Supplier Performance Evaluation using Analytical Hierarchy Process (AHP) Method in PT. Pelita Abadi Sentosa

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Abstract:- This study aim to identify and to evaluate the performance of selecting the right supplier for raw materials for automotive rubber. Research Data Obtained from PT. Pelita Abadi Sentosa for the period of 2017. The sampling method used was stratified random sampling, with population having experience or knowledge in the field of automotive chemical raw material coating the body for more than 3-5 years and working in the company PT. Pelita Abadi Sentosa. The analytical method use in this research was AHP. The results showed that the choice of suppliers in PT. Pelita Abadi Sentosa only consider the lowest prices is not good to apply in PT. Pelita Abadi. Quality criteria being the first choice because this affects for production on customer.

Keyword:- AHP, Criteria of Supplier Selectio, Supplier Peformance.

I. INTRODUCTION

Supplier selection decisions are important, as they are one of the earliest activities of an organization's business chain. The selection of the right suppliers is a key activity in purchasing, rather than the detail purchasing activity itself. Supplier selection become critical point in supply chain, because it has a big influence on the continuity for production. One way to resolve the problems of the supplier is to evaluate the performance of suppliers that had been used by the company. Through evaluation activities it is expected that consideration of whether the supplier is worth keeping or should change another supplier can be conducted.

As a fairly new company, PT. Pelita Abadi began to demand aspects of the speed of response, innovation and flexibility in product delivery. PT. Pelita Abadi Sentosa must be able to compete with its competitors. Increased demand from customers of PT. Pelita Abadi Sentosa has an impact on the increasing quantity of demand for goods to suppliers. However, the increase in demand for goods is not followed by a decline in prices and the higher delay in the arrival of goods from several suppliers. So that it can disrupt the smoothness in the supply chain to the customer even at risk of experiencing shortage for the customer. If you experience shortage, in the end, PT. Pelita Abadi Sentosa receives complaints from customers for the late delivery. PT. Pelita Abadi Sentosa has several times experienced delays in shipping products to customers.

There are differences of perception, between management which suppliers should be selected by the company. The board of directors tend to select best supplier based on the lowest price, with the reasons of obtaining a large profit. While the logistic department argues suppliers must be on time in delivering their material and supplies. And Quality Control department thinks that quality should be the main point in choosing a supplier.

Implementation of supplier performance evaluation at PT. Pelita Abadi Sentosa is carried out based on several criteria including quality, price, payment and delivery where each criterion already has a standard set by the company. But the supplier performance evaluation conducted by PT. Pelita Abadi Sentosa is still very simple and does not use weighting on existing criteria. The assessment criteria need to be weighted because the level of importance of each criterion is different.

Supplier	Jan	Feb	Mar	Apr	May	June
PT X	0	2	3	2	5	0
PT Y	0	1	1	2	0	0
PT Z	0	0	0	0	0	0

Table 1:- Delivery Delay *Raw Material Rubber Jan 18 – June 18*
Source: PT. Pelita Abadi Sentosa (2018)

Supplier	Jan	Feb	Mar	Apr	May	June
PT A	1	0	1	0	0	1
PT B	0	0	0	0	0	0
PT C	0	0	0	0	0	0

Table 2:- Quallity Reject *Raw Material Rubber Jan 18 – June 18*
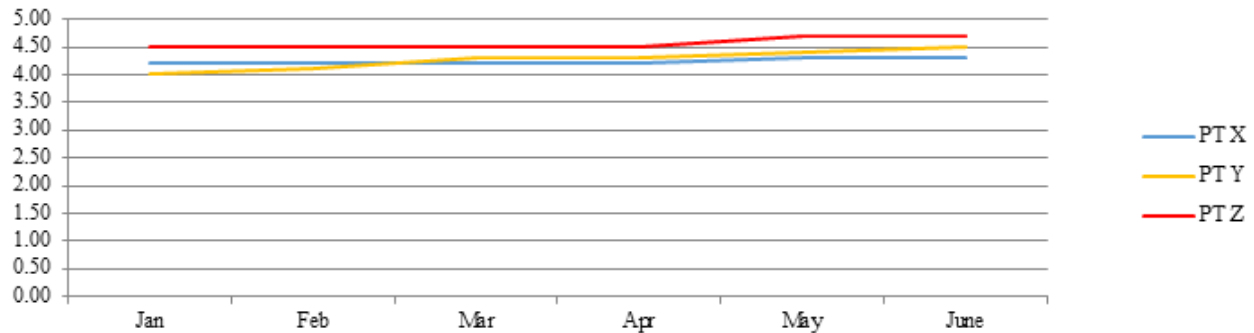Source: PT. Pelita Abadi Sentosa (2018)

Fig 1:- Raw Material Rubber Price Jan 18 – June 18 (USD)
Source: PT. Pelita Abadi Sentosa (2018)

II. LITERATURE REVIEW

AHP method developed by Thomas L. Saaty (1990) can solve complex problems where the criteria taken are quite a lot, the structure of the problem is not yet clear (Viarani, Zadry 2016). The AHP method was first proposed by Dr. Thomas L. Saaty of the Wharton School of Business in 1970. A problem solved using the AHP method is said to be complex if the structure of the problem is inaccurate, so the input used to solve this problem is human thought. But this thought, in order to have maximum results must come from people who have expertise (experts) in the field that will be used as an object. (Saaty, 1990). AHP is widely used in decisions for many criteria, planning, allocation of resources and determining priorities of strategies owned by players in conflict situations (Tahriri, F., et al, 2008).

AHP method can be used to process data from one expert respondent. However, in its application, the assessment of alternative criteria was carried out by several multidisciplinary experts (groups). The weight of the assessment for group assessment is expressed by finding the geometric mean (Geometric Mean) of the assessment given by all group members. This geometric value is formulated with GM= $(X1)(X2)(X3)...(Xn)^{1/n}$

GM = Geometric Mean
x1 = Respondent-1
xn = Respondent-n
n = Number of assessors

The criteria used in the selection of suppliers from some literature are as follow:

➢ Criteria for supplier selection according to Dickson based on ranking/order of importance level is as follows (Weber et al., 1991):
- Quality
- Delivery
- Past Performance
- Warranties & Claims Policies
- Production Facilities and Capacity
- Price
- Technical Capability
- Financial Position
- Procedural Compliance
- Communication System
- Reputation and Position in Industry
- Desire for Business
- Management and Organization
- Operating Controls
- Repair Service
- Attitude
- Impression
- Packaging Ability
- Labour Relations Record
- Geographical Location
- Amount of Past Business
- Training Aids
- Reciprocal Arrangements

III. METHODOLOGY

This research was conducted using qualitative and quantitative methods. The variable in this research is 'supplier performance appraisal variable'. Data were collected through interviews and questionnaires to the managing director, technical director, manager, purchasing department head. Data analysis technique in this research is AHP Method with the support of Microsoft Excel application.

The variable in this research is 'supplier performance appraisal variables. The population in this study is employee of PT. Pelita Abadi Sentosa which have experience in raw material over 3 years and decision makers. In this study, data were collected from 7 respondents including directors, technical heads and supervisor, logistic heads and supervisor, purchasing heads and supervisor.

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IV. RESULTS AND DISCUSSION

A. Hierarchy Structure Problems

In using the AHP method, the most important thing is to set the problem hierarchy. Where based on the hierarchy of this problem, the priority weight at each level will be described. In this research, the problem hierarchy consists of 4 levels. Level 0 is the goal to be achieved, level 1 is the criteria in general and level 2 is the sub-criteria that will compare specifically and more detail. Level 3 is the alternative (supplier) The systematic hierarchy can be seen in Figure 2.

B. Results

Based on the assessment of 7 respondents, the average value is measured using the geometric mean formula. This is because AHP requires only one answer for a comparison matrix. The results are shown in Table 4.
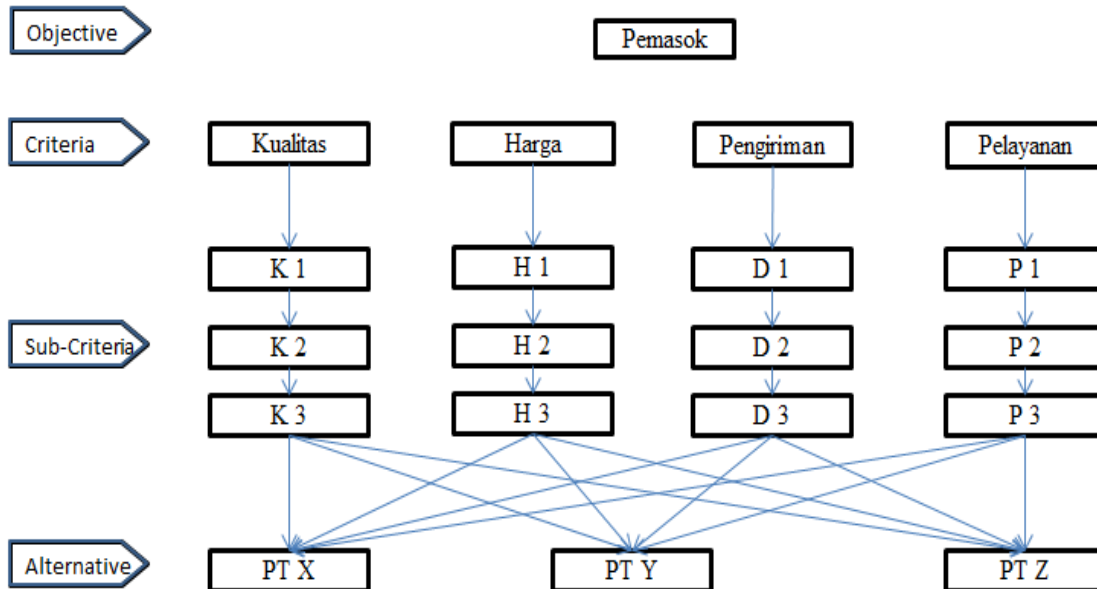

Fig 2:- Structure of the Hierarchy of Problems
Source: Saaty (1988)

CRITERIA	PRICE	QUALITY	SERVICE	DELIVERY	PRIORITY VECTOR	N	PRIORITY
PRICE	1	0,77	1,77	0,94	1,02	4	0,256
QUALITY	1,29	1	2,42	1,00	1,29	4	0,322
SERVICE	0,57	0,41	1	0,91	0,67	4	0,167
DELIVERY	1,06	1,00	1,10	1	1,02	4	0,255
TOTAL	3,92	3,19	6,29	3,85	4,00	16,00	1,000
EIGEN							4,06
CI							0,02
RI							0,9
CR							**0,0228**
STATUS							**KONSISTEN**

Table 3:- Priorty Assessment on Importance Criteria in Supplier Selection
Source: AHP Processing Results

The above data is the result of AHP. Tabel 3 and 4 shows that in choosing a raw material rubber supplier, PT. Pelita Abadi first priority is the quality criterion with a weight of 0.322, the second priority is the price criteria with the weight of 0.256, the third priority is delicery criteria with the weight of 0.255, next priority is the service with the weight 0.167.

Goals	Criteria	Weight	Priority	Sub-Criteria	Weight	Priority	Alternative	Weight	Priority
Supplier Selection Criteria	H	0.256	II	H1	0.447	I	PT X	0.605	I
							PT Y	0.269	II
							PT Z	0.127	III
				H2	0.206	III	PT X	0.327	II
							PT Y	0.215	III
							PT Z	0.457	I
				H3	0.346	II	PT X	0.368	II
							PT Y	0.406	I
							PT Z	0.226	III
	K	0.322	I	K1	0.567	I	PT X	0.263	III
							PT Y	0.288	II
							PT Z	0.449	I
				K2	0.211	III	PT X	0.254	III
							PT Y	0.269	II
							PT Z	0.476	I
				K3	0.223	II	PT X	0.520	I
							PT Y	0.203	III
							PT Z	0.276	II
	P	0.167	IV	P1	0.484	I	PT X	0.109	III
							PT Y	0.262	II
							PT Z	0.629	I
				P2	0.214	III	PT X	0.384	II
							PT Y	0.212	III
							PT Z	0.403	I
				P3	0.302	II	PT X	0.397	I
							PT Y	0.240	III
							PT Z	0.364	II
	D	0.255	III	D1	0.384	II	PT X	0.590	I
							PT Y	0.209	II
							PT Z	0.201	III
				D2	0.212	III	PT X	0.581	I
							PT Y	0.214	II
							PT Z	0.205	III
				D3	0.403	I	PT X	0.523	I
							PT Y	0.244	II
							PT Z	0.233	III
Information :							**Suppliers**	**Global Weight**	**Global Priority**
Priority I Priority II Priority III Priority IV							X	0.407	I
							Y	0.261	III
							Z	0.331	II

Table 4:- Global Priorty
Source: AHP Processing Results

Overall, PT X became the first priority with a global weight of 0.407, and PT Z become second priorty with a weight of 0.331, and the last priority was PT Y with a weight of 0.261.

C. Discussion

The results of measurements on four supplier assessment criteria, namely: price, service, quality and delivery of rubber raw material suppliers at PT Pelita Abadi Sentosa using the AHP method has shown that the quality criterion is the most important priority to be considered by the company with the achievement of priority weight of 0.322 out of the total weight of 1,000, which is then followed by the criteria for price, delivery and service with each priority weight respectively reaching 0.256; 0.255 and 0.167.

Priority supplier results obtained based on supplier assessment of raw material rubber suppliers at PT Pelita Abadi Sentosa by using the AHP method as a whole (global

priority) is PT X's suppliers. PT X's suppliers enter into the order of the first global priority with the acquisition of achieved global weights of 0.407 out of a total weight of 1.00. The second priority supplier is achieved by the next alternative, PT Z with global weight gain of 0.331 out of the total weight of 1.00 and PT Y's supplier being the last priority with global weight gain of 0.261. In achieving more specific results and results, PT Z's suppliers are among the top choice priorities for quality criteria, and service with the achievement of the respective weights for these criteria respectively by 0.134 for quality criteria and for shipping criteria with weight of 0.084. On the other hand, PT X suppliers entered into the main choice priority in terms of price & delivery criteria with the achievement of weights reaching 0.119 for price criteria and for service criteria with weights 0.143.

V. CONCLUSION

Based on the results of literature studies and forum discussions, Pelita Abadi Sentosa is advised to prioritize quality criteria (quality) in the selection of suppliers (work partners) and followed by price criteria, service criteria, and delivery criteria. This is clearly very reasonable because as a company engaged in the distribution of raw materials & fertilizers, especially raw materials for automotive rubber, the matters relating to the quality side at competitive prices are very reliable. The goods sent must be in accordance with the specifications requested by the customer. The level of customer satisfaction will greatly affect the company's image (image) and competitiveness at the level of competitors which will have an impact on the company's business continuity in the future.

Second The main supplier that is best in terms of global priority is PT X. The results of calculations that have been carried out using the AHP method can be a reference that in terms of criteria and sub-criteria expected by PT Pelita Abadi from a Supplier (working partner) , then PT X's suppliers are the best choice among the three alternatives or compared to other suppliers.

And the last If in the process of fulfilling the needs of customer goods that occur, the main supplier experiences limitations or deficiencies in the process of fulfilling the request of PT Pelita Abadi Sentosa, then PT Pelita Abadi Sentosa can appoint an alternative second supplier, namely: PT X to be made as an option alternative to meeting the needs of customer goods but still with the portion of the main supplier as a more dominant priority because this is in accordance with the criteria set by the company in order to achieve a more optimal process (efficient and effective).

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