CHAPTER I INTRODUCTION

I.1. Background

The production system is a collection of interrelated systems with the aim of transforming production inputs into production output. This input of production consist of raw materials, machinery, labor, capital, and information. For the ouput production is the product produced. The sub systems of the production system include planning and control of production, quality control, determination of standard operations, determination of production facilities, maintenance of production facilities, and determination of cost of production (Ginting, 2007).

PT XYZ is a manufacturing company in the regional civil and military commuter aircraft, as well as included the design and development, manufacture, assembly, and services of aircraft. PT XYZ was established in 1976 as a state-owned company in Bandung, Indonesia. The company has produced various types of aircraft such as CN295, CN235, NC212, N219 and manufactures the aircraft component to be exported such as component of Airbus A320 and MK-II.

On 2019 PT XYZ is conducting a tail boom project for helicopter to meet subcontract demand from France. Tail boom is the back side or the tail part of airplane. It divided into two main components there are Cone and Pylon as shown in the Figure I.1.

Figure I. 1 Component of Tailboom Helicopter

To meet the customer demand, the company must produce different amounts of tail boom each year as shown in Table I.1.

Tabel I. 1 Historical Demand Tailboom

Year	C/O (Unit)	Target Production (Unit)	Realization Production (Unit)
2015		4	3
2016	1	5	3
2017	1	9	7
2018	1	16	14

Based on production time data from 2015 to 2018, the company always has a delay in fulfilling target production. For this final project, focusing on Cone Assembly as continues the previous final project which has made an Electronic Kanban design on pylon assembly. In order to realize the complete Electronic Kanban for the tailboom assembly, so it be able to minimize the lead time in tailboom assembly process.

But, it can be seen that one of the company problems are some delay for each component and the delay of cone assembly known by comparing between plan finish date and actual finish date as shown in the Table I.2.

Tabel I. 2 Delay Comparison Of Cone

Year	Amount	Serial	Plan Finish Date	Actual Finish Date	Delay Information
2015	4 Cone	39	2/9/2015	4/29/2015	2 month
		40	4/13/2015	6/19/2015	2 month
		41	6/9/2015	8/5/2015	2 month
		42	11/27/2015	1/5/2016	1 month
2016	4 Cone	43	2/15/2016	2/24/2016	9 day
		44	2/12/2016	4/12/2016	2 month
		45	10/24/2016	11/16/2016	23 day
		46	12/14/2016	1/10/2017	1 month

Tabel I. 3 Delay Comparison Of Cone (Continue)

Year	Amount	Serial	Plan Finish Date	Actual Finish Date	Delay Information
2017	8 Cone	47	1/11/2017	3/10/2017	2 month
		48	3/1/2017	4/11/2017	1 month
		49	6/11/2017	6/28/2017	17 day
		50	7/28/2017	8/7/2017	10 day
		51	8/30/2017	10/2/2017	1 month
		52	10/8/2017	10/31/2017	23 day
		53	11/4/2017	12/17/2017	1 month
		54	12/27/2017	1/5/2018	9 day
2018	15 Cone	55	1/4/2018	1/5/2018	1 day
		56	2/1/2018	3/1/2018	1 month
		57	3/3/2018	4/7/2018	1 month
		58	4/27/2018	5/7/2018	10 day
		59	5/8/2018	5/22/2018	14 day
		60	6/28/2018	6/29/2018	1 day
		61	8/9/2018	8/27/2018	18 day
		62	8/22/2018	9/4/2018	13 day
		63	9/14/2018	9/14/2018	No delay
		64	9/24/2018	9/28/2018	4 day
		65	10/4/2018	10/4/2018	No delay
		66	10/20/2018	10/22/2018	2 day
		67	10/29/2018	11/7/2018	9 day
		68	11/19/2018	11/29/2018	10 day
		69	12/18/2018	1/18/2019	1 month

Based on the above table, it can be seen in completing cone assembly always has a delays starting from 2015 to 2018. And the following is the average delay of cone assembly each year as shown in Figure I.2.

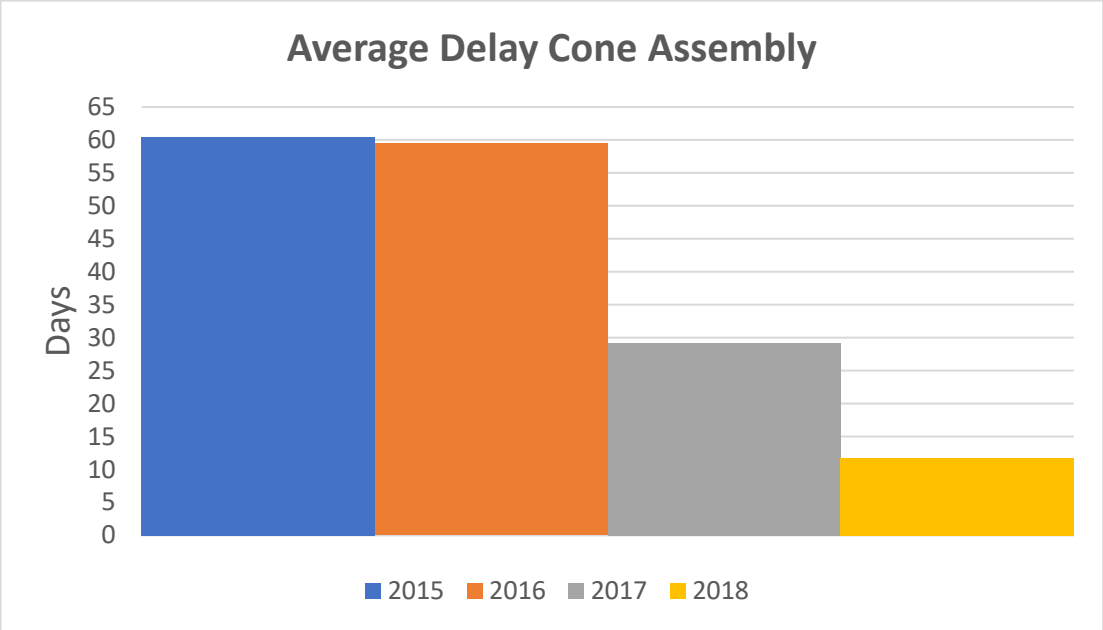


Figure I. 2 Average Delay Of Cone Assembly

In 2015 the average delay was 61 days, in 2016 was 60 days, in 2017 was 29 days and 2019 was 12 days. The reduction in delay from 2015 to 2016 is 2%, from 2016 to 2017 is 51%, and from 2017 to 2018 is 60% by making changes with the process flow and assembly layout. However, this decrease has not made the fulfillment of demand in accordance with the schedule, and there has been an increase in demand in 2019 and the next year, so there is still a need for continuous improvement so that the delay can be decreases.

There are some late in completing assembly from the production target. The delays of each sub assembly caused the lead time on the cone assembly will also increase, and will cause incompatibility with the plan. Assembly lead time is the time that normally passes between the issuance of a work order to the assembly floor and work completion.

Cone assembly consist of skin assy right, skin assy left and floor assy as shown in Figure 1.3. Every sub assembly has their components and should be ready for final assembly.

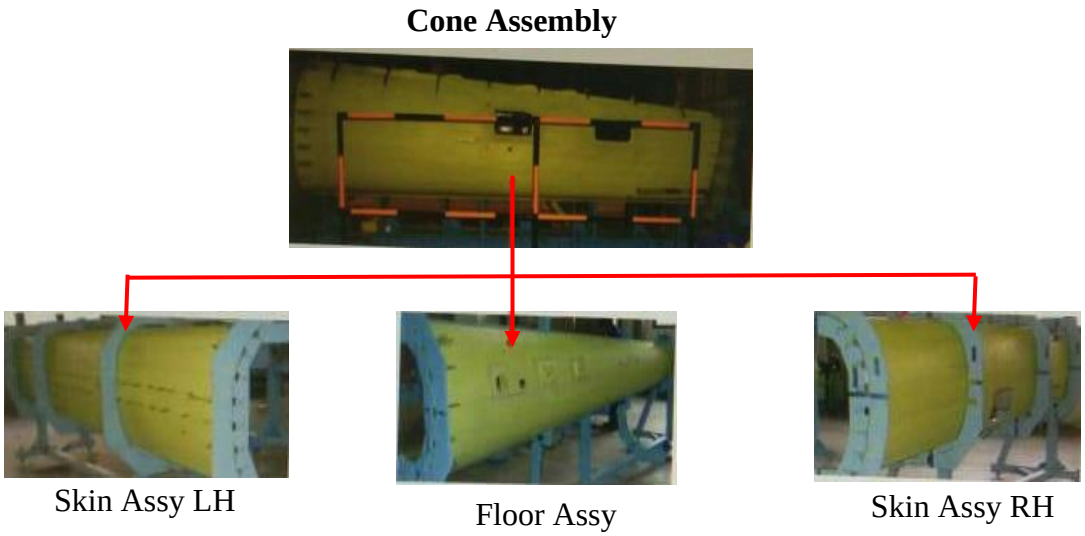
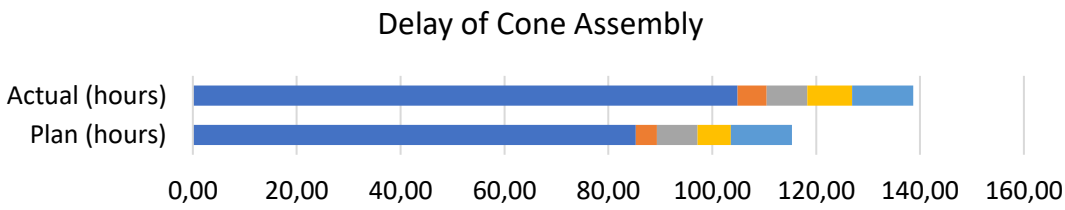


Figure I. 3 Cone Assembly

But in real condition some of components are not ready to be assembled because several reasons like parts is not available to assemble the component, and reject part because does not meet the requirement to assemble the component, and late of sub assembly process time in the each workstation which results in high cycle time in making one component, so that there is a delay time as shown in Figure I.4.



	Plan (hours)	Actual (hours)
Process 1	85,266	104,889
Process 2	4,084	5,584
Process 3	7,802	7,802
Process 4	6,433	8,670
Process 5	11,754	11,754

Figure I. 4 Delay of Cone Assembly

On the cone assembly there is a delay in getting information about the component needed, also for cone assembly process there are several parts needed are WEB, RIB, STIF, and REINF, and there is no warning about the availability of parts needed, it makes some part are not available. So that the problem for delay can be summarized in a tool to identify the problem, namely fishbone diagram as shown in Figure I.5.

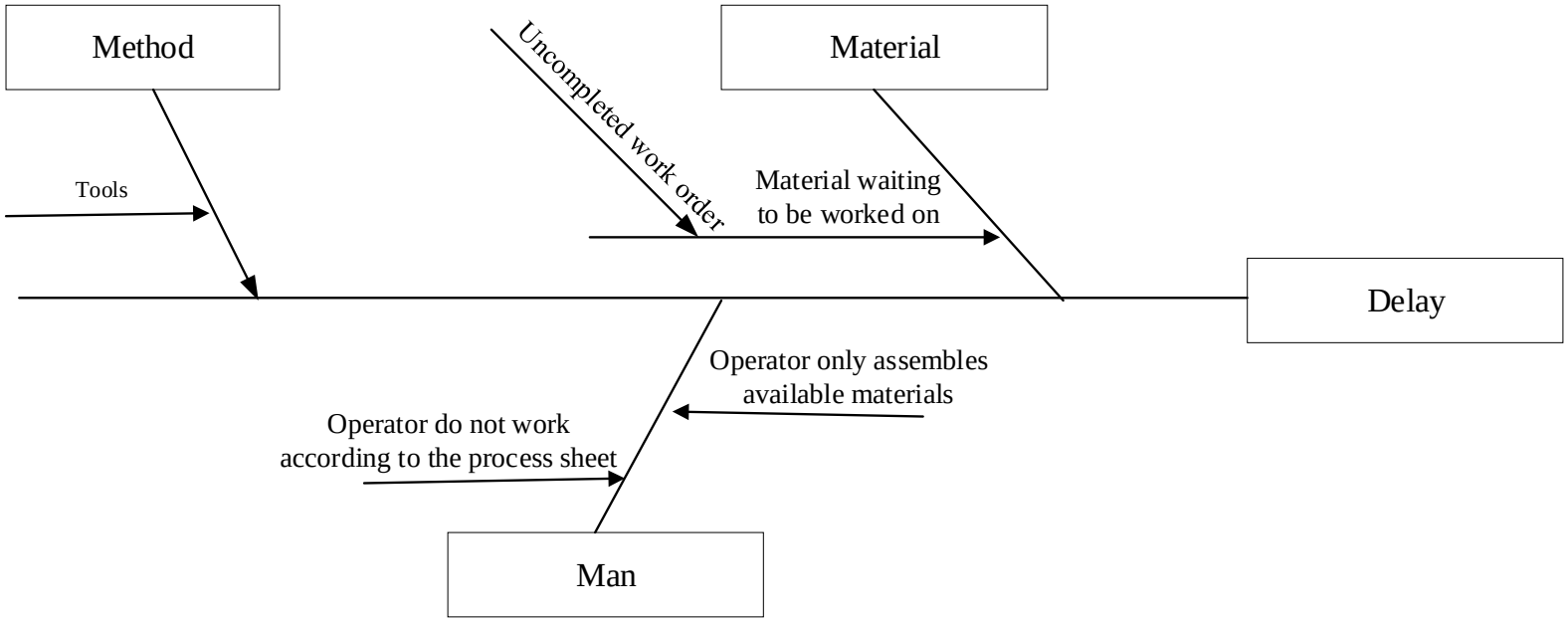


Figure I. 5 Fishbone Diagram

Based on the fishbone diagram above, it can be seen the existing problems. The cause of delay is explained by three main problems are method, man, and material. For Money and Machine are not explained because for finance there are no problems and the machine used is a jig that has no constraints.

The problem with the operator is not doing the work according to the process sheet, marked by not sending the complete work package. For material, there is material waiting to be worked on, this is because uncompleted the work package, so that when the operator assembles, it can only assemble parts or components that are available.

The delay causes the assembly line stop running and late of plan finish date. So that lead time for cone assembly will also be delayed. A major problem in this assembly line are late of date from each sub assembly for each component to processing final assembly.

To obtain all the components and sub assembly that are needed in the right amount and at the right time, the appropriate control system that can be used is Kanban. Kanban is a signboard which is used to control the production flow (Ahmad, Markkula, & Oivo, 2013).

According to Panneerselvam (2007), that Kanban is card that contain the product information required for production or assembly at each stage and details of the completion path. By using Kanban, the minimum inventory can be achieved at one time (Rahman, Sharif, & Esa, 2013).

However, there are some problem while using Kanban card is information about Kanban cards carried out manually by the operator, this process requires time for the operator and requires a lot of paper to be used. Then, the results of manual records must be entered into the system, the delay of inputting the data will hold over the update of the latest information which is integrated by all departments.

From this problem, the electronic Kanban system is designed to solve this problem. Kanban Electronic (E-Kanban) is a variation of conventional Kanban by converting physical signals into electronics, making it more accurate in transmitting information (Junior & Filho, 2010).

The information provided by electronic Kanban is more efficient and effective compared to conventional systems caused by a reduction in waiting time (Puar & Siregar, 2018).

I.2. Problem Formulation

Based on the background above, the problems to be elevated for this final project are:

1. How to reduce the delay using Kanban system in PT XYZ?
2. How many Kanban cards will be applied on cone assembly?
3. How to design the electronics Kanban on Cone Assembly Line in PT XYZ to control in process assembly to reduce lead time and improve order fulfilment?

I.3. Research Objectives

The objectives of this final project are:

1. Knowing how to design mechanism of Kanban that aims to reduce the delay on Cone Assembly Line in PT XYZ
2. Knowing the amount of card will be applied on Cone Assembly Line in PT XYZ
3. Knowing how to design the electronics Kanban on Cone Assembly Line in PT XYZ to control process assembly to reduce lead time and improve order fulfilment.

I.4. Research Limitation

To arrange the discussion of the problem in this final project research, it is necessary to limit the problem, including:

1. This research is only focus on cone assembly in Tailboom assembly line.
2. This research used the required data as an input, there are Bill Of Material, operation time, setup time, lead time, capacity box and historical demand.
3. The design of Electronic Kanban application is only for cone assembly line and sub assembly store area.
4. The required parts are assumed to be available in fabrication.

I.5. Research Benefits

The benefit of this research is providing electronic Kanban system so that:

1 As a proposal for PT. XYZ in carrying out the electronic Kanban system.

2 The cone assembly process can be monitored easily so that the operator can see the working status, also effective and simplify report system.

3 It facilitates control process of material or component needed in assembly process, so that it can be available at the right time according to the type and amount of goods needed.

4 Order fulfilment can be improved.

I.6. Writing Systematics

This final project has written by writing systematic as a follow:

CHAPTER I Introduction

This chapter contains descriptions of background research, problem formulation, research objectives, research limits, research benefits, and systematics of writing.

CHAPTER II Theoritical Background

In this chapter contains literature relevant to the problems studied and also discussed the results of previous research. The basic theories listed are used as theories that support the problem solving in the preparation of the final task. The basic theories are Just In Time, Waste, Kanban System, also Electronic Kanban System.

CHAPTER III Research Methodology

This chapter describes detailed research steps including: the stage of formulating research problems, formulating hypotheses, and developing research models, identifying and operationalizing research variables, preparing research questionnaires, designing data collection and processing, conducting instrument tests, designing data processing analysis.

CHAPTER IV Data Collecting and Processing

This chapter contains about collecting data from companies and then processing the data. The data explained Kanban system design that includes of Values Stream Mapping (VSM) current state and future state, Kanban cards calculation, Kanban card design, and the mechanism of Kanban system design.

CHAPTER V Data Analysis

This chapter contains an analysis of the data that has been collected and proposed system carried out in Chapter IV. The analysis includes an analysis of the current state with the advantages and disadvantages of Kanban system that have been designed.

CHAPTER VI Conclusion and Recommendation

This chapter contains conclusions obtained from research that has been done and suggestions for further research.