DEVELOPING AND ESTABLISHING WORK INSTRUCTION FOR MACHINE SETTINGS & ADJUSTMENT

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Abstract **-** The aim of this study is to establish a new work instruction with an effective procedure of machine settings and adjustment for production department of a company. The machines in the new plant need regular settings and adjustment to run smoothly. Lack of machines adjustment cause the production itself to exceed product wastage. The method used for analysis was survey questionnaire and swot analysis. Comparison was done by using before and after implementation product wastage data. The outcome of the study will be establishment and implementation of new work instruction.

Keywords*: Work Instruction, machine settings & adjustments*

1. Introduction

A work instruction is a set of step-by-step instructions produced by assembling information collected by an organization to help employees to carry out multiple operations. They distribute the procedure into a human-focused method of working that allows the specialist on the floor to finish the job on hand. An effective work instruction is important because they ensure the successful performance of a procedure as long as the processes. They also include clear and precise information to carry out a job in a safe and efficient way that conforms to all relevant manufacturing standards. These instructions aim to achieve quality output and consistency of performance. Work instruction also may help in reducing mistakes and failure to comply with industry regulations.

1.1 Problem statement

The management was made their way to build a new plant in 2017 and successfully finished in 2019. Finally, the new food production plant was started to operate in November 2019. Most of the process that has been done manually in old plant was replaced with advanced technology which is machinery in new plant. Even though a machine was replaced, there are still several adjustment needed regularly for the machine itself to function well. At the same time, lack of work instruction for the machine adjustment will affect the organization to achieve its target. Lack of work instruction for machine also increases the wastage during production especially at AMF-BX Line. AMF-BX Line function to process breast cap and fillet products effectively. There are wastage found in high quantity. It is because the machines is not adjusted and maintained well as stated in the manual as it succeed failure. There were also machine breakdown for several times due to improper adjustment made before starting the line. Improper settings and lack of adjustment towards the machine is the main cause for the above situation.

1.2 Objectives

The purpose of doing work instruction is:
1. To establish work instruction especially for machine settings and adjustments.
2. To minimize product wastage by implementing work instruction.

1.3 Scope/ Limitation of study

Main scope of this project is to establish a work instruction with enough information for production department use. Besides that, this work instruction only covers machine settings and adjustments for production department use. This work instruction is specially created for AMF-BX line of the production. This project will result to minimize the AMF-BX line product wastage.

2. Literature Review

2.1. Definition of work instruction

The definition of work instruction based on the American Psychological Association (APA) is a "description of the specific tasks and activities within an organization" (APA, 2019). A work instruction in business will generally outline all of the different jobs needed for the operation of the firm in great detail and is a key element to running a business smoothly".

2.2. Principle of work instruction

According to Blaga's point of view work instruction can be illustrated as an important source used to indicate the ways of performing work together with a procedure (Boer and Blaga, 2012). Work instruction should be in detailed form as it meets the main scope. They are analyzed in terms of their preciseness, suitability, and structure before approved by the company's head of the department and the general manager. Work instruction is encouraged to be done by the person who is involved in those particular processes. This should be done based on selected documents and is valid within that particular department that runs the regulation process. The instruction is established according to the type of work, its location, and its environment. The employer in charge that particular process should ensure the condition for each employee acquires sufficient and proper training on the form of information and instruction especially to their workplace.

2.3. Elements in developing flow chart for the processes

Beluško found the first step used to develop a flow chart is the definition of station and operation followed by definition of worker and workers, product or parts and tools used (Boer and Blaga, 2014). Header and footer are created in the template to make the workers easy to find the information. It also helps in raising the worker's attention toward the important information written. These elements stay at the top or bottom of the page so it would make the worker and team leader to have a concentration on the important information written. To increase the attention of the workers for additional information such as the created date and creator information are written in the footer. After finish adding the essential information into the header and footer, pictures of the product tools are added. The pictures created should be placed in the angle workers see them as they can reveal multiple sides. It is

necessary to place the pictures of the part and tools at the right side of the picture, it would create understanding among the workers.

2.4 Type of work instructions

a) Photographic instruction
According to Boer, a decision was made to use photographic material as an alternative method by transferring information from the existing work instruction. The new form of visual type instruction aims to illustrate the job that has to be done by the employee. The illustration of the instruction will be in short and simple, in the case to form understanding among the employees. Visual type instruction will highlight the comparison of what is expected to be done, versus what is not expected to be done or what is not with a picture guide.
b) Traditional instruction work instruction vs the photographic work instruction
Based on Boer, comparison between traditional instruction and the new photographic ways of presenting instruction was made by taking the needed time by the employee to present, assimilate and process the information. The result shows 50% of the time has been reduced by the new photographic ways of presenting method.

2.5 Survey Questionnaire study

Questionnaires are defined as content based instrument used to approach the participant to series of answer the question or respond to a statement to either by indicating a response. Usually it is created by rating a page, writing a number or checking a box on paper or online. Besides that, a survey or questionnaire with relative questions and answers can eliminate structured individual interviews as it can reduce time taken and save cost. It also has become the most common- used research tools in the social sciences. Questionnaires have become one of the method used by less experienced researchers to value their experiments or studies. The reason of researchers choosing questionnaires as it is easy to construct, they are portable or can be made available online. Moreover, the data they gather can be analysed effectively compared to spoken data which has to be recorded and transcribed before analysis.

3. Methodology

3.1. Brainstorming

Brainstorming help in identifying the problems and chances for improvement of the processes in establishing new work instruction at the company. Brainstorming is also used as a method for generate ideas to solve several problem that would occur while developing the work instruction. A mind map has been created to discuss about establishing new work instruction at first before plan a project. A work instruction will contain the information related to the machine settings and adjustment of the production department of DPP company. In the production department, there are five lines previously at the old plant. There are four major lines at the new plant operated by machines for most of the process when compared to the old plant. Therefore, this work instruction is different from the old work instruction.

3.2. Content format in work instruction

Subject
- The tittle of that particular section or description of the processes involved.

Purpose
- Be as specific as you need to be to define the purpose of the document.

Equipment
- List all unique tools required to perform tasks as indicated in this work instruction.

Reference
- Reference upward to the procedures that the work instruction is controlled by and reference forms by control number used to create records.

Instructions
- List all steps to be taken to complete the scope of this work instruction, in the exact sequence necessary.

3.3. SWOT Analysis

Figure 1. SWOT anaysis

Figure 1 shwos the swot analysis for this research project for more understanding of the job scopes.

3.4. Questionnaire survey study

A questionnaire is a set of questions that is responded by giving opinions towards any research or innovations. The questionnaire also means a lot in collecting quantitative data. It enables quantitative data to be collected and used for analyzation. Besides that, there should be a purpose of creating a questionnaire and it should be related to the objectives of the research. It is also a method used to collect information from a large number of people, known as respondents. A questionnaire that constructed effectively is critical to the success of a survey. Creating a questionnaire with suitable questions, appropriate scaling or with correct format will make the survey complete, because it represent the respondents views as well as their opinion. A tool used to review a questionnaire to ensure that the intended information is correctly collected is to pre-test with a smaller group of target respondents (Lundgren et al., 2008).

4. Result & Discussion

4.1. Data collection

Result and data was recorded for 2 months then discussed in two parts separately. Firstly, wastage quantity before and after implementation was collected. Secondly, the wastage data is used to compare and discussed well. Thirdly, a survey of questionnaire with related question about the work instruction is prepared then handed to the production department experts. This is mainly done to have their personal opinion about the new work instruction. Besides that, the comparison has been made using total product wastage data of before and after implementation. It is purposely done to have the percentage of total product wastage found in a week from its overall total production. Data collection that has been made starting from January 2020 until February 2020 was used to come out with a line graph.

Table 1. Overall product wastage data for January 2020.

January 2020	Week 1	Week 2	Week 3	Week 4
Total Product Production (Kg)	210080	231208	251100	205458
Product Wastage (Kg)	2821.7	3124.4	2591.2	2958
Product Wastage (%)	1.34%	1.35%	1.03%	1.44%

The product wastage data in AMF-BX line was successfully collected before establishing new work instruction. This data proved the need of regular adjustment towards machine. This data was collected on January for 4 weeks. Week one shows total of 2821.7 kg wasted product. Followed by 2nd week, whereby, 3124.4 kg of wasted product was collected. This data stated an increase of total product wastage in 2nd week. Next, 2591.2 kg of wasted product were collected in 3rd week. This shows decline of wasted product in 3rd week. Besides that, 2958 kg of wasted product was collected on the 4th week. This data shows an increase of product wastage compare to 3rd week data. The overall data of January shows an inconsistency. These data was converted to percentage form to study its effects towards the overall success of production process in processing the product. These data show more than 1% of wasted product is being collected in a week as tabulated in Table 1.

Table 2. Overall product wastage data for February 2020

February 2020	Week 1	Week 2	Week 3	Week 4
Total Product Production (Kg)	212300	214500	219110	215000
Product Wastage (Kg)	1683.3	1674.6	1729.7	1970.4
Total Product Wastage (%)	0.79%	0.78%	0.79%	0.92

It seems a drastic change in the amount of product wastage as it creates improvement. The technician puts effort to do the adjustment everyday to get the actual data of product wastage. The data in above table shows the data collected after implementation of the written work instruction for production department use. In the data, it seems the quantity of wasted product reduces as not went above 2000 kg compare to before implementation data. Wasted product collected for 1st week was 1683.3kg. Followed by 2nd week of 1674 kg. Both data shows a little difference. on the 3rd week the wasted product increases to 1729.7kg. Besides, again an increases to 1970.4 kg of wasted product on the 4th week. These data stated that work instruction really help in reducing wastage of product in the production department. If the adjustment and settings is done everyday, the chances of machine breakdown is low as well as product wastage. The collected data was converted to percentage form. The percentage data again proves that less than 1% of wasted product is found to be rejected by the machine as tabulated in Table 2.

Table 3. Comparison of before and after implementation wastage data

Product Wastage	Week 1	Week 2	Week 3	Week 4
Product Wastage In Jan 2020 (Kg)	2821.7	3124.4	2591.2	2958
Product Wastage In Feb 2020 (Kg)	1683.3	1674.6	1729.7	1970.4

In addition, both before and after wastage data was compared mainly to come out with a result. The comparison result shows up to 1000 kg of wasted product is being reduced weekly. The Figure 3 below clearly explained the difference between January and February wastages. On the 1st week of January, the wastage rose to 2821.7 kg and it dropped to 1613.3 kg in February. Almost 1138.4 kg of product has been saved due to proper adjustment before run the machine. On the 2nd week of January, the damaged product found was 3124.4 kg as it decreases to 1674.6 kg in February. Difference of 1449.8 kg found in 2nd week. On the 3rd week of January, 2591.2 kg of wasted product was found and it decreases to 1729.7 kg in February. For the last week of January, the wastage found was 2958 kg as it dropped to 1970.4 kg in February. We can conclude that, product wastage found in AMF-BX line are reducing in February 2020. It is because in February the technician managed to do machine settings and adjustment almost 4 days in a week as depicted in Figure 2.

Figure 2. Settings and adjustment done by the production technician at AMF-BX line

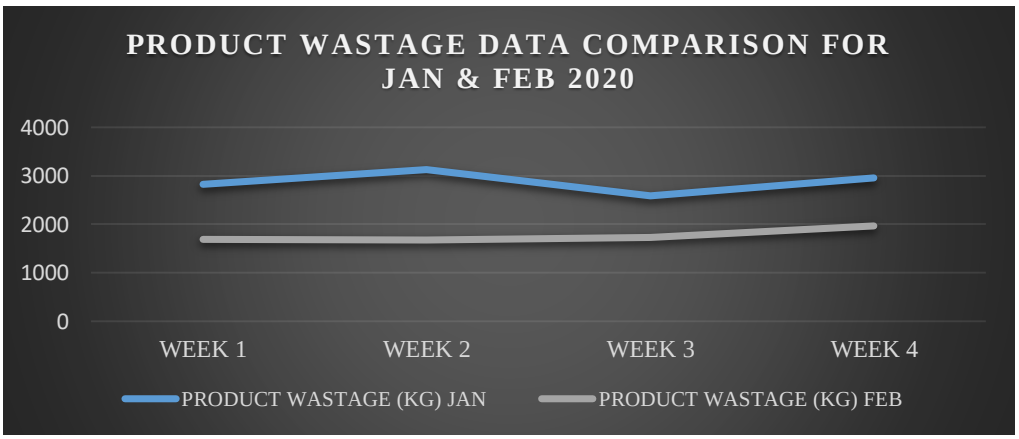

Figure 3. The effectiveness of the new work instruction to do changes towards the overall production of product in AMF-BX line.

Lack of setting and adjustment can impact the whole machine to succeed interior part damages in short period of time. The work instruction is created by using machine module's specific name as it can make the users to identify easily.

4.2. SWOT Analysis discussion

Swot analysis is used as a method to obtain the strength, weakness, opportunity and treats. It really helps this project to build a strategic plan to meet goals and improve operation. During implementation it is necessary to do analysis about the proposed swot analysis.

Strength

Lack of work instruction for machine adjustment lead the technician not to do maintenance until a breakdown occurs. Not only breakdown, lack of work instruction cause too much of wasted product found. Sometimes, the technician will try to do adjustment without any procedures and instruction. They used to do the adjustment with their own knowledge. It considered to be wrong that can increase the risk level. Because when the adjustment went wrong, it would affect the organizational to face high amount of product wastage. So creating work instruction with relevant information of the machines eliminates the risk as it maximize the product. Besides that, product wastages has become one of the problem succeed by the production department. The reason of product wastages was lack of machine adjustment. This

problem cause machine to process the chicken with damages. Not only that, lack of machine adjustment causes machine breakdowns. The adjustment should be done before the machine started to run almost every day. By doing this the machine will run smoothly without problem.

Weakness

The weakness of work instruction is when the technician or general operators failed to understand the language and terminologies used. Most of the workers in the company are foreign workers. They might not able to understand the language used in the work instruction. During implementation, it seems all of them are good in reading and understanding the instruction while doing the job effectively. Besides that, the workers might misunderstood and misinterpret the content. This problem can cause them fail to complete a job. Misunderstand can take place when they only focused on the picture without reading the steps. Because the pictures are illustrated to make the workers easy to identify machine interior structure. It seems the workers able to understand the language used so that they can avoid from being misunderstand.

Opportunity

The production department will feel better if the production increases. Almost more than 1% of wasted products are found in the production in a week. This situation will directly effects the organization to sustain or increase its productivity. So when the adjustment takes place, it reduces to less than 1% of product wastages. From this result, it is advisable to the whole organization to keep doing adjustment before run the machine to avoid product wastage. Secondly, when the number of breakdown reduces, it can minimize the production delay. Sometimes, the breakdown took almost one hour as it effects the whole production department to succeed production delay. Foreign workers becomes one of the issues that can lead this project to succeed problem at the beginning. As long this issue has failed to take place. Because the foreign workers are really good in understanding the language used. They can follow the instruction and steps to accomplish the job.

4.3. Work instruction survey questionnaire

Figure 4 shows the survey to evaluate the responses and personal view towards the established new work instruction. This questionnaire consist of 15 questions with 5 answer options as shown in figure below The questions was created after 2 weeks of the implementation. It is done properly to engage the relationship between production department experts. These responses are important to have their personal advices and recommendation towards the established work instruction. Moreover, this set of questionnaire is handed to 50 production experts and workers to have their personal opinion about the new work instruction. Their answers has been rated then and been evaluated as shown in the below table.

Figure 4. Respondents filling up the questionnaire

4.4. Survey questionnaire content discussion

a) Does work instruction able to reduce the product wastage at AFM-BX line?

The answer given by 45 respondents was always and another 5 answered often. Whereby, about 90% of respondents agreed that work instruction benefits to reduce product wastage in the mentioned line.

b) Does the information is relevant with the existing manual book?

The answer given by 47 respondents was never and 3 people responded by selecting always. Whereby, 94% of respondents disagreed with the question because the existing work instruction is about manual processes of old plant compared to settings and adjustments work instruction.

c) Are the information in the work instruction is efficient in educating the workers to complete the machine adjustments?

This question strongly agreed by the respondents as all of them answered always. This question results 100% in achieving the workers understanding about the content.

d) Does the information is well relate the pictures included?

Almost 35 people answered always and the rest answered often. This result shows 70% of the respondents agreed that the photo illustration help the workers to understand the content if they refers to the pictures.

e) Are the instructions facilitate working environment?

For this question, 35 respondents has agreed for always and the rest of them choose often. This question only able to achieve 70% of the respondents to choose always.

f) Does basic safety information is included in the work instruction?

For this question only 60% of them agreed and filled always. The rest of them equally anwered often and sometimes.

g) Does the included pictures benefits in reducing time taken to complete the adjustment?

This result shows that only certain times the picture helps in reducing time besides following the instruction

h) Does work instruction reduces number of machine breakdown in the production floor?

The answer given by 76% of the experts was always and the remaining percentage of experts filled often. This result shows that work instruction able to reduce machine breakdown in the production.

i) Do you often use the work instruction to make setting and adjustment of the machine?

Almost 80% of the respondents was selected always as their answer and the remaining 20% of people selected often.

j) Does the work instruction has enough steps of the setting and adjustments?

Almost 44% of respondents selected always and the remaining 6% of them selected often. This result shows that work instruction has been understood well by the users.

k) Do the organization use the setting and adjustment to control the product wastage?

This question was included to have the organization's opinion towards new work instruction. The main objectives was discussed in the question and it can be a chance for the experts to review this project. This particular question achieved 100% of respondent to choose always.

l) Does the work instruction is being used almost 4 days in a week?

This question managed to achieve 88% of the respondents to select always and the remaining 12% of respondents selected often. This result shows that adjustment is being done more than 4 days in a week.

m) Does this adjustment benefits machines performance?

The respondents agreed by giving 100% of answer for always.

n) Are the instruction is followed by the production technician to solve machine breakdown?

The result shows 60% of the respondents selected always and the remaining 40% of the respondents selected often and sometimes equally.

o) Does work instruction is also being used for other problem solving?

The answer given by respondents was 70% for always and followed by 20% for often whereby the remaining 10% for sometimes. This result shows that work instruction has the ability to overcome some other problem in the production.

5. Conclusion

In conclusion, this project has met its success to reach the production department team. New work instruction helps in solving wastage problem in the production department. Lack of settings and adjustments is the main cause of product wastage. It is because machine's need regular inspection and proper adjustment to run effectively. The adjustment should be done almost everyday before start up the machine. High volume of wastage found at its starting period. This project is done especially to help the production department workers to do regular machine adjustment to reduce product wastage. This project has successfully reached

the proposed objectives as stated. Besides that, the scope of this project is to establish a work instruction with sufficient information as it able to educate the users and finally reach the objective to minimize the AMF-BX line wastage. This scope has been achieved as it result in minimize the wastage level in the mentioned line as well. This effort also reduces the risk of machines malfunction or sudden breakdown.

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