SAFETY, HEALTH & ENVIRONMENT ASSET MANAGEMENT SYSTEM INTEGRATED WITH GIS FOR THE STEEL INDUSTRY

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SYNOPSIS:

Manual asset management systems have some problems in managing the asset. The Steel industry area has several plants, and many SHE assets have to be monitored and maintained. Therefore this improvement was conducted with the purpose of building system information on SHE asset management using GIS (Geographic Information System) to facilitate access to information, data management, and monitoring the completeness of SHE assets.

Assets clustering method based on their map coordinate that applied in the asset management system was proven on support inspection and managing the assets information with visualization. GIS used to visualize the asset coordinate and conditions on a geographical map, manage and store the assets' detailed information.

The integrated SHE asset management system is helpful in improving performance and helps planning for database integration, asset and space management, and the effective delivery of information. The system provides efficient results in reducing risks and increasing productivity in organizations.

The SHE asset management system is required to develop goods assets and human resources mapping.

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INTRODUCTION

Nowadays, asset management is a major challenge for business organizations and contributes significantly to improved production quality, safety, performance and the environment. However, asset management needs to be properly recorded and documented. [1] For decades, managers have wondered whether physical assets needed to produce products and provide services have been managed effectively and efficiently. [2]

Physically, the assets purchased need to have managed better and efficiently so that adequate administrative tools are needed by maintained and controlled the assets to reduce the possible risks [3]

The built environment is increasingly integrated with the digital environment, enabling new processes in asset management. [4] Implementing integrated asset management systems allows organizations to achieve efficient results in reducing risks and increasing productivity, providing a better understanding of how management systems influence the organizations.[5]

The integrated system can be applied in the Safety, Health, and Environment asset management system, which is in line with one of the three keys in the EU Strategic Framework on Health and Safety at Work 2021-2027 regarding the anticipation and management of changes in digital contexts that may have a significant effect on SHE management in all corporate sectors. [6]

The Steel industry is one of the large industries which has several plants. However, many SHE assets must be monitored, maintained and certified periodically.

Integrated SHE asset management system is useful to help in evaluating, performance, planning, and monitoring, and can be used to achieve efficient results in reducing risks and increasing productivity, providing a better understanding of how management systems influence the organizations. [5]

An effective technique to optimize asset management is required to overcome those problems. The proposed technique uses Geographic Information System (GIS). GIS in asset management helps with planning for database integration, asset and space management, and the effective delivery of information. In several studies, implementing a web-based GIS system has shown benefits in asset and facility management planning, management and auditing, and other benefits when optimized for use. [7][8]

Assets clustering method based on their coordinate in geographical map using GIS that applied in asset management system was proven on support inspection and managing the assets details information with visualization. [9]

The impact of artificial intelligence on the workplace might create opportunities and new challenges for OSH, its management, and its regulation. [10]

Furthermore, big data analysis results on SHE management have become an important

reference influencing safety-related decision-making. [11]

MATERIALS AND METHODS

In this research, there are several variables used, including:

Table 1. Variable

No	Variables	Operational Definition
1	SHE asset management practice	Activities or actions that taken by the HSE division in managing all forms of SHE assets
2	Asset data management	Managerial activities of SHE asset data to ensure sources of information are accurate, safe, neat, stored and well organized, and available to users of information.
3	SHE asset management information system	An information system that is useful for managing data and displaying information about SHE assets which includes the location of the coordinates, names, conditions, and pictures of the a. Hydrant box b. Light Fire Extinguisher c. First Aid Box d. Clinic e. Eyewash station f. Continuous Emission Monitoring System g. Water Treatment Plant h. WasteWater Treatment Plant i. Air Quality Monitoring System j. Sewage Treatment Plant

After determining the variables, analysis is carried out to collect data and develop the system. PIECES analysis was chosen to identify problems in the old SHE asset management system on **Performance, Information, Economy, Security, Efficiency and Service.**

Table 2. PIECES Analysis

No	Problem	P	I	E	C	E	S
1.	Management of SHE asset data not well system	√					
2.	Data is not integrated and lack visualization	√			√		
3.	Difficulty in updating data	√					
4.	The required data/information is not in accordance with current conditions (update delayed)	√	√				√
5.	Information on SHE assets is difficult to access		√			√	√
6.	Information provision is still manual, due to the data is unsorted or random		√	√	√		√
7.	Delay in monitoring due to not having a reminder	√	√	√			

RESULT & DISCUSSION

By analyzing the result, the first problem explained is that the current assets management activity in the industry needs more visualization, making assets documents invalid, especially the coordination of assets. The second problem, assets in the industrial area are scattered and not clustered. Asset cluster helps the monitoring activities to proceed gradually. Based on those problems and data gathered from discussions with the stakeholder,

an asset management system using GIS is proposed. This system provides spatial data embedded with asset information on the offline geographical map. The spatial data and asset information can be managed with a user interface and imported from the asset document given.

The possible solutions to solved the old system problems are shown in **Table 3**.

Table 3. List Possible Solution

| No	Problem	Solution
1	Unintegrated data $\Rightarrow$ difficult on updating and processing data	Built assets database and integrating between data
2	Lack of visualization $\Rightarrow$ makes performance inefficient	Assets visualization using web-based GIS
3	The assets document given is unsorted or random $\Rightarrow$ troublesome and time-consuming	Clustering assets in each plant and display asset's information
4	Delay in monitoring $\Rightarrow$ possible risk of damage in asset	Last checking date information as monitoring reminder
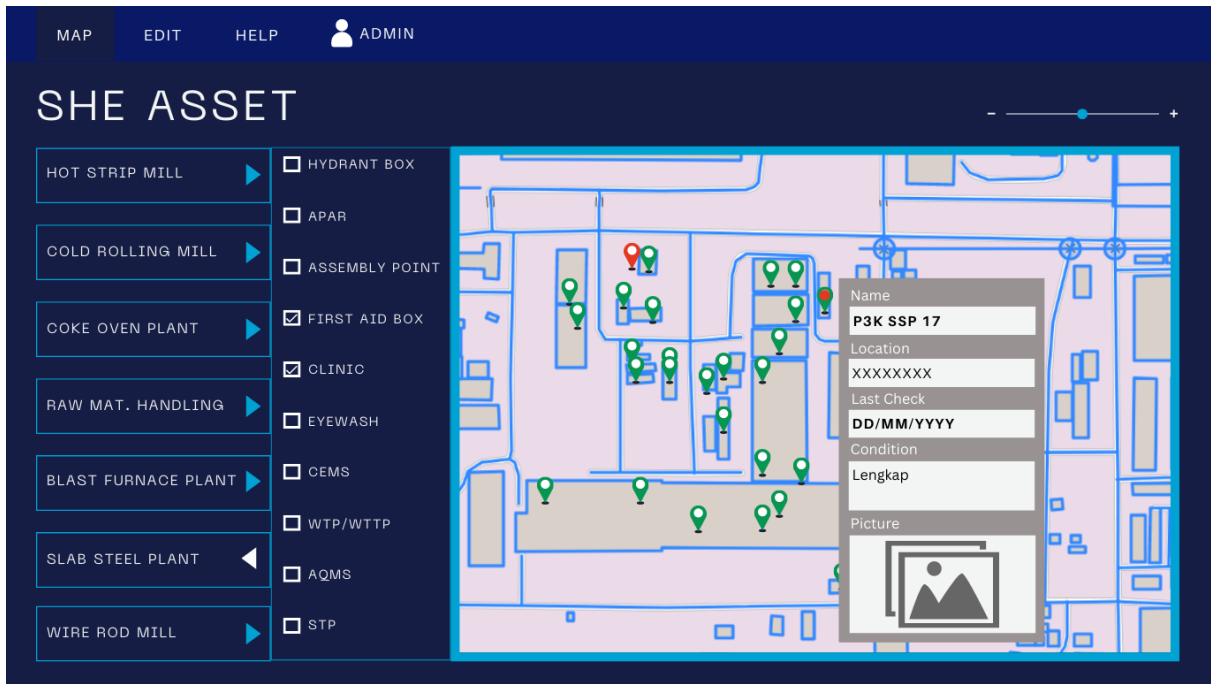
Figure 1. SHE Asset Management System

As seen in the **Figure 1**, the SHE asset management system equips with GIS features that help determine the location points or distribution of assets according to the related plant area. Each asset is categorized based on its type and information related to asset naming, location, last check date, condition, and image display.

The expected benefits from this SHE asset management system are:

1) The system is *User friendly* for maintaining the asset's value to avoid damage and depreciation of function.
2) Created awareness in risk management about the dangers and risks of the assets owned. When doing good asset management can reduce risk by adding control and prevention.
3) SHE asset management systems can increase security against asset loss due to good management.
4) Reduce time-consuming on collecting and updating data.
5) The asset information displayed is quite clear. It can be used to ensure each SHE asset's availability & condition and monitoring schedule.
6) Improving the performance of SHE asset management towards asset maintenance and sustainability.

Managing assets by mapping them provides a possibility of monitoring the asset accurately. The assets cluster could lead to effectiveness and flexibility in asset monitoring activity. It enables teamwork to do asset monitoring simultaneously which division of labor can divide

according to the cluster or gradually which the worker does not have to check in one day. This clustering assets technique using similar reliability distributions of assets enables addressing the maintenance optimisation problem of all the assets belonging to the same cluster.

SUMMARY

Improve company performance with a comprehensive information system on its activities. The development of this 4.0 era using technology is indispensable for industrial operations. One application of information technology is to use Geographic Information System (GIS). Using GIS as an application to perform asset management helps in maintaining the company's assets in the long term, especially in the steel industry, which has big data of SHE assets.

SHE asset management system is useful to help in evaluating, performance, planning and monitoring, and can be used to achieve efficient results in reducing risks and increasing productivity in the organizations. Using GIS for SHE asset management can improve the performance and helps with planning for database integration, asset and space management, and the effective delivery of information.

The SHE asset management system needs to develop goods assets and human resources mapping for the plan.

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