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THE EFFECT OF TERTIARY PACKAGING ON DISTRIBUTION

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Abstract: Packaging as an outbound process in warehouse plays important roles in product safety such as avoiding lost and damaged product or inner packaging. In this study, there were 1.11% customer complains in average each month that relates to damaged and lost product. This complains happened because there was no tertiary packaging during the shipment: land, water and air transports. The properties of tertiary packaging must be water resistant, lightweight and cheap, then polymer material matched these requirements, specifically was woven plastic sack that made of polypropylene (PP). After tertiary packaging implementation, the customer complains decreased to 0%. Other considerations by using this material are benefit-cost and time. Costs incurred are investment cost and operational costs and benefit are risks minimization such as lost and damaged products. There will also be packing process time around six minutes but tertiary packaging will shorten loading and unloading time. The objective of research is to minimize customer complain which is mostly caused by poor packaging. This research specifically studies tertiary packaging effect on distribution.

Keywords: Tertiary packaging, costs, time, shipment

INTRODUCTION

The packaging industry is one of the fastest growing sector in the world economy and expected to grow around 3% per year. Asia is the largest market and accounts for 40.6% of global packaging consumption in 2018 [1]. Packaging is defined as a product promotion or product protection that relates to logistics [2] and as a part of logistical systems [3], it means delivery must be safe to the final customer in good condition, and without packaging, materials handling would be a messy, inefficient and costly exercise, and modern consumer marketing would be virtually impossible [4].

There are many categories of packaging which are based on raw materials such as paperboard, flexible and rigid plastic, metal, glass and other [5], but plastic packaging has become popular in the industrial sector because of their special properties such as flexibility to shape according to needs; lightweight and easy to transport; durability; safe from chemical contamination and its impacts; sealability; weather and temperature resistance; water resist; and more importantly, it is cheap [6]. When the goods combined with packaging is known as a packing process.

According to [7], there are two physical processes in warehouse:

- inbound (receiving and putaway), and
- outbound (order picking and checking, packing and shipping)

which outbound process is more labor intensive. In packing process, each product is handled and checked in order to produce high accuracy and to minimize complain and return from the customer.

Packing contributes 23.2% in distribution of costs and 28.8% in distribution of working time in distribution centers where storage and picking contribute 45.9% and 34.7% [8], it means almost 70% of cost is resulted from outbound process and of course it is important for companies to reduce this cost. In this paper, we focus at the organization that is running its business in fashion and apparel of baby and kids cloths, and now, it has a packaging problem.

Every month, there were some complains from customers about damaged packaging that could possibly cause lost product, torn primary packaging, and dusty product. All complains happened when the products were shipped to out of town, it can be different islands or different towns, in other words, when the product was sent by third party logistics (3PL).

The objective of research is to minimize customer complain which is mostly caused by poor packaging. This research specifically studies tertiary packaging effect on distribution.

MATERIALS AND METHODS

Types and Function of Packaging

There are three types of packaging: primary, secondary and tertiary.

- Primary packaging can protect the product inside and is removed from the product by the user at the time of its usage.

- Secondary packaging helps in transportation of goods and should be easily removed so that primary packaging is not harmed when opening the product.
- Tertiary packaging sometimes described as transport packaging is necessary for producers as it helps in handling, storage and transportation of goods [9, 10]

Materials and Components of Packaging

Materials packaging that commonly used are plastics, paper, paperboard, metal, glass and wood. Plastic is the most common packaging option because it is light, easy to shape, durable, chemical resistance, suitable for coloring and labeling, and cost effectiveness option of packaging material [11].

Based on the type of material, the plastics/polymers segment is valued for profitable growth.

Regular plastic polymers that commonly used in packaging are as follows:

- Polyethylene (PE) is available in low density (LDPE) and has a low melting point and does not provide moisture blockade.
- High Density (HDPE) is generally used for bottles and tubs. It has a high melting point although it cannot take oven heat. It has high chemical resistance but cannot be used for aerated drinks.
- Linear Low Density (LLDPE) plastics are mainly used as seals in bottles and pouches.

Polypropylene (PP) has a high melting point and is durable for making lids, dispensers, bottles, jars, cartons, trays, etc. Polypropylene typically have higher melting point than PE yet they are not 'oven-able' and are better suited to hot fill products. Most food packaged and water bottles are made using this plastic, and this plastic. This kind of plastic is considered safe and can be easily recycle. The recycling code is 5.

Woven Plastic Sack - Polypropylene

PP is the lightest weight polymer and has a good rigidity and surface hardness. PP is better than PE in chemical resistance and grease resistance [12]. PP has an excellent physical, mechanical, and thermal properties when used in room temperature, relatively good resistance to impacts, high temperature resistance which is better than PE [13]. Woven plastic sacks can be made from PP. The strength and durability of woven plastic sacks produce reliability for containing and carrying a wide range of materials. Its waste was collected, cleaned and recycled by a complicated process [14].

RESEARCH METHODOLOGY

The first step is to formulate the problem currently exist at the company. In this stage, we investigate the main problem that cause the box damaged. After finding the main problem, we have to know the root cause and give the best solution from potential solutions. The framework of research is in figure 1 below:

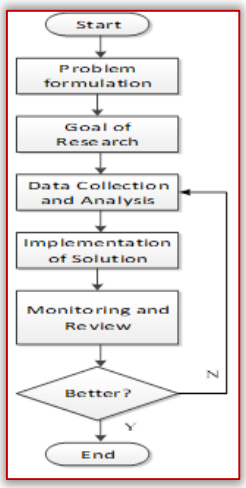

Figure 1. Framework of Research

RESULTS AND DISCUSSIONS

Finding the root cause of the problem

From January 2022 to November 2022, there were two to three complains per month. All complains were about damaged packaging and lost products. Figure 2 showed damaged packaging that received by one of the customers.

As a one of the top five branded fashion for baby and kids, of course this company must do finding the root cause of the damaged packaging problem.

Figure 2. Damaged secondary packaging

Table 1. Data of complains

Month	Number of item complained	Item qty shipped	Pct complain
Jan	9	206	4.37%
Feb	1	302	0.33%
Mar	2	384	0.52%
Apr	2	204	0.96%
May	2	250	0.80%
Jun	3	382	0.79%
Jul	2	442	0.45%
Aug	4	411	0.97%
Sep	2	364	0.55%
Oct	3	305	0.98%
Nov	4	274	1.46%
Average	3.09	320.36	1.11%

Although, the percentage of complain was under 1% per month in average, the company needed to know why and to solve the problem.

The existing conditions of product were:

- The product – baby or kids cloths were packaged by primary and secondary packaging. Primary packaging used was transparent plastics and secondary packaging used was one layer - carton box.
- The shipment of product was transported by truck or container. There were four to seven piles in a box. When the shipment was moved by water mode transportation, the humidy was higher and affected secondary packaging
- There was no tertiary packaging so that the carton box was easily scratched, torn and potentially damaged. If the carton box was torn then, the product was easily lost.
- Each carton box was moved manually when loading and it frequenty happened from seller to buyer.

From these conditions, we concluded that primary and secondary packaging were not enough, then the tertiary packaging was needed to avoid this damage. The properties of tertiary packaging must be water resistance in order to avoid humidity, lightweight in order to minimize the transportation cost, and good resistance to impact in order to avoid shock. From these properties, the most suitable material was polymer or plastics and we choose to use the woven plastic sack as a tertiary packaging.

Cost considerations

It is very important for organization to analyze cost that arised from tertiary packaging. Costs that possibly arised are:

- investment cost: sewing machine
- operational costs: sewing thread, plastic sack, label, and wage for operator

These costs will minimize some risks during the journey from warehouse to customer such as damaged product, lost product, and returned product from customer

Time considerations

When tertiary packaging is used, there will be additional time for outbound process, it is packing time. The details are as follow:

- To insert a carton box into plastic sack = 30 seconds. Maximum capacity is 8 carton boxes. Time estimation per plastic sack = 4 minutes
- To sew a plastic sack = 1 minute
- To attach a label to a plastic sack = 18 seconds

Normal time = (inserting time+sewing time+attaching label time) x rating

Normal time = (4 minute + 1 minute + 0.3 mi-nute) x 1.1 = 5.83 minutes

Standard time = normal time x allowances

Standard time = 5.83 x 1.1 = 6.41 minutes

Allowances is intended to worker for recovery from fatique and relaxation.

From this, we know that standard time for packing one plastic sack is 6.41 minutes. Although there is an additional packing time but this tertiary packaging – plastic sack will shorten loading time in warehouse and unloading time at the destination, because one plastic sack consists of 8 boxes, on the other hand, without tertiary packaging, loading and unloading time will be longer because the operators will input the boxes into the truck one by one.

Implementation stage: Implementing the usage of tertiary packaging

There are some steps for packing the secondary packaging. The steps are:

- Several carton boxes are put into plastic sack, the dimension is 110 cm x 150 cm. The amount of carton boxes that can be inserted into the plastic sack depends on dimension of carton box. Generally, there are 4 to 8 boxes per plastic sack.

Figure 3. Carton box in plastic sack

- The plastic sack is sewn

To avoid undesirable things and to guarantee the customers receive what they order, the plastic sack is sewn by an opera-tor that shown in figure 4.

Figure 4. Tertiary packaging is sewn

- Label is attached on plastic sack. Label consists of name of customer, destination and name of product. This package is sent by 3PL whether water transport, land transport, and air transport.

Post Implementation Stage

After doing the research, now the idea would be implemented for all shipment in December 2022. There were 220 items that shipped to the customers. There was no complain about damaged packaging. From this data, Tertiary packaging effectively prevents loss and avoids carton box from getting dirty.

Table 2. Number of complains per month

Month	Number of item complained	Item qty shipped	Pct complain
Jan	9	206	4.37%
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Sep	2	364	0.55%
Oct	3	305	0.98%
Nov	4	274	1.46%
Dec	0	220	0.00%
Average	3.09	312.00	1.02%

Figure 5. Complains from Jan to Dec 2022

The results of tertiary packaging implementation will be monitored every month and become one of the warehouse's key performance indicator (KPI).

Further research can be extended from this topic and will explore other tertiary packaging and its effect.

CONCLUSION

Decreasing customer complain about damaged packaging can be done by giving an additional packaging - tertiary packaging and it is plastic sack that made from polypropylene (PP). PP plays important roles for preventing damaged packaging, product loss, and dirtiness because it has properties that matches requirements such as water resistance, lightweight, good resistance to impact, and cheap. After implementing the tertiary packaging, the customer complain on damaged packaging was decreasing to zero.

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