

CHAPTER VII

RESULT, DISCUSSION, RECOMMENDATION AND CONCLUSION

This chapter will present the result of the implementation campaign. Performance comparison between pre- and post- implementation as well as the benefits reaped will be discussed. Additionally, suggestions and recommendations on further improving efforts will be offered.

7.1 Result and Discussion

The improvement activities cost the Company around 102,500 baht for purchasing the constructive materials of storage equipments and hiring extra labors, which in return benefits the Company at following aspects:

- Improving warehouse physical condition

The physical condition of the warehouse after the implementation is significantly improved as illustrated in the figure 7.2 blow. This is the result of removing the messy situation in figure 7.1 and proper warehouse layout. Since the untidy condition is removed, *unnecessary things are eliminated* and *useful raw materials are fully and quickly used*. Additionally, all of storage equipments and raw materials are systemically arranged at their due positions, which *facilitate the operations*. Moreover, the storage area is cleaner and neater, which directly *improves the working environment*.

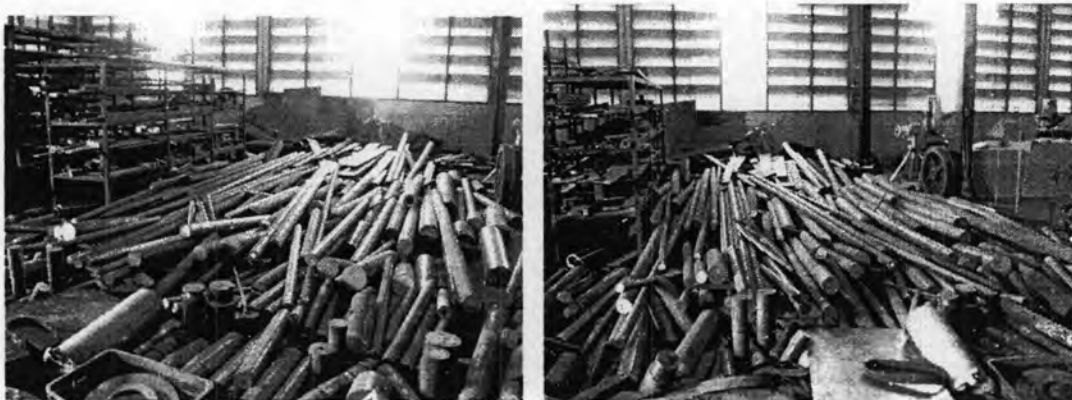


Figure 7.1: Warehouse appearance before implementation

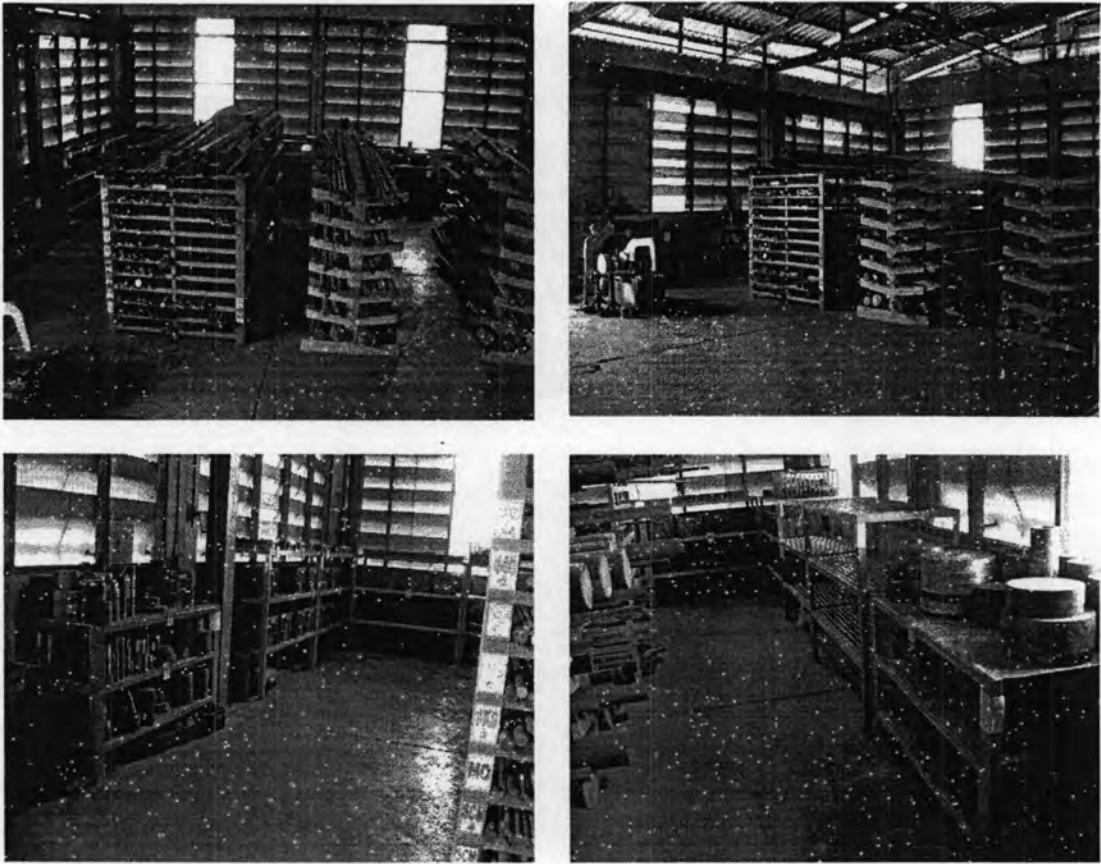


Figure 7.2: Warehouse appearance after implementation

- Inventory reduction

Owing to fast utilization of present raw materials, *current inventory level is reduced* as a result. Consequently, *extra cost on new purchase is avoided and more warehouse free space appears*. Besides these, quick use of the inventory also helps *reduce the depreciation of raw materials*. Therefore, it is roughly calculated that *100,000 baht has been* and *500,000 baht will be* saved from the extra purchase and raw material depreciation.

Due to the removal of the unnecessary components, on the other hand, not only is the inventory amount within the warehouse reduced, but also the expenditure on keeping dead stock and other unneeded items is eliminated, which directly *decreases the total inventory holding cost*. It is estimated that around *100,000 baht* on dead stock holding has been saved. Moreover, the Company is able to *make money from selling the dead stock* as scraps. For this reason, *50,000 baht* from the dead stock

sale is expected.

- Improving space utilization

The table 7.1 below depicts how much space is utilized by what area before and after the implementation campaign.

	Storage (m ²)	Aisle (m ²)	Stock Piling (m ²)	Total Space Used (m ²)
Before	20	10	70	100
After	45	30	0	75

Table 7.1: Space utilization before and after implementation

Observed from table 7.1, before the improving efforts, only 20 m² and 10 m² are respectively consumed by storage area and aisle. A large amount of space, 70 m², is occupied by the raw materials piling. As mentioned in section 4.4 that the warehouse size is measured 100 m², thus, the warehouse is fully covered.

After the implementation, a large proportion of space is covered by storage equipments and aisles. Thus, storage area totally takes up 45 m² and aisle area accounts for 30 m². On the other side, since the improving activities eliminate the stock piling condition, free space of 25 m² emerges consequently, which can be used for other purposes.

Based on the comparison above, it can be concluded that all usable space within the new warehouse has been efficiently utilized. Firstly, space of storage and aisle area has been significant **expanded by 45%** from 30% to 75%. Secondly, the stock piling is removed, so no space is wasted or improperly used. As a result, **free space has turned up**.

On condition that the Company maintains its current business status quo in future, the present warehouse is considered to be big enough to hold the required raw materials. This is because that the actual monthly demand within past two years kept stable according to the figure 4.16. Therefore, it is expected that, in the coming years, the monthly demand trend will continue to follow this changing pattern and will not fluctuate too much. For this reason, the present warehouse is able to cope with the perspective customer demand.

In case that the Company expands its business in future and the customer demand increases, the warehouse size is still sufficient to support the production line. This is because:

- 1) As discussed in the section 5.3.1, selective pallet rack can *hold over 100% more than the current amount of steel bars*.
- 2) After 5S implementation, some steel bars will be used up, which will decrease the inventory level. As a result, *more free space will appear*.
- 3) The Company is a make-to-order business unit and the purchasing policy is *“to order what it needs.”* Consequently, stock is usually not required.
- 4) *Free space of 25 m²* within the storage area is available for expansion, if necessary.

With the combination of these reasons, it can be convinced that whether or not the Company will expand its business, the present warehouse size is big enough for the foreseeable future.

- **Easier and faster storage, movement and retrieval**

The improvement of physical condition has directly *eliminated the difficulties of moving and picking raw materials*. Also, with the assistance of signboards (See figure 7.3) stuck on the storage equipment and colors painted on the raw materials, it becomes *easier and faster* for operators to *store and retrieve the required items* in

short time. In addition, the handling system, to certain extent, *facilitates the storage and movement of raw materials*. And aisles do not make congestion for employees to move the items. In comparison to the previous operation, therefore, all of these activities became easier and quicker.

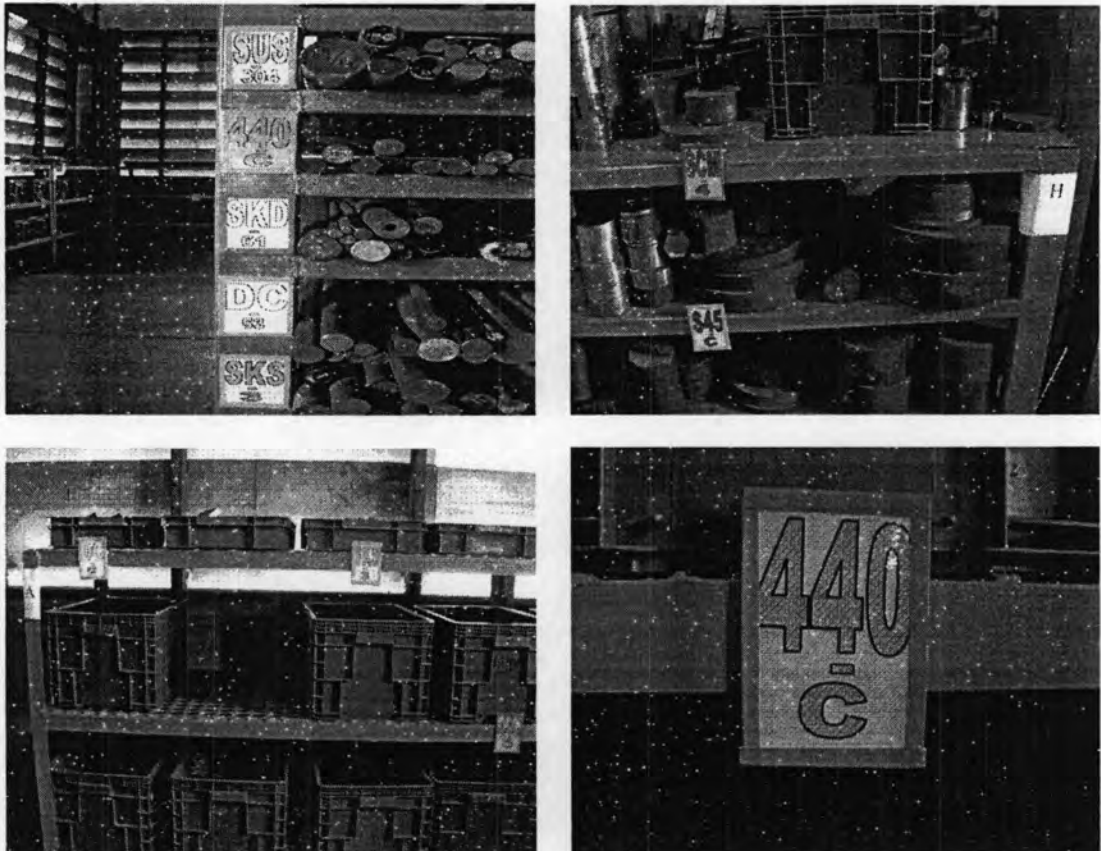


Figure 7.3: Signboards that identify stored materials and make storage and retrieval easier

- Improved efficiency of warehouse operations

The efficiency of warehouse operations is measured by time consumed in the new operations on the month basis. Regularly, the suppliers deliver the raw materials 10 times per month and the picking order from the production line occurs around 100 times per month. Therefore, time monthly spent on operations is calculated as *time-consuming per tour* multiple by *operation times per month*. The result is tabulated below.

	Inbound operation (minutes per tour × operation times per month)	Outbound operation (minutes per tour × operation times per month)	Delivery (minutes per tour × operation times per month)	Total (minutes)
Before	$23 \times 10 = 230$	$25 \times 100 = 2500$	$6 \times 100 = 600$	3330
After	$12 \times 10 = 120$	$5 \times 100 = 1000$	$2 \times 100 = 200$	1320
Percentage Reduced	48%	60%	67%	60%

Table 7.2: Warehouse operations time-consuming on the month basis (minutes)

See table 7.2 above, time spent on the inbound operation, outbound operation and the delivery has been respectively reduced by 48%, 60% and 67%, which lead to the significantly decrease of total operation time-consuming by 60%. This, to a large extent, results from the steeply reduction on the time-consuming on the outbound operation. On assumption of 8 working hours per day, therefore, the decreases of total operation time-consuming, 2010 minutes, can be translated into more than 4 working days. It implies that at least 4 working days per month or 48 working days per year can be saved from the new operations.

What the most important is that decrease on operation time usage helps *reduce the production lead time, machines and employees' idle time* as well as *increases the Company's capacity*. As a response of decrease of production lead time, the *production schedule is shortened*, which enable the Company to *complete several formerly unrealistic manufacturing tasks*. Also, the reduction of time from receiving the picking order to delivering the required raw materials directly *decrease the employee's waiting time* at the production line. Moreover, the working days saved from new operations per year, to certain extent, *increase the Company's capacity to get more customer orders*. By translating time into measurable value, it is reckoned that around

50,000 baht per month can be saved from the decrease of production lead time together with machine and employee idle time. *100,000 baht extra income can be get from increase of capacity to get more orders.* For reasons above, the warehouse operations become better and beneficial.

- **Better raw materials physical control**

Prior to the improving efforts, the production line usually has to wait for unpunctual delivery, which delays the production schedule as well as increase the machines and employees' idle time. Also, as mentioned in chapter 2, the employees often have no ideas of item location and amount in the warehouse due to the lack of raw material physical control.

By following the new inbound and outbound procedure, however, the raw materials are *appropriately assigned to the due location* and *timely delivered* to the production line. Additionally, with the information trace, the raw materials are under good management and control. The recorder sheet *easily tells the managers and warehouse staffs where the items are and how many each item has.* As a result, *the periodical quantity check is avoided.*

- **Better safety performance**

No injury and accident has happened after the safety plan take action. Therefore, *cost on compensation of injury and loss of days absent is avoided.* Although this important safety achievement is equivalent to that of pre-implementation, the potential safety trouble has been eliminated after safety improving activities. Firstly, the rubber elastic rope has been replaced by the steel chain. (See figure 7.4) Due to material mechanics characteristic, it has *more load capacity than rubber elastic rope and may not easily rupture during the raw material movement.* Thus, it is safer than rubber elastic rope. Secondly, *safety rule is distributed* to personnel and *safety responsibility from management to normal employee is assigned.* Thirdly, it has been observed that the warehouse employees self-consciously obey the safety rule and operating

procedure. (See figure 7.5) With the warning sign (figure 6.7) post on the wall of warehouse, helmet is worn during the steel bar movement and overhead crane is strictly operated within the permitted area. Fourthly, the safety performance is monthly reviewed by safety performance record (Table 5.4) and safety checklist (Appendix E) is used to investigate the potential accident and identify the hidden troubles. Due to these measures, *potential hazard is eliminated and the safety is guaranteed.*

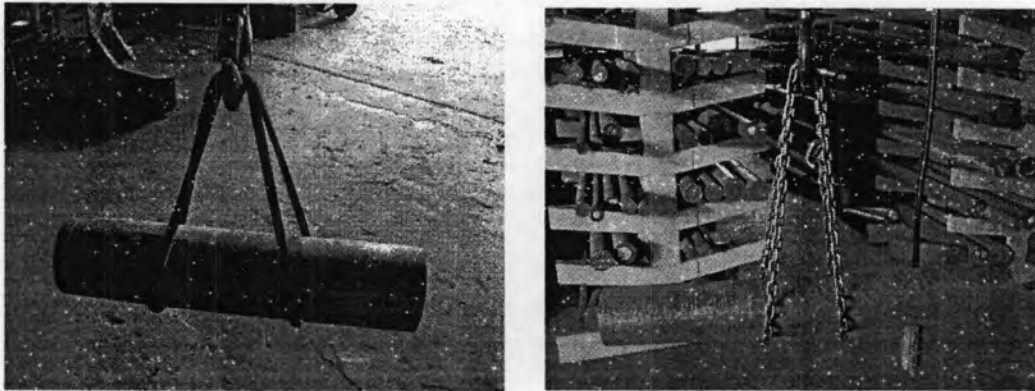


Figure 7.4: Fasten equipment before and after implementation



Figure 7.5: Safety operation

- Better security

After the security measures taking action, *all of raw materials are under good security.* There is *no stealing case* being reported to the management. In comparison to the pilferage case happening twice a week before the security improving efforts, the security performance has been enhanced.

The biggest benefit gained from the good warehouse security is the elimination of loss on pilferage. The manager has evaluated that average 4,000 baht loss per week incurs by the raw materials pilferage. By calculating, hence, around *200,000 baht* per year is under threat if the security problem is unable to be tackled. Through the better warehouse security measures, therefore, the *200,000 baht* loss on pilferage in one year is eliminated.

7.2 Recommendations for Further Improvements

Although the warehouse has been currently improved, further activities can be taken into account to continue improve the warehouse performance if the Company want to achieve higher efficiency.

Firstly, from the physical aspect, the warehouse condition needs maintenance under the concept of 5S. There is no end point for 5S and it is a non-stop process according to the note of 5S. Without the maintenance, the 5S will stop soon. The previous efforts made might be ruined and the condition in figure 1.1 may return again. Thus, the organization, orderliness, cleanliness and standardized cleanup should be repeated everyday.

Secondly, the continuous improvement can appeal to the information technology. In another word, introduce information system into the warehouse to manage the raw materials. It has been proved that the benefits brought by information system are huge and the companies with the information system operate more efficiently and effectively than those companies have not. In the warehouse function, the application of Warehouse Management System (WMS) such as MPR, MRP II and ERP, is increasingly becoming prevailing and applicable. The utilization of bar code, RFID helps reduce the inbound and outbound time-consuming. The computer-based network assists to achieve good inventory management. These advantages prove the application of computer-based information system into the BESCO Company profitable and productivity. However, one important point should be noted is that the information should be updated as soon as possible after each step of operation.

7.3 Conclusion

Before improvement, the focused warehouse in this case has undertaken several painful problems due to the improper material storage equipments, inappropriate layout setup, unclear responsibility and poor operations. With implementation of the proposed solutions and the 5S technique, several improvements are achieved. The warehouse physical condition is significantly improved. Inventory is reduced. Space utilization is increased by 45%. Warehouse operations are easier and faster, which reduces the production lead time and machine and employee idle times as well as increases the Company's capacity. Raw materials are under good management and control. Warehouse safety and security is well guaranteed. In order to achieve even better performance, however, the warehouse should be continuously improved. For this reason, it is recommended that 5S should be maintained and computer-based information system should be introduced to the warehouse.