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Decanter Brand Selection Using Multi-Criteria Decision Making: A Case Study

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Abstract: Decanters play a crucial role in Palm Oil Mills by separating the oil phase from the sludge underflow in continuous settling tanks during the clarification process. Given the significance of decanters and the multitude of manufacturers, this study focuses on a comprehensive evaluation of three-phase decanter brands selection. Utilizing the analytic hierarchy process, the research explores the nuanced criteria of economics, technical aspects, and service quality for brand selection. Sub-criteria include operational cost, price, overhaul cost, emulsion content, oil losses, capacity, distance to buffer tank, electricity consumption, service scheme, guarantee, spare part availability, and workshop location. The alternatives considered are common decanter brands in Indonesia: Alfa Laval, IHI, Flottweg, and Westfalia. Using Expert Choice®, the analysis identifies Flottweg as the optimal decanter brand based on performance, particularly excelling in service criteria with a priority weight of 0.336. Sensitivity analysis indicates that for IHI to be considered the first option, technical and economic criteria must be prioritized above 56.5% and 50.0%, respectively. This study also concluded that technical and service aspects are equally important in decision-making for the decanter brand in POM A, surpassing economic ones, with service aspects as the critical factor in decanter brand decision-making.

Keywords: Analytic Hierarchy Process, multi-criteria decision making, decanter, palm oil mill.

Introduction

In the natural course of events, the separation of solid particulates within a liquid medium typically transpires over an extended period, predominantly guided by the principles of coalescence and sedimentation [1]. A *decanter* is a meticulously designed apparatus that uses centrifugal force to rapidly and continuously separate solid particulates from liquid substrates [2]. Initially, decanters were predominantly employed in the dewatering processes of wastewater treatment and sugar extraction within the sugar industry [3]. Nevertheless, decanter design and technology advancements have led to widespread utilization across diverse industrial sectors, including food processing, chemical engineering, petroleum refinement, and palm oil production [4]–[6].

Decanters are used to separate the oil phase from the sludge underflow of continuous settling tanks (CST) in the clarification station of Palm Oil Mills (POMs) [7]. The decanter configurations can be broadly categorized into two principal types based on the composition of their phase outputs: the two-phase decanter and the three-phase decanter [8], [9]. However, A considerable number of POMs opt for the implementation of three-phase decanters, and this choice is motivated by several compelling factors. Using decanters reduces oil losses in the heavy phase, thus reducing oil loss. The heavy phase of the three-phase decanters is devoid of Non-Oil Solids (NOS), thereby mitigating the load of liquid waste. In addition, three-phase decanters typically incur lower maintenance costs when juxtaposed with their two-phase counterparts.

The market comprises over 30 manufacturers from diverse nations, all producing three-phase decanters. Within the Indonesian palm oil industry, renowned companies, including Westfalia (Germany), Alfa Laval (Sweden), Flottweg (Germany), and IHI (Japan), have gained recognition for their production of three-phase decanters. It is important to note that all brands of three-phase decanters share a common operational principle. However, distinctions emerge in design, operational parameters, and performance characteristics [6], [10].

It is essential to acknowledge that despite the shared operational principles among various manufacturers, notable disparity exists in the pricing structure for identical models. Moreover, the maintenance and operating costs also exhibit variability.

From a technical perspective, each brand presents distinct advantages and limitations. For instance, a decanter produced by manufacturer A may excel in the separation process, albeit at the expense of higher electricity consumption. Conversely, a decanter from brand B might offer greater flexibility in accommodating varied feedstock compositions, albeit with stricter requirements regarding the minimum height at which the decanter must be installed. Conversely, another brand may impose less stringent requirements on height requirement for installation but necessitate stricter adherence to feedstock composition guidelines.

The service-related dimension is similar to the technical considerations, where certain brands may excel in specific service-related areas while lagging in others. Additionally, the geographical proximity of potential users to service centers may also impact decision-making. For instance, a user may prioritize a brand with a nearby workshop despite potential shortcomings in service quality.

Given the indispensable role of decanters in Palm Oil Mills (POMs) and the intricate interplay of economics, technical specifications, and service considerations, it is imperative to conduct a comprehensive appraisal of the factors influencing brand selection for three-phase decanters. This appraisal encompasses an evaluation of economics, technical and service criteria. This scholarly work, therefore, expounds upon the intricate nuances involved in the preference-driven selection of a three-phase decanter brand by applying the Analytic Hierarchy Process. The Analytic Hierarchy Process (AHP) is suitable for addressing intricate problems or matters that entail values or subjective assessments. AHP is categorized among the multi-attribute decision-making frameworks capable of appraising different alternative options in decision-making scenarios. AHP assesses decisions through pairwise comparisons between two criteria, incorporating quantitative data and qualitative judgments. Given this advantageous characteristic, the current study employs an AHP-based evaluation methodology for determining the optimal brand of a three-phase decanter. This proposed decision support system was implemented in a palm oil mill situated in North Sumatra, Indonesia.

Methods

This research employed AHP to select the optimal decanter brand for a particular government-owned POM in North Sumatra. The study adhered to the general AHP methodology delineated in previous works [11], [12]. The initial step (Step 1) was conducting a focus group discussion (FGD) to discern the critical factors in choosing the appropriate decanter brand. In this FGD, criteria and alternatives were determined to build the AHP model, substantially influencing the decision-making process. The AHP model crafted based on insights from the focus group discussion can be seen in Figure 1. The selection of criteria was based on the careful assessment of their significance concerning the specific cases and the appropriateness and accuracy of the criteria and sub-criteria under consideration. The criteria employed in this study encompass technical, economic, and service aspects, and a detailed explanation of each criterion can be found in Figure 1. Other researchers have also utilized these criteria [13]–[16].

The alternatives used in this study were decanters commonly used in Indonesia, namely Westfalia, IHI, Alfa Laval, and Flottweg. Based on the given criterion, detailed specifications of alternatives can be seen in Table 1, collected from various sources, such as: (a) Official website pages, brochures, and catalogs from each decanter manufacturer, (b) Decanter quotation documents containing technical specifications and purchase prices for decanters received by POM A in 2018-2019, (c) Operational and maintenance costs from the commissioning report of the decanter at POM B, (d) Interviews with decanter distributors, (e) Interviews with palm oil processing and technology experts, and (f) Decanter Centrifuge Handbook.

The subsequent step (Step 2) involves developing a questionnaire for pairwise comparisons. Pairwise comparison is a numerical representation of the relationships between two criteria, utilizing quantitative data and qualitative judgments. While it might be true that several quantitative data are present for this comparison, some depend on the user's preference, such as workshop location. It is also worth mentioning that while the data can be quantified, it cannot automatically be ranked. For example, in terms of losses in the heavy and solid phases, some experts might have different opinions on which of the higher losses should be located, as these losses are interconnected. Due to this explanation, the rating model based on AHP cannot be employed for this study.

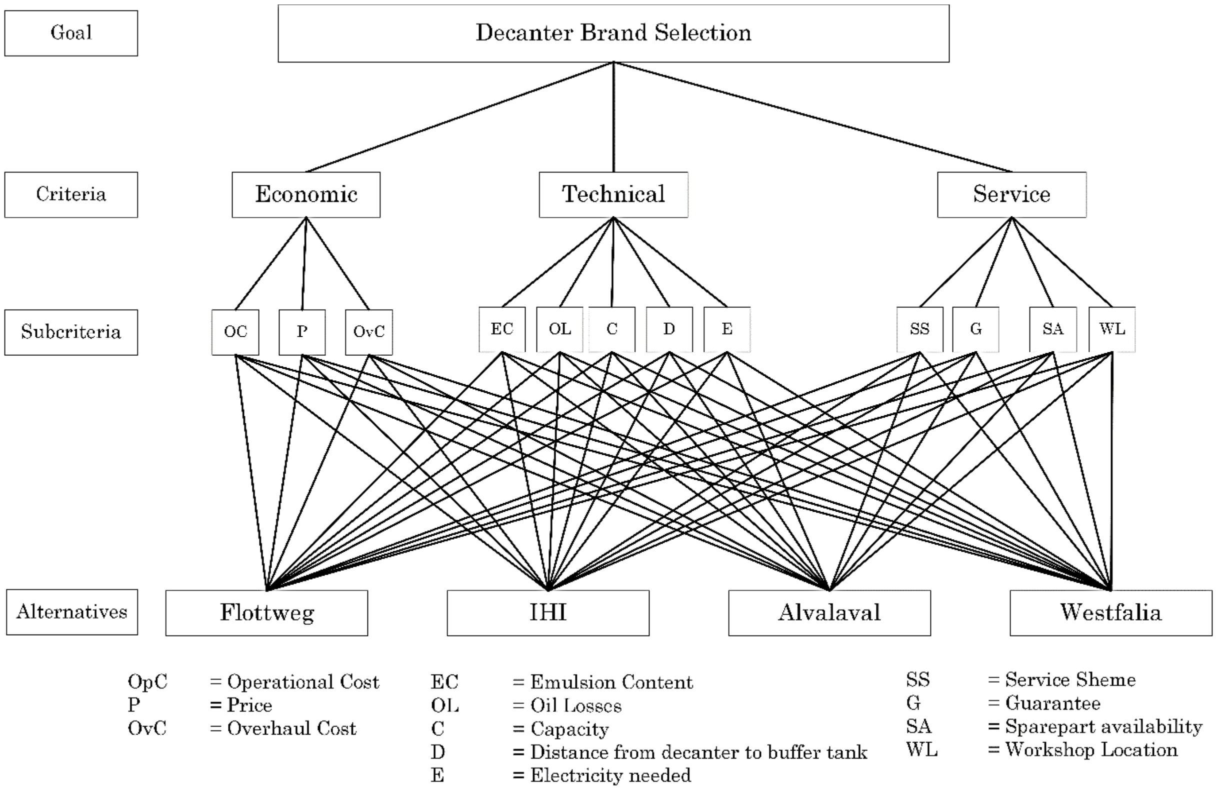

Figure 1. AHP hierarchy framework

Table 1. Specifications of alternatives

	Criteria	Unit	3-Phase decanter (in thousand Rupiahs)			
			Westfalia	Alva Laval	Flottweg	IHI
Economic criteria						
No.	Economic sub-criteria					
1	Operational cost	0	150	136-208	150-250	120-200
2	Price	0	2,565	2,565	4,540	4,400
3	Overhaul cost	0	200-500	170-342	250-500	200-400
Technical Criteria						
No.	Technical Sub criteria					
1	Emulsion content	%	5	10	<8	5
2	Oil losses on heavy phase	%	1.0	1	1.2	1,0
3	Oil losses on solid phase	%	4.0	3.5	3.0	3.0
4	Capacity	m^3/h	25	25	25	27-30
5	Distance	m	5	8	7	7
6	Electrical consumption	kW	37	55	70	55
Service Criteria						
No.	Service Sub criteria					
1	Service Scheme		Free service 3x and free spare part for the 1st Y	Extended guarantee/ service contract	Offer floating component during service	Extended guarantee/ service contract
2	Guarantee	Year	1 y since commissioning or 1.5 y since purchase	1	1	1
3	Spare part availability					
	Fast moving		2 weeks	Available	available	2 weeks
	Slow moving		4 weeks	4 weeks	4 weeks	> 4 weeks
4	Workshop Location		MDN	PKU, CGN, PNK, BDJ	PKU	MDN

Note: PKU: Pekanbaru; MDN: Medan; BDJ: Banjarmasin; PNK: Pontianak, CGN: Cilegon.

In early 2023, a questionnaire was distributed to ten participants through purposive sampling. The purposive sampling was done to gain better insight from professional experts working in the oil palm mills that already used decanters as the tool for the separation process. Among these participants, eight experts were selected from company X, to which POM A belongs, chosen for their extensive knowledge and experience in palm oil processing, supported by their relevant educational backgrounds and significant roles within the company. These experts were chosen because of their familiarity with POM A and their knowledge of what might be best for this particular POM. The remaining two participants were managing staff from two sister companies, Y and Z, of which POM A is a subsidiary with prior experience with decanters at their respective POMs. These two sister companies were chosen because they share the same region where the POM A is situated. The details of these experts can be seen in Table 2.

Table 2. Respondent's general information

No of experts	Age	Education level	Experience in palm oil mill (year)	Position	Company
1	57	Master	27	General manager	X
2	55	Master	25	Manager	X
3	48	Bachelor	21	Head of processing division	X
4	45	Bachelor	18	Head of processing sub-division	X
5	38	Bachelor	15	Technical assistant	X
6	35	Bachelor	12	Quality assurance assistant	X
7	30	Bachelor	7	Processing assistant	X
8	28	Bachelor	5	Processing assistant	X
9	42	Master	18	Head of processing sub-division	Y
10	44	Bachelor	18	Head of processing sub-division	Z

All participants clearly understood the significance of each criterion chosen for this study. The quantified questionnaire responses are collected from participants using Saaty's nine-point scale, as shown in Table 3.

Table 3. Saaty's pairwise comparison nine-point scale

Point	Definition	Description
1	Equal importance	Two elements are equal contributors
3	Moderate importance	One element is slightly preferred over another
5	Strong importance	One element is strongly preferred over another
7	Very strong importance	One element is very strongly preferred over another
9	Extreme strong importance	One element is most strongly preferred over another
2,4,6, 8	Intermediate importance value between two contiguous judgements	Contiguous to the two scale

Step (3) entails the compilation and computation of diverse expert assessments, which includes constructing the pairwise comparison matrix as an integral part of the AHP process [17]–[19]. The aggregation of varying participant evaluations was performed using the Geometric Mean Method (GMM), a method endorsed by Saaty [20]. Consistency Ratio (CR) is employed to ensure the credibility and rationality of the evaluation. If the CR value falls below 0.1, the weightings are deemed acceptable. Conversely, if the value exceeds 0.1, the weightings were not considered acceptable. A CR value of 0 indicated a perfect weight comparison [20]. Subsequently, a sensitivity analysis was conducted by altering the weight of evaluation criteria to assess the resilience of the results. The calculations in this study were executed using Expert Choice 11®.

Results and Discussions

Comparison Evaluation

Table 4. Pairwise comparison of main criteria concerning the goal (results from all participants combined)

Criteria	Economic	Service	Technical
Economic	1	0.62988	0.36275
Service	1/0.62988	1	1.43077
Technical	1/0.36275	1/1.43077	1

The consolidated data from pairwise comparisons was acquired through surveys and questionnaires utilizing GMM. The cumulative outcomes of these pairwise comparisons are elucidated in Table 4, wherein the Consistency Ratio (CR) attain3e a value of 0.08. As illustrated in Table 4, the Service criterion emerged as the most pivotal factor in selecting a decanter for this particular POM. According to the presented data, the service criterion held a slightly higher significance than the technical one. This finding underscored the imperative for consumers to seek assurance regarding service reliability during the utilization of the decanter, given the constraints in spare-part availability and repair tool accessibility within palm oil mills, coupled with a limited understanding of decanter repair procedures.

Table 5. Weights of criteria and sub-criteria for best decanter selection for a government-owned POM in North Sumatera, Indonesia

Criteria	Weight (1)	Sub-criteria	Weight (2)	Overall (1) x (2)
Economics	0.196	Operational Cost	0.441	0.086
		Price	0.276	0.054
		Overhaul Cost	0.283	0.055
Technical	0.391	Emulsion Content	0.102	0.040
		Oil losses	0.384	0.150
		Capacity	0.247	0.097
		Distance from decanter to buffer tank	0.128	0.050
		Electricity consumption	0.138	0.054
Service	0.413	Service Scheme	0.265	0.109
		Guarantee	0.318	0.131
		Spare part availability	0.258	0.107
		Workshop Location	0.159	0.066

The relative importance of individual criteria derived from expert choice in the context of all pairwise comparisons is elucidated in Table 5. This table comprehensively delineates the criteria weights assigned to each level, culminating in the overarching importance of the hierarchical decision-making model. In the evaluative context of identifying the optimal decanter brand, participant perspectives underscore the paramount significance of the Service criterion (0.413), closely followed by Technical (0.391) and Economics (0.196) at the last place.

In the sub-criteria analysis, the top three criteria exerting the most pronounced influence in alignment with the overarching goal are identified as Oil Losses, Guarantee, and Service Scheme. Oil losses emerge as a paramount criterion, representing a discernible consumer preference in the nuanced selection process of decanter brands. This preference is substantiated by the profound impact of oil loss on the production output and financial returns of Palm Oil Mills. The Guarantee and Service Scheme, constituents of the broader Service Criterion, have been demonstrated to exert a pronounced influence on the selection of decanters. This observation serves to underscore and fortify the perceived significance of the Service Criterion from the users' perspective.

The findings of this study exhibited notable parallels with the work conducted by Nasution et al. [21], particularly concerning the sub-criteria of Oil Losses within the Technical Criteria. Both studies converged in identifying oil losses as the most essential criterion in selecting decanters. The significance attributed to oil losses is rooted in its direct correlation with potential earnings, rendering its effective control crucial for-profit maximization. The strategic utilization of decanters in POMs is integral to intensifying profitability, thereby underscoring the pivotal importance of judiciously selecting an optimal decanter brand. In consonance with the antecedent assertion, it becomes evident that both the present investigation and the study by Nasution et al. concur in highlighting the superior significance accorded to the Technical Criteria compared to the Economics Criteria [21].

In contrast, the sub-criteria of Electricity Consumption, Distance from Decanter to Buffer Tank, and Emulsion Content exhibited a comparatively lower impact. Notably, these criteria are amenable to modification, and requisite adjustments can be accommodated within the mills. This observation underscored the relatively diminished importance of these specific criteria in the overall assessment.

The graphical representation in Figure 2 illustrates the relative weight of the preeminent brand in the decanter selection process concerning individual criteria. IHI had the highest preference in Technical (0.352) and Economic (0.323) criteria, as user opinions indicate. This data implied that users perceived IHI as excelling in pricing and decanter specifications, positioning it favourably within the technical and economic dimensions of evaluation. However, Flotwegg exhibited the most substantial preference in service (0.422), showcasing a marked superiority over other brands in this specific criterion. This data implied that the users acknowledge Flotwegg for delivering superior service, which was particularly underscored by their provision of floating components during decanter service, thus solidifying Flotwegg's excellence in providing reliable service. Moreover, the Service criterion was perceived as the most important factor amongst the criteria used in this study, which could be a factor that alters the preference results.

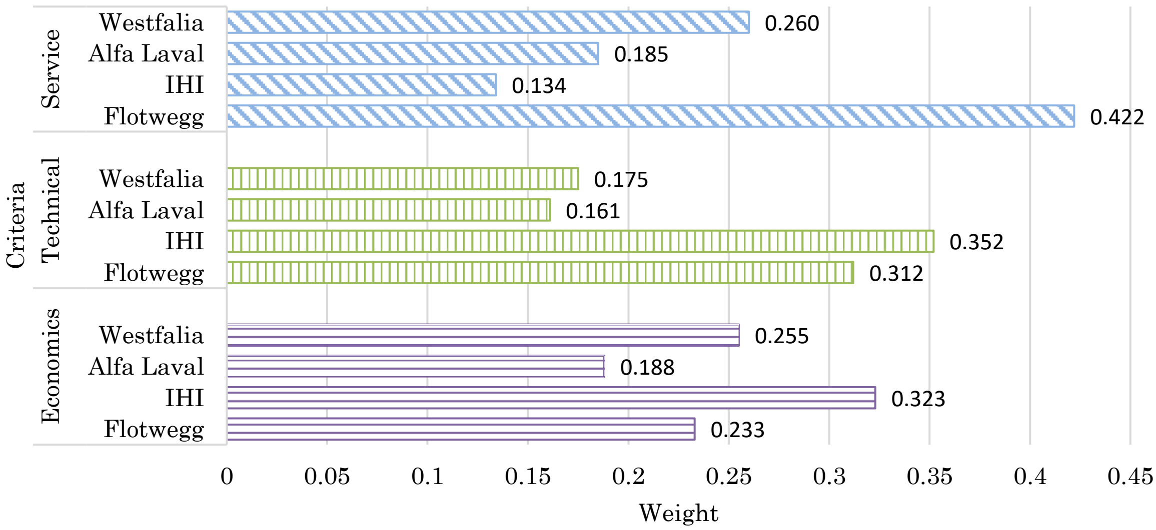

Figure 2. Synthesis weight of alternatives with respect to criteria for selecting the alternatives

Table 6. Synthesis weights of sub-criteria concerning the goal

Alternatives	Criteria	Sub-criteria	Priorities				
			GeoMean	Mean	SD	Min	Max
Alfa Laval			17.60%	19.34%	0.056	14.40%	29.40%
	Economics	Operational cost	0.012	0.020	0.022	0.001	0.057
		Price	0.018	0.011	0.014	0.001	0.043
		Overhaul cost	0.012	0.015	0.018	0.001	0.057
	Service	Service scheme	0.012	0.016	0.014	0.004	0.045
		Guarantee	0.028	0.024	0.022	0.003	0.067
		Sparepart availability	0.017	0.026	0.022	0.004	0.077
		Workshop location	0.012	0.009	0.005	0.004	0.021
	Technical	Emulsion content	0.009	0.014	0.010	0.001	0.028
		Oil losses	0.021	0.028	0.024	0.006	0.072
		Capacity	0.016	0.016	0.020	0.005	0.072
		Distance to buffer tank	0.007	0.005	0.003	0.001	0.013
		Electricity consumption	0.012	0.008	0.004	0.002	0.014
Flottweg			33.60%	31.90%	0.095	16.40%	44.90%
	Economics	Operational cost	0.022	0.024	0.038	0.002	0.123
		Price	0.016	0.015	0.013	0.002	0.043
		Overhaul cost	0.014	0.012	0.010	0.001	0.034
	Service	Service scheme	0.042	0.063	0.064	0.010	0.185
		Guarantee	0.050	0.036	0.025	0.006	0.073
		Sparepart availability	0.041	0.046	0.028	0.010	0.106
		Workshop location	0.025	0.021	0.019	0.002	0.061
	Technical	Emulsion content	0.015	0.016	0.011	0.004	0.035
		Oil losses	0.046	0.044	0.010	0.019	0.053
		Capacity	0.032	0.025	0.011	0.007	0.044
		Distance to buffer tank	0.019	0.011	0.006	0.003	0.025
		Electricity consumption	0.014	0.008	0.005	0.001	0.016
IHI			26.40%	24.80%	0.080	12.90%	35.50%
	Economics	Operational cost	0.033	0.014	0.009	0.002	0.027
		Price	0.018	0.022	0.015	0.006	0.044
		Overhaul cost	0.021	0.015	0.009	0.002	0.024
	Service	Service scheme	0.009	0.018	0.027	0.001	0.070
		Guarantee	0.023	0.019	0.023	0.002	0.067
		Sparepart availability	0.011	0.010	0.009	0.001	0.032
		Workshop location	0.007	0.004	0.003	0.001	0.009
	Technical	Emulsion content	0.013	0.020	0.018	0.001	0.049
		Oil losses	0.057	0.068	0.037	0.016	0.109
		Capacity	0.037	0.035	0.019	0.013	0.060
		Distance to buffer tank	0.015	0.009	0.004	0.004	0.019
		Electricity consumption	0.020	0.014	0.009	0.002	0.031

Alternatives	Criteria	Sub-criteria	Priorities				
			GeoMean	Mean	SD	Min	Max
Westfalia			22.50%	23.91%	0.076	15.20%	36.50%
	Economics	Operational cost	0.029	0.019	0.020	0.002	0.057
		Price	0.021	0.025	0.020	0.005	0.057
		Overhaul cost	0.007	0.007	0.010	0.001	0.034
	Service	Service scheme	0.018	0.028	0.020	0.004	0.077
		Guarantee	0.048	0.043	0.024	0.010	0.077
		Sparepart availability	0.014	0.022	0.012	0.012	0.048
		Workshop location	0.017	0.015	0.006	0.008	0.028
	Technical	Emulsion content	0.009	0.010	0.008	0.001	0.026
		Oil losses	0.016	0.023	0.017	0.002	0.047
		Capacity	0.012	0.012	0.008	0.004	0.024
		Distance to buffer tank	0.013	0.012	0.010	0.001	0.027
		Electicity consumption	0.021	0.022	0.020	0.002	0.072

Analyzing the data shown in Table 6, it is evident that the criteria of Technical and Service carried a more pronounced influence on the preference distribution among the brands compared to Economics. Flotwegg stood out with the highest preference weights in both Technical (12.60%) and Service (15.80%) criteria, signifying a strong inclination towards this brand based on its technical features and service offerings. Conversely, IHI demonstrated a relatively higher preference in the Economics criterion (7.20%) than other brands. This finding suggested that IHI was perceived as excelling economically, offering favorable pricing or cost-related advantages. Westfalia exhibited a balanced distribution across all three criteria, with somewhat higher preferences in Technical (7.10%) and Service (9.70%) than in Economics (5.70%). On the other hand, Alfa Laval indicatesdthe lowest preference weights across all three criteria.

The outcomes of this study manifested the superiority of Flotwegg over the other brands considered. Flotwegg commanded a substantial user preference weight of 33.60%, establishing it as the foremost choice among participants. In comparison, IHI secured the second position with a user preference weight of 26.40%. The subsequent positions were occupied by Westfalia and Alfa Laval, with Westfalia in the third position and Alfa Laval in the fourth and final position, as determined by the users' expressed preferences. This hierarchy of preferences elucidatesdthe distinct levels of user inclination towards the various decanter brands under consideration, with Flotwegg emerging as the most favored choice, as shown in Table 6 and Figure 3.

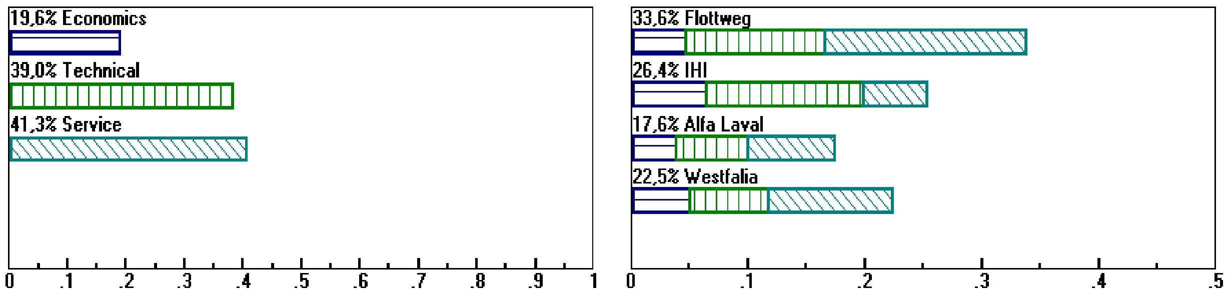

Figure 3. Alternatives priorities

Sensitivity Analysis

To scrutinize the ramifications of shifting criteria priorities, a sensitivity analysis was methodically executed employing the dynamic sensitivity functionality embedded within the Expert Choice program. The overarching objective of this dynamic sensitivity analysis was to discern the impact of prioritization alterations on the alternatives' hierarchical rankings, achieved through the dynamic modulation of criteria priorities [22]. The effect of criteria priorities on overall results is shown in Figure 4 – 7.

By elevating the significance of economic criteria, as elucidated in Figure 4, a discernible shift in the ranking of priorities was evident. Notably, when the priority values associated with economic criteria surpassed the threshold of 50.0%, IHI emerged as the foremost preference for decanter selection, relegating Flottweg to the position of the second most viable alternative. Correspondingly, Figure 5 depicts a noteworthy inversion in the prioritization of the first and second alternatives, achieved through a heightened emphasis on technical criteria, reaching a priority value exceeding 56.5%. Notably, in both instances, the third and fourth ranks remained unchanged under the influence of these dynamic sensitivities.

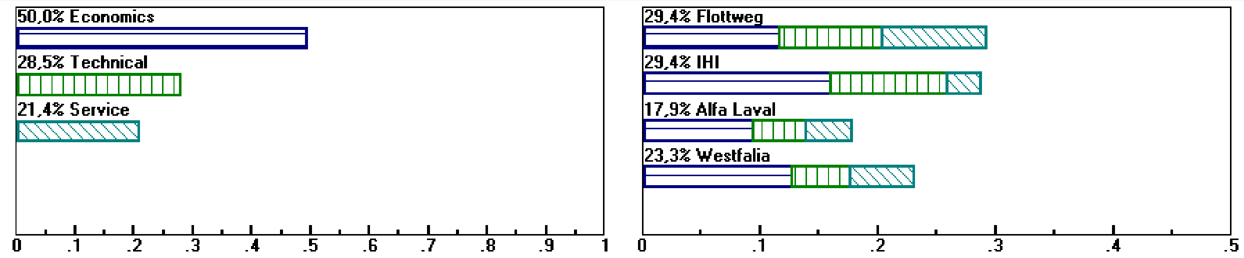

Figure 4. Dynamic sensitivity under the goal by modifying the priorities of economics criteria

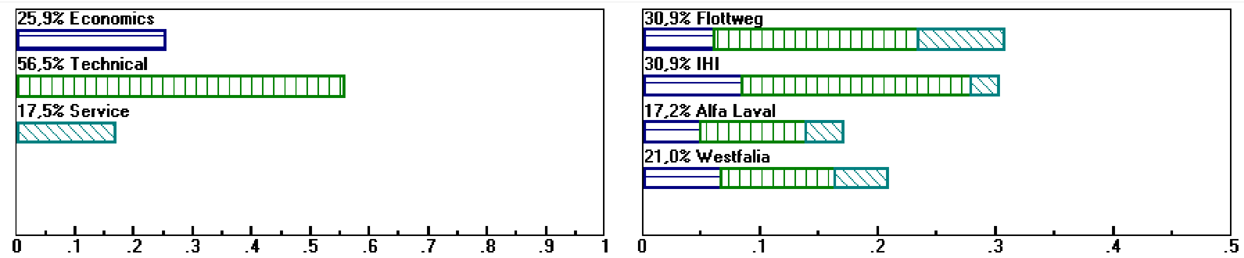

Figure 5. Dynamic sensitivity under the goal by modifying the priorities of technical criteria

Figures 6 and 7 delineate the dynamic sensitivities resulting from alterations in the prioritization of Service criteria. The observed data revealed that a progressive escalation in the priorities assigned to service criteria, exceeding the threshold of 47.5%, induced the repositioning of IHI to the third rank, with Westfalia ascending to the second. Subsequently, a subsequent elevation in these priorities to more than 76.1% precipitates a scenario wherein IHI assumed the status of the least favorable option, while Westfalia and Alfa Laval became the second and third preference alternatives, respectively. Notably, throughout these variations, Flottweg maintained its status as the most optimal choice among decanter alternatives.

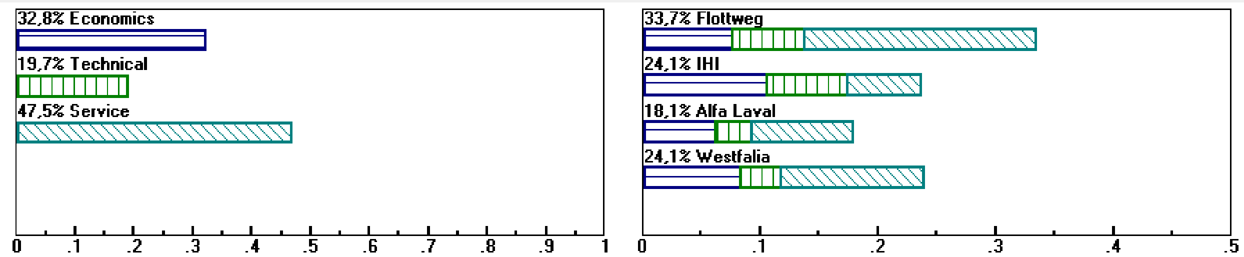

Figure 6. Dynamic sensitivity under the goal by modifying the priorities of service criteria (1)

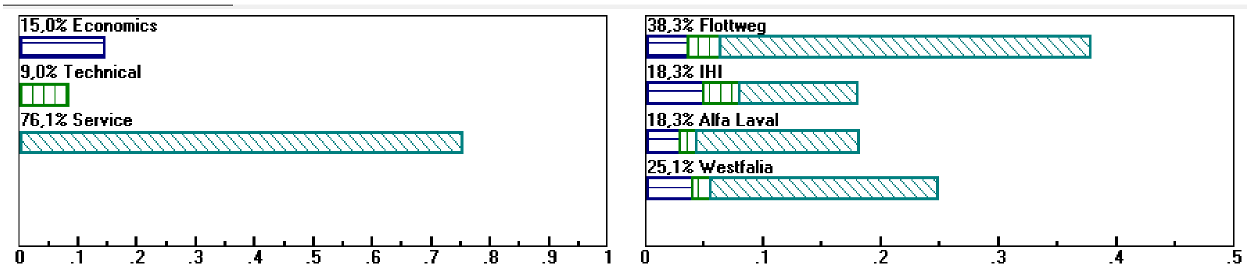

Figure 7. Dynamic sensitivity under the goal by modifying the priorities of service criteria (2)

The presented sensitivity analyses delineate discernible trends concerning prioritizing technical, economic, and service criteria in decanter selection. Specifically, an elevated emphasis on technical and economic criteria elucidates IHI's ascendancy as the preeminent decanter option. Conversely, a heightened significance attributed to service criteria invariably designates Flottweg as the optimal choice, consistent with the original AHP outcomes. Notably, Alfa Laval assumes a consequential role only as the tertiary option, attaining relevance exclusively when service criteria achieve a prioritization level of 76.1%. This outcome underscores a noteworthy user preference, elucidating that, under these circumstances, Alfa Laval is perceived as the least favorable decanter option.

Conclusions

In this study, an AHP-derived assessment framework was formulated to facilitate the judicious selection of a decanter brand, taking into consideration economic, technical, and service-related criteria. The candidates under scrutiny encompassed prominent decanter brands widely employed in Indonesia, namely Alfa Laval, IHI, Flottweg, and Westfalia. Based on the performance evaluation of these alternatives, Flottweg emerged as the most suitable decanter brand for the specified POM investigated in this study, with IHI securing the second-ranking position.

The comprehensive evaluation of alternatives was conducted due to the hierarchical prioritization of essential criteria, namely technical, economic, and service-related considerations. By employing sensitivity analyses, the study discerned that under circumstances where the weights assigned to technical and economic criteria exceeded 56.5% and 50.0%, respectively, IHI could be deemed a preferable choice over Flottweg. Consequently, the AHP-based evaluation method conclusively determined that Flottweg is the optimal decanter for deployment in this particular POM, with IHI as the second most viable option.

This study also concluded that technical and service aspects are equally important in decision-making for the decanter brand in POM A, surpassing economic ones, with service aspects as the critical factor in decanter brand decision-making. The importance of the technical aspect stems from the need to improve oil extraction from the separation process done by decanters to maximize profit. Meanwhile, the priority attributed to the service aspect is caused by the lack of skilled workers who can work on decanters in POM A. Flotwegg, who offers the most reliable service scheme, ranked as the 3rd most crucial sub criteria globally, emerges as the most suitable decanter for POM A.

However, it is also worth mentioning that the results of decanter brand decision-making can be different for other POMs. The difference in POM characteristics can cause this variation. For example, a POM with a higher emulsion content in its feedstock will prefer a decanter with a more relaxed feedstock composition requirement, thus altering the preference. Additionally, a POM with limited free space might choose the one with the most minor height requirement. Moreover, a financially struggling POM might resort to the one with the least required investment.

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