CHAPTER 2

CASE STUDY: BACKGROUND AND PROBLEM ANALYSIS

2.1 Background

In this thesis WANTANA FOUNDRY CO., LTD, so called WFD, was selected as a case study for scheduling modeling.

2.1.1 Company profile

WFD was established in July 2003. The company's business is a foundry manufactured in gray and ductile cast irons, FC and FCD. The company manufactures automotive, electrical, and mechanical parts. The core business is automotive parts, about 80%, provided to car manufacturing such as HONDA, MITSUBISHI, and so on. By the way, the company does not directly submit the parts to car manufacturing, it has to submit the parts to Somboon Malleable Iron Industry (SBM), the first tier supplier for car manufacturing, for machining before sending to car manufacturing.

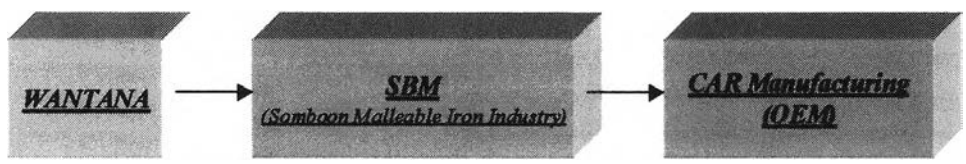

Figure 3 The supply chain of WDF.

In the other words, WFD is the second tier supplier in the car manufacturing supply chain.

Vision: To be superior in casting products.

Mission: To reach customer satisfaction in terms of good quality, right cost, on time delivery, and good services.

2.1.2 Product Description

The company used in this thesis is automotive foundry. The product can be categorized into various different aspects.

By raw material (metal):

There are seven kinds of metal used in foundry as below.

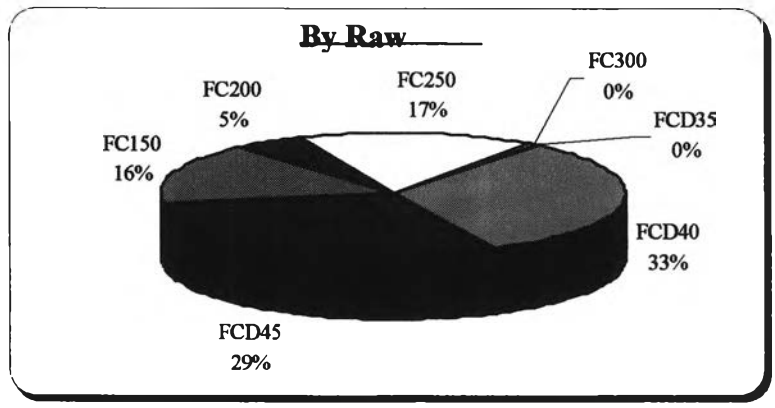

Figure 4 The ratio of seven types of raw material using in the production line.

Each metal has its own characteristic that used for different purposes. Customer will specify the raw material matching with the function of each product and also give the qualification requirement in term of stress, strain, etc which are the critical to function (CTF) parameters of that product.

Each raw material requires different composition in melting process. Product using the same raw material can share the same melting process. However, switching from one material to other materials is not a big concern in the process since there is no additional setup time required. But many types of raw material require more complicate and difficult in raw material management

By core type:

Normally it should have only two types that are non-core product and core product. However, in this case, core product can be segregate into manual core and auto core. So, they can be categorized into three groups. The ratio of each group is as below.

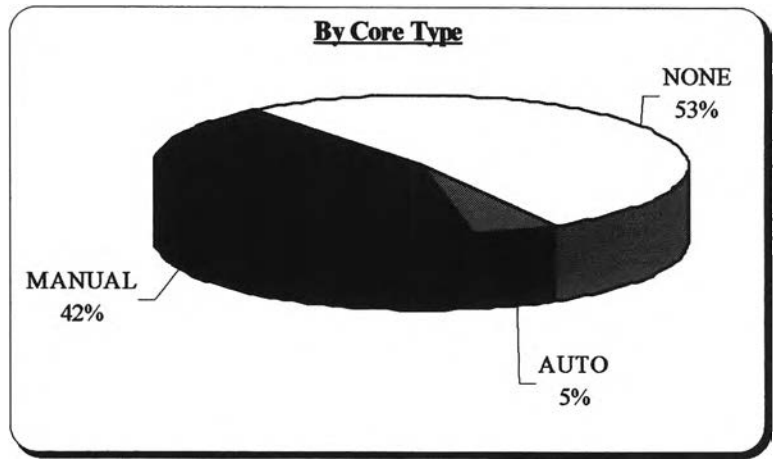

Figure 5 Categorized product by core type.

In the production point of view, the core product requires different process and also need more consideration because the defect rate is quite high when comparing with the non core product.

2.1.3 Process Description

Generally, there are three main processes in the foundry.

- Melting Process: To melt the raw material by using electrical furnace with capacity at 1 ton /900 KW.

- Molding Process: It consists of automatic sand mixture line, automatic molding line and automatic molding machine with capacity at 120 molds per hour.

- Grinding process: This is so called backend process. It consists of 3 main operations which are short blasting, grinding, and run out.

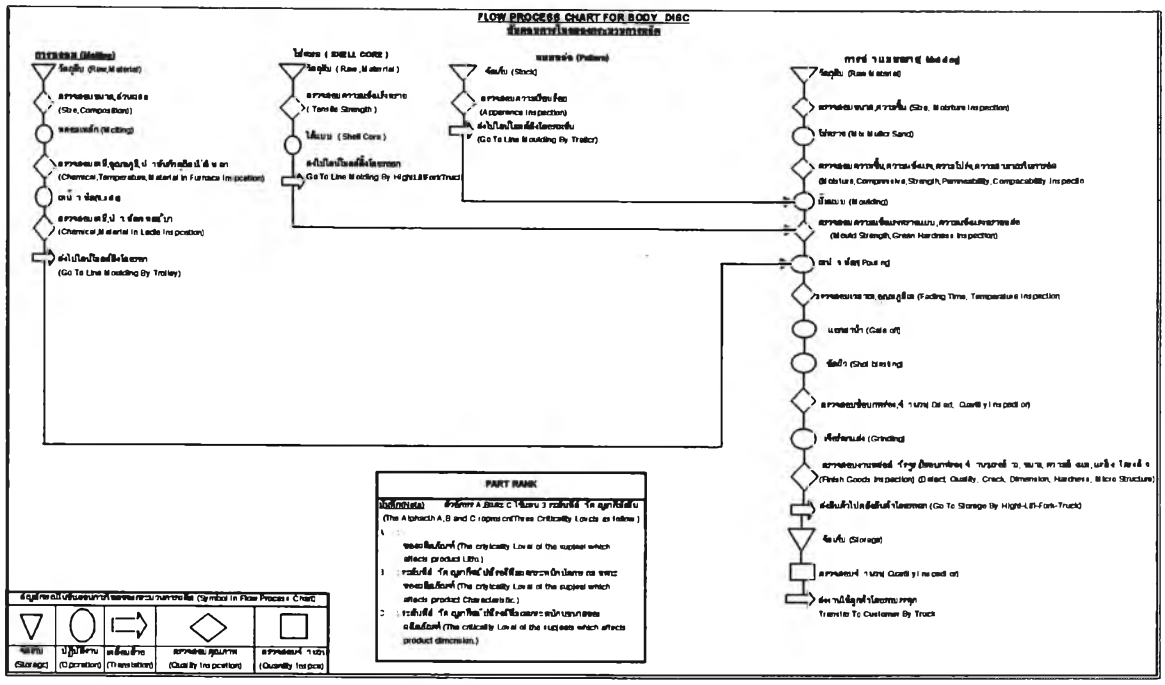

Figure 6 (a): Process Flow.

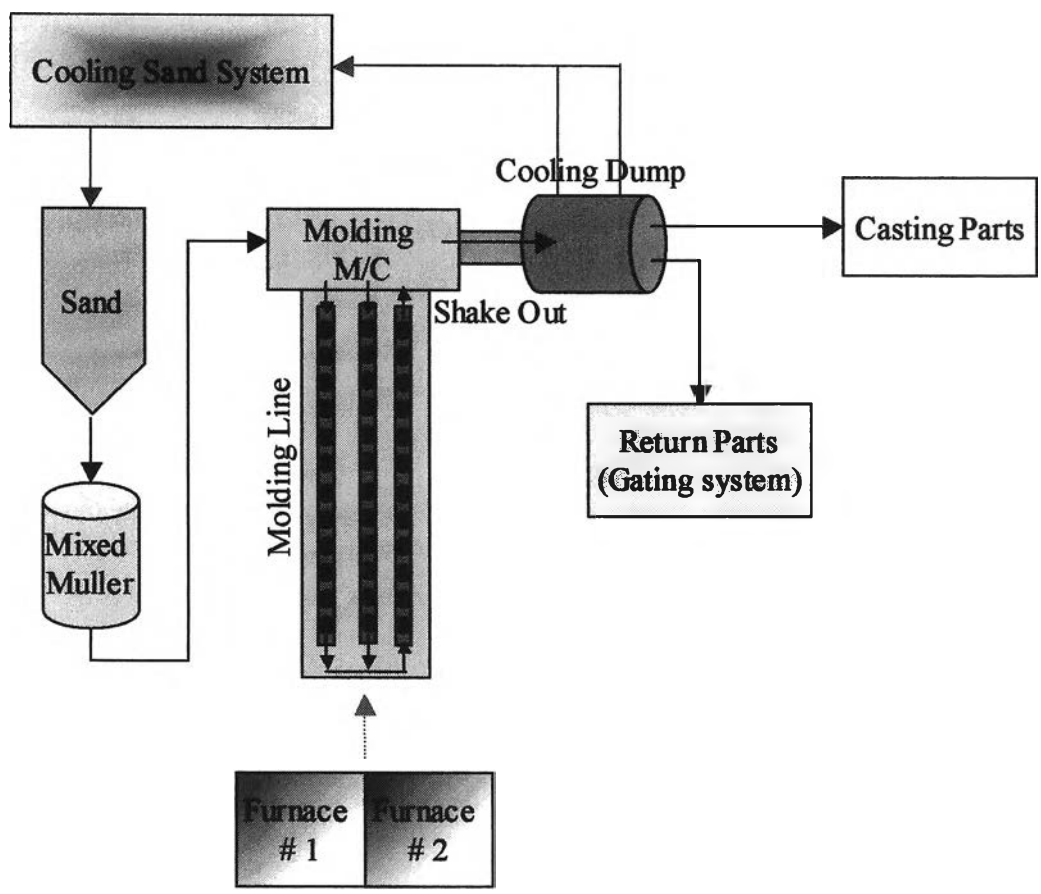

Figure 6 (b): Plant Layout and Process Flow.

Melting Process:

This process is to mix and melt the raw material, steel scrap and return scrap, with chemical product under the proper combination. In this process, there are three inspections in order to check the material composition and temperature. They have to be checked in two conditions that are in furnace checking and in ladle checking. This is to ensure that the raw material is ready and qualified. This is a very important process because passing the unqualified material through the process will cause high reject rate at the backend process or at the final test. It will be even worst if these parts escape from internal rejection and reject at customer.

It could be addressed that this process is an important process, because if the material composition is wrong or these materials are heat under the improper temperature / time, the material characteristic will be have a problem in term of strength, strain, surface, etc.

Molding Process / Backend Process:

This process is to transform melted iron (from melting process) to finish goods. The melted iron is poured into sand mold under the proper temperature and time. This process also involves gate off before going to the grinding process. In this process, there are six inspection operations as shown in figure 6.

Grinding Process:

This process is short blasting for cleaning the surface and grinding for removing the in- gate of product before shipping to customer.

In this process, it consists of many types of machine as below:

- Short blasting M/C
- 18" Grinding M/C
- 20" Grinding M/C
- Run out M/C

This is mainly to improve the surface finishing condition.

2.2 Problem Analysis: Exiting Situation

2.2.1 Exiting Scheduling Model

Currently, there is no scheduling model in WFD. Production manager is the one who generates scheduling plan. The production plan is generated by daily based on the MPS and exiting FG inventory and WIP. Thus, the efficiency of the plan is totally based on the production manager's skill.

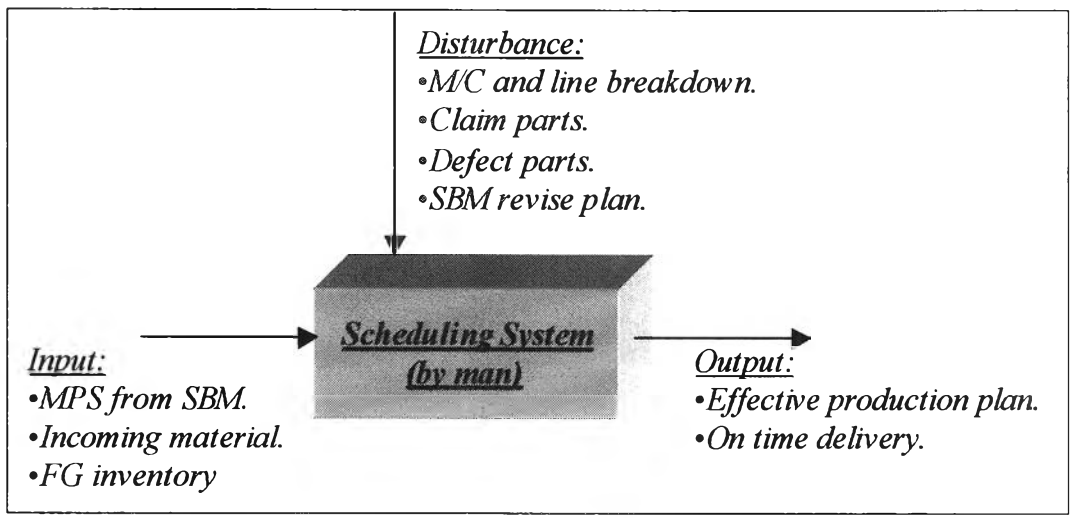

Figure 7: The current scheduling system.

There are four main disturbances impact the production plans that are:

- Machine and Line Breakdown: Since there is only one furnace and one automation line for molding. If either one is broken down, whole process has to be stopped.
- Claims: Once the company receives the claim parts, it has to re submit the parts as soon as possible. If the reclaim number is high, it should be impact not only the production plan, but also the raw material planning as well as the manufacturing cost.
- Defects: Normally, the company factor production yield at 90%. If yield is lower than this, the production plan has to be revisited.
- SBM revise plan: As addressed before, SBM approximately revises a MPS once a week. Therefore, even the company receives the MPS monthly, it has to plan only for a week. However, weekly planning didn't impact to overall production because lead time of the product is much more shorter

than this. But, high fluctuation in MPS plan did impact to production especially for production planning and scheduling.

Another factor impacted to scheduling system is information system in the company. There is no real time monitoring system or any tracking system. Thus, the company do not know the exactly FG inventory as well as the status of each job. It will use the number from the planned production yield and will update inventory by weekly. This factor becomes a major constrain especially when some problems are occurred in the line and caused high defect and have to be scrapped all lots. In this case, the simulated inventory from production yield plan will be far away from the actual inventory leading to wrong information when doing the production scheduling.

Regarding process flow, furnace is a main bottleneck in the process thus the production manager will make a production schedule only at this process. For molding machine and cooling dump, they are continuous processes that have to use the same schedule as furnace.

2.2.2 The Related Policy for Scheduling.

The company does not have scheduling policy. Currently, the company has very closed relationship with SBM.. Thus, the scheduling production for SBM is very flexible.

2.2.3 Advantages and Disadvantages of Existing Scheduling Method

Advantages

1. High Flexibility

Current scheduling system has very high flexibility. The production manager can adjust the plan as many as he wants according to that situation. This is a main advantage for this business because, under the current market condition, automation market has high demand fluctuation. Normally, SBM will give MPS for one month, however, the plan keep changing all the time regarding demand change.

Besides, WFD does not have real time information system for inventory checking and production output checking. So production manager, sometime, has to adjust the plan after found out that the output or inventory missed plan.

Moreover, since there is only single line, production has to be halted when the line was broken down. This is also make the plan has to be adjusted.

2. Low cost.

The scheduling cost is very low because of no investment on any system. Since production planning and scheduling is the job function of production manager, there is no extra cost to pay for.

Disadvantages

1. Totally depended on individual skill – Not a best in class strategy.

It clearly shows that exiting scheduling is totally depended on production manager's skill. That means this system has no consistency. Besides, since there are many various products / shipments, and company scale becomes bigger and more complicate, the man skill cannot generate " the best in class strategy" for production planning. The computer system has to be introduced.

2. Leading to poor resource planning.

Even with automation line, it still needs manpower to support especially in the back end process. Normally, there are two shift / day. Poor scheduling can be leading to poor resource planning. This can be observed from high % over time of employees. Thus, the cost of product is higher than what it should be.

3. Leading to poor material management

Like resource planning, the more flexible the production scheduling, the more difficult the material management.

4. Not compatible with high complexity of product ranges and shipments

The higher the complexity of product ranges and shipments, the lower the efficiency of existing production scheduling is. From the market trend, the product ranges will increase rapidly in the couple years. So, the company has to study more on production

scheduling in order to develop their own scheduling process compatible with the dynamic market environment.

2.2.4 Problem Analysis

There are three main sources of problem in existing scheduling system.

- Problem from supply chain
- Problem from inefficient method
- Problem from shop floor data feedback

Problem from supply chain

1. High fluctuated demand from customer

This is, also, a major problem. However, this problem is influenced from customer in the supply chain and very difficult to deal with because it is an automotive market characteristic.

2. No information sharing

The information has not been shared from the upstream to the downstream of the process. In the scheduling point of view, the important information is the "exact" demand planning from the upstream. Nowadays, each company in the chain asks for some buffer from the downstream company. This makes the downstream companies have difficulties to deal with unreal demand.

Problem from inefficient method

1. No scheduling model / algorithm – highly depended on man skill

Exiting scheduling plan is totally depended on production manager. In the other words, it is depended on man skill leading to inconsistency plan. Moreover, since there are many products and various shipment conditions, manual scheduling system cannot optimize the mean tardiness.

2. No buffer

This problem is a combination from high demand fluctuation and inefficient scheduling method. Foundry always "build to order" all the time and does not have enough time to build up some inventory. Thus, it is very difficult to cope with high demand fluctuation.

Problem from shop floor data feedback

1. No real time inventory (FG and WIP) checking system.

The production time of each product is very short, less than one day, but foundry checks an inventory once a week. Thus, without real time inventory / shop floor status (in order to check the WIP status) really impact to scheduling system.

2. No shop floor feedback

This is the consequence problem form problem 1 (no real time inventory checking system). Since the company didn't have any real time checking system in the production line, it is very difficult and slow to detect the problem. That means, if there are some quality related problems occurred in the production line, many batches might be exposed to this problem before somebody alert and stop the production line. This is one of factors that make the company missed the shipment.