

Supplier Selection Analysis of Polypropylene Using Analytical Hierarchy Process In Global Izupolyndo

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Abstract- Selection of suppliers is essential for the company. Therefore, every company must have specific criteria that serve as a benchmark supplier selection tailored to the needs and wishes of the company. PT Global Izupolyndo an industry engaged in plastic and fiber for bottled water products. Supplier selection is a problem that must be resolved with a view of many factors or criteria. One method that can be used for this problem is the Analytical Hierarchy Process (AHP). The purpose of this study is to select the right supplier using AHP method in accordance with the criteria established by the company. The criteria of this study consisted of price, delivery time and quality / quality. This research is devoted solely to the raw materials of polypropylene which is the main raw material manufacture of glass / plastic bottles. The method used in this study is Analytical Hierarchy Process (AHP). The results of this study indicate that PT C is the best supplier with a weight of 0.499 and the supplier with the last priority is PT D with a weight of 0.067.

Keyword: *Analytical Hierarchy Process (AHP), Selection of suppliers, poly propylene, Supplier*

I. PRELIMINARY

PT Global Izupolyndo is a branch of a group of companies called Izumi Group. The company produces plastic packaging which is only produced for the packaging and perceptions of purchasing and supplier selection carried out by the company have not applied specific methods in decision making so that the Analytical Hierarchy Process (AHP) method is needed. This method will give priority weight to the criteria owned by the company as well as alternative priorities in choosing suppliers with the help of the expert choice application. This method is expected to help companies choose the best supplier that has the highest value so that in the future the company will use the AHP method as a benchmark in the decision making process to choose which suppliers will meet the raw material needs.

II. LITERATURE REVIEW

A. Supplier Definition

Supplier the company selected or volunteered to provide the necessities required by a company in the form of goods or services. Furthermore, a supplier of an intangible asset that is best for each organization / company [2].

of PT Gajah Izumi Mas Perkasa products. Relatively increasing sales every month, especially for cup packaging sales. This makes the company must increase its production. An important initial factor to consider in production is the availability of raw materials. The main raw material used by this company is polypropylene type plastic seeds which are commonly used to make cup packaging. In meeting these packaging needs, of course the company has several partner companies selected as suppliers to supply the availability of raw materials.

Generally, companies have certain criteria that become supplier's assessment in accordance with the wishes and needs of the company. Supplier-selection criteria is the process by which a company reviews, evaluates and selects its suppliers to be part of the company's supply chain, there are several factors taken into consideration in determining supplier-selection criteria in addition to offering prices such as delivery time for replacement, timeliness reliability, flexibility submission, frequency of submission, minimum number of shipments, quality of supply, transportation costs, delivery of payments, information coordination capabilities, coordination of capacity design, tax and exchange rates, and survival of the company [1]. During this time, the assessment given is only in the form of a score based on experience

B. Supplier Benefits

Suppliers (Supplier) is an important part in the conversion system that starts from input factors such as raw materials (raw materials) called suppliers separately inventories of raw materials and in the transformation process in the form of adjuvant (Accessories and parts) and equipment components for engines (spare parts) called supplier of components and parts, as well as to the output of materials for packaging (packaging) [3]. without supplier, Companies certainly can not carry out their business processes because the lack of raw materials or other materials that will be used to manufacture products that have.

C. Supplier Selection

Assessment and selection of suppliers is one of the tasks of procurement management. Activity selecting suppliers take a long and careful consideration, especially for the main supplier selection [2]. The major potential supplier to serve as a supplier in the long term. This selection process

involves an initial evaluation, inviting them to presentations, to conduct field visits. Therefore, the supplier selection is a matter of concern.

D. Supplier Selection Criteria

The main task of the purchase is to conduct and determine supplier, Make purchases and procurement of goods, services and equipment [4]. Supplier selection process starts from the needs requested by the user and then look for a supplier in accordance with the needs of the company, conduct initial screening and prepare the shortlist suppliers are considered fit the criteria, choose the best and then perform periodic monitoring and evaluation.

E. Polypropylene

Abbreviated PP Polypropylene is a thermoplastic polymer material used for plastic packaging, household appliances, electronic equipment and the constituent baigan motor vehicles [5]. This plastic type has a RIC code (Resin Identification Code) number 5. The preparations can be made by extrusion or injection molding. Injection Molding is a process of melting the plastic and to be put into the mold to be formed according to need.PHP

F. Analytical Hierarchy Process

Analytical Hierarchy Process is a general measurement theory. This theory is used to lower the scale ratio of the two pairwise comparisons [6]. This comparison can be drawn from the fundamental scale pengukuran reflecting the preferences and feelings.

In general, the AHP allows to consider several factors together, the possibility of dependence and feedback and also make numeric reciprocal to get a conclusion.

III. RESEARCH METHODS

A. Types of Research

The research design carried out was quantitative research, and source of data is primary, the primary data needed in this study is obtained from respondents who will provide answer of priority level supplier, priority of criteria and comparison of one and another suppliers and the secondary data is consist of suppliers list.

B. Data Collection Technique

1. Documentation
Namely the data obtained from each part relating to research, such as company profile, organizational structure, and documents that are appropriate.
2. Questionnaire
Namely data collection techniques carried out by giving a set of questions or written statements to the respondent to answer [7].
3. Interview
Interview is meeting of two people to exchange information and ideas through question and answer, so that meaning can be constructed in a particular topic.

C. Data Processing Technique

This research is a quantitative method. object of this research is *supplier polypropylene*. There are 4 suppliers that serve as the sample, namely PT A PT B PT C, PT D. The

respondents in this study is three persons, namely purchasing, accounting (accounts payable), the head of production. The criteria and sub-criteria in this study are as follows [8]:

1. Price
Subcriteria: negotiate the price and responsive to questions.
2. Delivery time
Sub-criteria: response to urgent requests and delays
3. Quality / quality
Sub-criteria: quality problems, the effect on production, and the complaint handling time.

The steps in the method of AHP is:

1. Structure the hierarchy problem
AHP hierarchy in a breakdown of the criteria and sub-criteria in use in selecting a supplier company. The problem with choosing a supplier in PT Global Izupolyndo structured into three levels with the starting sequence of objectives, criteria, sub-criteria and alternatives. As for the structure of the hierarchy as follows:
level 0 : The purpose of the decision (*Goal*)
level 1 : Criteria
level 2 : subcriteria
level 3 : Alternatives
2. Creating a pairwise comparison matrix
Pairwise comparison matrix illustrates the relative contribution of influence between each element against each criteria and objectives above. Criteria and alternatives made with pairwise comparisons. Rankings are used usually in the form of scale with the number scale of
1. Indicates that the lowest to scale 9 which shows the highest value.

TABLE I. SCALE RATINGS PAIRWISE COMPARISONS

Numeric Value	Options
1	Equal
3	marginally strong
5	strong
7	Very strong
9	extremely strong
2,4,6,8	Intermediate values to reflect the fuzzy inputs
Reciprocals	Reflecting dominance of secondary alternative fompared with the first

(Source: Bhushan and Rai, 2004)

- comparison matrix with weights
2. Multiply the number of rows with weights
 3. Counting by summing the results of time divided by $n.\lambda_{max}$

$$\lambda \max = \frac{1}{n} \sum_i^n = 1 \text{ aij} \dots \dots \dots (1)$$

4. Calculating Consistency Index

$$CI = \frac{\lambda \max - n}{n - 1} \dots \dots \dots (2)$$

5. Calculating the ratio of consistency
 In considering various things AHP measure overall consistency with consistency ratio with the following formula [8]:

$$CR = \frac{CI}{RI} \dots \dots \dots (3)$$

Measurement consistency conducted to see inconsistencies repon given of respondents. With the provision that if $CR < 0.1$, then the value of the criteria of pairwise comparison matrices are considered consistent and vice versa dijil larger then perandangan value provided is considered inconsistent and need to recharge the pairwise matrix values both criteria, sub-criteria and alternatives.

6. Calculating the weight priority for sub-criteria and alternatives

The calculation is performed as the above and then determined by multiplying the global priorities of each subkriteria local priority with the priority criteria. After that do the calculations for each alternativesupplier the same as the above manner [8].

After all the weights are known entirely for sub-criteria and the supplier is then determined supplier will be selected that are from the multiplication of weights with weights supplier criteria and who has the highest score will be chosen as the best supplier [9].

V. RESULT AND DISCUSSION

A. Develop Hierarchy

As in drawing up the hierarchy, Level0 an election supplier, Level 1 is the criterion that consists of quality, price / quality and delivery time. Level 2 is the sub-criteria of each criterion. On the criteria of price, subkriterianya are negotiating prices, responsive to questions. Furthermore, the sub-criteria of quality / quality the sub-criteria are quality issues, pengaruh against production and complaint handling time. Sub-criteria and the time delivery is a response to an urgent request and delivery delays.

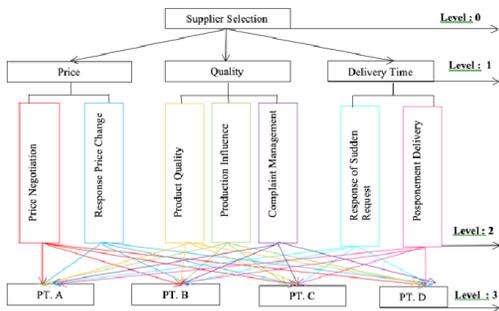


Fig. 1. Hierarchy Structure

B. Creating a Pairwise comparison matrix

Pairwise comparison matrix illustrates the relative contribution of influence between each element against each criteria and objectives above. In order to obtain weight rating of each criteria, sub-criteria and rating scale alternative then made pairwise comparisons, then the assessment that has been obtained from the fifth respondents averaged using the geometric mean.

TABLE II. ASSESMENT OF PRIORITY INTEREST CRITERIA IN SUPPLIER SELECTION

Criteria	Price	Delivery Time	Quality
Price	1	6.804	2.080
Delivery Time	0.147	1	5.809
Quality	0.481	0.172	1

Next will come the weight of each criteria

TABLE III. PRIORITY INTEREST (WEIGHTS) CRITERION IN SUPPLIER SELECTION

Criteria	Weight	Priority
Price	0.149	II
Quality	0.754	I
Delivery Time	0.097	III

After weighting the criteria obtained, the next step is to calculate the pairwise comparison matrix in the sub-criteria and sub-criteria-criteria-alternatives such as the above. It will get a global priority like this.

TABLE IV. GLOBAL PRIORITY

Level 0 (Goal)	Level 1 (Criteria)	Level 2 (Subcriteria)	Weight	Alternative	Score
Supplier Selection	Price (0.149)	Price Negotiation	0.115	PT A	0.031
				PT B	0.070
				PT C	0.007
				PT D	0.007
		Response Price Change	0.034	PT A	0.006
				PT B	0.023
				PT C	0.003
				PT D	0.002
	Delivery Time (0.097)	Response of Sudden Request	0.082	PT A	0.028
				PT B	0.007
				PT C	0.043
				PT D	0.004
		Posponement Delivery	0.014	PT A	0.004
				PT B	0.001
				PT C	0.008
				PT D	0.001
	Quality (0.754)	Product Quality	0.176	PT A	0.053
				PT B	0.018
				PT C	0.090
				PT D	0.014
		Production Influence	0.529	PT A	0.133
				PT B	0.044
				PT C	0.318
				PT D	0.034
Complaint Management	0.049	PT A	0.011		
		PT B	0.004		
		PT C	0.029		
		PT D	0.004		

After the global weighting is obtained, the weight of each alternative as a whole can be calculated by summing all the weights whole. Results are shown as follows:

TABLE V. OVERALL ALTERNATIVE PRIORITY

Alternative	Weight	Priority
PT A	0.268	2
PT B	0.163	3
PT C	0.502	1
PT D	0.068	4

The table above shows overall, PT C is *supplier* with the greatest weight is 0502 so that the company can choose PT C as the best company. Furthermore, the second priority, namely PT A with a weight of 0268, the third priority, namely PT B with a weight of 0168, and suppliers on the final weight, namely PT D with a weight value of 0.068.

VI. CONCLUSION

A. Conclusion

Based on the criteria and the best overall subcriteria PT C is considered the best supplier with a weight of 0.499. The second priority in supplier selection is PT A with a weight of 0.266 and followed by PT B with weights of 0.168 and PT D with a weight of 0.067. From these results, it can be concluded that the best supplier for PT Global Izupolyndo is PT C to be used as a business partner in the long run because overall PT C has a higher value compared to other suppliers.

B. Recommendations

Based on the results of the analysis and conclusions above, the researcher advises the company and related parties to:

In meeting the needs of polypropylene raw materials, the criteria should be used as the basis for the addition of suppliers as in terms of services / services provided for each purchase and supplier attitude because service and attitude are also important in a long-term relationship will be done.

Companies in meeting the needs of polypropylene raw materials should pay attention to the weight of supplier selection criteria because each supplier has a different weight and can be combined with existing criteria so that the company will get the right supplier according to the needs and desires of the company. Based on the calculations that have been made, it is recommended that the company establish a cooperative relationship with PT C because the company has a higher rating compared to other suppliers. And can provide results from the assessment using the AHP method to the supplier as feedback for future improvements.

For further research, it is expected to involve respondents who are authorized in decision makers directly in choosing suppliers to determine the weight of the criteria, subcriteria and alternatives. For further research, it is expected to add material on SRM (Supplier Relationship Management) in the data analyzer so that the analysis results will be more detailed.

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