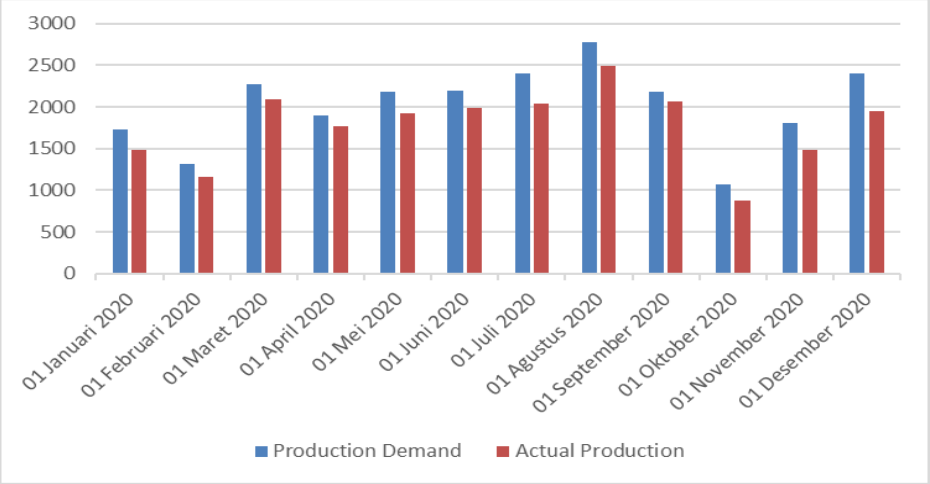
Chapter 1 Preliminary

1.1 Background

PT ABC is a manufacturing company that specialized in manufacturing dies, jig, press metal and welding process for automotive component and gas stove. PT ABC is located in Bekasi city West Java province. They takes the order as a third party manufacturer from several manufacture that specialized in automotive goods. As a manufacture industry, PT ABC has several manufacture process that using machine to complete every order. There are consist of 4 types of machines that PT ABC use namely press machine, robot machine, compressor machine and forklift which added up to total of 14 machines.

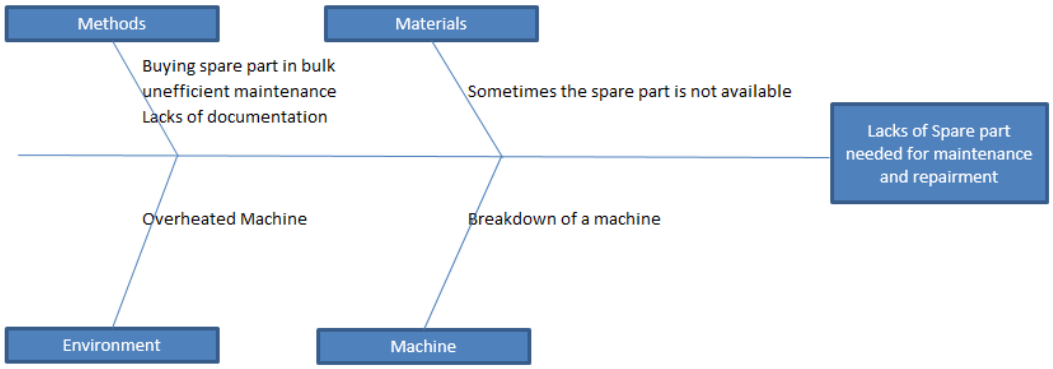
From this machine they doing several manufacturing process such as manufacturing dies, manufacturing jig, stamping process and welding process. PT ABC manufacture die to make an automotive parts for their customer. Die is tool used in manufaturing company to make mold for specific part of thing they created using cutting method and shaping method using a press machine. They also doing a welding process which is a manufacturing process that is used to fuse two metal parts together.

The data that taken from ABC company are the symptom of problem that happens in ABC Company. In the year of 2019 PT ABC cannot complete all of the order that needed to complete that year.



Pictures 1.1 The Production Demand and The Actual Production

It can been seen in the picture 1.1 there are disperancy between the production that PT. ABC hoped to be achieved and the actual production that happens in PT.ABC. All of the production each month can fulfill the target demand. This are happening because as it stated before that the machinery in PT.ABC has several breakdown so it's delaying the production. The main reason as to why this is happening because PT ABC has a procuring problem in the spare part area that needed to fix those machine also lacks of planning in the maintenance.



Pictures 1.2 Fishbone

The fishbone chart in the pictures 1.2 is made for easier understanding for the root cause problem. PT ABC has efficiency problem in their manufacturing mainly because the machine they have sometimes breakdown and sometimes does not have the spare part. The method point shown in fishbone show the reason that is becuase PT ABC buying their spare part in bulk and uneficient maintenance because of lack of their spare parts and also the lacks of documentation for everything makes it hard to determine what kind of policy should be use in PT ABC. The environment point shown in fishbone is the overheated machine because of the method or policy that are being used in PT ABC. The machine point shown in fishbone show that sometimes the machine has breakdown. The material point shown in fishbone chart is that sometimes the spare part is unavailable. Last but not least the machine point in the fishbone is breakdown of a machine because of the lacks of spare part in material point

Table 1.1 Machine Data

No	Nama Mesin	Jumlah Mesin	Spare part yang dibutuhkan
1	Mesin Press Ciamix 160 T	4	Vanbelt, Relay, Seal, Oring, Contactor, Kanvas kopling, Neeple, Bearing
2	Mesin Welding	6	Long Back Cup, Regulator, Neeple, Cable, Contactif, Tip Body, Nozzle, Automatic Torch, Ceramic
3	Mesin compressor	3	Vanbelt, Automatic Bar, Filter Element, Selang Angin, Dinamo Motor
4	forklift	1	Vanbelt, Kampas Rem, Kampas Kopling, Packing Head, Filter Oli, Filter Solar, Selang Tangki, Clamp

In the table 1.1 machine data, it shown the type of machine, the amount of machine and what kind of spare parts usually needed for said machine. The firs machine is Press Machine ciamix 160 T which has 4 machine in the manufacture. The type of spare part needed for Press machine is vanbelt, relay, seal, oring, contactor, canvas, neeple and bearing. The next one is welding machine which has 6 machine. The type of spare part needed for welding machine is long back cup, regulator, neeple, cable, contactif, tip body, nozzlem automatic torch, and ceramic. The next one is compressor machine which has 3 machine. The type of spare part needed for compressor machine is vanbelt, automatic bar, element filter, wind pipe, motor dynamo. Last but not least is forklift which has only one machine. The type of spare part needed for forklift is vanbelt, kanvas break, kanvas kopling, packing head, oil filter, solar filter, tank pipe, and clamp.

After the explanation of the machine that exist in PT ABC, we will determine which machine that will be the main focus of this research. Based on the interview that the writer did with one of the manager in PT ABC, it's said that in the year of 2019 there are a lot of order that didn't finished in the specified time that already's been agreed upon. And the reason of that is because there are a lot of machine that broke down that year. From all of the machine that exist in PT ABC it's said in the interview that has been done by the writer and one of the manager that work there, that for some reason the press machine has the most broke down record compared to other type of machine. Because of that, the writer will decided that the press machine will be the subject machine of this research.

Inventory policy is one of the problem in the inventory system that related to how to keep the demand fulfilled within minimum cost according to Senator (2006). This problem are related to considering how much is the operating stock and safety stock, which is how many goods that being ordered, when to ordered, and how many is the safety stock.

This problem may seem easy to solve according to common people. One of the answer is to provide inventory goods as many as posible before the demand is asking for it. The other aswer is to provide the goods after the goods is needed. But all of the answer above may not be the best solution because there is still some variable needed to consider, such as cost of the goods and downtime of the process.

One of the problem that may concur in the industry related to inventory policy is spare part inventory. Spare part inventory has a distinct difference between raw material inventory. One of the difference is raw material spare part usually has a deterministic property and has a constant demand while spare part inventory usually has a probabilistic property.

The policy is to keep a minimum level of inventory for spare parts. For example, spare part "A" must always available in warehouse for x amount. Wether the company will use it or not, the inventory level must stay the same. If the spare part is not being used that month, then they will not order for more. On the contrary if the spare part is used for y amount, then the company will order for the same amount that are being used that year.

For several item, there is no problem occur in the company. But for another item, it will lead to shortage item when preventive maintanance and repairing machine is being proceed. When that happen, it will lead to machine breakdown and disrupt the manufacturing process.

Based on explanation about inventory policy from before, writer found and read a paper created by siddique (2018). In his paper, siddique explain about connection between inventory policy and maintenance to found result that more efficient to set when the purchasing of spare part and the ammount of spare part purchasing. Also in his paper, siddique explain about how to solve this kind of problem inside a system which the machine is assume as new machine what he called repairable system using the value of ordering cost, holding cost, and maintenance cost.

Therefore to find the right number of spare parts and when to buy spare parts is discussed in this final project.

1.2 Problem Formulation

The following are the question that will need to be answered in this final report, and that question are;

a. What is the optimal amount of inventory PT.ABC should order?
b. When PT ABC should order the spare part?

1.3 Research objective

The purpose of this study is shown below;

a. To find out how many the optimal number of spare parts is ordered.
b. To find out when to order the spare parts

1.4 Benefit of research

The benefits of this research are as a means for students or for the problem analyst to put forth ideas and analysis that can be used by the problem user or the company where the data is taken related to increasing efficiency in calculating inventory, especially for spare parts.

1.5 Scope, limitation and Assumption

The scope, limitation and assumption of this research is shown below;

a. Scope and Limitation

   The scope of this final project is only to discuss inventory policy for spare parts only. With output when the time of purchase and how much each purchase. While for the limitation is that the author will only discuss the inventory side and will not go into maintenancane scheduling. Eventhough the mathematical model is explaining about both maintenance and the inventory

b. Assumption

   The author create an assumption based on the what the paper created by Siddique (2018), which is;

   - The request inside planning horizon is probabilistic and has normal distribution with average (D) and standard deviation
   - Times in each constant order T for every order, product will come to the factory simultaneously with lead time (L), ordering process will be processed when inventory reach ordering spot (r)
   - The price of the product (p) is constant

- The ordering price (A) is constant for every ordering process and holding cost (h) is equal with the price of the product and the price of holding
- The price of inventory deficiency (cu) is equal to the amount of product that can be satisfied or equal with the time (it's not related to the amount of lackiness)

1.6 Systematics Writing

For systematic writing contains conclusions and a brief explanation of each chapter that is on this TA;

a. Chapter 1 Preliminary

   In this chapter, it contains background, formulation of the problem, research objectives, benefits of research, scope of boundaries and assumptions and systematics of writing.

b. Chapter 2 Study Literature

   In this chapter, contains literature review and reasons for choosing research methods and positions choosed by writer in order to solve the problem in the company

c. Chapter 3 Research metodology

   In this chapter, contains step by step how to solve the problem in the company. The steps consist of problem structure and systematic problem solving

d. Chapter 4 Integrated System Evaluation of Creation Result

   In this chapter, all data needed to solve the problem is explained. There are several step which is problem identification, data searching and data processing, and closing.

e. Chapter 5 Validation and Evaluation

   In this chapter, all the data that has been processed is described. The analysis is to compare between the existing condition and the proposed condition. Based on the analysis, the writer will suggest the best action for the company to minimize the cost.

f. Chapter 6 Closing

   In this chapter, the conclusion is made based on the purpose of the final task that has been set before. In this chapter also contain all the suggestion for the company and the next research for improvement in the next era.