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Monitoring And Controlling Pollutants with Modern Methods and Using Artificial Intelligence in the Anode Manufacturing Unit of the South Aluminum Factory (SALCO) in Lamerd

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Abstract

This study examines the monitoring and control of pollutants using modern methods and artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) in Lamerd. The aim of this research is to evaluate the impact of advanced technologies on improving air and water quality and managing environmental pollution. For this purpose, analytical and comparative methods were used and various indicators such as data integration, real-time data analysis, communication with Internet of Things systems, predictive modeling, early warning system, and public education and awareness were examined. The findings show that real-time data analysis and communication with Internet of things systems have the highest priority among the indicators, respectively, which indicates the importance of these factors in improving monitoring efficiency and preventing environmental crises. Also, the use of artificial intelligence technologies such as ChatGPT can help to identify environmental problems more quickly, promote environmental culture among employees, and reduce environmental costs. Finally, this research emphasizes the importance of new approaches in pollutant monitoring management and shows that integrating AI technologies with monitoring systems can lead to improved environmental quality and public health in heavy industries such as aluminum production.

Keywords: Pollutant control, pollutant monitoring, artificial intelligence, Internet of Things, Chat GPT.

Introduction

The increasing growth of industrialization and urbanization, despite economic and social achievements, has left a destructive impact on the environment. Emissions of greenhouse gases, particulate matter, and chemical pollutants have caused the destruction of ecosystems, reduced biodiversity, and increased pollution-related diseases in various societies. This situation has caused serious concerns, especially in areas with a high concentration of heavy industries, such as aluminum industries. Production processes in these industries, especially anodizing, with the emission of hazardous gases such as fluorides, volatile hydrocarbons, and particulate matter, pose a direct threat to the environment and public health (Almalawi et al., 2022).

Traditional environmental monitoring methods, which mainly rely on field measurements, sensor networks, and satellite images, although they provide valuable information, have shown significant inefficiencies due to limitations in real-time data processing and early detection of pollution events (Masood, Ahmad, 2021).

These challenges are exacerbated in areas such as the South Aluminum Plant (SALCO), which is associated with a high concentration of industrial production. Therefore, the need to use new technologies to monitor and manage environmental pollution is increasingly felt. In this regard, artificial intelligence has been recognized as a transformative tool in analyzing complex data, identifying emerging patterns, and providing data-driven decisions (Lotrecchiano et al., 2022).

Advanced AI technologies such as machine learning and natural language processing enable the analysis of large-scale, multi-source environmental data such as sensor data, satellite imagery, and social media data (Zhao et al., 2023). These technologies not only have the ability to detect anomalies early and predict pollution impacts, but also can facilitate decision-making by producing accurate and understandable reports for policymakers and industrial managers (Hamza et al., 2022).

The use of AI in environmental monitoring can help increase the speed and accuracy of data analysis, improve the identification of pollution sources, and provide effective solutions to reduce environmental impacts. In particular, combining AI techniques with the Internet of Things and big data analytics can provide more efficient tools for pollution management in industries (Fang et al., 2023). Given the widespread consequences of environmental pollution caused by industrial activities, it seems essential to identify and use new tools in the management and monitoring of this problem. Artificial intelligence technologies, with their ability to analyze big data, predict anomalies, and provide practical solutions, play a significant role in reducing environmental impacts and improving the quality of natural resource management (Guo et al., 2022).

However, the effective use of these technologies requires extensive research tailored to the specific conditions of industrial areas. Especially in industries such as aluminum, whose production processes are the main sources of air pollutants, the use of artificial intelligence-based models can create a major transformation in identifying and reducing the effects of pollution (Agarwala, 2021).

The importance of this research is due to the provision of a new approach in the use of artificial intelligence technologies for more accurate and effective management of environmental pollutants in polluting industries. Using machine learning algorithms, this research can help identify pollution sources, analyze their impacts, and provide evidence-based solutions. The results of this study will not only help reduce the negative environmental impacts of industries, but can also be used as a reference for policymakers and industrial managers in developing sustainable and responsible environmental programs.

Table (1), lists the articles studied. In the first stage, key indicators are identified. These indicators include data integration, real-time data analysis, connectivity with Internet of Things systems, and predictive modeling. These indicators were selected based on a review of scientific articles and practical experiences in similar industries. For example, data integration refers to the ability to combine information from different sources, such as sensors and satellite images, which can help identify pollution sources more accurately. Real-time data analysis also allows for rapid response to sudden changes in air and water quality. After identifying the indicators, data is collected. This data includes information from environmental sensors, air and water quality data, and historical information about pollutants. Various methods are used to collect this data, such as surveys of environmental experts and the

use of existing databases. The Analytic Hierarchy Process (AHP) model is also used to analyze the data and prioritize different solutions for using artificial intelligence in pollution control at the Salco anode manufacturing unit. The AHP model is a multi-criteria decision-making method that helps evaluate and rank various factors such as the type of technologies used, costs, effectiveness, and public acceptability. In this regard, the opinions of experts in the fields of environment, aluminum industries, and information technology are used as input data for the AHP model, and its results will be used as the basis for providing optimal solutions to improve pollution monitoring and control. Given this mixed research method, it is expected that the results of this study can help to more effectively identify pollution sources and provide practical solutions to reduce environmental impacts. This research can also be used as a reference for policymakers and industrial managers in developing sustainable and responsible environmental programs.

Theoretical Framework

In this research, the main objective is to investigate the application of advanced artificial intelligence techniques, especially technologies such as ChatGPT, to monitor and control pollutants in the anode manufacturing unit of the South Aluminum Plant (Salco) in Lamerd. This research seeks to use artificial intelligence to analyze complex data, identify pollution patterns, and make quick decisions to improve the quality of the environment in this plant. The theoretical framework of this research is based on new technologies and advanced monitoring methods, which include the use of sensor networks, satellite images, and Internet of Things devices. This study provides basic definitions and classifications of key topics related to pollutant monitoring and control using new artificial intelligence technologies. Artificial intelligence refers to technologies that have the ability to simulate human cognitive processes and can be used to analyze data, learn from experience, and make automated decisions.

According to Russell and Norvig (2020), artificial intelligence refers to systems that can perform tasks that usually require human intelligence. Pollutant monitoring refers to the process of monitoring pollutant levels in the environment using various tools and techniques that help identify and control pollution.

Mason et al. (2019) defined this process as a monitoring system for measuring and analyzing pollutants. IoT devices include devices that are capable of collecting data and communicating with each other to provide useful information about the environment (Ashton, 2009).

These devices are particularly useful in environmental monitoring and can collect real-time data from sensors. Key topics of this research include new technologies, pollution management, and public participation. New technologies include artificial intelligence, machine learning, natural language processing, and the Internet of Things. Pollution management refers to continuous monitoring, identifying pollution sources, and making data-driven decisions. Public participation also refers to the use of artificial intelligence tools to increase public awareness of pollution levels and preventive measures. This theoretical framework emphasizes the need to integrate new technologies with management approaches in order to more effectively address the environmental challenges posed by polluting industries. The use of AI systems can not only help identify environmental problems more quickly, but also lead factories towards greater sustainability by promoting environmental culture among employees and reducing environmental costs.

Research Background

In recent years, the use of new technologies and AI in monitoring and controlling environmental pollution has expanded significantly.

- Al-Malawi et al. (2022), designed an Internet of Things (IoT)-based system that uses combined AI techniques to monitor and predict air pollution.
- In order to predict air pollution, Masoud and Ahmed (2021), reviewed emerging AI techniques and analyzed the application and performance of these methods.
- Feng et al. (2023), conducted a systematic review to examine the role of AI in waste management in smart cities and identified the challenges in this area.
- Other studies have used AI to identify pollution sources and analyze environmental data.

- Lutriciano et al. (2022), used AI techniques to identify pollution sources and showed the role of environmental data in improving the accuracy of these systems.
- Zhao et al. (2023), examined the impact of AI on reducing the intensity of pollutant emissions in China and achieved positive results in reducing pollutants.
- Hamza et al. (2022), presented a framework based on big data analysis that helps to more accurately monitor air pollution. Research has also examined the management of water pollution and marine environments.
- Agarwala (2021), examined the application of AI in marine pollution management and provided solutions to reduce its impacts.
- Yeo et al. (2020), examined the role of AI in addressing environmental challenges and pollution control.
- Neti et al. (2023), analyzed the use of artificial intelligence to control water pollution and protect environmental health.

These studies show that artificial intelligence is a powerful tool in the prevention and control of environmental pollution and can help reduce the harmful effects of the environment.

Table 1. List of articles studied

Research results	Research Method	Title	Publication year	Author(s)
Developing an Internet of Things-based system to monitor and predict air pollution using artificial intelligence.	Case study	An Internet of Things-based system to enhance air pollution monitoring and forecasting using hybrid AI techniques.	2022	**Al-Malawi, A. et al.**
Analysis of artificial intelligence techniques in air pollution prediction and evaluation of their performance.	Systematic review	A review of new artificial intelligence techniques for air pollution prediction: fundamentals, applications, and performance.	2021	**Massoud, A. and Ahmed, K.**
Investigating the application of artificial intelligence in municipal waste management and identifying related challenges.	Systematic review	Artificial Intelligence for Waste Management in Smart Cities: A Review	2023	**Fang, B. et al.**
Identifying pollution sources using environmental data and artificial intelligence techniques.	Case study	Artificial Intelligence for Pollution Source Identification	2022	**Loutreciano, N. et al.**
Investigating the effects of artificial intelligence on reducing the intensity of pollutant emissions in China and identifying new patterns.	Data analysis	The impact of artificial intelligence on the intensity of pollutant emissions - evidence from China	2023	**Zhao, P. et al.**
Designing a framework for monitoring air pollution using	Case study	Environmental air pollution monitoring framework based on big	2022	**Hamza, M. A. et al.**

big data and artificial intelligence.		data analysis and artificial intelligence		
Providing effective solutions for managing marine pollution with artificial intelligence.	Case study	Managing marine pollution using artificial intelligence	2021	**Agarwala, N.**
Investigating environmental challenges and the role of artificial intelligence in pollution management.	Systematic review	Addressing environmental challenges in pollution control using artificial intelligence	2020	**Yi, Z. et al.**
Analyzing trends and applications of artificial intelligence in air pollution management.	Bibliometric analysis	Applications of Artificial Intelligence in the Field of Air Pollution: A Bibliometric Analysis	2022	**Guo, K. et al.**
Investigating the impact of artificial intelligence on environmental justice and urban air pollution monitoring.	Case study	Environmental justice and the use of artificial intelligence in urban air pollution monitoring	2022	**Krepnova, T. G. et al.**
Identifying the positive effects of using artificial intelligence in reducing pollution of marine ecosystems.	Case study	Using artificial intelligence to reduce pollution of marine ecosystems	2023	**Fazery, M. F. et al.**
Investigating new technologies in predicting air pollution and their impact on people's health.	Systematic review	Artificial Intelligence Technologies for Predicting Air Pollution and Human Health: A Narrative Review	2022	**Subramaniam, S. et al.**
Investigating the applications of ChatGPT in biological and environmental fields.	Case study	Using ChatGPT: Its Impact on Biological and Environmental Sciences	2023	**Agatakleos, A. et al.**
Analyzing the limitations of ChatGPT in introducing environmental justice and its impact on policymaking.	Case study	Limitations of ChatGPT in Introducing Environmental Justice Issues in the United States: A Case Study	2023	**Kim, J. et al.**
Developing an Internet of Things-based system to monitor and predict air pollution using artificial intelligence.	Case study	An IoT-based system to enhance air pollution monitoring and forecasting using hybrid AI techniques	2022	**Al-Malawi, A. et al.**
Analysis of artificial intelligence techniques in air pollution prediction and evaluation of their performance.	Systematic review	Exploring new artificial intelligence techniques for air pollution prediction: fundamentals, applications, and performance	2021	**Massoud, A. and Ahmed, K.**

Investigating the application of artificial intelligence in municipal waste management and identifying related challenges.	Systematic review	Artificial intelligence for waste management in smart cities: A review.	2023	**Fang, B. et al.**
Identifying pollution sources using environmental data and artificial intelligence techniques.	Case study	Artificial intelligence to identify pollution sources	2022	**Loutreciano, N. et al.**
Investigating the effects of artificial intelligence on reducing the intensity of pollutant emissions in China and identifying new patterns.	Data analysis	The impact of artificial intelligence on the intensity of pollutant emissions - evidence from China	2023	**Zhao, P. et al.**
Designing a framework for monitoring air pollution using big data and artificial intelligence.	Case study	Environmental air pollution monitoring framework based on big data analysis and artificial intelligence	2022	**Hamza, M. A. et al.**
Providing effective solutions for managing marine pollution with artificial intelligence.	Case study	Managing marine pollution using artificial intelligence	2021	**Agarwala, N.**
Investigating environmental challenges and the role of artificial intelligence in pollution management.	Systematic review	Addressing environmental challenges in pollution control using artificial intelligence: A review	2020	**Yi, Z. et al.**
Analyzing trends and applications of artificial intelligence in air pollution management.	Bibliometric analysis	Applications of Artificial Intelligence in the Field of Air Pollution: A Bibliometric Analysis	2022	**Guo, K. et al.**

Research Methodology

This study uses a mixed research method to investigate the application of artificial intelligence in monitoring and controlling pollutants in the anode manufacturing unit of the South Aluminum Factory (Salco) in Lamerd. Initially, a systematic review of 23 articles related to the use of modern technologies in industrial pollution monitoring and the application of artificial intelligence in pollutant management is used to collect primary data. These articles include research and case studies from similar industries and advanced techniques such as machine learning, natural language processing, and the Internet of things. In this way, conceptual frameworks and operational models that have been used in the field of pollutant monitoring, especially in the aluminum industry, are extracted.

Research Findings

The present study focused on evaluating the impact of modern methods of monitoring and controlling pollutants using artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) in Lamerd.

1- Real-time data analysis: One of the most important findings of this research is the advanced real-time data analysis capabilities of artificial intelligence models. These models are capable of instantly processing data from

environmental sensors, satellites, and IoT devices used in the factory's anode manufacturing unit. The results showed that using these methods allows for the rapid identification of anomalies, unusual trends, and sudden changes in air and water quality. These instant analyses are particularly effective for identifying pollutants such as particulate matter, toxic gases, and heavy metals, and through this, more preventive predictions and measures can be taken to reduce pollution. Thus, an early warning system is effectively created that helps managers take corrective measures before pollution reaches critical levels.

2- Use of adaptive learning: The second important finding of the research was the impact of using adaptive learning in the ChatGPT model. Adaptive learning models continuously learn from historical and real-time data and can identify patterns associated with specific pollutants, pollutant sources, and environmental conditions. This data-learning feature improves the accuracy of predictions, especially in the field of identifying complex patterns and simulating the behavior of pollutants in the future. For example, at the South Aluminum Plant, using this capability specifically in simulating the progress of pollutants and determining critical times for pollutant emissions significantly increased the accuracy of decision-making and helped officials manage resources more effectively with more accurate and timely information.

3- Strengthening decision-making support systems: Another important finding of this research is the strengthening of decision-making support systems in the anode manufacturing unit using artificial intelligence. The integration of the ChatGPT model into pollution monitoring systems enabled decision makers to receive complex data in a simple and understandable language. The model is able to present its analyses in a concise and simplified form in the form of descriptive reports that are useful for technical and administrative officials. As a result, this helps improve the speed and accuracy of making more informed decisions, especially in the field of rapid action against critical pollutants. For example, when the level of pollutants reaches a critical level, the model automatically sends alerts and suggests actions such as stopping production processes or changing pollution control methods.

4- Multi-source integration: In this research, the study of integrating artificial intelligence models with sensor networks also yielded positive and effective results. In the anode unit of the South Aluminum Plant, sensors collect data including temperature, pH level, dissolved oxygen, and pollutant concentration. Using ChatGPT, data from these sensors is processed in real time and patterns of changes in air quality are quickly simulated. These models not only effectively increase the capacity of sensor networks, but also transform monitoring systems into intelligent systems that can automatically respond to environmental changes without the need for human intervention. This saves time and reduces the possibility of human error in monitoring processes.

Real-time data analysis

Real-time data analysis using artificial intelligence and advanced systems enables rapid processing of information related to pollutants. These systems are able to quickly collect information from sensors in the factory and surrounding areas and alert authorities in the event of a sudden increase in pollutants. This capability is especially necessary in emergencies such as fires or industrial explosions to take immediate measures to reduce pollutants. The data used in this study was collected from various sources. Including environmental sensors that measure air quality and pollutant levels, historical data on pollutant levels, satellite images to monitor environmental changes, and social media data to collect public opinions. Variables collected for real-time data analysis include levels of specific pollutants (such as carbon dioxide and particulate matter), atmospheric conditions (temperature and humidity), time of events, and the geographical location of sensors. This data is analyzed using artificial intelligence algorithms to identify pollution patterns and take necessary measures to reduce their negative effects. In this way, real-time data analysis helps in making quick and effective decisions in pollution management and can help in faster identification of environmental problems, promoting environmental culture among employees, and reducing environmental costs.

Data integration

Artificial intelligence can collect and combine different data from different sources such as ambient air sensors, satellite images, weather information, and even input data from social networks. This data is analyzed in an integrated manner to obtain a comprehensive picture of the status of pollutants and their sources. This information

helps plant managers to implement better policies to reduce pollution and take the necessary preventive measures at the right time.

Predictive modeling

Using machine learning techniques, predictive models can be created for future pollution levels. These models can help plant managers, especially in various simulations, to make better decisions to reduce pollutants. Accurate predictions of the pollutant situation enable authorities to be prepared for more polluted periods that may occur in the future.

Adaptive monitoring

AI systems are able to continuously learn from new data and improve their predictive models. For example, if they encounter new sources of pollutants in the plant, these systems can automatically update their models and provide more accurate predictions.

Early warning system

AI systems are capable of detecting rapid changes in weather and industrial conditions that may lead to pollution. These systems can alert authorities well in advance of environmental crises such as significant increases in pollution, so that preventive measures can be taken and the negative effects of pollution on the plant and the region can be avoided.

Public education and awareness

The use of AI in creating warning and awareness systems can help inform the public and plant employees about pollution levels and preventive measures. This can be done using natural language tools and simple messages that do not require technical knowledge.

Open, pivoted, and selective coding

Table 2. Open, axial and selective coding around opportunities

Main topics	Categories	Subcategories	Number of documents	Concept (Code)
Data analysis and situation forecasting.	Rapid prediction of pollutants, immediate warnings.	Real-time data processing, anomaly detection.	7	Real-time data analysis
	Predicting the future situation, preventive measures.	Air quality prediction, pollutant simulation.	4	Predictive modeling
	Reducing analysis time, more accurate results.	Efficient data processing, pattern extraction.	3	Data challenge
	Understanding the root causes of pollution, assessing the effects of pollution.	Long-term data analysis, pollution pattern identification.	4	Identification of pollution trends
Learning and adaptation of	More accurate prediction of pollutants, improving decision-making.	Learning from real-time data, simulation.	4	Adaptive learning

artificial intelligence.	Adapting to new conditions, improving the accuracy of assessments.	Learning from new data, improving predictions.	3	Adaptive monitoring
Decision support and warning systems.	Facilitating informed decisions, clarifying information.	Data analysis in plain language, reducing complexity.	3	Decision support systems
	Reducing the effects of crises, taking preventive action in crises.	Real-time data processing, crisis prediction.	3	Early warning system
Data and artificial intelligence integration.	Improving monitoring systems, automatically responding to changes.	Sensor data processing, pattern simulation.	4	Integrating AI models with sensors
	More accurate analysis of trends, identifying critical points.	Combining different data, creating a comprehensive picture.	5	Data fusion
Community engagement and awareness.	Increasing public awareness, community participation.	Converting technical data into simple reports.	2	Natural language processing
	Public awareness, direct communication with the system.	Using natural language, easy access to the system.	2	User-friendly interaction

Challenges

There are numerous challenges facing environmental officials and experts in implementing new technologies such as artificial intelligence and IoT systems in pollution monitoring and control processes in factories. These challenges can directly affect the performance of monitoring systems and the accuracy of predicting and controlling pollutants. Among the most important challenges are the integration and analysis of various data from multiple sources, effective communication with IoT devices, the complexities of environmental forecasting models, continuous changes in pollution sources, security and privacy concerns, the need for user training, and limitations in financial and computational resources. In this table, these challenges have been comprehensively examined along with the main categories and subcategories related to them, so that appropriate solutions can be presented to improve monitoring and pollution control processes at the South Aluminum Plant (Salco) in Lamerd.

Table 3. Open, axial, and selective coding of challenges

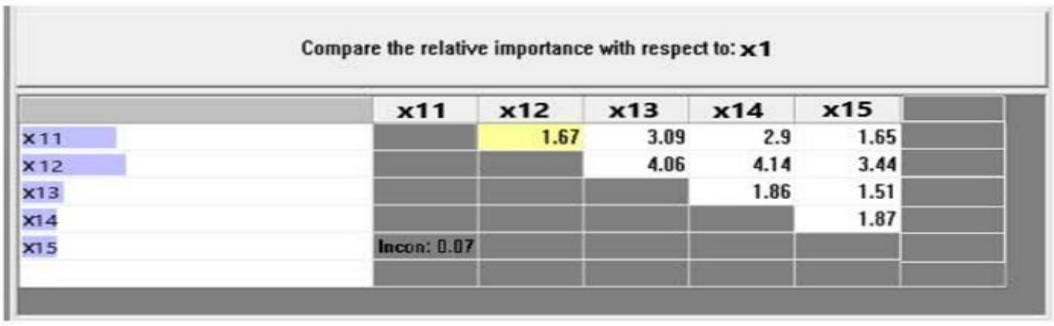
Categories	Subcategories	Number of documents	Concept (Code)	Main category
Integration of sensor and database data, more accurate	Collecting data from various sources, processing real-time data	13	Data Integration and Analysis	Data management and resource integration.

prediction and analysis				
Processing pollution data, connecting to sensor systems	Communicating with sensors, processing data from IoT devices	12	Communication with IoT Devices	Internet of Things systems and devices.
Predicting pollution status, simulating pollutants	Predicting pollution with complex models, simulating pollutants	5	Predictive Modeling and Simulation	Predictive modeling and simulation.
Evaluating pollution sources, analyzing industrial pollution causes	Variable sources of pollution, identifying and analyzing pollutants	4	Environmental Challenges and Pollution Sources	Environmental challenges and pollution sources.
Concerns about personal data, information security	Protecting sensitive data, maintaining system security	3	Privacy and Security Concerns	Data security and privacy.
Learning decision-making, optimal use of technology in the factory	Training employees, translating technical data into plain language	2	User Understanding and Training	User education and awareness raising.
System maintenance costs, using limited resources	Requirement of computational resources, budget and investment constraints	3	Resource Constraints	Resource constraints and financial challenges.

Prioritizing Opportunities and Challenges

Based on the content analysis of English articles and texts, opportunities for monitoring and controlling pollutants with modern methods and using artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd were identified in 12 main categories in two dimensions of opportunities and challenges.

Table 4. Pairwise comparison of opportunities for monitoring and controlling pollutants with modern methods and using artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd



After building the model in the Expert Choice program and entering the pairwise comparison matrices, the weights of the criteria were obtained. The prioritization of 5 indicators is shown with the help of the Expert Choice software.

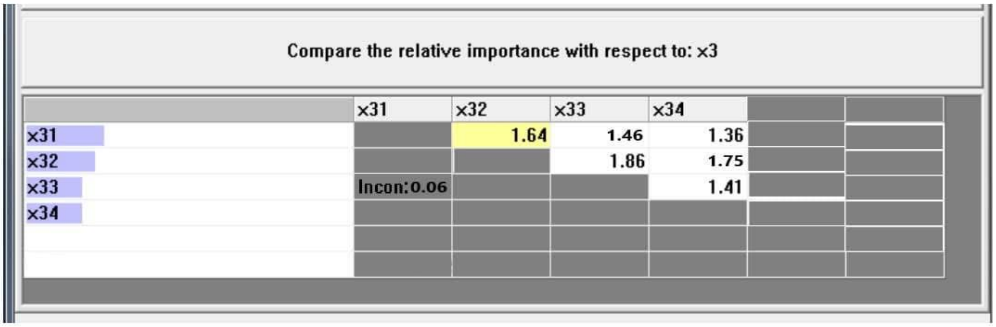
Figure 1. Examining opportunities for monitoring and controlling pollutants with modern methods and using artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd

Table 5. Prioritizing opportunities for monitoring and controlling pollutants with modern methods and using artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd

Priority	Weight	Indicators	Row
2	0/245	Data Integration	**1**
1	0/260	Real-time Data Analysis	**2**
3	0/219	Improving River Water Quality through Predictive Modeling	**3**
4	0/215	Identifying Pollution Trends	**4**
5	0/095	Adaptive Learning	**5**

As can be seen in the table below, the real-time data analysis index with a relative weight of 0.250 is the most important. Therefore, it has the most impact among the 5 indicators. Adaptive learning with a relative weight of 0.95 is in the last priority.

Table 6. Pairwise comparison of threats for monitoring and controlling pollutants with modern methods and using artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd



After building the model in the Expert Choice program and entering the pairwise comparison matrices, the weights of the criteria were obtained. The prioritization of the 4 indicators based on the results of the research studied is shown using the Expert Choice software.

Figure 2. Prioritizing threats to monitor and control pollutants with modern methods and the use of artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd

Table 7. Prioritizing threats to monitor and control pollutants with modern methods and the use of artificial intelligence in the anode manufacturing unit of the South Aluminum Factory (Salco) Lamerd

Priority	Weight	Indicators	Row
2	0/245	Data Management and Resource Integration	**1**
1	0/260	Communication with IoT Systems and Devices	**2**
3	0/219	Predictive Modeling and Simulation	**3**
4	0/215	Environmental Challenges and Pollution Sources	**4**

As can be seen in Table 7, the index of connection with Internet of Things systems and devices is 0.260, which is the most important. Therefore, it has the most impact among the 4 indices. The incompatibility rate is 0.06, which is desirable.

Conclusion

The use of advanced technologies, especially artificial intelligence such as ChatGPT, in the anode manufacturing unit of the South Aluminum Plant (Salco) in Lamerd can create a fundamental transformation in air quality monitoring and pollution management. These technologies, with their ability to process large volumes of data and provide fast and accurate analyses, help identify environmental problems and pollution caused by industrial activities. In particular, systems such as ChatGPT can automatically collect and analyze air quality information in real time and provide effective recommendations to decision makers in the plant. This can significantly improve monitoring efficiency and prevent environmental crises. AI-based technologies can also help to more accurately predict future pollution trends. These predictions allow Salco to allocate its resources more effectively to reduce pollutants and prevent environmental problems. Using AI systems, environmental data can be reviewed in real time and any inconsistencies or failures in environmental processes can be immediately identified. This capability allows for faster response to changing environmental conditions, which is essential for protecting the environment and the health of society. In addition, implementing advanced technologies in Salco can promote environmental culture among employees and managers. By using smart systems, employees can easily learn about the state of the factory's environment and become more aware of environmental challenges and threats. This not only helps improve production processes, but also strengthens the culture of environmental responsibility among employees. Ultimately, the implementation of advanced technologies in the Salco factory can help reduce environmental costs and improve economic performance in the long term. By reducing resource waste and optimizing production processes, AI systems can simultaneously reduce environmental pollution and lower operating costs. This is beneficial not only for the factory, but also for society and the environment. Given the numerous advantages of AI technologies such as ChatGPT in monitoring environmental quality and responding quickly to challenges, it can be expected that the Salco factory will play an important role in sustainable development by using these technologies. The implementation of such technologies can significantly improve the environmental status of the

region and provide a healthier environment for future generations. Thus, Salco can be a successful example of a sustainable and environmentally friendly industry that is also accompanied by economic growth.

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