

Outsourced High-strength Steel Purchasing

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Bachelor's thesis

May, 2010

Degree Programme in Logistics Engineering
School of Engineering and Technology



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Author(s) Liu,Kefei	Type of publication Bachelor´s Thesis	Date 11.05.2010
	Pages 49	Language English
	Confidential	Permission for web publication
Title Outsourced High-strength Steel Purchasing		
Degree Programme Logistics Engineering		
Tutor(s) Mr. Jaakko Viitala		
Assigned by Sichuan Topcen Logistics Corperation		
Abstract <p>The thesis was based on Sichuan Sunkun Equipment Corp outsourcing its high-strength steel plate purchasing activity to Sichuan Topcen Logistics Corp. The reason for this was that high-strength steel plates are in short supply in the market and Sunkun is not an expert in purchasing. It brings a series of problem to Sunkun and enforces Sunkun to outsource the purchasing activity to Topcen.</p> <p>The goal of the thesis was to analyze the existing system and optimize it. According to the theory of outsourcing and purchasing, the whole purchasing activity is optimized through personnel reorganization, sourcing strategy, setting up supplier relationships and management and supplier measurement. JIT was suggested as a target to achieve in the future.</p> <p>The result of the study is that suppliers are classified, and ths main supplier Wusteel is chosen. Suppliers are measured at certain periods to keep them competitive and maintain the material quality.</p>		
Keywords High-strength steel industry, supplier evaluation, supplier relationship management, supplier measurement		
Miscellaneous		

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1 Introduction

1.1 Background

Topcen Logistics and Sunkun Equipment both belong to Sichuan Academy of Aerospace Technology (SCAAT). I did my practical training at Topcen logistics. Sunkun is a fast-developing company which does not have enough experience in material purchasing. It seems more and more important to control the cost of material purchasing when the price of steel has been doubled in a year. In this case, Sunkun and SCAAT decided to outsource the purchasing of high-strength steel business to Topcen which is more professional in purchasing.

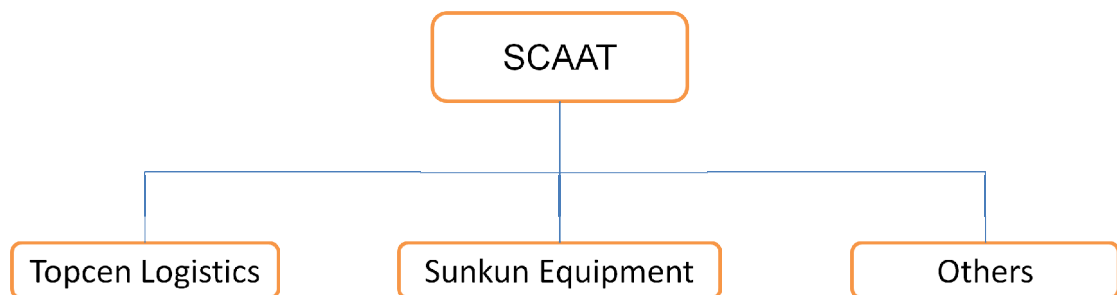


FIGURE 1. Company structure of SCAAT

1.1.1 Topcen Logistics

Its main operations are industrial raw material purchasing, warehousing, machining and distribution. Its predecessor is a supplies department of SCAAT.

An independent logistics company was built to satisfy the increasing demand of the purchasing business in 2006. Its annual net profit is about 15,000,000 RMB (1,600,000 Euro) and over 30% of the profit is from the

Sunkun project. There are 52 employees and 5 departments included in this company. It owns a warehouse of 11816 m² and 10 trucks. Just in front of the warehouse, it has a 1000 m² office area. The working environment and facility are pretty good.

1.1.2 Sunkun Equipment

Its main product is hydraulic support which is used in mining industry. According to the difficult environment during mining operations, the demand for the material strength is also extremely high. They are a new civil company with certain military high-tech. That is why their products have been so popular since they started this business.

1.2 Introduction of the problem

Lack of electricity in industrial enterprises becomes more and more serious. And most of power plants still use coal as the fuel. This directly causes that the demand for coal increases. In the meantime, the mining companies have to increase the output of coal to fulfill the increasing demand. The increased output of coal means more equipment and personnel. This can explain why Sunkun's equipment is so popular. Then, a circle is formed for the steel company at the beginning to the end user (see FIGURE 2). The steel company acts a special role in this relationship and it affects the price of all the products mentioned in FIGURE 2.

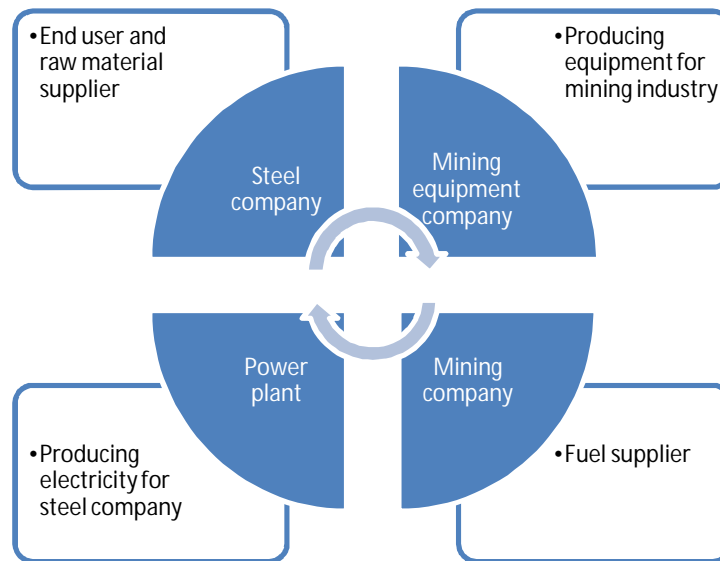


FIGURE 2. Company relationship

In this complex relationship, Sunkun is in a passive position. Its sales are increasing when the price of steel is increasing even quicker. At the same time, high-strength steel output is less than the demand. Controlling that the operational cost is competitive in the market and getting enough profit are Sunkun's biggest challenges. For those purposes, Sunkun decided to outsource its steel purchasing business to Topcen to cut down raw material cost.

1.3 Goals of the Study

Sunkun expected the reasonable price of material to minimize their costs. Firstly, the lead-time had to be shorted and the ordering risk had to be reduced on advanced sourcing strategy. Then, strategic relationships had to be managed with the supplier. At last, to measure the existent supplier and to be ready for further optimization were necessary.

This project was Sunkun's first outsourcing project as well as Topcen is. As a contractor, Topcen have to control the technical risk, commercial risk,

contractual risk, performance risk to satisfy Sunkun's demand. All these topics are still new for most of Chinese companies and hard to manage. Outsourcing management and assessment have to be built to increase efficiency between those two companies.

1.4 Research Methods

Literature from (Arjan J. Van Weele, 2005) is the basis of the thesis. These literatures which are concerning purchasing and outsourcing explain this business briefly and make it understandable for the reader. It is not possible to design and develop any system without theoretical support.

Realistic data and experience from the internet and colleagues supported the theoretical part. They can also be considered as a basis to improve for the purpose of cost reduction and efficiency improving.

1.5 Steel Industry in China

China has the biggest output of steel in the world. It produced 568 million tons of steel in 2009 with a 13.5% increase when the whole economical environment was of a low-level. This output makes up 47% of the world's output. In the meantime, 55.3 billion RMB profits were made from the total sales of 2247.8 billion RMB. The profit margin was only 2.43% with high prices.

One reason for this low profit is that most ironstone needs to be imported. China produced 180 million tons of ironstone and imported 628 million tons from Australia and Brazil. The price of ironstone is controlled by BHP

Billiton, Rio Tinto Group and Vale of Brazil ,which are the three biggest ironstone producers.

The other reason is that there are too many small and medium-sized companies in steel industry. Those SMEs are not able to produce high value-added products with economical, environmental and advanced technologies. (Financial Circle internet pages; Baidu Know-how)

1.6 High strength steel

1.6.1 Definition

The full name is high strength low-alloy steel. “It is a type of alloy-steel that provides better mechanical properties or greater resistance to corrosion than carbon-steel. HSLA steels vary from other steels in that they aren't made to meet a specific chemical composition, but rather to specific mechanical properties.” (High-strength low-alloy steel, Wikipedia)

In the Chinese market, the high strength steel is mainly divided into the following categories by yield strength: Q390, Q420, Q460, Q500, Q550 and Q690. These steels are widely used in mining equipment, excavators, cranes and hydraulic supports. According to demand of the customer, the producer can supply the steel in different thicknesses and areas. (Steel market internet page)

1.6.2 Market Analysis

The total output of high strength steel was 700 thousand tons in 2007. And the output was 1.1 million tons in 2008. The more than 50% increase shows a highly developed market. There are several companies which are

famous in this market, such as: Jinan steel, Baoshan steel, Wuhan steel, Wuyang steel and Anyang steel. All these companies are state-owned enterprises, so they are named by the places where they are located. Baosteel is the biggest steel group in China

2 Outsourcing

“Outsourcing expenditures in 2000 in the US were around \$340 billion and were expected to grow at a rate of 15 per cent annually”. For the purpose of achieving strategic goals, reducing costs, improving customer satisfaction and providing efficiency and effectiveness improvements, companies use outsourcing to increase their competitiveness (Arjan J. Van Weele, 2005).

Outsourcing is defined as “the decision and subsequent transfer process by which activities that constitute a function, that earlier have been carried out within the company, are instead purchased from an external supplier” by Axelsson and Wynstra (2002). In other words, certain activities of an enterprise are transferred from their duty to another external party. This party may also contain the original assets and personnel. There will be an extended relationship between the parties involved over a longer period of time. In order to keep this relationship longer, the buyer has to provide its relevant completed business profile to the contractor for deeper cooperation (Arjan J. Van Weele, 2005).

2.1 Outsourcing as a Tool in Business

According to Gartner (2003): Satisfaction with the business benefits from outsourcing contracts fell from 86 percent in 2001 to 50 percent in 2001 among board-level executives in Western Europe. European companies wasted 6 billion euro due to poor deal structures and poorly managed relationship with IT outsourcing companies in 2002

Corbett (2002) reports that: The use of outsourcing is growing stronger. Satisfaction with service providers is strong but there are some concerns. Only 60 percent of executives are satisfied with their outsourcing initiatives and only 11 percent of the executives are very satisfied...

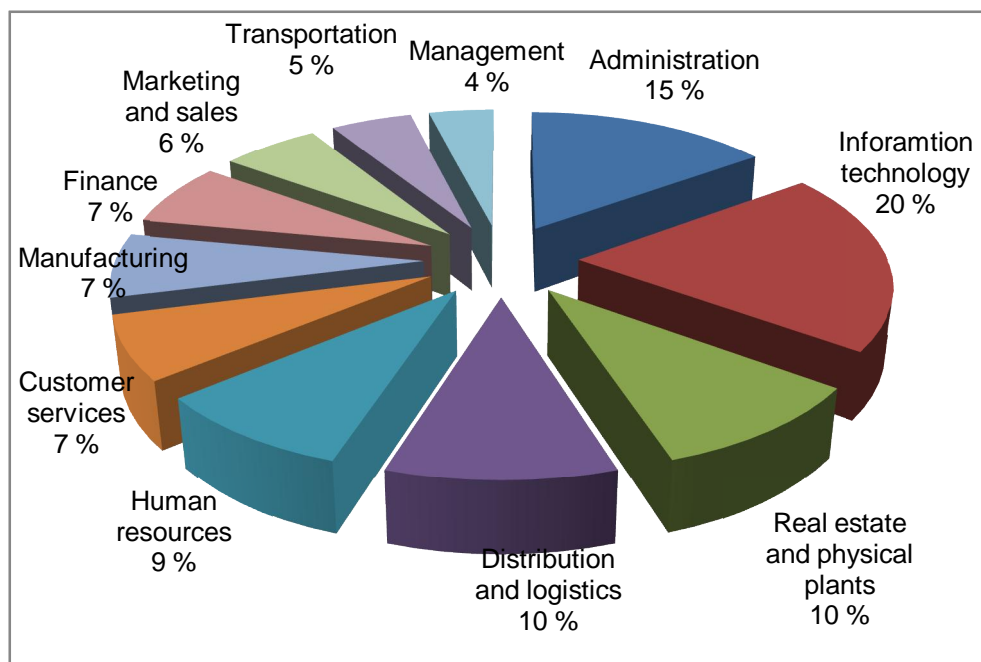


FIGURE 3. Outsourced activities

These reports have different results about the research of outsourcing.

Generally, half of the cases of outsourcing projects do not seem to produce the results that were expected from them. But, this outsourcing business still grows fast in the US and Europe. There are plenty of reasons for the company to choose outsourcing, such as: to reduce and control operating costs, improve company focus, access to world-class capabilities, free resources for other purpose, lack of resource etc (Arjan J.Van Weele, 2005).

2.2 Outsourcing Process

Most of author agreed on that there are three essential phases in outsourcing. Firstly, the strategic phase defines the reason to outsource certain activities to someone else. Then, this outsourcing decision becomes an implement through contract negotiation, project execution and transfer. The last one is the operational phase which is essential to the success of outsourcing (Arjan J.Van Weele, 2005).

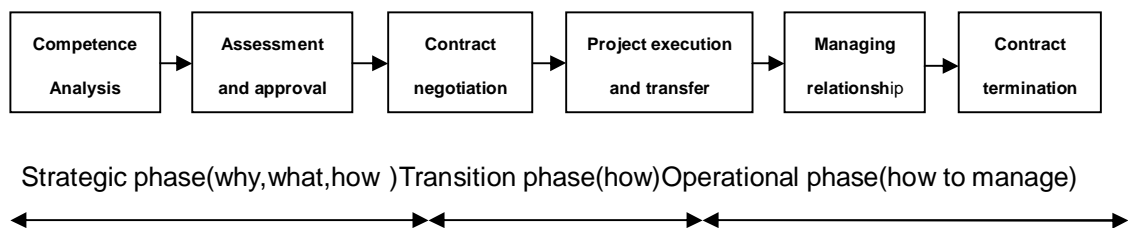


FIGURE 4. The outsourcing process

2.2.1 Strategic Phase

As mentioned earlier, there are plenty of reasons for companies to outsource their activities. The outsourcing decision is made based on (1) focus on core competence, (2) focus on cost efficiency/ effectiveness and (3) focus on service. In this way, the outsourcing strategy is aligned with

these motives and the outsourced activities should contribute to this strategy (Arjan J. Van Weele, 2005).

The transaction cost approach and the core-competence approach are applied to the analysis of the candidate of outsourcing. The level of the transaction costs affect by the frequency of the transaction, the level of the transaction specific investment and the external and internal uncertainty (Ellram & Billington, 2001). The core competencies provide company with its long-term competitive advantage. These competencies must be closely protected and are not to be outsourced (Arjan J. Van Weele, 2005).

The contractor must be able to have the necessary technical and managerial capabilities to deliver the expected and required level of performance. The contractor should also be able to understand and be committed to these requirements (Arjan J. Van Weele, 2005).

2.2.2 Transition Phase

A contract is made to keep the relationship and it is the legal key document in the outsourcing process. Within the contract, both the outsourcer and contractor try their best to maximize the rewards of the relationship while minimizing the risk. The contract and the type of contract should reflect the business plan to achieve the outsourcing strategy (Arjan J. Van Weele, 2005).

“After the contract is signed and all the issues in the preceding phase have been dealt with, the key activities in the phase are establishing the basis for supplier integration, defining the workflow interfaces and adapting the organization as a result of the transfer to activities to the supplier”. The

Contractor's organization is usually tested against the requirements of contract before the last phase starts (Arjan J. Van Weele, 2005).

2.2.3 Operational Phase

Two processes are contained in the operational phase; they are managing the relationship and contract termination. Within a close relationship between the outsourcer and contractor is the only way to achieve the goal of the outsourcing operation. A good outsourcer- contractor relationship should be involve the factors such as trust, flexibility, team approach, shared objectives and open communication (Arjan J. Van Weele, 2005).

The agreed service level on a regular basis and possible competitors are used to measure the performance of the services provided. “ A common mistake made by a buyer is not only to feel and act responsible for the measurement process, but also feel and act responsible for the execution of the contract. Successful outsourcing requires a shift in mind set for the buying organization” (Arjan J. Van Weele, 2005).

3 Purchasing

“A business is becoming more and more competitive, purchasing and supply chain management are increasingly recognized as key business drivers by top managers. Since most companies today spend more than half of their sales turnover on purchased parts and services, efficient and constructive relationship with suppliers are keys to the company’s short-term financial position and long-term competitive power”. The globalization of trade, advanced information technology and changing consumer patterns are the main elements which put purchasing at a new position (Arjan J. Van Weele, 2005).

3.1 Function of Purchasing

Purchasing makes sure an enterprise’s regular operation. Raw material and production equipment are essential for an enterprise with a real product.

Purchasing affects enterprise’s product quality. The quality of raw material and production equipment which are purchased determine the quality of product.

Purchasing is also a main tool to control total costs. If the purchasing cost takes a big part in the total, the enterprises’ revenue will be low or even negative. A good purchasing management reduces the inventory cost, saves purchasing costs in total and speeds up capital turnover.

Purchasing determines the product life cycle of an enterprise. Purchasing

is the start of a production line, therefore the time and quantity issues must be considered (Zheng Chengwu, 2009).

3.2 Purchasing Process

There are six steps in a regular purchasing behavior:

- Determining the needs of purchasing
The production department of an enterprise makes a requisition which contains goods' functional and technical specification of the goods, and the quantity arrival time.

- Selecting applicable supplier
According to the production requirements, a purchasing plan concerning detailed requirement on quality, transportation, inspection, etc. has to be made. The supplier's characteristics must highly meet those requirements. Then, those qualified suppliers will receive a request for quotation from the buyer and make their bids. Finally, the buyer makes a decision through their supplier assessing system.

- The purchasing contract
A contract has to be made after the supplier has been chosen. The contract may refer to different specific additional terms and conditions which are caused by purchasing policy, company culture, market situation, product characteristics, etc. Price, terms of delivery and terms of payment should be mainly considered.

- Ordering
Orders are made from buyer to supplier with the purchasing contract.

Depending on the quantity and time of delivery, the contract can be divided into several orders by buyer. An order includes an order number, the product characteristics, unit price, number of units required, expected delivery time, delivery address and invoicing address.

- Expediting

Nobody can make sure that there is no risk during all the order handling process. The buyer must set up a certain method to solve the possible problem to make sure the order is finished just at the right time and place.

- Follow up and the process assessment

After the purchased goods have been used in the production, the purchasing work is not finished yet. Warrant claims, penalty clauses, the purchase and supplier documentation have to be paid attention to as part of after sales service. Furthermore, the buyer should keep track of the supplier's quality and delivery record which is the main indicator when evaluating a supplier. To choose a good supplier for a long term will benefit the enterprise both in finance and product (Arjan J. Van Weele, 2005).

3.3 Supplier Selection

Suppliers affect the quality and cost of the buyer's product. Time to delivery is also considered as a quality of customer service. Bases on theory, the buyer can make a list of issues that may affect the performance of those three elements. Then, we can make a short-term or long-term supplier selection standard within an efficient purchasing.

3.3.1 Short-term Standard

The following are the short-term standard

- a) Proper product quality
- b) Low cost
- c) On time delivery
- d) High service level
- e) Ability to finish the contract

3.3.2 Long-term Standard

A long-term relationship must be developed from a short-term relationship.

In this way, to this standard are added certain elements based on the short-term standard.

- a) Financial situation of supplier
- b) Supplier's internal organization and management
- c) Stability of supplier's employee (Du Linxiang and Yang Zan,2008)

3.4 Purchasing Performance

In order to optimize the purchasing strategy, internal and external communication, purchasing visibility and the buyer's motivation, supplier measurement is applied to indicate the purchasing performance.

Four dimensions for the measurement of purchasing activities

- Product/quality dimension

It is the most basic index. The buyer always mentions the standard, which the material has to meet, in the contract. But, the quality of the product may change more or less in practice. Then there is a certain

certification rating system to quantize the quality. Some buyer may require the supplier to get the ISO certificate.

- Price/cost dimension

Price is the most central part of this phase. According to this price, the buyer analyzes the cost of supplier and the possible room for price reduction. Payment is also mainly considered.

- Logistics dimension

There are several important issues, such as purchasing lead time, order backlog, inventory turnover, supplier capability, etc.

- Organization dimension

Human resource management takes a big part in this part. Motivation of the personnel affects the effectiveness of the buyer a lot. Advanced purchasing system and management are still essential (Arjan J. Van Weele, 2005).

3.5 Supplier Relationship

The purchaser's feature and management strategy determine the relationship between the supplier and purchaser. Sometimes it is coherent and temporary, but sometimes it is tight and long-term.

3.5.1 Relationship category

There are five main types of supplier relationships: short-term target, long-term target, penetration, alliance and vertical integration.

- Short-term target

In this relationship, the supplier can serve the standardized product and service. Both sides hope to keep this relationship in long term and stable. But they all focus on the negotiation skills and own profit except putting them in a win-win situation. Once the purchasing activity is done, the relationship is terminated. Only the employees of the purchasing department are involved in this process.

- Long-term target

For the purpose of getting more profit and cutting down costs on both sides, they are willing to improve the relationship and get closer. Almost all the departments of the enterprise are involved in the purchasing activity.

- Penetration

It is developed on the long-term relationship. In order to be involved in the business activity of another partner, the enterprise puts their employee into the other's activity to consider the other partner as their company's prolongation. Then the supplier will know how their product affects the buyer and find the direction to improve the product. And the buyer can also demand relevant improvement.

- Alliance

It can be considered an unstable supply chain.

- Vertical Integration

All the members of a supply chain are integrated together as an entire enterprise. It requires each independent enterprise to fully understand

the target and demand of the supply chain to make this chain working smoothly. (Zheng Chengwu, 2009)

3.5.2 Supplier Relationship Management

Most enterprises manage the suppliers as their resources to achieve low cost and high revenue. To cooperate with supplier will the support to buyer's effectiveness and make a result of "1+1>2".

The following factors should be observed when cooperating with a supplier:

- To cooperate and guide the supplier to improve the production technology and product quality.
- To communicate with the supplier accurately and duly. The contents of communication should be cost, production plan and quality control.
- Let the supplier get involved in the buyer's product design. Supplier can assist in the capability and functioning of raw material and component at the very beginning of product design. And the supplier can also transform the cost demand of the buyer into the capability and function of raw material and component in a short time.
- Build a project group between the buyer and supplier. It will be easier and faster to solve the problem in the supply and procurement process.
- Apply suitable incentives to the supplier. This is a good way to keep a good relationship in long-term. (Zheng Chengwu,2009)

4 Just-in-time (JIT) delivery

The principle of just-in-time management (JIT) means that all materials and products become available at the very moment when they are needed in the production process, not sooner and not later, but exactly on time and in exactly the right quantity. The major objective of applying JIT is to minimize buffer stock and extensive quality control procedures on incoming materials. The basic idea is to cut down the cost and to use the budget economically.

In this way, nothing is produced if there is no demand. The production process is pulled by customer orders. But every functional area in the organization has to be involved and willing to do JIT. For purchasing, JIT heads to make exactly required materials and products available at exactly the time they are needed for only adding value to the product itself, indirect and unnecessary costs are avoided (Arjan J. Van Weele, 2005).

Because the supplier is responsible for the transportation and finishing the consignment at Topcen's warehouse. Topcen can not affect the supplier's motivation of JIT no matter if the supplier is or is not willing to be JIT. To choose a supplier who is willing to be JIT at the very beginning is significantly important to achieve the target of the Topcen JIT strategy. Topcen requires the supplier to be able to deliver orders frequently in different quantities. To facilitate this, the supplier is informed of the production planning and the related purchasing requirements on a daily, weekly and monthly basis through delivery schedules which are available online. Then, Topcen will be able to plan his production and materials requirements more effectively.

5 Topcen as a contractor

The communication between Sunkun and Topcen affect the result of outsourcing very much. The material, which is high-strength steel bought by Topcen, is the key element of Sunkun's product. There is also one employee of Topcen residing at Sunkun for better communication.

Sunkun decides on the demand quantity and supplier, which is not working. Because the supplier and market information is poor at Sunkun, they choose suppliers mostly by experience. The result is not always the one they expected. Topcen realizes this point, and prepares a few stocks themselves to sell to Sunkun at a higher price than buying. The best way is that Sunkun informs about its demand every season and gives Topcen the right to choose the supplier.

The supplier is responsible for the transportation, and Sunkun just receives the steel plates at its plant. So, Topcen has to concentrate on the procurement, payment, and monitor the active situation. The employee of Topcen will service Sunkun since steel arriving of Topcen's warehouse. He will find a truck to deliver the material to Sunkun and handle all the paper work including invoice, quality report and bill.

6 Purchasing personnel at Topcen

The process is made based on the purchasing theory. There is nothing else needed to be changed but the personnel structure and duties. The process flow the following figure illustrates each employee's duty in pricing in the purchasing activity.

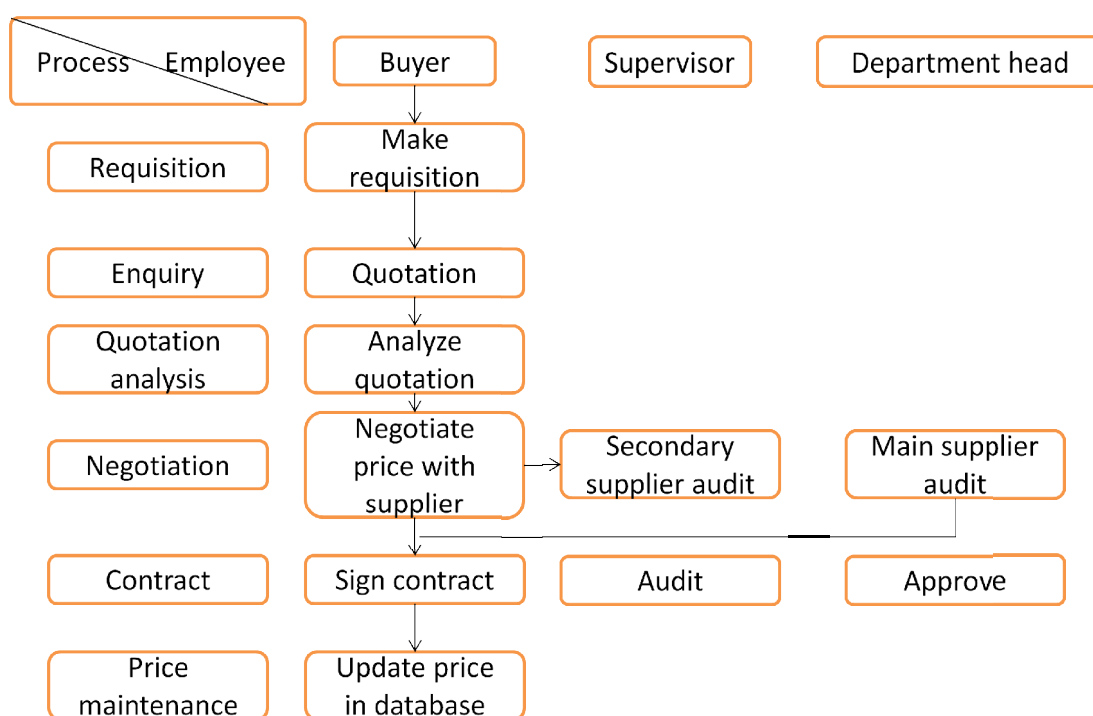


FIGURE 5. Duties of the personnel in the purchasing department

This figure is made due to the following reasons in Topcen:

- The price of high-strength steel may change a lot in a short time, so Topcen has to update the market information and enquire the latest price. Then they negotiate the price with secondary and main suppliers.
- For the main supplier, Topcen can determine the discount, terms of payment, time of delivery, demand of quality and law issues in a

standard contract to simplify the negotiation process. On the meantime, it decreases the purchasing cost and ensures stability of the purchasing plan.

- If there is useless or exceeding authorization, the contract can be cancelled.

7 Supplier Selection and Sourcing Strategy at Topcen

To choose an appropriate supplier is significantly important in a purchasing activity. It will guaranty the quality and delivery time of the product or service that is purchased if right supplier is chosen. Otherwise, it may lead the enterprise into failure. Because Sunkun decides the supplier and order quantity, sometimes they may choose an improper supplier due to unprofessional purchasing skills and personal behavior. In this way, Sunkun's product is unstable and delivery is always delayed. Especially in the summer of 2008, raw material resources are limited and transportation took more time, because the terrible earthquake happened in the Sichuan province.

7.1 Method of Selection

Because the goal of purchasing is not totally achieved, Sunkun must restart supplier performance evaluation or even give Topcen the right to choose supplier, which might be better.

Recently, Baosteel has been the main supplier. They select the others

based on the supplier's technique, product quality and price comparison.

The main defects of the current method are:

- The selection factors are not enough. Quality and price are the only elements considered. They ignore the willingness of the supplier, delivery commitment and purchasing cost.
- They make the choice of the supplier subjectively. Sometimes the head of purchasing department determines which supplier is used, and this supplier may not be fit for this purchasing assignment.

For those problems, Sunkun has to replace the method of selecting suppliers based on the existing supplier with into the ABC analysis. The existing suppliers are Jinan steel, Baoshan steel, Wuhan steel and Anyang steel. According to the following element, a new supplier can be selected:

- The selection process must be objective. It is necessary to build a quantified level to assess the supplier performance.
- The evaluation factors must be clearly named and rated for the selector from cross-function department. These selectors, who have a professional background of material, production and business, will lead this selection into success.
- Updating the data in this system, because the market, purchaser and suppliers are changing all the time.

7.2 Steps in Selection

According to the historical data, experience and current market, the selection factors with weight and detailed description are made. The

factors are: overall performance, production, R&D, quality, logistics and delivery, raw material purchasing, environmental issues and cooperation. The detailed description and weight of each factor are made in Appendix 2 to Appendix 9. Supplier selection result are in Figure 6. (Zheng Chengwu 2009. Arjan J. Van Weele, 2005)

Factor	Weight	Result			
		Baosteel	Wusteel	Jisteel	Ansteel
Overall performance	15	3.75	12.75	3.5	9
Production	15	9.75	12	12	12
R&D	15	13.2	14.25	13.2	13.2
Quality	15	11.25	13.5	13.5	13.95
Logistic and delivery	10	1	10	8	8
Raw material purchasing	5	2	4.5	3.75	4.75
Environmental issue	5	4.25	3.25	3.25	3.25
Cooperation	20	7	20	13.6	19.6
Final result	100	52.20	90.25	70.80	83.75

FIGURE 6. Supplier evaluation

7.3 Result of Selection

Because Sunkun's steel demand scale is not big for those four suppliers, it is hard to negotiate the price and cooperate with them if Topcen divides its demand into these suppliers. In this way, Topcen should choose one main

supplier as supplier A. According to the selection process, we can get the result that:

- Baosteel's product is in a high level. But its raw material is mainly imported, and it causes that cost in an very high level. Another cause is that Baosteel is located in Shanghai, and the distance to Sunkun is about 2106 km by road. In this way, Sunkun has to keep its inventory in a high level due to the long distance. It means that both the transportation and inventory costs will be high. Baosteel and Topcen cannot be long-term partners because Sunkun's demand is too small for Baosteel.
- Jisteel's product line cannot satisfy Sunkun's demand. That goes against one supplier focus rule. It will decrease Topcen's ability of price negotiation. Another issue is that Jisteel is also far away from Sunkun. It can be considered as supplier C.
- Ansteel is in the second place of scoring. It is not very close to Sunkun, but not too far either. It meets Sunkun's demand well. Its product supply and cooperation willingness are much better than Baosteel's.
- Wusteel gets the highest score and it is the closest to Sunkun. It gets almost the highest score in every evaluation factor. The overall performance and cooperation are its winning points.

As a result, Wusteel and Ansteel are the first two in scoring, but their products cannot compare with Baosteel's. Their transportation and inventory costs are lower than Baosteel's. Sunkun's demand seems to be

higher to those two suppliers compared with Baosteel. If supplier A is chosen from those two suppliers, Sunkun can cooperate with them in a long-term to improve product quality through supplier evaluation and incentives, to get a stable supply. Wusteel, which gets the highest score, is supplier A. Ansteel is supplier B and Jisteel is supplier C. As mentioned before, all the KPIs may change by time and market. So, Topcen should update the data at certain intervals.

8 Managing Supplier Relationship at Topcen

8.1 Principle of Relationship Set up

After the supplier has been selected, it is necessary to keep a good relationship with the supplier for stable supply, reliable quality and reasonable price. Within efficient measures, Topcen and Wusteel can enhance their communication, build trust, and solve problems. Based on the theoretical issues, a good supplier relationship needs the following preconditions:

- Having the same target and satisfying the final customer requirements.
- Willingness of both to cooperate. Apply both in the WIN-WIN situation.

Because Wusteel is supplier A, the bases which to set up the relationship are:

- For Wusteel, Sunkun is a medium sized customer. Wusteel hopes to get a large number of orders and Sunkun's loyalty through setting up a relationship.
- For Sunkun, to improve its influence on Wusteel to get a stable supply,

reliable quality and reasonable price.

Topcen and Wusteel can set up a relationship according to the stable relationship base. In order to achieve a WIN-WIN situation, the following principles have to be obtained in setting up a supplier relationship.

- Motivation of senior management principle. The willingness and motivation of senior management is needed to get support in the whole enterprise.
- Transparency principle. Their cost structure and development strategies are available for each other.
- Super long-term principle. They can even keep this relationship for an indefinite period, at least for 3 years. Otherwise, the variable quality of the relationship will increase in short-term cooperation.
- Alliance principle. In order to adapt to the market, they are built up together as one entity. The competition between enterprises has changed into the competition of supply chains. All players involved in this supply chain contribute to this whole chain
- One-to-One principle. One supplier supplies one purchaser in a certain industry.
- Performance evaluation principle. Wusteel must improve and solve problems according to Topcen's performance evaluation and feedback.
- Eliminate risk principle. To sign security agreement of business and production data with Wusteel. This agreement is a powerful sanction for relationship set up.

8.2 Method of relationship set up

8.2.1 Operational method

- In the purchasing phase: To sign a long-term standard contract. Wusteel commits to primary quality and favorable price. And Topcen will commit to the primarily chosen and timely payment.
- In the technical cooperation phase: To set up an inter-functional project group. Enhance communication to reduce cost, improve quality and cut down time of delivery.
- In the information phase: Topcen and Wusteel exchange the information and feedback in long-term cooperation, production plan, design and problem. Each company should pay regular company visits to each.

8.2.2 Tactical method

- In the organization compatibility phase: Wusteel sends a fixed long-term employee to Topcen; partly open their management system (such as: share information call-board, marketing information, technology information).
- In the process optimization phase: To simplify the process of technical cooperation and administration. Increase reaction of supply chain and reduce total costs of supply chain.
- In the inventory management phase: Wusteel should better prepare certain account of stock. Then Topcen may change its ordering strategy from stock based ordering to order based order to achieve JIT.

8.2.3 Strategic Method

Sign a long-term agreement of cooperation. And both companies convince that they will not impact the others' benefit.

Based on the relationship built, they are put in a WIN-WIN situation. The single purchasing activity has become logistics, finance and information activities. Of course, the supplier will not be unchanged by time. Topcen has to react to the changes and to catch it up for stabilizing the relationship.

9 Supplier measurement and motivation mechanism

The steel market has not been stable recently due to the fast increasing price of steel stone and the bad economy market. So, Key Purchasing Indicators cannot be stable in this changeable market. Topcen has to determine the KPIs of supplier measurement according to Sunkun's demand and market information.

9.1 Process of Supplier Measurement

A standardized measure process is needed for performance measurement. The measurement process of Topcen is shown in Figure 7:

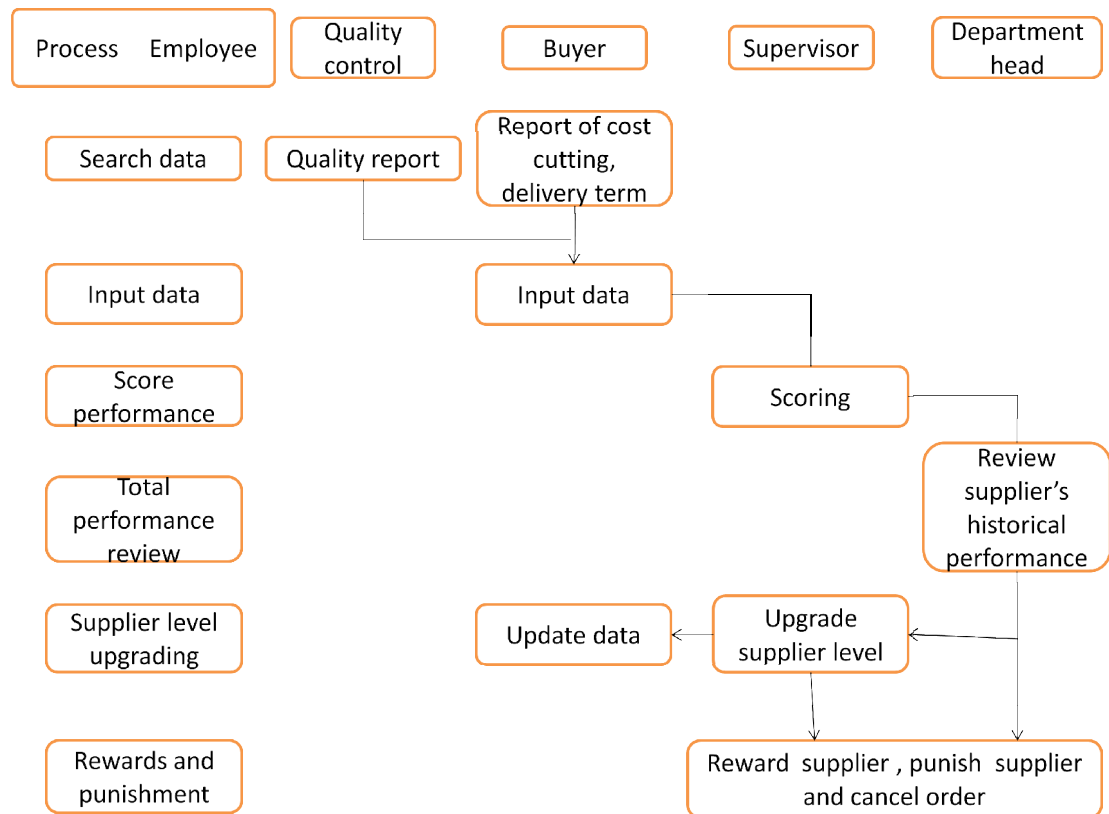


FIGURE 7. Supplier measurement process

Instructions of Figure 7 are the follows:

- Suppliers and the external departments should be able to get into the communication channel of regular or essential problems feedback. This information of channel contains a responsible person, telephone, e-mail, precautions.
- The data collector will report to the purchasing department monthly. The problems appeared from data, Topcen should negotiate with the supplier and solve them together.
- After communicating with the finance, quality, technique and production departments, the purchasing supervisor scores on the suppliers. Then, the final measurement is done with the supplier's historic performance and is sent to all departments involved.
- All suppliers are divided into different levels (I, II, III....) by scoring.

9.2 Motivation Mechanism

As we know, the supplier also measures Topcen when Topcen measures them. In this way, Topcen must be honest and fair in measuring the supplier. For the purpose of WIN-WIN, the supplier will refund Topcen and be willing cooperate with Topcen. A clear supplier reward and punishing system becomes more necessary.

For the suppliers classified as I and II levels, Topcen can share its profit which is saved from the process and quality optimization. An agreement that consist of 50% saving profit sharing and 70% of guaranteed purchasing amount for level I supplier is suggested. When Wusteel's product is qualified in more than half year, Sunkun can reduce the frequency of quality checks. But if there is an unqualified product, Topcen has the right to cancel the profit sharing mentioned before. If Wusteel is scored as a level II supplier, Topcen should reduce the percentage in the reward agreement to spur Wusteel to develop further.

For the suppliers classified as III and IV, warning for downgrade supplier in ABC analysis. For instance Ansteel is scored higher than Wusteel, warning Wusteel to pay attention. If Ansteel is scored highest in two continuous measuring periods, Ansteel will be Supplier A. 20% saving profit sharing and 30% guaranteed purchasing amount are applied to level III supplier. Level IV supplier will get even less than level III according to the same principle.

For level V supplier, orders are cancelled and the reasons are explaining to urge the supplier to further development

10 Results

Even though Sunkun is popular in the market, steel plates are out of stock and unstable situations happen sometimes with improper suppliers. This causes customer complaint and Sunkun's competitiveness is decreasing. It is good to optimize this purchasing system through personnel management, supplier selection, supplier relationship management, supplier measurement and motivation mechanism theory.

Sunkun and Topcen are state-owned enterprises. And management philosophy is behindhand advanced management. In this way, there are unbalanced rights, unclear punishments and unmotivated employees in these two companies, which are the causes of the purchasing bottleneck. Through building a rewarding system, reassigning personnel, giving clear responsibility, optimizing the pricing process, and increasing motivation, stock out can be avoided.

Sunkun chooses suppliers by limited elements without any systematic selection method. As a result, suppliers do not match with Sunkun, supplies are usually delayed and in low quality. For the purpose of finding the most proper the supplier to keep stable supply and product quality, Sunkun is advised to choose its supplier with the ABC analysis. Based on overall performance, production, R&D, quality, logistic and delivery, raw material purchasing, environmental issues and cooperation a supplier can be found from existing suppliers (Baosteel, Wusteel, Jisteel, Ansteel). Finally, the result is that Wusteel is supplier A, Ansteel is supplier B and Jisteel is supplier C. Ansteel as a secondary supplier can spur Wusteel on and respond to Sunkun's demand if necessary.

Due to its old management system, Topcen have not set up a supplier relationship and did not have real partners. In the meantime, Topcen was seen as a secondary customer to those suppliers and suppliers would abandon Topcen's orders if their outputs were limited. In this thesis, Topcen is suggested to set up a relationship with supplier according to operational, tactical and strategic phases.

A good relationship between the purchaser and supplier is the basis of cost and quality optimization. Supplier measurement and motivation mechanisms are applied to keep and improve the good relationship.

At the end, the competitiveness of Sunkun's product has increased, which is the purpose of this thesis. They also have a model to solve problems and to improve.

11 Conclusion

The JIT purchasing system is an important part of a detailed supply chain. It means that the supplier must supply goods frequently and accurately and cut down waste to reduce lead time from order placing to consignment. JIT could increase reacting time, reduce inventory cost and optimize supplier relation to achieve the competitiveness upgrade. Topcen and Sunkun should look forward in this developing direction.

The strict requirement of a supplier of almost perfect quality, high trust, short distance, close partnership, fair refund and EDI capability are still barriers to achieve high effectiveness, low cost and low inventory.

At Topcen, the purchasing activity includes always an unbalanced information exchange process from Sunkun to suppliers, its reaction time to customer is slow, there is not any relationship set with the supplier, an EDI system is not applied, and it is a small customer for their supplier. In conclusion, Topcen is still far away from the JIT concept, but it has to start using this JIT strategy to move on.

Once the steel supply is stable, the overseas market is a place for Sunkun to go. And Sunkun has already successfully sold their product to the United States. But the profit they got is not what they expected. To choose a proper exporting method can reduce a big part of the exporting cost. And that is what Sunkun needs to do in the near future.

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Appendixes

Appendix 1. Sunkun's product



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Appendix 1. Sunkun's product



Appendix 2. Supplier overall performance assessment

Factor	KPIs	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
Overall performance	Location (30)	a) in 500 KM to Sunkun ..(30) b) in 1000 KM to Sunkun ..(15) c) more than 1000 KM to Sunkun..(5)	Purchasing department	5	15	5	5
	Supply ability (35)	a) Able for all steel ..(35) b) able for most steel ..(20) c) able for some steel...(0)	Purchasing department	35	35	20	20
	Gap with Sunkun's capability (35)	a) Sunkun takes supplier's big market share.(35) b)Sunkun takes supplier's small market share..(0)	Purchasing department	0	35	0	35
Total points				40	85	25	60

Appendix 3. Supplier production assessment

Factor	KPIs	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
Production	Productivity (50)	a) its productivity is capable for the order - 100% (35) - 75% (28) - 50% (20) - 25% (10) - none (0)	Purchasing department	0	35	35	35
		b) expansion potential - yes (15) - no (0)	Purchasing department	15	15	15	15
	Reliability (40)	qualification rate - normal+5% (40) - normal±5% (20) - normal- 5% (0)	Purchasing department	40	20	20	20
	Documentation of Production (10)	a) well done (10) b) partly done (5) c) none (0)	Purchasing department	10	10	10	10
Total points				65	80	80	80

Appendix 4. Supplier R&D assessment

Factor	KPI	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
R&D	advanced technique (30)	a) CAD is used to assist design (30) b) CAD is not used (0)	R&D Engineer	30	30	30	30
	Sample (15)	Sample arriving time a) On time (15) b) one week later(8) c) two weeks later(3) (d) more the two weeks(0)	R&D Engineer	8	15	8	8
	Technical Description (20)	Its product is satisfied with Sunkun? (a) totally (20) (b) partly (10) (c) not at (0)	R&D Engineer	20	20	20	20
	Customer service (35)	Possibility to develop new product for Sunkun a) yes (15) b) no (0)	R&D Engineer	0	0	0	0
		Product demonstration for Sunkun a) yes (15) b) no (0)	R&D Engineer	15	15	15	15
		Technical support for Sunkun a) yes (15) b) no (0)	R&D Engineer	15	15	15	15
Total points			88	95	88	88	

Appendix 5. Supplier quality management assessment

Factor	KPI	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
Quality management	Quality standard (20)	ISO9000 prove a) yes (15) b) no (0)	Quality engineer	15	15	15	15
		ISO audit record a) yes (5) b) no (0)	Quality engineer	5	5	5	5
	Quality control process (45)	Quality control and record at key point a) yes (10) b) partly (5) c) no (0)	Quality engineer	10	10	10	10
		Qualified audit employee and equipment a) yes (10) b) no (0)	Quality engineer	10	10	10	10
		Audit program match with technical agreement a) 100% (5) b) 80%~99% (3) c) < 80% (0)	Quality engineer	5	5	5	5
		Average audit difference with agreement a) higher (0) b) equal (8) c) lower (15)	Quality engineer	15	15	15	8
		Audit documentation a) yes (5) b) no (0)	Quality engineer	5	5	5	5

	Customer service (35)	React time after quality problem a) in a week (20) c) 2-3 weeks (10) b) longer (0)	Quality engineer	10	10	10	20
		Send permanent employee in Sunkun a) yes (15) b) no (0)	Quality engineer	0	15	15	15
Total points				75	90	90	93

Appendix 6. Supplier logistic and delivery assessment

Factor	KPI	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
Logistic & delivery	Delivery (10)	Time of delivery satisfied with Sunkun a) yes (5) b) no (0)	Purchasing department	5	5	5	5
		Delivery reliability a) yes (5) b) no (0)	Purchasing department	5	5	5	5
	Transportation (35)	Relative transportation cost (a) high (0) (b) middle (15) (c) low (35)	Purchasing department	0	35	15	15
	Emergent order (45)	Accept at anytime a) yes (45) b) no (0)	Purchasing department	0	45	45	45
	Inventory (10)	Keep in certain level for Sunkun a) yes (10) b) no (0)	Purchasing department	0	10	10	10
Total points				10	100	80	80

Appendix 7. Supplier raw material purchasing assessment

Factor	KPI	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
Raw material purchasing	Supplier management (40)	Supplier assessment a) yes (25) b) no (0)	Purchasing department	25	25	25	25
		Supplier database a) yes (15) b) no (0)	Purchasing department	15	15	15	15
	Raw material costs decrease and improvement (60)	Decreasing potential a) yes (20) b) no (0)	Purchasing department	0	20	0	20
		Supply chain improvement a) yes (20) b) no (0)	Purchasing department	0	20	20	20
		Improvement documentation a) yes (10) b) no (0)	Purchasing department	0	10	10	10
		Improvement executing a) good (10) b) normal (5) c) bad (0)	Purchasing department	0	0	5	5
	Total points			40	90	75	95

Appendix 8. Supplier environmental issue assessment

Factor	KPI	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	An steel
Environmental issues	Environment audit (30)	ISO 14000 a) yes (30) b) no (0)	Quality engineer	30	30	30	30
	Environment protection (30)	Pollution in production a) yes (0) b) no (15)	Purchasing department	0	0	0	0
		Solution for decreasing pollution a) yes (15) b) no (0)	Purchasing department	15	15	15	15
	Energy saving (40)	Apply strict energy saving plan a) extremely (40) b) normally (20) c) badly (0)	Purchasing department	40	20	20	20
Total points				85	65	65	65

Appendix 9. Supplier cooperation assessment

Factor	KPI	Assess Standard	Jury	Bao steel	Wu steel	Ji steel	xAn steel
Cooperation	Contract period (30)	Long-term contract willingness a) yes (30) b) no (0)	Purchasing department	0	30	0	30
	Cooperation willingness	To set alliance a) yes (15) b) no (0)	Purchasing department	0	15	15	15
		Sunkun as primary customer a) yes (15) b) no (0)	Purchasing department	0	15	15	15
	Cost structure (10)	Willing to supply cost structure a) yes (5) b) no (0)	Purchasing & finance department	5	5	5	5
		Cost structure competitiveness a) high (5) b) middle (3) c) low (0)	Purchasing & finance department	0	5	3	3
	Quality agreement (10)	Quality controlling and compensation willingness a) yes (10) b) no (0)	Quality engineer	10	10	10	10
	Customer service (20)	Perfect service system a) yes (20) b) no (0)	Purchasing department	20	20	20	20
	Total points			35	100	68	98