

REDUCING THE WASTAGE OF THE PROCESS OF ASSEMBLING HEAT PUMP DRYERS OF THE ABC ENGERING Co.,Ltd. UNDER THE ECRS PRINCIPLE

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ABSTRACT

Reducing various losses in the production process It is very important, whether it is loss from raw materials, production methods, machinery or personnel errors, If the organization has effective control methods, problems will not occur. or occurs rarely and when problems arise, there should be a systematic way to improve quality.

The purpose of this research is (1) to reduce the waste of the heat pump dryer assembly process of ABC Engineering Co., Ltd. under the ECRS principle, and (2) to develop a standard work instruction manual. The population in this research consists of executives and production staff, totaling 13 people. The tools used in the research were 1) Observation pattern of heat pump dryer assembly process 2) work flow process chart 3) Bar chart 4) Questionnaires. For the methodology of this research are 4 steps: 1) study the production process 2) process improvement. Produced using ECRS principles and 3) implementation and monitoring 4) Develop a work standard manual.

The results showed that 1) reduction of time wasted in the drying process assembling the dryer. With the heat pump heat system of ABC Engineering Co., Ltd. under the ECRS principle, before improvement there was a total time of 1473.7 minutes. After the improvement, there was a total time reduction of 1424.8 minutes, reducing wasted time by 48.9 minutes. 2) Reduce activity waste in the dryer assembly process with a heat pump heat pump system of ABC Engineering Co., Ltd. with ECRS principles before improvement, there are 3 steps in total, 10 activities. Aluminum goes together for speed. 3) For the work standard manual used in work is appropriate at the most level.

Keywords: West reduction, Process improvements, work study

INTRODUCTION

Development of current products and services There is often intense competition in terms of quality, price, and delivery. and cost Therefore, controlling the production and service processes Therefore, it has become a tool that plays an important role in increasing the ability to respond to such as competitive situations. In a small business, production control may not be very complicated. Executives can make their own plans based on past experiences. But if the business expands more There are more customers. and production of products and More diverse services Process control will become more complex to the point where decisions cannot be made alone by any one person. Because production is related and shares information with other work systems, such as ordering systems. Warehouse management system Maintenance

system Quality control system Employee training and development system and sales or marketing systems, etc., which appear often as the business expands but The profit rate has decreased. Product quality deteriorates and the delivery was not in time even though the production capacity still remained. (Somkiat Korbuakaew, 2017:12)

ABC Engineering Company Limited, Phahonyothin Road, Lat Yao Subdistrict, Chatuchak District, Bangkok Province, Established in 1991 until the present. Has operated a business to assembling a dryer with a heat pump system Currently, there is a problem with the production process. and reducing production costs in many process.

Therefore, there is a need to improve the production process. In this research, methods for reducing waste in the production process were used, starting with analyzing production conditions and searching for the causes of waste in the production process. To improve the process of assembling dryers with heat pump systems of ABC Engineering Company Limited using ECRS principles, consisting of Eliminate, Combine, Rearrange and Simplify. So that factories can reduce the time that problems occur in the production process. Including increasing production value to produce that will not be wasted leads to increased profits and increases the working capacity of employees.

This study has the following objectives:

1. to reduce the waste of the heat pump dryer assembly process of ABC Engineering Co., Ltd. under the ECRS principle.
2. to develop a standard work instruction manual of ABC Engineering Co., Ltd.

LITERATURE REVIEWS

Business operations today, Entrepreneurs often consider diverse sources of raw materials, Investment worthiness analysis, Production flexibility, Standards in production processes and products. It is based on trade agreements and customer satisfaction. Therefore, businesses must operate efficiently and effectively in accordance with international standards. There is speed in delivering products and services. With better quality, cheaper price, and modern technology. Including having innovations that are superior to competitors in the market.

However, With the changing context Thus making the work process for producing products or services in business operations that will meet the needs of customers. Focus on reducing costs to create savings and minimize waste that may occur in the work process. It will also increase the ability of employees to work efficiently (Efficiency) in the work process. How to reduce losses in that process There are various methods as follows: (Grerkiat Korbuakaew, 2023:289-290)

- 1) Work study is a technique for studying methods and performance measurement to be used to analyze various work steps. To improve work and used to establish and develop work standards and working hours, including use as a tool for managing reward plans, various systems to lead to productivity improved.

- 2) 7 Wastes of Lean, The lean method of production is a philosophy developed by the Toyota Production System (TPS method). It focuses on eliminating inefficiency while delivering the highest level of value to the customer. Lean manufacturing is a manufacturing philosophy that is based on the distinction of the concept of production from the flow of production from raw materials to products and from product design to customer service, with the aim of eliminating waste and producing products to meet the needs of customers. (Allen et al., 2001) The 7 wastes, known as 'Muda' are the various forms of inefficiency that the lean production systems seek to eliminate. Waste, by definition, is something that adds no value. By removing these forms of inefficiency, company can boost manufacturing plant's productivity and return-on-investment. its including 1) Overproduction, 2) Zero inventory,

3) Defects lead to a huge waste of time, 4) Motion wastage, 5) Over-processing, 6) Waiting, 7) Transportation

3) The 7 QC tools for process improvement are systematic and scientific methods for problem solving and they are used product and process improvement. It's including 1) Check sheet, 2) Pareto Diagrams, 3) Cause and Effect Diagrams, 4) Scatter Diagrams, 5) Graphs, 6) Scatter Diagrams, and 7) Control Chart. (Manomat et al., 2012)

4) Process improvement is a methodology within project management, specifically in manufacturing, that helps you take in and evaluate feedback about your processes to ensure continual improvement. Its aim is to always be improving the efficiency and effectiveness of your business strategy, customer or manufacturing processes.

5) **ECRS**, Its lean technique for improvement product, Acronym for ECRS.

Eliminate – Identify the steps and details of work that can be quickly eliminated

Combine – When work cannot be eliminated, then seek to combine steps together

Rearrange – Work can also be rearranged in a different order or sequence that can be faster, easier or safer

Simplify – Make the process work easier to complete through the use of visuals, aids, fixtures and templates.

METHOD

Waste refers to what is lost in the production process without causing any benefit, which results in a decrease in work efficiency. This research uses a work study to adjust the research steps for reducing waste of the heat pump dryer assembly process. the techniques used to waste reduce, including 7QC Tools, process improvement, 7 Wastes of Lean, and ECRS, etc. There are 4 steps in the research process as follows.

1. to study the production process and improvement
2. to improve production process
3. to implementation and monitoring
4. to develop work standards manual

In this research, the researcher has used the process of work study, Including the application of method study and work measurement and comparative analysis with the research methodology and tools to use in the research. The summary is as shown in Table 1.

Table 1 The analysis comparing the application of work study procedures to research methodology.

Work study	Application	Research Methodology	Technique/Tool
Job selection	Elimination because there is a definite assignment.	-	-
Collecting data Job analysis	It is used in a total of 2 steps. It's the same process.	1. to study the production process	1. Process flow diagram 2. Process chart 3. Average statistics 4. The theory of 7 west
Job improvement	Apply to process	2. to improve production process	ECRS principle

Work study	Application	Research Methodology	Technique/Tool
Job measurement	Apply to process	3. to implementation and monitoring	1. Process chart 2. Bar chart 3. Average statistical value 4. Percentage statistics
Standard work instruction manual	Apply to process	4. to develop work standards manual	Standard operation manual,
Promotion uses improved working methods.	Used is the dissemination of manuals in document form or displayed at work sites.	-	-

RESULTS

Research on reducing waste in the process of assembling a dryer with a heat pump system of ABC Engineering Co., Ltd. has the results of the research summarized as follows.

1. to study the production process and improvement

From data collected at ABC Engineering Co., Ltd. between 20-21 September 2022, 2 days, 5 production cycles per day. It was found that the production process has a total of 3 steps and 10 activities, divided as follows: working 8 activities, inspection 2 activities.

After the improvement, it was found that the moving distance remained the same. and using a total of 10 production employees remains the same. For the time spent working on each activity, namely (1) assembling the cabinet base takes an average of 0.2 seconds less. (2) Putting the wheels together on the base takes an average of 2 seconds. seconds (3) Attaching all 4 wheels supports takes an average of 2.4 seconds less. (4) Assembling shelves takes an average of 0.4 seconds. (5) Installing aluminum plates takes an average of 2 seconds less. (6) Installs a cabinet. Lighting takes an average of 20 seconds less. (7) Installing a heat pump system takes an average of 20 seconds less. (8) Installing a sewer pipe takes an average of 1.2 seconds less. (9) Checking the orderliness takes an average of 1.2 seconds less. 0.7 seconds (10) Preparing products for delivery takes the same average time.

2. to improve production process

The researcher has improved the production process using ECRS principles as follows.

Elimination: From the results of the assembly process analysis, it was found that steps for installing an electrical cabinet and steps for installing a sewer pipe. The number of employees can be reduced from 3 people to only 2 people because of the sewerage installation process. It doesn't take much time to perform the job. Only 1 employee can be used to install the sewer pipe.

Combination: From the results of the analysis of the assembly process, it was found that steps to install a heat pump system It can be included in the same steps as the aluminum sheet installation process. This is because the process of installing a heat pump system takes a long time. and there were few employees, thus causing the process to be delayed. By having employees install the aluminum sheets together with the steps for installing the heat pump system for proper operation.

Simplify: From the results of the analysis of the assembly process, it was found that in the process of installing the electrical cabinet. There will be problems with installing the electrical system because some cabinets already have electrical systems installed. Some cabinets do not have an electrical system installed. Therefore it takes quite a long time. To install an electrical system in a cabinet that does not yet have an electrical system. It's easy to do. Dividing the staff into 2 parts. Part 1 will make machines that already have an electrical system installed in the next step. Part 2 should install the electrical system on a cabinet that does not have an electrical system installed for speed.

3. to implementation and monitoring

3.1 Apply by adopting improved production processes. Present to management to request permission to use the improved process.

3.2 Follow up by observing and recording data in the process flow chart (Flow Process Chart) from 20-24 September 2022 (5 days).

3.3 Compare results by using data from the analysis of results before improving the process of assembling a dryer using a heat pump system. and after improving the dryer assembly process by using a heat pump system. Presented with flow charts and bar charts.

4. to develop work standards manual

Prepare work procedures and present them to executives. By having the working employees come to a group meeting (focus group) of 12 people, with everyone having a unanimous resolution that developing a work manual is appropriate. It will make the heat pump dryer assembly process easier.

DISCUSSION

From research on reducing waste in the heat pump dryer assembly process of ABC Engineering Co., Ltd. There are points of the findings that lead to a discussion of the results as follows.

1. From research it was found that after improving activities 3 and 5 by combining activities resulting in a reduction in work time, namely activity 3, fixing all 4 wheel supports, 14.1 seconds/piece, and activity 5, installing aluminum plates, 48 seconds/piece, totaling 62.1 seconds/piece, remaining time reduced after combining the 2 steps. When remaining 11.7 seconds/piece, work time decreased by 6.1 seconds/piece, helping to reduce wasted time in people's work. and can reduce working time conforms to ECRS principles in terms of combining certain steps together and helps reduce waste due to the production process. Processing resulting from the production process having overlapping work in many steps. Consistent with the research of Atchara Phongpittaya (2017), studying the improvement of the calico fabric production process. Using ECRS principles, a case study of a company In Phra Pradaeng District, Samut Prakan Province, come help solve the problem for the factory and be able to reduce wasted work time from 20.28 minutes/piece, remaining time reduced after combining the 2 steps to 12.61 minutes/piece. Work time decreased by 6.67 minutes/piece, representing a reduction in time. down 5.94 percent and which corresponds to Niyomrat R. et al., (2021) who has studied the subject "Process Improvement of White Coconut Meat Production in Samut Songkhram Province". The results showed that the white coconut production process had a problem with the coconut fiber extractor machine stopped working. There was 1 non-value added activity and 10 necessary non value added activities. To improve the production process by (1) Make a working standard for loading into the coconut fiber extractor machine. (2) Include activities of preparation for internal transport, which are necessary non value added activities; to be the same activity as the main activity. (3) Change the main workload and adjust the number of employees according to the changing process; and

(4) Cut off non-value added activities and activities that are not directly related to quality control of production processes and products obtained.

2. The development of work instruction procedures can be developed by using all employees to work together to develop when successful, it is presented to management to demonstrate the process. or post announcements in the work area and is used as a standard in the process of assembling a dryer with a heat pump system. So that all employees can perform their jobs correctly and can reduce errors that may cause harm to the establishment.

CONCLUSION

From the results of a research study on reducing waste in the heat pump dryer assembly process of ABC Engineering. The information obtained represents studies and improvements to correct errors. with the principles of ECRS very well. These findings can be used to find ways to improve operations and develop operational manuals.

1. From research it was found that improvements using functional studies and ECRS principles have helped to reduce machine failures. Therefore, the company should apply the working methods in this improvement to real work. There is a maintenance plan for every machine. Because every machine is a machine. That directly affects work in each production step if there is a breakdown, failure or machine fatigue. will affect power Production and production period.

2. From the research it was found that The company incurred waste from the assembly process and waste from waiting (Delay) as the main problems that were used to improve the production process. However, the company should analyze the production conditions to find other waste. such as overproduction, material inventory, transportation, movement (Motion), especially waste from the production of waste (Defect) in order to reduce waste in the factory.

3. From the research, it was found that by studying and improving the heat pump dryer production process of ABC Engineering Co., Ltd. other development and quality improvement processes could be used to develop work efficiency, such as doing activities. 5S and the group to create quality within the organization to make the work of employees and developing machinery to always have quality, etc.

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