

CHAPTER 4

DEVELOPING FIVE PRELIMINARY STEP OF A HACCP PLAN

I. INTRODUCTION

This chapter will present the first five step of HACCP plan. Although these five steps are not included in the principles of HACCP, they are necessary as preparatory or preliminary steps to proceed the later steps. The five preliminary steps in this chapter are:

Step 1 Bring together HACCP resources/assemble the HACCP team.

Step 2 Describe the product description.

Step 3 Identify the intended use and consumers of the food.

Step 4 Develop a process flow diagram.

Step 5 Verify the diagram in the operation it is meant to represent.

II. ASSEMBLY THE HACCP TEAM (STEP 1)

In order to select members of HACCP team, the most important thing is the commitment from every level of management, which is necessary for implementing any quality system. The HACCP plan may be more difficult to implement without a firm commitment. Top management should inform all employees the intention to apply HACCP system in the company. All members involved in developing HACCP plan must assure that they will use HACCP in their works.

This step is about assembling HACCP teams that have knowledge and skills to develop HACCP plan. The team should consist of persons from different departments, including with representatives from production, sanitary, laboratory, engineering, and inspection. The team members must have enough experience and skills because they will record, inspect and evaluate technical data, and identify hazards and critical control points. In a small factory, one person might do more than one jobs, this may be required a consultant or other members from outside (e.g. an expert in public health risks associated with the product/process). However, a plan that is developed totally by outside sources may lack support by the plant personnel. HACCP team should contain members who relate to daily activities of production process since these people are familiar with specific changes and limitation of works. Their representation will increase a sense of ownership among those who will have to implement the plan. In addition, it will be a bonus for developing HACCP plan if those employees have some knowledge of the applied aspects of food microbiology and of HACCP principles and techniques, although this knowledge can be supplemented by outside experts or the use of guidance materials or technical literature. The members of HACCP should be selected from:

- person who will be involved in hazard identification
- person who will be involved in CCPs determination
- person who will monitor critical control points
- person who verify operations at critical control points
- person who will examine samples and perform verification procedures

HACCP team should consist of members who have a basic understanding of the following knowledge.

- the technology/equipment used on the processing lines
- the practical aspects of food operations
- the flow and technology of processes
- applied aspects of food microbiology
- HACCP principles and techniques

The Case Study

In the case company, the HACCP team consists of Heads of all departments and Plant Manager in order to bring as much knowledge to the table as possible. Assistant Production Supervisor is included in the team because of his specialty of physical inspection of rice. Top management will involve in the meeting randomly. Although we try to gather as much knowledge as possible, some staffs are not included in the team such as packing line supervisor and loading supervisor since at that time it is the high season of rice exporting. Thus, it is necessary to select person who can sufficiently spend their time for developing HACCP plan. Moreover, they can be trained by the production supervisor. In the team, there is no outside expertise but we can ask for the information and suggestion from the professor at Rice Research Center at Phatum Thani to adequately analyze all biological physical and chemical hazards. The HACCP team in the case factory consists of seven staffs as shown in Table 4.1. The employee or employees writing the HACCP plan should understand some basic things about the establishment: The technology and equipment used in processing lines; the practical aspects of food operations; and the flow of the process in the plant. Table 4.1 illustrates names, positions, and background or skills of the members. For setting up HACCP team, it is necessary to issue the command as an official document as shown in command no.12, since all members and employees will perceive the serious intention of the company for developing the system.

TABLE 4.1 MEMBERS OF HACCP TEAM

Name	Position/Department	Background/Skills
Mr. Adisai Athiphanumphai	Plant Manager	Engineer
Mr. Teerapol Pichitronnachai	Supervisor/Administration	Rice Bags, Estimation of production and stocks.
Mr. Tawee Daeng-manee	Supervisor/Safety	Safety, Foreman, and Construction
Mr. Aimim Nasa	Supervisor/Technical	Technician
Miss Suchada Rojsang	Supervisor/Production	Production planning
Ms. Virairat Naktomya	Supervisor/Quality Control	Chemical Inspection
Mr. Manop Meesang	Assistant/Production	Physical Inspection

The qualification or education background of each member is shown in the following table.

TABLE 4.2 THE QUALIFICATION OF HACCP MEMBERS

Position/Department	Qualification
Plant Manager	Engineering Management/Experience in rice industry and managing a food factory.
Supervisor/Administration	Experience in administrative work and documentation/Stock control and management/Verify the amount of incoming and outgoing materials.
Supervisor/Safety	Have governmental certification for safety officer in a factory/ Background in construction field.
Supervisor/Technical	Expert in rice processing machine/Understand the preventive maintenance program.
Supervisor/Production	Good in production planning/Physical inspection of rice.
Supervisor/Quality Control	Good in Laboratory analysis and chemical properties of rice/Understand quality system (for verification and audit).
Assistant/Production	Deep knowledge of physical characteristics and inspection of rice/Sources of rice and suppliers.

COMMAND

No. 012

Date 26/08/42

Subject: Assemble HACCP team

The company agrees to set up HACCP team for developing HACCP system (Hazard Analysis Critical Control Points) in the factory. The members are as follows.

- | | | |
|---------|----------|-----------------|
| 1. Mr. | Adisai | Athiphanumphai |
| 2. Mr. | Teerapol | Pichitronnachai |
| 3. Mr. | Tawee | Daeng-manee |
| 4. Mr. | Aimim | Nasa |
| 5. Miss | Suchada | Rojsang |
| 6. Ms. | Virairat | Naktomya |
| 7. Mr. | Manop | Meesang |

The members must cooperate to develop HACCP system in the factory from now on.

Signature.....

(Mr. Adisai Athiphanumphai)

Plant Manager

Non-confidential document

III. PRODUCT DESCRIPTION AND INTENDED USE (STEP 2 AND 3)

3.1 Describe Product (Step 2)

HACCP team must describe product description in detail in order to help for identifying all hazards that can be occurred in end product, including with ingredients, production process, packaging, and others that can used to produce product. Product description should contain product name, ingredients, and factors that are important for microbiological such as water activity (a_w), Ph and etc. Furthermore, it should contain production process and technology used, appropriate package, intended use, and target group.

The most important thing to make a good product description is that HACCP team must familiar with product characteristics and the use of product; for example, the consumers that may have risk when consume the product. HACCP team must understand product in detail as much as possible, and must know all ingredients or components in product and production processes. This information will be very significant especially for microbiological hazard because the team has to evaluate whether ingredients or product characteristics relate to the ability to grow of any microbiological hazard.

Before recording any detail of product description, HACCP team must determine these following issues.

1. *Product characteristics*

- Raw materials and additives
- The probability that microbiological hazards can contaminate in those raw materials and what are these microorganism.
- Is there any preservative used? Is it used in acceptable level? And can this acceptable level be appropriate for achieving technical objectives?
- The influence of acid or base condition of product (Ph) to protect or stop the growth of microbiological hazards.
- Water activity of the product whether it can stop the growth of microbiological hazards.
- Oxidation/reduction potential of the product

2. *Checklist of production process*

- The chance of contamination during arrangement, processing and storage.
- Related microorganism and chemical hazard which will be destroyed by cooking or heating.
- Related microorganism and chemical hazard that can contaminate after the food product has passed heating process.

- The need for more seriously controlled processes.
- The processes are set up on the basis of scientific principle.
- The effect of packaging to the survival or growth of microorganism.
- Time consumed in every production process and storage.
- Conditions to control products during distribution.

3.2 Identify Intended Use (Step 3)

The use of products should be identified on the basis of the use of general users or end consumers. HACCP team must specify where the product is placed and how the target group uses it. It is very important when the target group of the product is in high-risk groups such as the olds, pregnant, allergic, and infant.

The Case Study

The HACCP team must create a complete description of each food product to assist in the identification of possible hazards that may be inherent either in the ingredients or in the packaging materials used in the formulation of the product. Most team members are familiar with the product properties, destination and usage due to long experience in rice business. However, some scientific information need to be gathered from outer sources such as Rice Research Center at Phatum Thani in order to create a suitable product description. According to product description form in Table 4.2, we can describe the product description in detail as follows.

- ◆ *Product name (common name).* In order to separate our product from the other type (sold in bulk), we decide to add the word “bag-packed” to present that the product can be sold in retail shop and ready to cook.
- ◆ *Important end product characteristics - properties or characteristics of the food under review which are required to ensure its safety (i.e. a_w , pH, preservatives, etc.).* The properties or characteristic of rice are that it is dry and can be kept without preservation for a long time. Another useful information is water activity (a_w), which indicates the amount of water in the product that can be used by microorganism to grow up. Therefore, the lower the water activity, the lower the chance to occur pathogen. Since rice is normally dry, water activity of rice is less than 0.6.
- ◆ *How it is to be used (i.e. ready-to-eat, for further processing, heated prior to consumption).* Although the way of cooking depends on the individual preferences, the objective to present how to cook rice is to ensure that consumer will cook rice in such a way that can eliminate biological hazards. In this case, we decided to present the most ordinary cooking direction of Thai Hom Mali rice.

- ◆ *Type of package, including packaging material and packaging conditions (i.e. modified atmosphere).* All types of packaging should be listed under which the product will be sold. Moreover, this should include bulk packs for further processing down to consumer size packages. The packaging material of the case product is a plastic bag. There are two kinds of plastics used for packaging, which are Polyethylene (PE) and Polypropylene (PP). PP has lower quality for packaging because of higher air permeable characteristic. Nevertheless, the case factory often uses PP for its product packaging due to lower costs.
- ◆ *Shelf life, including storage temperature/humidity.* The team members will discuss about the anticipated shelf life of the product under normal marketing conditions at given storage temperature and humidity, as applicable. Microbiological challenge studies may be required to validate the safety of the chosen shelf life if such information is not available. In this case, we decided to determine the shelf life of the product at 2 years although uncooked rice can be kept far longer than that. The main reason belongs to product quality will drop due to the occurrence of insects and the fainter smell if it is kept too long. Furthermore,
- ◆ *Where it will be sold (i.e. retail, institutions, further processing).* The places where the product is usually sold are in retail shops such as Supermarket, Restaurant, and other Asian stores in Europe and USA.
- ◆ *Labeling instructions (i.e. handling and usage instructions).* Any safe handling and usage information pertinent to the product should be indicated and compared to the generic model. However, there is no labeling instruction on the rice bags now.
- ◆ *Special distribution control (i.e. shipping conditions).* Describe any special controls required during shipping and storage e.g. temperature, humidity. Since rice is a low-risk product, there is no special distribution control for rice.
- ◆ *Target Group.* This is the part of identifying intended use of the product. The product can be consumed by all types of consumers, including with high-risk consumers (old, pregnant, and child) without any hazards.

TABLE 4.3 PRODUCT DESCRIPTION AND INTENDED USE

1. PRODUCT NAME (s)	BAG-PACKAGED RICE
2. IMPORTANT PRODUCT CHARACTERISTICS (OF END PRODUCT) (a_w , Ph Preservatives,....)	$a_w < 0.6$, No preservative, Dry, and has fragrant smell
3. HOW IS IT TO BE USED?	1 cup of rice, rinsed 1¾ cups of water. Cook for 20 minutes or until water is absorbed.
4. PACKAGING	In Plastic bags (PE or PP)
5. SHELF LIFE	2 years
6. WHERE WILL IT BE SOLD?	Supermarket, Restaurant, other Asian stores in Europe and USA
7. LABELLING INSTRUCTIONS	
8. SPECIAL DISTRIBUTION CONTROL	
9. TARGET GROUP	GENERAL CONSUMER

IV. FLOW DIAGRAM (STEP 4 AND 5)

4.1 Construct Flow Diagram (Step 4)

Flow diagram is very helpful for identifying ways of contamination during processes and proposing ways to control. Moreover, it can make the discussion among team members easier. The review from incoming materials to the production process can make it easier to identify and control hazards in HACCP system.

The following flow diagram should be made up of interview, observation of production processes, and other sources of information such as blueprints. Flow diagram should determine every important process from inspection of incoming materials to delivery. For one type of products, flow diagram must have enough useful details for hazard identification, but it should not contain too many details that may cause flow diagram a lot of trivial points.

In order to have complete information, we should consider details and gather data from each process. We should consider these following data from the production process.

- Detail of components or ingredients and packaging (Biological, Chemical, and Physical data).
- Sequences of all processes (including raw material).
- Condition of flow of liquid and solid.
- Flow diagram of reworks or defected products.
- Designed characteristics of equipment.

Plant Layout

Plant layout should be drawn in order to understand product flow and employee traffic in each production line. Moreover, it should illustrate direction of product transportation from receiving raw materials, storage, and packaging, to delivery to customers. For presenting direction of employee traffic, the layout should include path of employee, including with changing room, washing room, and canteen. Furthermore, it should identify the position of washing and cleaning tools.

In summary, we should include these following information into plant layout.

- Direction of employee traffic
- Lines that may have chance to occur cross contamination
- Zoning area
- Line of product flow, ingredient, and packaging
- Hand-washing area, toilet, cleaning room, changing room and canteen

4.2 On-site verification of flow diagram (Step 5)

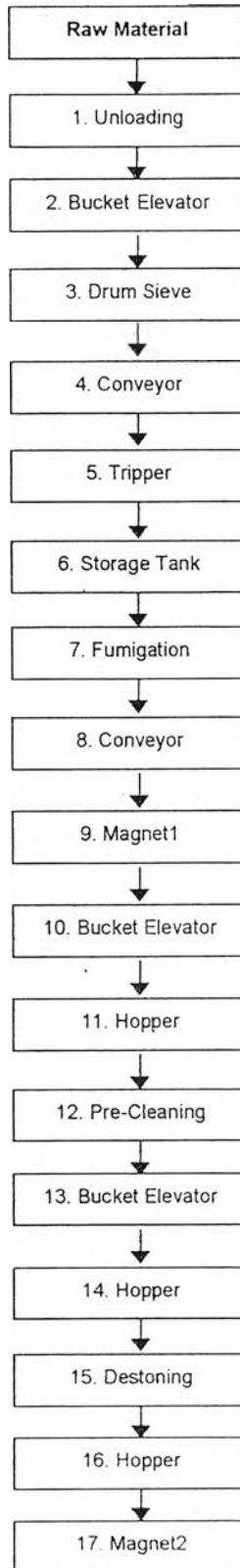
Once the Process Flow Diagram has been drafted, it must be verified by an on-site inspection for accuracy and completeness. This will ensure that all the major process steps have been identified. It will also validate the assumptions made with respect to the movement of product and employees in the food premise.

The Case Study

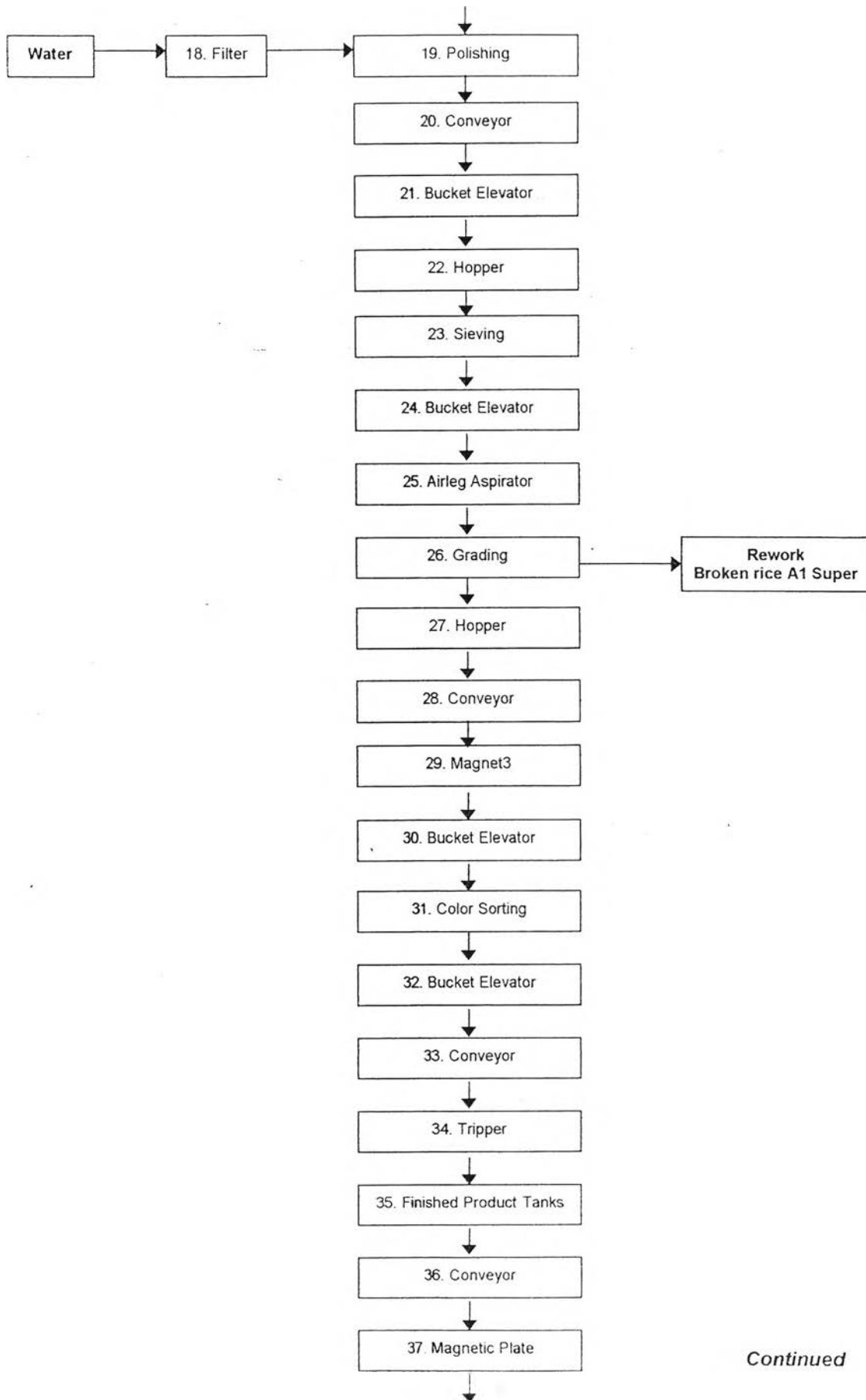
In the case study, a process flow diagram is constructed to identify all the steps used to prepare the product from receiving through final shipment that are directly under the control of the establishment as shown in Figure 4.1. There are 48 steps of the production processes in the diagram. This also includes steps that occur before or after the processing occurs in the establishment. For the verification of the process flow diagram, all members of the team had actually walked to the production line and looked at each step of the production processes. Consequently, we found some missed steps, which are magnet1, magnet2, and airleg aspirators. Therefore, the verification is very useful to make an accurate flow diagram although it is drawn by the person who works in the plant everyday. He may miss something he sees everyday until he never notices them.

After constructing a full process flow diagram, the process step description is created to describe each step of processes to make all members understand all processes. The process step description is illustrated in Table 4.3.

FIGURE 4.1 FLOW DIAGRAM OF THE CASE FACTORY



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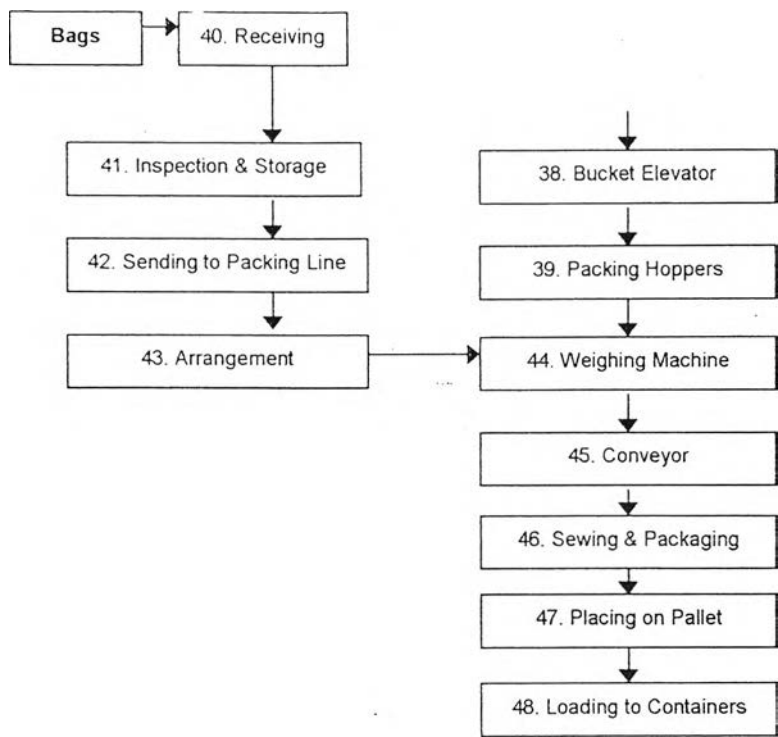


TABLE 4.4 PROCESS STEP DESCRIPTION

No.	Process Step	Description
0	Raw materials	-
1	Unloading raw materials	Unload raw materials from truck or stockpiles in order to storage in raw materials storage tanks.
2	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
3	Drum sieve	This step uses wide mesh sieve (look like a roller) for separating big rope and other materials
4	Conveyor	Transport raw material during the process through belt conveyor
5	Tripper	Used as a change valve for switching or selecting the tank to keep raw material.
6	Storage tank	Store raw material in sealed tanks.
7	Fumigation	Aluminium Phosphide is used to get rid of insects that adulterate rice. This step is done by putting fumigation (tablets) in a tray and waiting until they disintegrates. The fumigation is circulated by a blower.
8	Conveyor	Transport raw material during the process through belt conveyor
9	Magnet 1	Magnet is attached at the end of conveyor to get rid of metal.
10	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
11	Hopper	A hopper is used to store work-in-process during each machine.
12	Pre-cleaner machine	A sieve is used to separate large and medium materials such as rope, wood, and paper from product.
13	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
14	Hopper	A hopper is used to store work-in-process during each machine.
15	De-stoner machine	This machine is used to separate stone, glass or other materials that are heavier than rice. It uses air pressure to blow rice up, and vibrates to move other materials to the back of the machine.
16	Hopper	A hopper is used to store work-in-process during each machine.
17	Magnet 2	This magnet is installed on the top of polishing machine to reduce the number of metal.
18	Filter	Filter is used to clean water before use in polishing process.
19	Rice polisher	This machine makes rice glossy by making rice polish to each other and adding little water to reduce temperature.
20	Conveyor	Transport raw material during the process through belt conveyor

No.	Process Step	Description
21	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
22	Hopper	A hopper is used to store work-in-process during each machine.
23	Sieving machine	Separate very small size of rice out of the product such as small broken grain and starch. The machine works on the basis that rice will fall vertically and smaller grain should have shorter diameter.
24	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
25	Airleg Aspirator	Divide rice to each grading machine equally.
26	Grading	<p>Separate rice according to the length of rice grain by using rollers that have different size of holes. The different sizes of holes in each roller will allows rice that have smaller sizes fall into them. Thus, rice can be separated according to their length as follows.</p> <ul style="list-style-type: none"> • More than 6.0 mm. • From 5.25 to 6.0 mm. • From 4.5 to 5.25 mm. • Less than 4.5 mm. <p>Product less than 4.5 will be brought to rework in production line of broken rice</p>
27	Hopper	A hopper is used to store work-in-process during each machine.
28	Conveyor	Transport raw material during the process through belt conveyor
29	Magnet 3	This magnet is installed at the end of the conveyor to reduce the number of metals.
30	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
31	Color Sorter	This machine detects the light intensity of rice when they pass fluorescent bulbs. Then, any material that is darker than rice will be ejected by air-ejectors.
32	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
33	Conveyor	Transport raw material during the process through belt conveyor
34	Tripper	Used as a change valve for switching or selecting the tank to keep raw material.
35	Finished-product storage tanks	Store finished products that already passed production process.
36	Conveyor	Transport raw material during the process through belt conveyor
37	Magnet 4	This is a plate magnet installed over the belt conveyor before product will be transported to packing tanks.

No.	Process Step	Description
38	Bucket Elevator	Bring products upward to convey them to other places by the use of static force.
39	Packing tanks	Store products for separating to each packaging line.
40	Bags receiving	Inspect and receive bags from suppliers
41	Inspect & store bags	Test quality of bags (color and smell), and size of bags. Store bags of the racks.
42	Sending bags to packing line	Sending bags to bag-arrangement area.
43	Preparing rice bags	This step is used for preparation of bags by putting inner bags inside polypropylene bags. (This step is only done when the bags are polypropylene.)
44	Weighing machine	Fill rice into rice bags according to specified sizes such as 5 kg, 10 kg and etc.
45	Conveyor	Transport raw material during the process through belt conveyor
46	Sewing and Packaging	Sew rice bags after filling rice. Sometimes it is necessary to pack the bags in boxes. This step includes miscellaneous items such as ribbons, barcodes, and medal.
47	Placing on pallet	Bags that already packaged will be placed on a pallet (1 tons per pallet), and brought to stockpiles.
48	Loading to containers	Products will be transported by forklift and placed in front of containers. Then, workers will load the goods into containers.