation of the bottling facility revealed that every facet of the HACCP system's seven guiding principles and 12 implementation procedures was firmly in place. The HACCP structure's execution throughout operations needs to be improved, nonetheless, based on the scores received. Retraining staff members in HACCP could be advantageous Additionally, GMP compliance was excellent, and if maintained, there would be no problems that may prevent the HACCP programme from being implemented. Since no high-risk outcome was found by the risk calculations, it appears that the theory that the application of HACCP processes ensures success in maintaining food safety was right in this case. When a complete picture is taken into account, this does not exclude food safety risks in the facility under investigation.

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