CHAPTER I
INTRODUCTION

This chapter covers the background, problem formulation, objective, scopes, assumptions, and outline of this research.

1.1 Background

PT Semen Padang is the first cement producer in Indonesia. Activities undertaken by this company include the activities of fulfilling the needs of raw materials up to distributing cement to the consumers. PT Semen Padang performs mining the main raw materials and purchasing the supporting raw materials from several suppliers to meet production requirements. Supporting raw materials received from suppliers include coal (low calorie, medium calorie, and high calorie), iron sand, copper slag, pozzolan, clay, and gypsum. The source of purchase of each supporting raw materials made by PT. Semen Padang can be seen in **Table 1.1**.

The process of supporting raw materials purchasing is carried out through two lines, which are inland and sea lane. On inland purchasing, suppliers will send supporting raw materials directly to PT Semen Padang using trucks. On sea lane purchasing, the supporting raw materials are sent using vessel until the seaport

Table 1.1 Source of Supporting Raw Materials Purchases

Raw Materials	Sources
Coal	Inland
Iron sand	Inland
Cooper slag	Sea lane
Pozzolan	Inland
Clay	Inland
Gypsum	Sea lane

and further will be transported using trucks to PT Semen Padang. When arrived, supporting raw materials are then stored in the dedicated stockpile in Department of Inventory Control.

Trucks that bring supporting raw materials will pass through several activities in the Department of Inventory Control. The activity begins by entering the initial weighing area and ends by leaving the final weighing area. Truck activity scheme is illustrated in **Figure 1.1**.

According to **Figure 1.1,** it can be seen that every incoming truck will pass through the weighing truckloads process. The process of weighing truckloads is performed to determine the net weight of supporting raw materials brought by each truck to PT Semen Padang. This weighing process is done by using truck weighing facilities (truck scales) that are located in the storage entrance.

Department of Inventory Control only has two truck scales which are one unit of initial scale and one unit of final scale. Description of truck scales can be

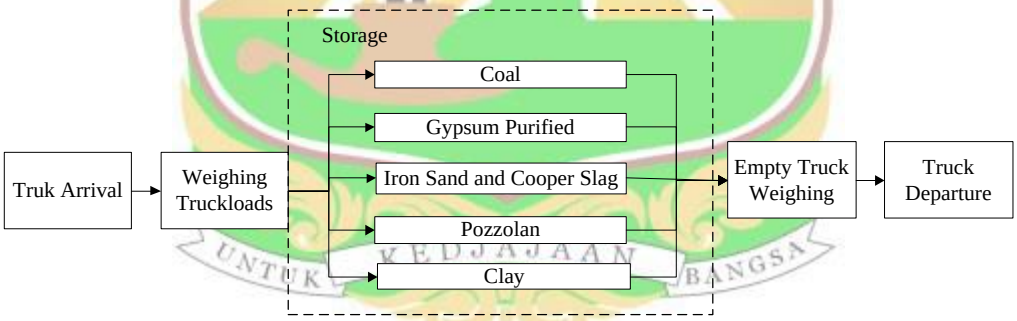

Figure 1.1 Truck Activity in Indarung

Figure 1.2 Scales Position

Table 1.2 Scales Description

Scales	Quantity	Usability	Maximum Capacity
Initial scale	1 unit	Weighing truckloads	60 tons
Final scale	1 unit	Weighing of empty truck	30 tons

(Source: Interview)

seen in **Table 1.2**.

Suppliers send supporting raw materials to fulfill the demand from PT Semen Padang based on one month contract. Currently, to fulfill the demand, the suppliers send supporting raw materials to PT Semen Padang any time until the contract commitment is fulfilled. This condition makes the frequency of delivery trips are larger on certain days, and lower on the other days. The number of all supporting raw material delivery trips during March 2018 is illustrated in **Figure 1.3**. Percentage of the delivery trip for each material can be seen in **Figure 1.4**.

Based on **Figure 1.4** it can be seen that coal is the material that has the highest frequency of delivery trip. According to the data record in March 2018, the amount of coal sent by the supplier is around 132,000 tons. But according to Fae (2018) that proposed coal purchase allocation for fulfilling coal quality standards in PT Semen Padang, it is known that coal requirement is 170,800 tons/ month. The increase in the number of material needs occurs because the Indarung

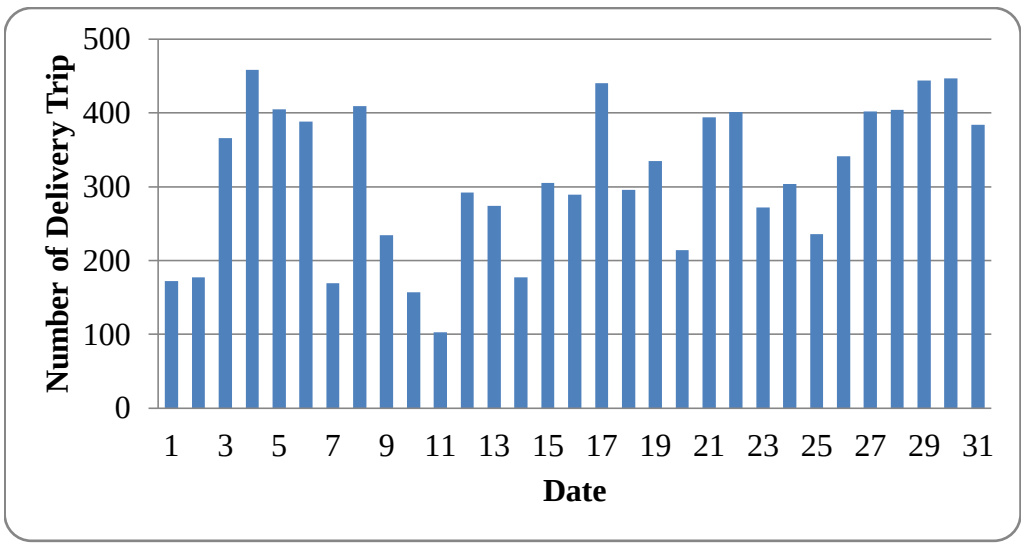

Figure 1.3 Number of Supporting Raw Material Delivery Trips During March 2018

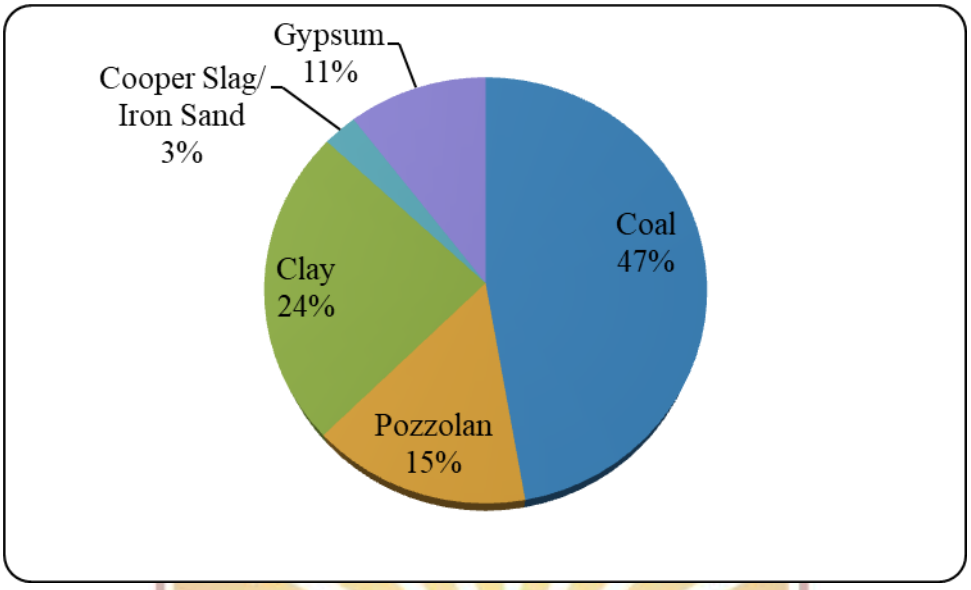

Figure 1.4 Percentage of Delivery Trip for Each Material in March 2018

VI Plant is already operating. To fulfill this requirement, the frequency of coal delivery trip will increase. The increase in the number of the delivery trip will increase the number of the entity that will be served on the scales.

Based on interviews conducted with several parties in PT Semen Padang, when the frequency of delivery trip is large, it will cause a queue on the scale. In fact, there has been a queue all night on the scale area. This queue also arises because of the lack of available scales to serve all trucks that arrive and the increases in the number of the delivery trip that will be served on the scales. According to Harrel (2004), queue affects the cycle time or flow time of an item or customer. The longer the trucks waiting, the bigger the cycle time is. Queue causes the cycle time of truck increases and accordingly, the time spent to transport supporting raw material becomes longer and slows down the process of receiving and storing the supporting raw material in the stockpile.

In the case of sea line purchasing, the longer time of supporting raw material (gypsum) transported from Teluk Bayur seaport to Indarung will cause vessel docking time increases as vessel-load discharging process disturbing. When actual vessel docking time exceeds the standard time i.e. 6 days, it incurs

demurrage cost. However, if the time to transport gypsum from Teluk Bayur seaport to Indarung is less than 6 days, PT Semen Padang will claim despatch cost.

Unlike the inland purchasing where the material is sent directly by suppliers, the process of sending gypsum from Teluk Bayur Seaport to Indarung is carried out by transporters in collaboration with PT Semen Padang. The transporter provides trucks which are then used to transport the gypsum. PT Semen Padang and the transporter collaborated so that the gypsum transporting process did not exceed the standard time. In steady state condition, the capacity of unloading facility is able to unload the vessel-load in less than 6 days (with the average processing time is 5 minutes/ delivery trip, the available time is 17 hours/ day, and the average of gypsum truckload is 35.32 tons/ delivery trip). But in the realization, the transporting process often passes the standard time. As an example, in November 2017; a vessel that carries supporting raw materials of Thailand Gypsum has exceeded standard time at the seaport about 8.82 days. This overtime makes PT Semen Padang paying the demurrage for US 105,400.40.

Therefore, it is necessary to improve system performance in reducing queue time to optimize the processes of receiving & storing supporting raw materials in the stockpile and reduce the time spent transport gypsum from Teluk Bayur Seaport to Indarung to be less than 6 days. The method used in solving the problem in this research is the simulation modeling method. This is because the system observed is more complex, which is observed the entire process of supporting raw material transportation system that occurs in Indarung and Teluk Bayur Seaport. In addition, there is an uncertainty of the arrival time, the processing time for each activity, and the existence of certain conditions that occur in the system, so this study is considered suitable to be solved using a simulation approach.

1.2 Problem Formulation

Based on the aforementioned background, it is identified that PT Semen Padang has a queue problem that occurs in the weighing scales area. It happens because of trucks carrying the supporting raw material come in large numbers at the same time in the scale area and the lacking number of available scales to serve all trucks that arrive. This queue will increase because there is an increase in the number of coal deliveries. Queue causes the cycle time of truck increases and slows down the process of receiving and storing the supporting raw material in the stockpile. Moreover, the transporting process of gypsum from Teluk Bayur Seaport to Indarung often passes the standard time. This overtime makes PT Semen Padang paying the demurrage.

Therefore, it is necessary to construct a model of supporting raw material transportation system in PT Semen Padang based on current requirement to improve system performance in reducing queue time to optimize the processes of receiving and storing supporting raw materials in the stockpile, and reduce the time spent transport gypsum from Teluk Bayur Seaport to Indarung to be less than 6 days.

1.3 Objectives

The objectives of this research are:

1. Construct a simulation modeling of supporting raw material transportation system in PT Semen Padang based on current requirement.
2. Reduce average queue time in scales
3. Reduce time to transport gypsum from Teluk Bayur Seaport to Indarung to be less than 6 days.

1.4 Scope

Scope or the boundary of the system is only the process of supporting raw materials transportation that occurs in Indarung, Teluk Bayur Seaport, and transportation of gypsum trucks from Teluk Bayur to Indarung and vice versa.

1.5 Assumptions

Assumptions of this research are as follows:

1. Trucks unloading time is calculated starting from the trucks leaving the initial scale to entering the final scale queue.
2. Arrival time is calculated when the truck enters the initial scale
3. Truck drivers and all operators have worked according to standard time.
4. All gypsum trucks are available at Teluk Bayur Seaport when the vessel carrying gypsum arrives.

1.6 Outline

This final project report consists of several chapters, which are:

CHAPTER I INTRODUCTION

This chapter covers the background, problem formulation, objectives, scope, assumptions, and outline of this research.

CHAPTER II LITERATURE REVIEW

This chapter covers the explanation of the theories used to support the research such as system and models, queueing theory, simulation modeling, model building, Arena software, and related research.

CHAPTER III RESEARCH METHODOLOGY

This chapter consists of the methodology of the proposed research. In general, this research methodology consists of several stages i.e. system survey, problem identification, problem formulation, literature review, method selection, developing the conceptual model, data collection, model construction, model verification and validation, conducting simulation experiment, analysis, and conclusion.

CHAPTER IV SIMULATION MODEL BUILDING

This chapter covers the detailed model building steps of supporting raw materials transportation system in PT Semen Padang, start from system description to model verification and validation process.

CHAPTER V IMPLEMENTATION AND ANALYSIS

This chapter covers the implementation of the simulation model followed by simulation experiments. The output of simulation experiments will be analyzed to determine the achievement of the objectives that have been formulated.

CHAPTER VI CONCLUSION

This chapter covers the conclusion of this final project and suggestion for future research.