Information Sciences Letters
An International Journal

http://dx.doi.org/10.18576/isl/121232

Extent of Application of Green Productivity Standards in Al-Sumoud Refinery in Baiji: Case Study

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Received: 21 Aug 2023, Revised: 21 Nov 2023, Accepted: 27 Nov. 2023.
Published online: 1 Dec 2023.

Abstract: The study's objective is to ascertain the proportion of implemented green productivity standards, identify implemented green productivity standards, and identify deficiencies in Al-Sumoud Baiji Refinery's dedication to enhancing productivity and safeguarding the environment in crude oil refining. The data was gathered via on-site visits to businesses, direct observation of work activities, and personal interviews conducted with engineers, chemists, and administrative personnel. The primary results suggest that the Al-Sumoud Baiji Refinery has demonstrated a favorable inclination toward diminishing solid and gaseous waste, thereby decreasing environmental harm and decreasing environmental harm and enhancing production. The adoption of green productivity standards is commendable, with the highest level of employee participation suggesting a strong awareness among workers about minimizing pollution and industrial emissions. Refinery management offers education courses to foster this awareness. This strategy mitigates adverse environmental effects and enhances productivity in oil refining.

Keywords: "Minimizing pollution, Green production, industrial emissions, Green product creation."

1. Introduction

Business organizations are unquestionably operating in a very competitive business climate. Given these circumstances, our industrial organizations have no alternative but to seek shelter under the auspices of thriving industrial performance while prioritizing environmental preservation (Zhang et al., 2023:2). Given this, numerous studies have emerged on green productivity, including one conducted by Lee et al. (2023:2). Green productivity is a crucial factor in achieving sustainable development since it contributes to energy conservation and the reduction of waste and emissions. The study by Rahko and Alola (2023:3) found that the advancement of environmental technology, whether through process or product innovation, has positively impacted the rise of green productivity in organizations. The study by LU et al. (2023:2) addresses the lack of theoretical and empirical investigation in green productivity.

Environmental protection from the negative effects of waste, emissions, and residues from economic activities is a crucial issue facing humanity in the twenty-first century. The ecological imbalance created by the excessive use of natural resources, such as raw materials and energy, necessitates the search for effective mechanisms to combat this phenomenon. Green production is a new approach based on applying specific environmental standards to reduce the negative impact of pollutants, particularly industrial oil, on the environment and the natural environment. Al-Sumoud Baiji Refinery has no choice but to rely on green productivity to achieve sustainable development. The current competitive conditions in the company's environment make it necessary to determine green productivity, as it contributes to modern manufacturing and sustainable development.

The study found that Al-Sumoud Baiji Refinery's poor industrial performance, particularly in producing gasoline, is reflected in the poor quality of its products. The company's inability to meet growing local demand due to frequent stops and large quantities of black oil production indicates low productivity. Despite Iraq's abundant production and reserves of crude oil, there is a lack of knowledge and application of the benefits of rapid development in production and operations, including applying green productivity to improve productivity and protect the environment. The problem can be formulated with the following questions: What is the level of implementation of green productivity standards, including pollution avoidance, green production, lean production, supplier integration, green product innovation, green process innovation, corporate environmental responsibility, and employee participation, in the Al-Sumoud Baiji Refinery?

1. Is there a deficiency in implementing green productivity standards, such as pollution prevention, green production,

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lean production, supplier integration, green product innovation, green process innovation, corporate environmental responsibility, and employee participation, inside the Al-Sumoud Baiji Refinery?

This study examines the implementation of green productivity standards at Al-Sumoud Baiji Refinery. The standards encompass various aspects such as pollution prevention, green production, lean production, supplier integration, green product innovation, green process innovation, corporate environmental responsibility, and employee participation. The study also investigates whether there are any gaps in the implementation of these standards.

1.1 The Main Research Objectives are the following:

1. The study explores the application of green productivity standards at Al-Sumoud Baiji Refinery, including pollution prevention, green production, lean production, supplier integration, green product innovation, green process innovation, corporate environmental responsibility, and employee participation, and if there is a gap in their implementation.
2. The study evaluates the feasibility of incorporating the Al-Sumoud refinery into the green productivity portfolio by implementing green productivity criteria.
3. To identify and address the shortcomings in implementing green productivity standards within the Al-Sumoud refinery, enhancing its operational efficiency and providing evidence of its effectiveness.

2 Methodology

The Hypotheses of the Study

The researcher begins by formulating hypotheses relevant to the concerns stated in the question, as outlined below.

1. this study focuses on the Al-Sumoud Baiji Refinery, which is capable of adopting and implementing green productivity standards.

2. A discrepancy exists in implementing green productivity criteria within the examined refinery, specifically according to the standard points.

2.1 The Research Community and Sample

The Al-Samoud Baiji Refinery, the largest oil refinery in Iraq's Salah al-Din governorate, was chosen as a case study for practical research. With an annual production capacity of 15 million metric tons of oil derivatives, it is the most important and efficient refinery among the four refineries of North Refineries Company. The reason for choosing Al-Sumoud Baiji Refinery is its functioning and productive nature despite the challenging conditions in the country. The practical side of research can be applied to the al-Sumoud refinery, resulting in results closer to the real practical reality than an alternative (extraordinary) reality. This decision highlights the importance of a functioning and productive company in challenging conditions.

Table 1: Tools for Building a Scale Checklist.

The Main Variable	Sub Variable	Number of Questions	References
Standards green productivity	Pollution prevention	4	(Rao, 2004)
	Green production	6	(Rao, 2004)
	Lean production	6	(Rao, 2004)
	Integration with the provider	4	(Rao, 2004)
	Green product creation	5	(Kam &Wong, 2012) (Pun, 2004) : (Huang &Wu, 2010)
	Creation of the green process	5	(Kam &Wong,2010) variable (Pun, 2004) paragraphs : (Huang &Wu, 2010)
	Corporate environmental responsibility	4	(Rao, 2004)
	Employee participation	5	(Rao, 2004)

2.2 Methods of Collecting Data and Information

The study utilized various methods to gather data and information on the theoretical and practical aspects of refinery operations. The theoretical aspect involved utilizing scientific sources like books, journals, articles, conferences, and the Internet. The practical aspect involved frequent visits to sites, direct observation of work, and personal interviews with

engineers, chemists, and administrators. The study also included data from refinery departments, a checklist, support from experienced specialists, and the Internet.

The research sample was restricted to departments engaged in activities directly associated with green productivity. They were conducting a purposive sampling of individuals holding director positions in various agencies, departments, and divisions, as well as experienced engineers from specific departments such as the Environment and Studies Department, the Refining Department, the Industrial Water Treatment Department, the Energy Production Department, the Hydrogenation Departments, the Pumping, Storage, Receiving Department, and the Cost Accounts Department, to acquire accurate responses to complete the checklist.

2.3 Research Methodology

This study utilized a case study approach to analyze descriptive criteria of research variables and used statistical methods to determine frequencies, arithmetic mean, agreement percentages, and gap size using a checklist approach.

To measure the study's variables, measure the study's variables to ensure the checklist's ability to measure the study's variables accurately. This involved presenting the checklist to experts and specialists in administrative sciences. The purpose was to verify the criteria validity and alignment with the research hypotheses and objectives. Additionally, it aimed to ensure the scientific clarity and accuracy of the criteria. The study employed a tripartite scale to assess the degree of alignment between the real standards and their corresponding application needs.

2.4 The Concept of Green Productivity

Industries worldwide are undergoing significant transformations, including liberalization, privatization, and globalization, causing increased competition and environmental impact. Green productivity is one of those concepts, as it includes protection (Gandhi et al., 2006: 594). A concept that includes conservation was introduced by the Asian Productivity Organization (APO) to address the global environmental crisis. Supported by the Japanese government, the Green Productivity Program was introduced in 1994, where the causes of important environmental problems were identified, and the focus of the application was mainly on small and medium enterprises (Hirakawacho et al., 2002:3). Focusing on small and medium-sized enterprises. The program was launched in response to the Earth Summit of the Year in 1992, aiming to improve productivity and reduce environmental impacts by spreading awareness of green productivity (Ahmed, 2012: 68). Green productivity can be defined from various angles, including its application, philosophy, and results achieved. Some researchers consider green productivity from different perspectives, such as the programs it is applied to, its philosophy, or the results achieved.

Table 2: Some Concepts of Green Productivity.

N	The Definition	Researcher
1	It is a strategy for applying appropriate tools, techniques, technologies, and management systems to provide environmentally friendly products and services.	(Hang &Hong, 2001)(Tuttle&Heap,2007)
2	Is the production of economic value taking into account the environment	(Kim &Hur,2002)
3	It is a strategy to improve productivity and environmental performance simultaneously for socio-economic development by applying appropriate tools, technologies, and management systems to provide environmentally compatible goods and services.	(Shireman, 2003) (Avishek et al.,2008) (Singgih, 2010) (Ahmed, 2012)
4	It is the method that enables the organization, whether large or small, to understand what it should do about the impacts on the environment that cause a decrease in the organization's efficiency, increase costs, and reduce its productivity.	(Hirakawacho et al , 2002)

The primary emphasis of various concepts lies in the core aspect of green productivity, which entails analyzing and reassessing production procedures to enhance productivity while concurrently mitigating adverse environmental effects.

2.5 Green Productivity Standards

The researchers will rely on the Dawood (2017:2) model in defining green productivity standards in the practical aspect, which are as follows:

1- Green productivity is centered on pollution prevention, a crucial aspect of environmental protection. This involves preventing pollution at its source and treating the remaining waste at the end of the line. This process reduces the generation of pollutants, thereby minimizing their impact on humans by limiting air and water pollution in the environment using effective techniques, technologies, or activities.

2- According to Rao (2004), green production entails an integrated environmental protection strategy for processes, goods, and services to address pollution causes, boost environmental effectiveness, and lower risks to both people and the environment.

3- Lean production is a method that focuses on reducing non-value activities and resource usage, enhancing efficiency through statistical control, Kanban principles, design, time reduction, human resource utilization, team building, and employee performance evaluation.

4- Effective management enhances the ability to create dual value for the company and its suppliers, as they are interdependent and linked by common interests.

5- Green product innovation involves the development, production, and marketing of modern, environmentally friendly products that have a significant advantage over traditional ones due to their minimal impact on the environment, including energy, raw material demand, air, emissions, effluents, water, solid waste, and other emissions generated during the product's life.

6- Green process innovation involves utilizing creative ideas to adopt production processes and management practices with minimal negative impact on the environment, human health, society, culture, and economy (Kam & Wong, 2011:472). It promotes the conscientious management of the environment and prioritizes human well-being, community cohesion, cultural preservation, and economic sustainability.

7- Corporate responsibility for the environment, or environmental responsibility, is one of the elements of social responsibility incumbent on industrial enterprises. In recent years, the interest of countries and international and regional organizations in this issue has increased significantly, especially with the increase in the scale of economic activities and their negative impact on the environment. Corporate environmental responsibility is the company's compliance with laws and regulations issued by public authorities to protect the environment (Pride & Ferrell, 2003, p. 85).

8- Worker involvement is a management strategy that empowers frontline workers with information and knowledge to understand organizational performance and participate in decision-making. This approach slows down resistance to change and enhances their ability to innovate and seek specific solutions, according to Jones (1998). Worker involvement in industrial processes and innovations fosters a collaborative and dynamic work environment. Frontline workers' active involvement in decision-making processes concerning industrial practices and innovation initiatives helps them navigate through changes and fosters a culture of ongoing improvement and the capacity to adapt and innovate within the industrial setting.

3 Analyze the Results of the Checklist

This study presents the results of answering checklist questions about the refinery's reality and the gap size. The data was extracted using descriptive analysis from frequencies, arithmetic means, and percentages. The results were compared using a triple scale (fully achieved, partially achieved, not achieved) and corresponding weights (3, 2, 1), with the average scale partially achieved. A purposive sample of directors of agencies, departments, divisions, and experienced engineers was drawn from various departments, including the Environment and Studies Department, Refining Department, Industrial Water Treatment Department, Power Production Department, Hydration Department, Pumping, Storage, and Receiving Department, and Cost Accounting Department. The questionnaire was then re-examined after a month to ensure realism. The final answers were analyzed to ensure they corresponded to reality. The study's findings provide valuable insights into the refinery's operations and the need for improvement.

Green Productivity Standards

The researchers will rely on the Dawood (2017:2) model in practically defining green productivity standards in the practical aspect, as indicated in Table (3). Table (3) indicates that the criterion "pollution prevention" has a partially verified rating of (2), with a compliance rate of 66.7% and a gap of 33.3%.

The findings suggest that the Al-Samoud Baiji refinery actively endeavors to minimize the production of diverse pollutants, thereby mitigating their impact on human health and the surrounding environment. The findings align with the research by Singgih et al. (2010), which focused on increasing productivity by implementing green productivity strategies to reduce waste.

Table 3: Analysis of the Results of the Pollution Prevention Criterion.

N	Pollution Prevention	Fully Verified	Partially Verified	Not Verified
1	The solid/liquid waste minimization process contributes to maximizing the utility of the production system.		*	
2	Educating the use of electricity and water contributes to maximizing the benefit of the production system.		*	
3	The refinery has special techniques for calculating gaseous emissions in the air to control them.		*	
4	The refinery is keen to reduce noise in the workplace.		*	
	weights	3	2	1
	repetitions	0	4	0
	The result	0	8	0
	weighted arithmetic mean	2		
	The percentage of compliance	0.667		
	gap size	0.333		

The calculations were conducted in the following way (Al-Mamouri and Al-Qargoli, 2006: 4), (Al Faihan and Al-Bayati, 2008: 113), (Al-Khatib, 2008: 349), (Al-Shammari, 2013: 173):

Weighted arithmetic mean= (total(repetitions x weight))/ (repetitions total) (1)((0×3)+(4×2)+(0×1))/(0+4+0) =8/4=2.0

The percentage of compliance = (arithmetic weighted mean)/ (scale in higher degree)

(2)= 2/3= 0.667= 66.7 %

Gap Size = 1 – Match Range Percentage

= (1-0.667) =0.333 = 33.3%

The percentage of the matching range depends on the magnitude of the weighted arithmetic mean obtained. The denominator represents the highest score on the scale, and the numerator is the highest. The lowest level is when the magnitude is 66.7%, with a gap of 33.3%. The lower the gap due to optimization processes, the better and closer to the fully achieved state. Calculations are performed for other variables; the results are shown in tables.

B. Green production: The results of Table 4 show that the sub-criterion "green production" has obtained an average value of (1.833), within a non-achievement scale and close to a partial achievement scale. The percentage of compliance is 61.1%, and the gap size is 38.9%.

The findings demonstrated that Al-Samoud Baiji Refinery prioritizes the prevention of pollution at its origin rather than focusing on remedial measures downstream. The findings align with the research by Tsai et al. (2015), which proposed that using green production as a strategic approach facilitates sustainable development, reduces pollution, and motivates industrial firms to use environmentally friendly practices. This, in turn, enables cost reduction and efficient utilization of resources, thereby mitigating energy waste. The judicious allocation of primary resource energies, human resources, and operational processes in production leads to enhanced productivity and environmental performance.

Table 4: Analysis of the Results of the Green Production Standard.

N	Pollution Prevention	Fully Verified	Partially Verified	Not Verified
5	The filter is committed to using raw materials (improvers, water treatment materials) that do not harm the environment.		*	
6	The refinery takes some measures to reduce pollution from the source, such as examining the crude for radioactive contamination before refining it.		*	
7	The refinery seeks to replace environmentally questionable materials and processes with others that do not harm the environment.		*	
8	The refinery considers environmental requirements consider environmental requirements when designing its operations.		*	
9	The refinery seeks to use green production technology in its production processes.		*	
10	The refinery aspires to use alternative energy sources in some of its			*

	operations to reduce environmental negative effects.			
	Weights	3	2	1
	Repetitions	0	5	1
	The result	0	10	1
	Weighted arithmetic mean	1.833		
	The percentage of compliance	0.611		
	Gap size	0.389		

C- Lean Production: The results of Table (5) show that this criterion obtained a rate of (2), i.e., partially achieved, and that the percentage of the extent of conformity is (66.7%) and the size of the gap is (33.3%).

The findings suggest that the Al-Samoud Baiji refinery recognizes that the conventional production approach leads to excessive utilization of materials and other production resources. Consequently, the refinery has adopted lean production as a methodology to eradicate waste in all facets of its operations. The findings support Anwer et al.'s (2023) research and show that management should use modern production methods. These methods aid in minimizing material and resource waste during manufacturing processes, ultimately enhancing operational efficiency and enabling the company to effectively adapt to environmental changes by adopting lean production.

Table 5: Analysis of the Results of the Lean Production Criterion.

N	The Lean Production	Fully Verified	Partially Verified	Not Verified
11	The refinery needs to reorganize production processes to ensure the highest possible use of available resources.		*	
12	The refinery works to adhere to the controls and instructions that ensure the disposal of everything that is unnecessary and does not add value to production.		*	
13	The refinery searches for the causes of non-conformity to the planned results and the causes of waste generation to treat them.		*	
14	The refinery often uses control and process control charts.	*		
15	The refinery considers implementing the reuse program for some obsolete units economically and environmentally feasible.		*	
16	The refiner believes that implementing the recycling program for some waste is an urgent necessity.			*
	weights	3	2	1
	repetitions	1	4	1
	The result	3	8	1
	weighted arithmetic mean	2.0		
	The percentage of compliance	0.667		
	gap size	0.333		

D. Integration with the supplier: The results of Table 6 show that this criterion obtained a rate of 2.25, i.e., fully achieved, and that the percentage of the extent of conformity is 75% and the size of the gap is 25%. The findings suggest that Al-Samoud Refinery is actively cultivating a mutually beneficial relationship with its suppliers, intending to enhance efficiency and generate value for both the refinery and the suppliers. The findings are consistent with research by Rao (2004), which emphasizes the significant role of processors in implementing the industrial greening program. Hence, to effectively adopt green productivity, the refinery must allocate a substantial amount of time and resources toward developing and maintaining processors.

Table 6: Analysis of the Results of the Standard of Integration with the Provider**.**

N	Supplier Integration	Fully Verified	Partially Verified	Not Verified
17	The refinery selects its suppliers according to their commitment to environmental standards.		*	
18	The refinery urges its suppliers to take measures to protect the environment.		*	
19	The refinery helps its suppliers to design their environmental management systems.		*	
20	The refinery ensures that the best suppliers are identified and advised of	*		

	what is expected to be supplied.			
	weights	3	2	1
	repetitions	1	3	0
	The result	3	6	0
	weighted arithmetic mean	2.25		
	The percentage of compliance	0.75		
	gap size	0.25		

E-Creativity of the Green Product: The results of Table 7 show that this criterion obtained a rate of (1.8), i.e., within an unattainable scale, with a percentage of the conformity range (60%) and a gap size of (40%). The findings indicated that Al-Samoud Baiji Refinery actively pursues implementing innovative concepts, creating and producing contemporary and eco-friendly commodities. The findings align with the research conducted by Ogiemwony et al. (2023), as the utilization of inventive concepts in the development and production of eco-friendly goods aids in improving the environmental and societal efficacy of the refinery.

Table 7: Analysis of the Results of the Green Product Innovation Criterion.

N	Green Product Innovation	Fully Verified	Partially Verified	Not Verified
21	The refinery is looking for alternative materials for some currently used materials, which are not environmentally friendly.		*	
22	The refinery studies the possibility of improving the product's properties to raise its operational specifications.		*	
23	The refinery intends to reuse some of the materials in the new production.			*
24	The refinery chooses materials that complement or improve production which consume the least energy and resources. It also has the least impact on the environment.		*	
25	The refinery develops the product by selecting some required materials for production that generate the least pollution compared to the available ones.		*	
	weights	3	2	1
	repetitions	0	4	1
	The result	0	8	1
	weighted arithmetic mean	1.8		
	The percentage of compliance	0.6		
	gap size	0.4		

F-Green Process Innovation: The results of Table (8) show that this criterion obtained a rate of (1.8), i.e., within an unachieved measure, with a percentage of conformity (60%) and a gap size of (40%). The findings suggest that Al-Samoud Baiji Refinery actively strives to include innovative concepts that promote production methods and managerial strategies that minimize or eliminate adverse effects on the environment, human health, society, culture, and the economy. The findings align with the research conducted by Khazeal and Majeed (2020), which shows that implementing innovative green practices, such as altering manufacturing processes and systems to produce eco-friendly products, plays a significant role in attaining environmental and social objectives.

Table 8: Analysis of the Results of the Green Process Innovation Standard.

N	Green Process Innovation	Fully verified	Partially verified	Not Verified
26	The refinery adopts low-cost production processes.			*
27	The refinery is keen to adopt high-quality production processes.		*	
28	Workers contribute to better redesigning production processes to reduce emissions and waste.			*
29	The refinery seeks to increase the efficiency of the production process through its commitment to environmental and social standards set by international treaties on the industrial sector.	*		
30	The refinery is keen to adopt highly flexible production processes in dealing with variables.		*	
	weights	3	2	1
	repetitions	1	2	2
	The result	3	4	3
	weighted arithmetic mean	1.8		

	The percentage of compliance	0.60		
	gap size	0.40		

G: Corporate Environmental Responsibility: The results of Table 9 show that this criterion obtained a rate of (2), which is partially achieved; the percentage of the extent of conformity is (66.7%); and the size of the gap is (33.3%). The findings suggest that Al-Samoud Baiji Refinery actively strives to include innovative concepts that promote production methods and managerial strategies that minimize or eliminate adverse effects on the environment, human health, society, culture, and the economy. The findings align with the research conducted by Khazeal and Majeed (2020), which shows that implementing innovative green practices, such as altering manufacturing processes and systems to produce eco-friendly products, plays a significant role in attaining environmental and social objectives.

Table 9: Analysis of the Results of the Corporate Environmental Responsibility Standard.

N	Corporate Environmental Responsibility	Fully verified	Partially verified	Not Verified
31	The refinery defines its commitment to local communities.		*	
32	The refinery contributes to achieving (a sustainable world) - the need to achieve the highest productivity rates and strike a balance between production, development, and the environment and the preservation of its resources.			*
33	The refinery plans to green its products (make its products from adding pollutants) as much as possible.		*	
34	The refinery seeks to select fires that successfully address environmental issues.	*		
	weights	3	2	1
	repetitions	1	2	1
	The result	3	4	1
	weighted arithmetic mean	2.0		
	The percentage of compliance	0.667		
	gap size	0.333		

Workers' participation: The results of Table 10 show that this criterion got a rate of (2.6), i.e., within a partially achieved scale, with a percentage of the extent of conformity (86.7%), and with a gap size of (13.3%). The findings indicate that Al-Samoud Baiji Refinery is actively engaged in enhancing and refining the competencies of its workforce, leading to a favorable influence on production. The findings align with the research conducted by Rao (2004), indicating that workers play a crucial role in the green productivity program by dedicating significant time and effort to training, educating, and enhancing their skills. as a significant reservoir of ideas for environmental advancements.

Table 10: Analysis of the Results of the Workers Involvement Standard**.**

N	Worker Involvement	Fully Verified	Partially Verified	Not Verified
35	The refinery is committed to a work program that ensures workers' participation in the various issues related to their work.		*	
36	The refinery provides highly specialized programs for training employees.	*		
37	The refinery conducts an integrated study to determine the training program's needs.	*		
38	The refinery documents the names of the trainees, the specific topics for their training, and the topics on which they were trained.	*		
39	The refinery always strives to give employees the correct (updated) version of the documents necessary to perform the assigned tasks.		*	
	weights	3	2	1
	repetitions	3	2	0
	The result	9	4	0
	weighted arithmetic mean	2.6		
	The percentage of compliance	0.867		
	gap size	0.133		

Summary of the Results of the Checklist Analysis

The descriptive analysis determined the weighted arithmetic mean and percentages of the variables' corresponding reality

to the business. The results were compared using a triple scale with weights (3, 1, 2), resulting in an average of (2). The results are presented in Table (11).

Table 11: Summary of the Results of the Green Productivity Checklist

N	Green Productivity	Weighted Arithmetic Mean	Extent of Conformity(%)	Gap Size(%)
1	Pollution prevention	2.0	66.7	33.3
2	Green production	1.833	61.1	38.9
3	Lean production	2.0	66.7	33.3
4	Integration with the provider	2.25	75.0	25.0
5	Green Product innovation	1.8	60.0	40.0
6	Green process innovation	1.8	60.0	40.0
7	Corporate environmental responsibility	2.0	66.7	33.3
8	Worker Involvement	2.6	86.7	13.3

The study conducted at Al-Samoud Beige Refinery confirmed all research hypotheses, with the first hypothesis stating that a good percentage of green productivity standards application is due to the availability of requirements and ingredients. The second hypothesis suggests a gap between the standard points of green productivity standards and what is applied in the refinery, as confirmed by the data analysis results. The study's findings highlight the need for further research and improvement in implementing green productivity standards.

4. Results and Discussion

The topic concerns, conclusions, and suggestions related to the applied aspect (checklist). Which is the result of what the research results showed through field coexistence in the refinery in question, as follows:

4.1 Conclusion

1. The Al Sumoud Refinery is actively working to prevent pollution through its environmental department, mobile laboratory, and equipment for studying pollutants, noise, and radiation sources. However, the refinery's efforts have not reached the level of making its production green or environmentally friendly.
2. The products are still considered traditional and cannot withstand international competition due to primitive and uneconomical processes. The refinery operator's interest in organizing production processes through control and management schemes is limited due to the aging of refinery plants.
3. The refinery selects suppliers carefully based on environmental considerations, aiming to reduce negative environmental impacts and protect society.
4. The refinery is moving slowly towards producing environmentally friendly products and is not achieving the level of creativity characteristic of organizations that do not rely on a monotonous traditional approach.
5. The refinery is preparing to use environmentally friendly processes, such as an isomerization plant, but the current operation is not considered green or creative.
6. The refinery is committed to defining its responsibility to the community by successfully managing environmental issues and tracking pollutants. They are also interested in developing solutions to treat industrial water and solid waste before discharging it into rivers and sending it to the rivers.
7. The refinery's commitment to employee participation is evident in their interest in training programs that make them highly skilled and efficient workers, enabling them to solve problems and challenges -the refinery faces.

4.2 Recommendation

1. The refinery's departments must collaborate to reduce pollution and develop effective solutions, such as setting up a solid waste incinerator and increasing the flare system. They should also focus on increasing production by focusing on research and modern scientific studies, especially in the oil industry.
2. Refining obsolete units can be done through a reuse program, considering economic feasibility and the availability of spare parts or manufacturing options. The refinery can also use industrial waste recycling programs to convert waste into raw materials for industry use. In collaboration with accredited suppliers, the refinery should establish a plan to improve and develop its existing facilities in line with modern global trends and develop new units to accommodate future growth. Modern technologies are urgently needed in the oil industry, and the refinery should produce national products that compete with imported products.

3. The refinery has good financial resources compared to other non-oil sectors, making it an independent entity. To protect resources, the refinery should extract desirable products from waste or undesirable products, such as black oil, to develop resources towards an optimal world that preserves future generations' rights and protects society from environmental impacts due to excessive or over-depleting resources. A rotation program of workers between departments can eliminate monotony, qualify workers for more experience, and reduce the impact of pollutants on workers.

4. Researchers have noticed increased concentrations of pollutants in certain refinery areas, resulting in higher odors and noise levels. For example, the area surrounding the industrial water treatment department has pollutants, exposing workers to greater health problems than those in the steam generation department.

Future Research

Considering the significance of the current academic variable and the need for further academic scientific study on this variable, the researchers have put forth a series of suggested future research titles that can be valuable for researchers in the future:

1. The significance of green production in waste reduction.

2. Employing green productivity strategies to minimize flaws.

3. The significance of green productivity in safeguarding the environment.

Acknowledgment

The authors want to acknowledge the financial support from the INTI IU Research Seeding Grant 2023: INTI-FEQS-1-06-2023. We express our gratitude to Al-Samoud Refinery in Baiji for their assistance in acquiring data for the research. Additionally, we would like to acknowledge the Northern Technical University for its administrative support in this study.

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