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Implementation kaizen method for reducing losses percentage of octopus frozen processing at PT. XYZ Makassar

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Abstract. PT. XYZ is one of the companies in Makassar which engaged in the processing of octopus commodity. This study was aimed to identify factors contributing to the losses using kaizen method in a raw octopus processing industry. The factors contributing to the losses were identified from direct observation during octopus processing and analyzing company's data records from February until April 2018. The direct observation on gutting employees discovered the average shrinking size for A grade (2000 g-up) was 9.1%, B grade (1000-2000 g) was 10%, and C grade (0-1000g) was 10.6%. Inconsistencies were found after analyzing the data records at the gutting stage. While the standard gutting percentage is 12% on all octopus raw material sizes, the actual average gutting value was 13.7%. The results suggest that it is possible to establish a higher standard for optimizing corporate profits. The saving gained per 1% weight on C grade was estimated Rp 758,240,000,-/year while B grade was Rp 996,544,000,-/year, and A grade was Rp 1,191,520,000,-/year. These savings can be achieved by the addition of supervision during gutting process and sortation purchasing employee, training for employee awareness and work system applied by the company.

Keywords: kaizen method, losses, octopus

1. Introduction

Statistics of the Fish Quarantine and Quality Control Agency (BKIPM) in February 2018 reported Indonesia was among the biggest fish producer countries with volume of export 80,244 tons (47.59%), imports 31,954 tons (18.95%), domestic entry 10,799 tons (6.40%), domestic came 42,660 tons (25.30%) and transit 2,956 tons (1.75%). Indonesia's daily export value was 2,865.86 tons. The export consists of several products, including octopus. Octopus was ranked 9th with export value 2,640.8 tons or 3.29% from total export value [1].

These statistics indicate marine fishery products can support Indonesian economy. The large amount of fish in Indonesian waters makes it as one of the most reliable export commodities to increase country's foreign exchange [2] and this sector can be a source of national economic growth [3].

PT. XYZ Makassar, South Sulawesi is a seafood processing company with one of their superior commodities is frozen raw octopus. In the implementation of the production process there are still various obstacles that cause less than the maximum profit gained, due to discrepancies in the percentage of work losses as compared to the standards set by the company.



The main goal of "kaizen" is to eliminate waste that does not provide added value to the products or services. The waste needs to be eliminated because it causes unnecessary costs that reduce the profits [4]. Thus, the production process that takes into account quality will produce products that are free from damage. This means avoiding the company from generating waste and inefficiency. So the cost of production is low [5].

2. Research Methods

The main data for this research were flow of activities in processing raw materials (raw octopus) until end products (i.e. frozen octopus). In the processing room, information and data of non-compliance for employee factors, raw materials, processing methods, work systems, were recorded. Observation was carried for every stage where activities might had contributed to shrinkage and caused loss that eventually led to the reduction of company profit. Other data included company's production data, literatures and publish researches relevant to the objective of this research. In addition to the direct observation, interviews were made to company's field supervisors and other officers.

Company's production data were analyzed to identify presence of any discrepancy to the company standard or objective that needed to be investigated. This problem identification was carried using Microsoft Excel. After consultation and considering potential corrective action and implication on company profit, some discrepancies that were then selected for further investigation. Data from direct observation on the company activities at the fish processing unit were used for calculation employee's productivity.

For each problem defined from selected discrepancy, root problem(s) were identified using fish bone diagram. The diagram depicted 4M approach which included results from observations on man (human/employee), management, methods, materials (raw materials) on predetermined non-conformities that led to the root of the problems which company wanted to solve. After defining the root problem, the authors attempted to identify all potential solution with an objective of correcting the non-conformities. The criteria of a potential solution was action that can be done mostly by the company. Once the solution was selected to be the recommendation, the authors estimate the value of the final products (i.e. frozen octopus) if the company apply the recommended solution. Base on the calculation of the estimate, then the company may take some actions accordingly.

3. Results and Discussion

3.1. Discrepancies

Incompatibility of shrinkage values was found at the stage of the gutting and thumbing process (table 1). The shrinkage value was calculated as portion of weight difference between before and after processing to the weight before processing (%). The company set the maximum the shrinkage at gutting process is 12% and that at thumbing process is 6%. From the 18 observation days, in the gutting process there were only two days with shrinkage below 12% (i.e. April 25th and 26th 2018) meanwhile for the thumbing process there was only one day with shrinkage below 6% (i.e. April 26th 2018). This statistics indicated that in April 2018 the discrepancy occurred almost every day. The worst discrepancy in the gutting process was 17.6% on April 3rd 2018; the gap was 5.6% above the standards set by the company. During the stirring process, the worst discrepancy was 9.1% on April 3rd 2018; the gap was 3.1% above the standards. The implication of such discrepancies were significant when calculating the amount of products loss.

Table 1. Non-compliance with company standards.

| No | Date | Gutting (kg) | | Gutting Losses (max 12%) | Flower before thumbler (kg) | Flower after thumbler (kg) | Losses thumbler (max. 6%) |
|----|------------------------|--------------|-------|--------------------------|-----------------------------|----------------------------|---------------------------|
| | | Before | After | | | | |
| 1 | Monday, 2 April 2018 | 8891 | 7542 | 15.2% | 951 | 874 | 8.1% |
| 2 | Tuesday, 3 April 2018 | 8463 | 6978 | 17.6% | 128 | 116 | 9.1% |
| 3 | Wedne, 4 April 2018 | 5479 | 4619 | 15.7% | 351 | 322 | 8.4% |
| 4 | Thursday, 5 April 2018 | 7396 | 6204 | 16.1% | 531 | 488 | 8.1% |
| 5 | Saturday, 7 April 2018 | 10640 | 8958 | 15.8% | 812 | 744 | 8.3% |
| 6 | Monday, 9 April 2018 | 6087 | 5067 | 16.8% | 447 | 408 | 8.9% |
| 8 | Wedn, 11 April 2018 | 12354 | 10610 | 14.1% | 977 | 903 | 7.5% |
| 9 | Friday, 13 April 2018 | 12158 | 10428 | 14.2% | 319 | 292 | 8.5% |
| 10 | Mond, 16 April 2018 | 12262 | 10520 | 14.2% | 485 | 444 | 8.5% |
| 11 | Tues, 17 April 2018 | 7461 | 6256 | 16.2% | 338 | 313 | 7.5% |
| 12 | Friday, 20 April 2018 | 9767 | 8380 | 14.2% | 496 | 458 | 7.6% |
| 13 | Satur, 21 April 2018 | 5957 | 4965 | 16.7% | 141 | 131 | 6.9% |
| 14 | Mond, 23 April 2018 | 11477 | 9734 | 15.2% | 618 | 570 | 7.9% |
| 15 | Wed, 25 April 2018 | 5359 | 4802 | 10.4% | 476 | 447 | 6.1% |
| 16 | Thurs, 26 April 2018 | 5305 | 4732 | 10.8% | 769 | 735 | 4.4% |
| 17 | Friday, 27 April 2018 | 6638 | 5704 | 14.1% | 626 | 583 | 6.9% |
| 18 | Mond, 30 April 2018 | 5377 | 4627 | 13.9% | 712 | 651 | 8.6% |

3.2. Problems identification

The above information was used for further investigation to identify potential factors responsible for the discrepancies. This is the basis for determining improvements made to reduce waste and nonconformities that occur so as to optimize the profits obtained by the company. The monthly shrinkage during the gutting stages in February was 12.90%, March 14% and April 14.80% (figure 1). This indicates that the problem was consistent, i.e. monthly discrepancy was higher than the company standard (12%). From observation and interviews, this problem was due to several factors, namely how the employee worked, the quality of raw material before and after the gutting process, the methods applied in dry storage that caused w/w water levels decreased and the difference in the weight reported from the purchasing unit and processing unit.

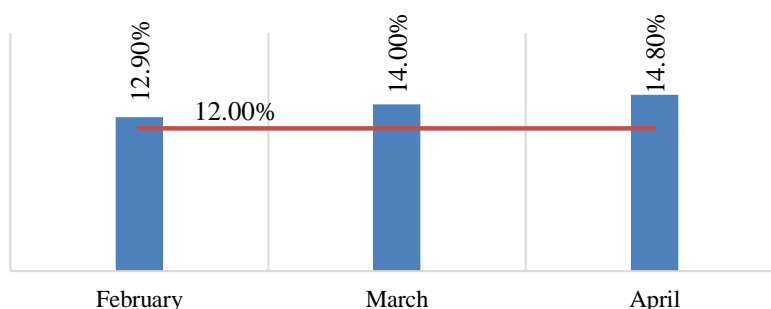


Figure 1. Monthly shrinkage during gutting process in February, March and April 2018, — standard.

Direct observation on the employees who performed the gutting process revealed that the average shrinkage was below the standard values, no discrepancy (figure 2). The shrinkage was, however, differed among three sizes of raw octopus; the average shrinkage of materials for size A was 9.1%, for size B was 10%, and for size C was 10.6%. Intensive direct supervision on each employee successfully promoted workers to focus on their job, good working atmosphere, and efficiency. Because octopus meat was slightly sliced and no waste was produced, so working process did not affect the weight of the material. It meant that the direct supervision did not make any significant effect in the shrinkage.

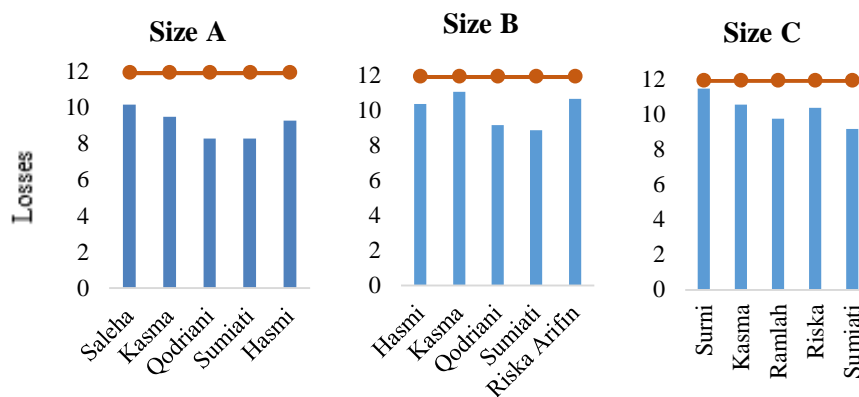


Figure 2. Shrinkage during gutting process for three size types of materials, size A = 2000 g – up, B = 1000-2000 g, C = 0-1000 g, — standard.

This condition is different from the work atmosphere in the actual production process. In intensive observation where employees are oriented to the quality of the results and the amount of work based on time because of intensive supervision during the process. In terms of work quality, the results of intensive observations were not found much difference, only octopus meat was slightly sliced and not wasted so it did not affect the weight.

The actual working conditions in the field was different from the condition in the industry. In the field, there were three production lines but only one line with supervisor. The workers did not fully focus on their work because the amount of octopus meat they processed did not affect their income. So the employees tended to work casually which caused some raw materials being left idle. The work load depended on the effort of the supervisor to distribute the raw materials to each of the three production line. The problem at the stage of the gutting process was influenced by various other causes, however the shrinkage was due to precooling process (figure 3).

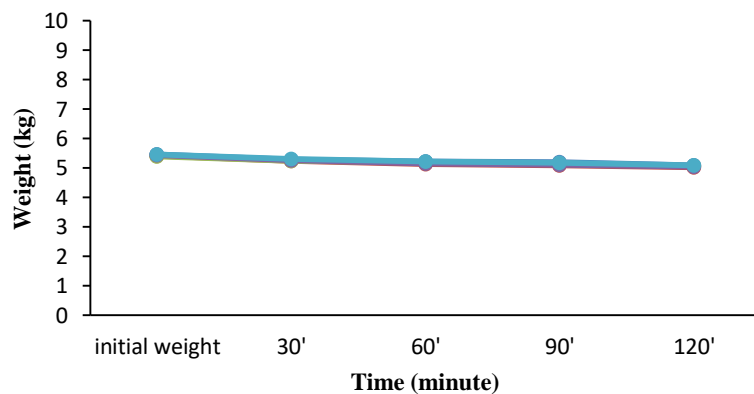


Figure 3. Quantity losses, — = observation 1, — = observation 2, — = observation 3, — = observation 4, — = observation 5.

The process of handling octopus was done while waiting for the gutting process. Precooling used a dry system which did not use additional water and the drainage hole was only closed with makeshift tools, so the water always dripped out. From 5 observations, the average initial weight was 5.43 kg, after 2 hours the final weight was 5.1 kg or shrinkage of 6.1% of the initial weight. Such shrinkage was due to a relatively long immersion time (± 24 hours) because the the amount of raw materials received by the company exceeded its capacity. The ice blocks for the dry precooling process were crushed in the tub directly without grinding process so the ice depressed the raw materials during the immersion process. This pressure triggered the release of water content or moisture in the raw materials. This was the reason why the materials become lighter than before the process.

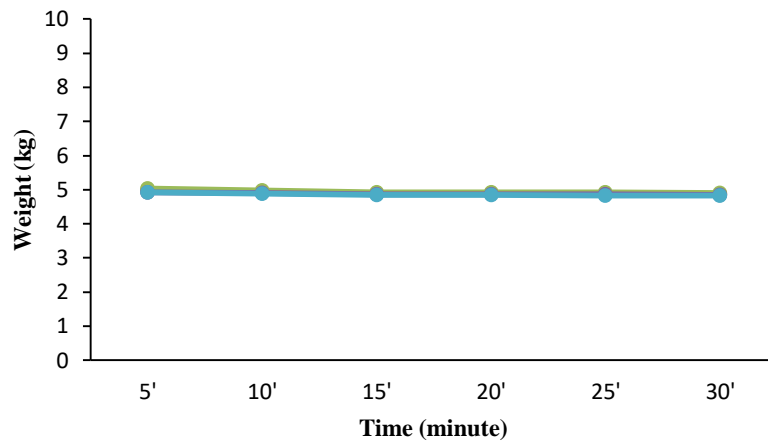


Figure 4. Quantity losses, —●— = observation 1, —●— = observation 2, —●— = observation 3, —●— = observation 4, —●— = observation 5.

The time of planting during the production process will affect the water content of the octopus (figure 4). After 30 minute being left before weighing or gutting process, the samples of 5.15 kg had weight 5.6% lower than their initial weight. The company discovered inconsistency of the scales used by the suppliers and the production unit (table 2).

Table 2. Difference between supplier weight and production unit.

| No | Date | Supplier weight (kg) | Rescale (kg) | Difference (kg) | Percentage (%) |
|-------|---------------|-------------------------|-----------------|--------------------|-------------------|
| 1 | 23 April 2018 | 11,477 | 11,310 | 167 | 1.45 |
| 2 | 25 April 2018 | 5,359 | 5,336 | 23 | 0.43 |
| 3 | 26 April 2018 | 5,305 | 5,267 | 39 | 0.73 |
| 4 | 27 April 2018 | 6,638 | 6,597 | 41 | 0.62 |
| 5 | 30 April 2018 | 5,377 | 5,371 | 6 | 0.12 |
| 6 | 2 May 2018 | 12,064 | 11,892 | 171 | 1.42 |
| 7 | 5 May 2018 | 5,143 | 5,091 | 53 | 1.10 |
| 8 | 7 May 2018 | 4,947 | 4,890 | 58 | 1.17 |
| 9 | 9 May 2018 | 4,991 | 4,940 | 52 | 1.03 |
| Total | | 61,304 | 60,692.2 | 610 | 0.99 |

Difference was evident between the weight of raw materials in the receipts and the reading of re-weighing at the company (table 2). From the entire re-weighing process carried out by the company, the difference was 0.99% from the amount of 61,302 kg.

3.3. Problem roots

Based on condition and data analysis above, a ishikawa or fishbone diagram was developed (figure 5). The diagram consists of 4 main factors causing discrepancies measured in percentage of shrinkage that occur in the production process, namely manpower (employees), management, method and raw material (table 3).

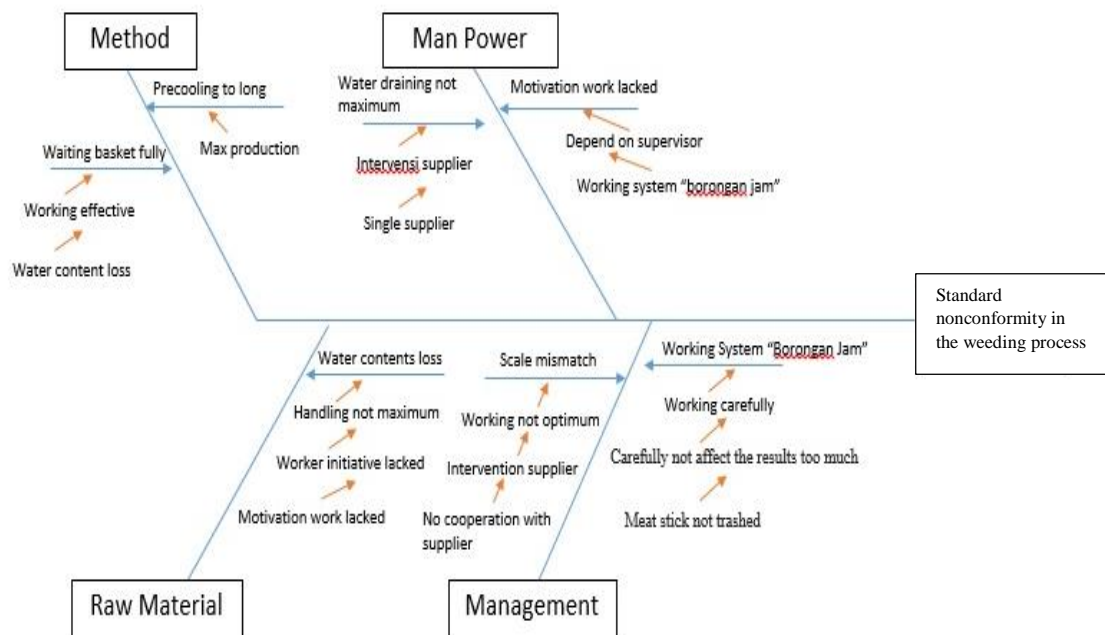


Figure 5. Fishbone diagram.

Table 3. Table of cause and effect problems.

| Parameter | Cause | Effect |
|---------------------|--|--|
| <i>Manpower</i> | <ul style="list-style-type: none"> - Lack of number of employee supervisors at the stage of the gutting process - Lack of work motivation for gutting employees - Lack of employee sorting of purchases | <ul style="list-style-type: none"> - Employee performance is unstable. motivation depends on the supervisor's initiative - Sorting employees rush to complete work |
| <i>Management</i> | <ul style="list-style-type: none"> - The employee's "Jam Jam" income system A little amount of work and the slow pace of work has no effect on income - <i>Single Supplier</i> | <ul style="list-style-type: none"> - Lack of employee motivation - The production depends on the raw material obtained and triggers a monopoly from the supplier |
| <i>Method</i> | <ul style="list-style-type: none"> - There is a method of dry storage to wait for raw materials to be carried out by employees of the gutting section - Waiting for a full basket before weighing | <ul style="list-style-type: none"> - Much wasted water content. Affects the weight of the results |
| <i>Raw Material</i> | Susceptible to loss of water content | The weight of the yield scale does not meet the shrinkage standard |

The company's standard was not achieved because of several factors, employees, raw materials, methods and management. For the employee aspect, it was found that the productivity of employees was not stable because their compensation was fixed as 'borongan jam' regardless of the quality, but depended upon supervisor initiatives. In the sorting process. There were only two workers who become in-rush so that the water did not drain sufficiently.

3.4. Problem solution

Based on the fishbone diagram, the authors identified various possibilities to solve the problems. Suggestions for improvements are listed on table 4. Some suggestions for improvements submitted to the company from aspects of employees, methods and management. This is an attempt to reduce the level of waste so as to increase the profits earned. In the method aspect, it is recommended that a wet storage is carried out but the limited facilities and infrastructure contained in the production space caused reduced storage capacity due to the addition of water media. This is of particular concern to the company. Therefore, it is better to apply the use of steamed ice to avoid pressure on the raw material

and properly close the drain hole. In the management aspect, it is advisable to cooperate with suppliers to minimize the mismatch of the purchase results due to possible interventions.

Table 4. Problem solution.

| Conclusion | Solution |
|---|---|
| Manpower: | |
| - Lack of employee motivation | - There needs to be training for employees, especially for employees at the gutting stage |
| - Additional employees and the application of a work shift system for purchase sorting employees | - Addition to sorting employees |
| Raw Material: | |
| Vulnerable Loss of water content | Minimize activities that require time when raw materials are left for a long time |
| Management: | |
| - The implementation of a work system that is less results oriented so that it results in a lack of employee motivation and is dependent on supervision | - The replacement of the employee's work system becomes "Borongan Hasil" and provides rewards with various nominations so that employees are more self-motivated in completing work |
| - A single supplier who can play prices. methods of purchasing raw materials | - Collaboration with suppliers to minimize nonconformities |
| Method : | |
| - Dry storage causes a decrease in BB water content due to the length of process and the type of ice used | - Replacement of the wet storage method (additional water is added to the storage tank); if dry storage is used then crushed ice should be used |

3.5. Estimated saving

Estimate of nominal value obtained for applying our suggestion are listed in table 5. The average of raw material receipts from February to April 2018 was 154,747 kg / month. If shrinkage can be reduced by 1%, at the gutting process the company can save Rp 2,256,450.00/day, Rp 54,180,000.00/month and Rp 758,240,000.00 /year. This estimate depends on the size type of the material produced and the amount of raw material received by the company.

Table 5. Estimated saving.

| Time | Raw Materials (kg) | 13% | Gutting Losses (kg) | | | Difference of 1% (kg) |
|----------------------------------|--------------------|--------|---------------------|--------|---------------|-----------------------|
| | | | 14% | 15% | 16% | |
| Daily | 6,447 | 773.64 | 838.11 | 902.58 | 967.05 | 64.47 |
| Monthly | 154,747 | 18.57 | 20.12 | 21.66 | 23.21 | 1.55 |
| Years | 2,166,458 | 259.97 | 281.64 | 303.30 | 324.97 | 21.66 |
| Loss of 1% increase in shrinkage | | | | | | |
| Time | Price (Rp) | Size | Difference | | Total (Rp) | |
| Daily | 35,000 | C | 64.47 | | 2,256,450 | |
| Monthly | 35,000 | C | 1.55 | | 54,180,000 | |
| Years | 35,000 | C | 21.66 | | 758,240,000 | |
| Daily | 46,000 | B | 64.47 | | 2,965,000 | |
| Monthly | 46,000 | B | 1.55 | | 71,208,000 | |
| Years | 46,000 | B | 21.66 | | 996,544,000 | |
| Daily | 55,000 | A | 64.47 | | 3,545,850 | |
| Monthly | 55,000 | A | 1.55 | | 85,140,000 | |
| Years | 55,000 | A | 21.66 | | 1,191,520,000 | |

4. Conclusion

PT. XYZ experienced shrinking problem that exceeded the company's standard for the gutting process. Suggested improvement to avoid further loss includes replacement of working system, collaboration with suppliers of raw materials, and replacement of wet storage method.

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