

CHAPTER IV

KEY QUALITY INDICATOR DEVELOPMENT

This chapter presents how to create and develop the Key Quality Indicator (KQI), of the Hydraulic Cylinders Division, Factory Department. This will be a guideline for other divisions of factory department and other departments in the ABC Company to develop KQI in order to achieve customer satisfaction purpose ultimately.

4.1 Key Quality Indicator Development Procedure

The procedure of how to develop KQI of the Hydraulic Cylinders Division can be summarised as follows.

- 4.1.1 Define the objectives/targets of company's quality policy.
- 4.1.2 Evaluate critical success factors to satisfy customer needs/company's quality policy.
- 4.1.3 Define and evaluate Quality Indicators of the Factory Department.
- 4.1.4 Select the Key Quality Indicators.

4.2 Company's Quality Policy

ABC's executives and employees must emphasis on delivery quality products and services with on-time delivery to satisfy customer requirements with the employee's continually quality improvement concept.

4.3 Key Quality Indicator Development

4.3.1 Factory Department's Target

With regards to the company's quality policy, the factory department's target can be summarised as follows.

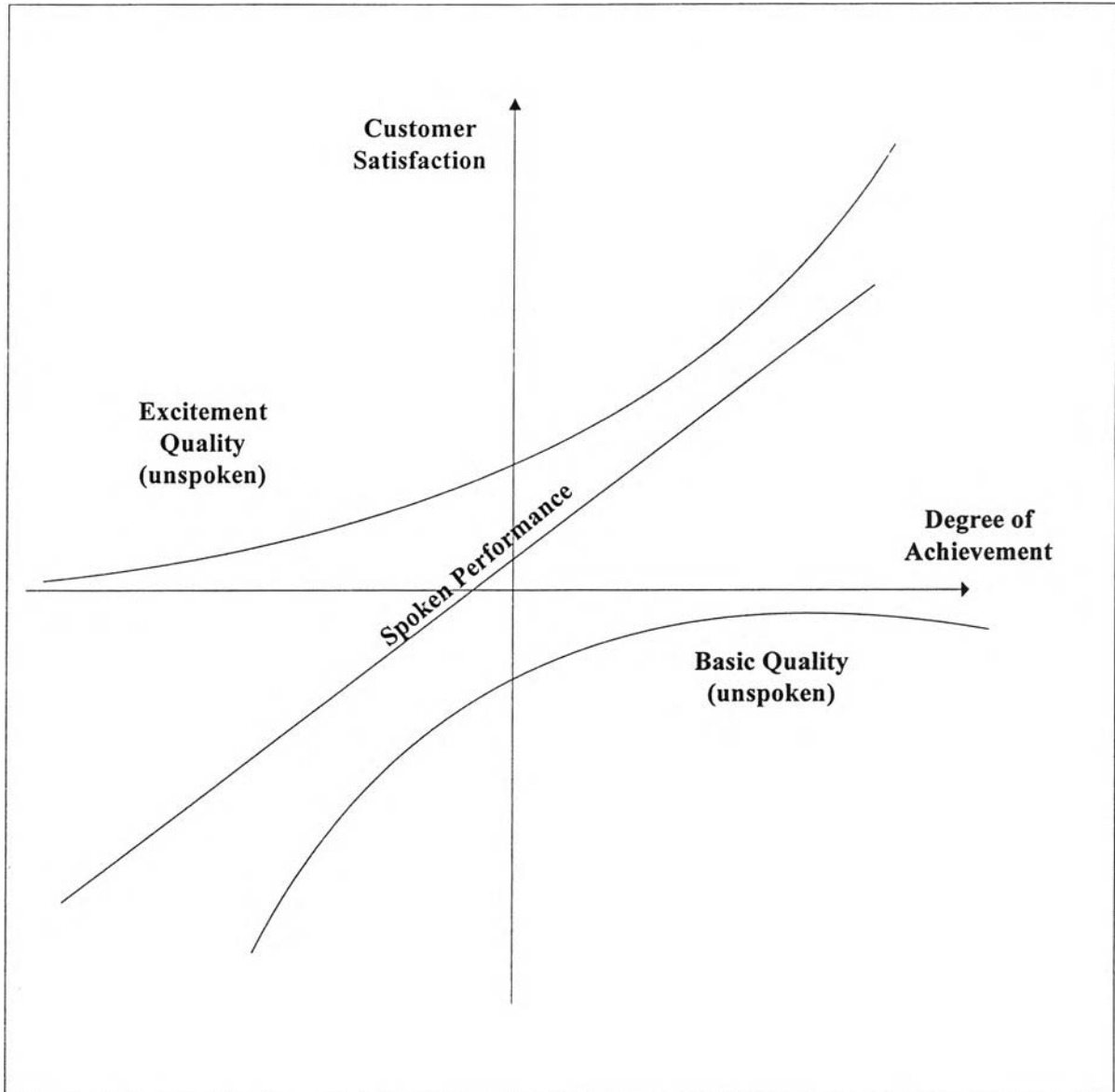
1. To reduce the manufacturing cost by minimising production time, defection rate and waste.
2. To apply a properly maintenance program for machinery.
3. To revisit the existing manufacturing process and develop it to be the most efficient process.
4. To emphasis on product design in order to response to customer requirements.
5. To develop staff's knowledge and skill and encourage teamwork and involvement.

4.3.2 Factory Department's Critical Success Factors

According to the Department's quality target, the critical success factors to satisfy customer needs/company's quality policy can be defined.

Customer needs in regards to quality can be explained by using the Kano model of quality. The Kano model of quality indicates that the simplistic view of customers having requirements which improve satisfaction in a linear fashion depending upon the degree to which they are met does not fully reflect the complex nature of the process of satisfying customers.

Figure 4.1: The Kano Model of Quality



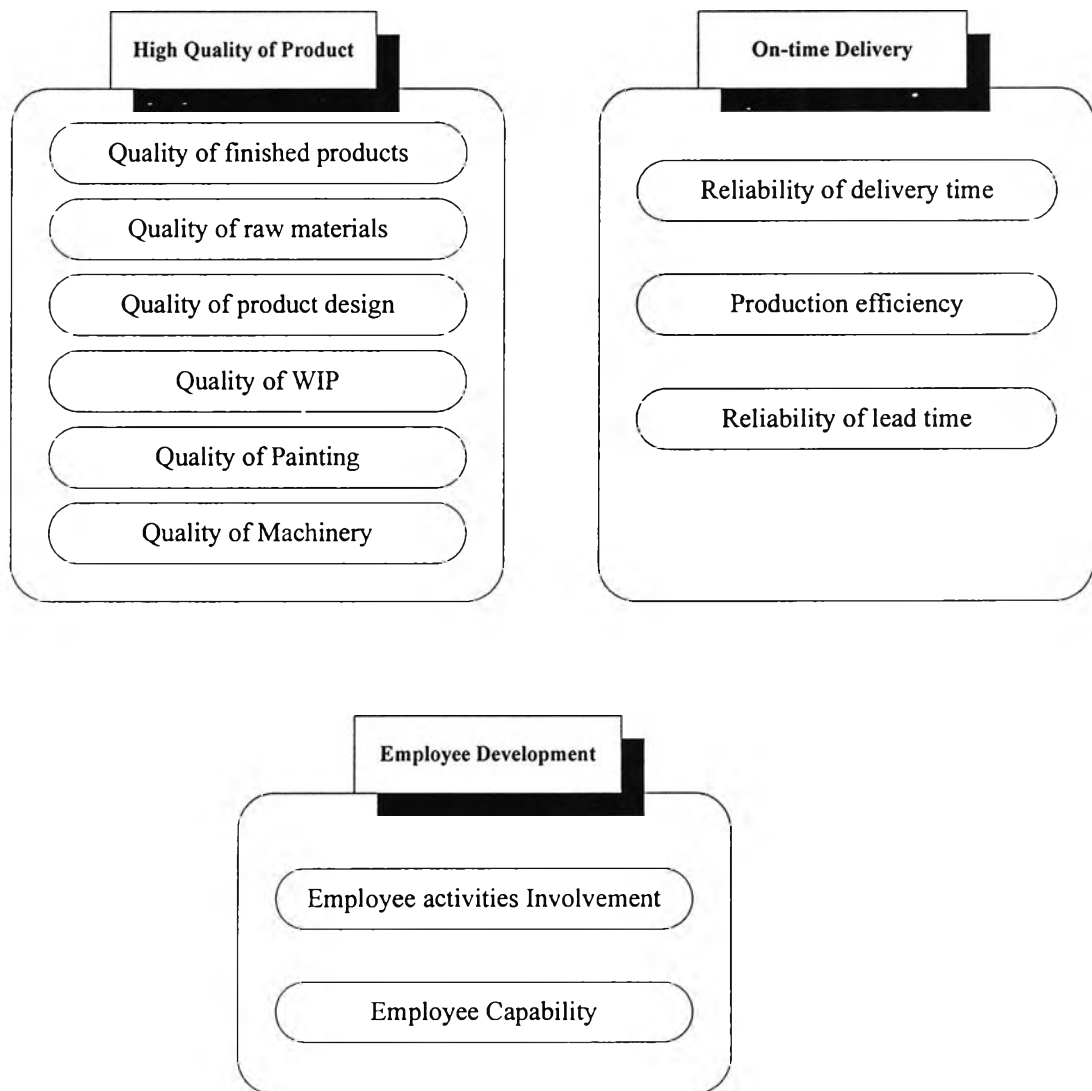
According to the above figure, Spoken performance issues will be of the form “I would like the product/service to achieve this level of performance”. If the performance meets or exceeds this level the customer will be satisfied on that issue. However, the customer will be dissatisfied on this issue if the performance does not meet the indicated level.

The Basic quality area is related to items that a customer will not specify performance levels for since customer assumes these levels will be met as a matter of

course. This area sometimes called “Must be Attribute”. Therefore, if the company fail to fully satisfy one of these criteria the company will have a very dissatisfied customer. For ABC company, the complaint in regards to quality of product shows that the primary requirement has not been fulfilled and resulted in the company’s position moving lower towards the bottom of the curve (customer dissatisfaction).

As a result, the company should set the company’s critical success factor based on customer needs in regards to quality and company’s quality policy.

Figure 4.2: Factory Department’s Critical Success Factors



4.3.3 Factory Department’s Quality Indicators

4.3.3 Factory Department's Quality Indicators

The Factory Department's Quality Indicators (QI) will then be set by align to the department's quality goals and key success factors. The department's Quality Indicators is summarised in the following table.

Table 4.1: Factory Department's Quality Indicator

Critical Success Factor	Quality Indicator Measurement	Correlation to Customer Complaints	
		High	Low
Quality of Finished Products	Number of defects due to quality of design	◆	
	Number of defects in regards to quality of WIP	◆	
	Number of defects due to specification of product	◆	
	Number of defects due to the assembly of product	◆	
	Number of defects due to the quality of finished product	◆	
Quality of Raw Materials	Damaged raw materials caused from storage process (value, percentage)	◆	
	Number of defects in regards to damage of raw materials	◆	
	Number of defects due to the quality of raw materials ordered from suppliers	◆	
Quality of Design	Number of defects due to the design of product	◆	
	Number of approved design to total design		◆
	Improvement of design lead time	◆	
Quality of WIP	Number of mistakes in product assembly		◆
	Number of mistakes in quality examination	◆	
Quality of Painting	Number of defects due to painting	◆	
	Number of approved painting work to total work		◆
	Improvement of painting lead time	◆	
	Number of days in painting that deviated from the plan	◆	

Table 4.1: Factory Department's Quality Indicator (continued)

Critical Success Factor	Quality Indicator Measurement	Correlation to Customer Complaints	
		High	Low
	Number of reworks		◆
Quality of Machinery	Number of machinery down time due to improper machinery maintenance	◆	
	Number of mistake in production due to improper machinery maintenance	◆	
Reliability of Delivery Time	Number of days in late and postpone delivery of finished products	◆	
	Number of days delayed from the production plan	◆	
	Number of days in late and postpone delivery of design for customer approval	◆	
	Number of days in late and postpone delivery of the approved design to related sections	◆	
	Number of days used in WIP inspection that deviated from the plan		◆
	Feasibility that other sections that related to production can follow production plan created by Engineering section	◆	
	Number of days deviated from production plan due to unavailability of raw materials	◆	
	Number of days deviated from production plan due to unavailability of WIP	◆	
	Percentage of on-time delivery to total delivery	◆	
Production Efficiency	Improvement of production lead time		◆
	Percentage of finished product manufactured to target of finished product manufactured	◆	
	Number of days used in WIP assembly that deviated from the plan	◆	

Table 4.1: Factory Department's Quality Indicator (continued)

Critical Success Factor	Quality Indicator Measurement	Correlation to Customer Complaints	
		High	Low
	Number of re-assembly		◆
	Number of infeasible production plan		◆
	Number of days in production that deviated from the plan	◆	
	Number of reworks happened from poor production plan		◆
	Number of days used in WIP assembly that deviated from the plan	◆	
Employee Development	Number of approved Kaizen suggestions		◆
	Number of approved 5S project		◆
	Average number of training days per employee	◆	
	Number of employee that pass the exam to total attendance		◆

4.3.4 Select Factory Department Key Quality Indicators (KQIs)

Generally, the measurement indicator should be clear, simple, measurable and highly related to the strategy of an organisation. According to Pasu (2003), good Key Performance Indicators should have the following characteristics:

- highly correlated to company's vision, mission and strategy
- clear and simple
- measurable
- reflect company's actual performance
- lead to company's development

For ABC, the similar criteria is also recommended to used in selecting KQI:

- highly correlated to company's quality goal
- highly correlated to company's on-time delivery goal
- implementation feasibility

- company's actual performance's reflection
- lead to the company's improvement and development

The score used in evaluating Performance Indicators rated from 1-the lowest score, to 5-the highest score.

- "5" refers to the highest correlation level of the indicator and selection criteria
- "4" refers to a high correlation between the indicator and selection criteria
- "3" refers to a fair correlation between the indicator and selection criteria
- "2" refers to a low correlation between the indicator and selection criteria
- "1" refers to none correlation between the indicator and selection criteria

In this case, the company only evaluates the Quality Indicator that highly related to customer complaints. The Quality Indicator with high score will be selected as the Key Quality Indicator. The following tables show the result of the evaluation of Quality Indicator.

Table 4.2: Factory Department's Quality Indicator Evaluation Score

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthy					
Quality of Finished Products	Number of defects due to quality of finished products	Monthly	5	3	5	5	5	5	5	33
	Number of defects due to quality of design	Monthly	4	3	4	5	4	4	4	28
	Number of defects in regards to quality of WIP	Monthly	4	3	4	3	4	4	4	26
	Number of defects due to specification of product	Monthly	4	3	4	5	4	4	4	28
	Number of defects due to the assembly of product	Monthly	4	3	3	4	4	4	4	26

Table 4.2: Factory Department's Quality Indicator Evaluation Score (continued)

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthy					
Reliability of Delivery Time	Number of days in late and postpone delivery of finished products	Monthly	4	4	4	4	4	4	5	29
	Number of days delayed from the production plan	Weekly	3	4	4	4	4	4	4	27
	Number of days in late and postpone delivery of design for customer approval	Weekly	3	4	4	4	3	3	4	25
	Number of days in late and postpone delivery of approved design to related sections	Weekly	3	4	3	4	3	3	4	24
	Number of days used in WIP inspection that deviated from the plan	Weekly	3	4	3	3	3	3	4	23

Table 4.2: Factory Department's Quality Indicator Evaluation Score (continued)

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthy					
	Feasibility that other sections that related to production can follow production plan created by Head of Engineering	Weekly	3	4	3	4	3	3	4	24
	Number of days deviated from production plan due to unavailability of raw materials	Weekly	3	4	4	4	4	4	4	27
	Number of days deviated from production plan due to unavailability of WIP	Weekly	3	4	4	4	4	4	4	27
	Percentage of on-time delivery to total delivery	Weekly	4	5	5	4	5	5	5	33
Quality of Raw Materials	Damaged raw materials caused from storage process	Bi-weekly	4	3	4	4	3	3	3	24



Table 4.2: Factory Department's Quality Indicator Evaluation Score (continued)

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthiness					
	Number of defects in regards of damage of raw materials	Bi-weekly	3	3	4	4	3	3	3	23
	Number of defects due to quality of raw materials ordered from suppliers	Bi-weekly	3	3	4	4	3	3	3	23
Production Efficiency	Improvement of production lead time	Weekly	3	4	4	4	4	4	3	26
	Percentage of finished product manufactured to target of finished product manufactured	Bi-weekly	5	5	4	4	4	4	4	30
	Number of days used in WIP assembly that deviated from plan	Weekly	3	4	4	3	3	4	3	24
	Number of re-assembly	Weekly	3	4	4	3	3	4	3	24

Table 4.2: Factory Department's Quality Indicator Evaluation Score (continued)

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthy					
	Number of days in production that deviated from plan	Bi-weekly	4	4	4	5	4	4	4	27
	Number of reworks happened from poor production plan	Bi-weekly	4	4	4	4	3	4	3	26
	Number of days used in WIP assembly that deviated from plan	Weekly	3	4	4	3	3	4	3	24
Quality of Design	Number of defects due to the design of product	Weekly	4	3	4	4	4	4	4	27
	Number of approved design to total design	Weekly	4	3	4	3	3	4	4	25
	Improvement of design lead time	Weekly	4	3	4	3	3	4	4	25
Quality of WIP	Number of mistakes in product assembly	Weekly	4	4	4	3	3	4	4	26

Table 4.2: Factory Department's Quality Indicator Evaluation Score (continued)

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthy					
	Number of mistakes in quality examination	Weekly	4	3	2	3	3	4	4	25
Quality of Painting	Number of defects due to painting	Weekly	4	4	3	4	3	3	4	25
	Number of approved painting work to total work	Weekly	3	2	3	4	3	3	3	21
	Days improvement in painting lead time	Weekly	3	2	3	4	3	3	4	22
	Number of days in painting that deviated from plan	Weekly	3	2	3	4	3	3	3	21
	Number of reworks	Weekly	3	4	3	4	3	3	3	21
Quality of Machinery	Number of machinery down time due to improper machinery maintenance	Monthly	4	4	4	3	3	3	4	25

Table 4.2: Factory Department's Quality Indicator Evaluation Score (continued)

Critical Success Factor	Quality Indicator Measurement	Frequency	Evaluation Criteria							Total Score
			Correlated to the Company's Goal			Implementation Feasible	Clear	Actual Performance Reflection	Lead to Company's Improvement and Development	
			Quality	On-time Delivery	Trustworthy					
Employee Activities Involvement	Number of approved Kaizen suggestions	Quarterly	4	2	3	3	2	3	4	21
	Number of approved 5S Project	Quarterly	4	2	3	3	3	3	4	22
Employee Capability	Average number of training days per employee	Quarterly	4	2	3	3	3	4	4	23
	Number of employee that pass the exam to total attendance	Monthly	4	2	3	3	3	3	4	22

The Factory Department Manager and Head of each section will then select the Key Quality Indicator. Although ABC has an ultimate goal of customer satisfaction level improvement, Key Quality Indicator can not be only selected from the customer perspective. The reason is that the result from measures of all related perspectives will ultimately lead to customer satisfaction.

Key Quality Indicator will be then selected from the highest score and can be summarised in the below table. However, only the two highest score quality indicator will be used for this study.

Table 4.3: Quality Indicator

Critical Success Factor	Quality Indicator Measurement	Evaluation Score
Quality of Finished Products	Number of defects due to quality of finished products	33
Reliability of Delivery Time	Percentage of on-time delivery to total delivery	33
Production Efficiency	Percentage of finished product manufactured to target of finished product manufactured	30
Quality of Design	Number of defects due to design of product	27
Quality of WIP	Number of mistakes in product assembly	26
Quality of Painting	Number of defects due to painting	25
Quality of Machinery	Number of machinery down time due to improper machinery maintenance	25

Table 4.3: Quality Indicator (continued)

Critical Success Factor	Quality Indicator Measurement	Evaluation Score
Quality of Raw Materials	Number of damages caused from storage process	24
Employee Capability	Average number of training days per employee	23
Employee Activities Involvement	Number of approved 5S project	22

With the purpose of this study and limited time, only the top two key quality indicators are selected for implementation, which are quality of finished products and reliability of delivery time.

The selected Quality Indicator is therefore more align to the company's strategy since it is formulated by using company and division's strategy as a guideline. Moreover, it covers more than one perspective, which are inter-related to each other and crucial for company improvement and development.

4.4 Target of Quality Indicator

Target of each Quality Indicator is recommended to set for improvement purpose. Not all required data is available for ABC at this time. Therefore, target of some Quality Indicator in the first implementation will not be available. Target can then be set after cycles of implementation.

The following table is recommended to use as a monitoring tool once the implementation is taken. It shows the actual result of each Key Quality Indicator and target to be achieved. The other quality indicators presented in previous section should also follow this guideline. For the implementation purpose, we will emphasis on the Key Quality Indicator only and the target presented here will be used for monitoring purpose. The target will be then reviewed and amended from time to time.

Table 4.4: Target of Key Quality Indicator

Key Quality Indicator	Calculation Formula	Unit	Frequency	Actual	Target
Quality of finished products	Number of defects due to quality of product	Items	Monthly	40	20
Reliability of Delivery Time	Number of on-time delivery lot to number of total delivery lot	%	Weekly	87%	95%