Application of VGIS Digital Twin Platform for Enhanced Oilfield Disaster Management and Environmental Protection

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VGIS (Virtual Geographic Information System) Platform is a unified oilfield operations management platform based on MaaS (Management as a Service) that integrates advanced technologies such as AIoT (Artificial Intelligence & Internet of Things), GIS (Geographic Information System), Digital Twin, and AR (Augmented Reality)/ VR (Virtual Reality). The VGIS platform connects, collects, integrates, analyses, and acts on disparate data sources to provide the oilfield with a centralized view to help make informed decisions fast, bring operational visibility across all assets to improve safety and operational efficiency, reduce costs and improve margins, provide comprehensive analytics and decision support, increase business agility, and reduce management complexity. This is a case study of the application of the VGIS platform Majnoon oilfield, Basrah, Iraq. VGIS digital transformation, production process, and KPIs (Key performance indicators) are highly managed taking oilfield management to a higher level globally, in this study, the objective is to address and resolve the issue of high costs associated with using cloud services by utilising a local Data Center (a large group of networked computer servers typically used by organizations for the remote storage, processing, or distribution of large amounts of data). This approach involves directly uploading 3D maps to ensure faster service on the intranet, eliminating the need to pay for cloud services.vGIS aims providing a platform for researching and implementing monitoring and controlling processes in a more convenient and remote manner. The vGIS platform has emerged as a crucial instrument in the realm of disaster response and crisis management. This technology enables responders to rapidly evaluate, analyse, and respond to crucial information in real-time. This research examined the application of vGIS technology in disaster response and analyse the potential advantages and obstacles associated with its utilisation.

Povzetek: Študija predlaga zasnovo varnega video enkripcijskega sistema, ki temelji na H.264 in kaotičnem iterativnem sistemu za oddaljeno spremljanje z omrežnimi roboti. Sistem izboljšuje varnost notranjih prostorov in omogoča učinkovito video šifriranje v realnem času.

1 Introduction

This case study explains the application of the VGIS platform for the Majnoon oil field which located 60 km from Basrah south of Iraq, it is one of the richest oil fields in the world with an estimated 38 billion barrels of oil. Initial production at the field was achieved in September 2013 with the successful opening of the first well. An initial production capacity of 175,000 bopd (barrels of oil per day) was achieved. Production capacity was increased to 194,000 bopd in 2014. The oilfield is currently producing about 240,000 bopd. Basrah Oil Company (BOC) plans to increase production to 450,000 bopd within three years.

The Majnoon Oilfield's increasing exploration and production activities pose a major challenge to increasing efficiency and mitigating risk due to the ever-changing dynamics, as routine operations and management require large amounts of technical data for analysis, which are divided among different departments and limit the efficiency of operations and management. According to the Majnoon Field Y2021-2025 Field Development Plan, the intelligent oil field (IOF) is the focus of production enhancement measurements.

Therefore, BOC plans to build a comprehensive, integrated VGIS platform, the application center of IOF, to support collaboration and intelligent decision-making. The VGIS platform will create a virtual reality model of the Majnoon oilfield and help operators create and fine-tune production plans, processes, workflows, and monitor operational performance. The goal of the VGIS platform is to improve efficiency, safety, and productivity and minimize risks as well as costs at the Majnoon oilfield.

Two major technologies are used: GIS and VR. GIS (Geographic Information System), a mature technology, is used to input, store, process, analyze, and output spatial information [1] . The technology of GIS allows to manage the spatial components of the everyday business objects of the petroleum industry, such as leases, wells, pipelines, environmental concerns, facilities, and retail stores, in the corporate database and effectively observe appropriate geographic evaluations throughout the company, as the knowledge and awareness of GIS technology become increasingly important [2]. The VGIS platform provides a convenient, fast, and easy way to seamlessly integrate with other information services. More than 90% of oilfield business is related to spatial localization. The GIS system is critical to the process of oil exploration and data sorting [3]. The techniques of GIS provide search, visualization, and analysis capabilities for spatial facts in almost all phases of oil exploration and production. Through the spatial information of entities such as oil and gas units, reservoirs, wells, pipelines, and stations, GIS is used as a reference to organize data and realize information exchange [4]. GIS, which is a mixture of property statistics and area alignment statistical systems, will be the key generation in creating and implementing virtual oil areas from both broad and narrow perspectives. This is the reason why the VGIS system collects GIS as the cornerstone of the platform [5].

VR (Virtual Reality), a technology recently adopted by many international oil giants, is gaining acceptance in the oil and gas industries. By creating a holographic simulation of real environments, VR creates a mirror image of the real oilfield. It is an innovative visualization platform for geospatial data and provides a platform for capturing, managing and analyzing oilfield production and operational data. Leading global oil companies such as BP (British Petrolium Company) and Chevron, etc., have deployed Generation VR to automate their oilfields and efficiently reduce supplier and equipment costs.

The fundamentals of VGIS are to create a 3D digital map of Majnoon, integration with static and live data, provide GIS services, integrate all business data through data governance, and intelligent decision making with BI (Business Intelligence) applications. Upon userfriendly interface, VGIS will present locations, statistics results, reports, charts to support collaboration, decision making, provide a solid foundation for future applications such as ubiquitous security, remote inspection, online training, etc. [6].

2 Related works

Abdalla (2018) [3], this study extracted number of concepts of immersion such as data integration and collaboration, increasing information space from different sources to targeted users, increased spatial understanding, spread of knowledge of the location, enhancement of more natural interaction, faster planning and quicker integration and interaction, increased sense of control and presence, number of options, and number scenarios. The result is limited real-time capabilities.

Xu and Shao (2020) [5], this paper analyzes the technical features and advantages of Geographic Information System (GIS) and lists the application methods of GIS in the construction the oil and gas resources information system. It proposes the classification scheme of oil and gas resources information. By using the multi-data integration technology supported by GIS, it realizes the flexible transformation and transfer of spatial data. With the help of GIS spatial analysis, it realizes oil and gas decision support functions such as virtual drilling.

Sami et al. (2007) [7], this paper presents the role of GIS as a tool and illustrates its applications in the oil field management. The paper also outlined GIS experiences in Sudan and its capabilities for handling spatial data and remotely sensed materials, with reference to surface features management in the oil production fields of Greater Nile Petroleum Company (GNPOC) in Sudan.

M. Arif et al. (2020) [6], this paper discusses the oil field that was developed and commissioned in 2017, it adopted, designed, and applied technology facilitated unmanned operation of field from downhole to export. This paper details the use of state-of-the-art algorithms for identification of well flow conditions, deployment of advanced analytics for surveillance, and optimization of ESP wells.

Cheng Wei, Zhang Yanmei (2012) [8], this paper proposes a system framework which based on GIS technology and technology of integrated 2 dimensions (2D) with 3 dimensions (3D) to solve the oil fundamental business application. A Browser/Server (B/S) system based on this architecture can implement offshore platforms, stations' facilities and equipment, long distance pipeline and underground reservoir.

Yunqiang Chen et al. (2019) [9], this paper expounds the research and progress of augmented reality at home and abroad. Authors introduce the key technologies, development tools and application of augmented reality in some fields as well as, discussed the key technologies, development tools, applications, and AR cloud as future work. They utilized an intelligent display technology, 3d registration technology and intelligent interaction technology constitute the core technology circle of AR and play an important role in the development of AR

Alistair Ford and Philip James (2015) [10], this paper describes the use of ArcGIS as an integration tool for 3D petroleum datasets. Using multipath features in a geodatabase, complex three-dimensional features can be stored in a geodatabase and visualized within the ArcGIS environment in 3D.

Table 1 shows the summary of the related works details.

Table 1: Summary of the related works details

Study	Technology/Methodology	Key Findings	Limitations
Abdalla (2018) [3]	GIS in Petroleum Geology	Improved spatial data management	Limited real-time capabilities
Xu and Shao (2020) [5]	Digital Oilfield Construction	Facilitated data exchange	Does not fully integrate VR/AR
Sami et al. (2007) [7]	GIS in Oil Industry Management	Enhanced data visualization	Lack of integration with IoT
M. Arif et al. (2020) [6]	Digitalization, AI, and cutting-edge	enhancement of operations efficiency, profitability, and environmental safety	Lack of integration with AI
Cheng Wei, Zhang Yanmei (2012) [8]	GIS technology and technology of integrated (2D) with (3D)	solve the problem of spatial data visualization	Does not fully integrated VGIS
Yunqiang Chen et al. (2019) [9]	Intelligent display technology, 3d registration technology and the core technology circle of AR	development of AR	Does not fully covered AR
Alistair Ford and Philip James (2015) [10]	integration of complex 3D objects with standard spatial data from conventional GI sources	ability to visualise, analyse and interact with objects of interest in 3D	Not handling the complex three-dimensional data types and spatial representations

3 Aims of the VGIS project application

3.1 General goals

The VGIS platform aims are to build a unified geographic information platform for oilfields, create a unified standard system, and utilize advanced geographic information technologies such as Big Data, cloud computing, and microservices to provide a consistent, efficient, and highly accurate map service as well as integrate all map data and services of the Department, break down information silos, and realize the connection and sharing of map data. This project integrates advanced GIS technology and information technology with oilfield business to support the construction and integration of oilfield management capabilities, such as rapid mapping of thematic oilfield data, data aggregation, data sharing, business collaboration, and improves the application of geographic information visualization as well as perception capabilities to oilfields to effectively improve management. The sharing and efficient application of all business data in an oilfield avoids the duplication of data creation, improves the systematicity and scientificity of management decision applications, and provides solid and powerful support for oilfield information creation.

As shown in Figure 1, the VGIS system integrates existing systems in the oilfield and collects site-specific information to provide new business insights that improve analysis and decision-making. Input data include exploration data, production data, storage data, HSE (health, safety, and environment) data, Internet of Things (IoT) data, etc., the types of vector data, image data, and VR modeling data associated with different topics such as exploration, drilling, production, storage, construction, operation, and HSE in the VGIS system.

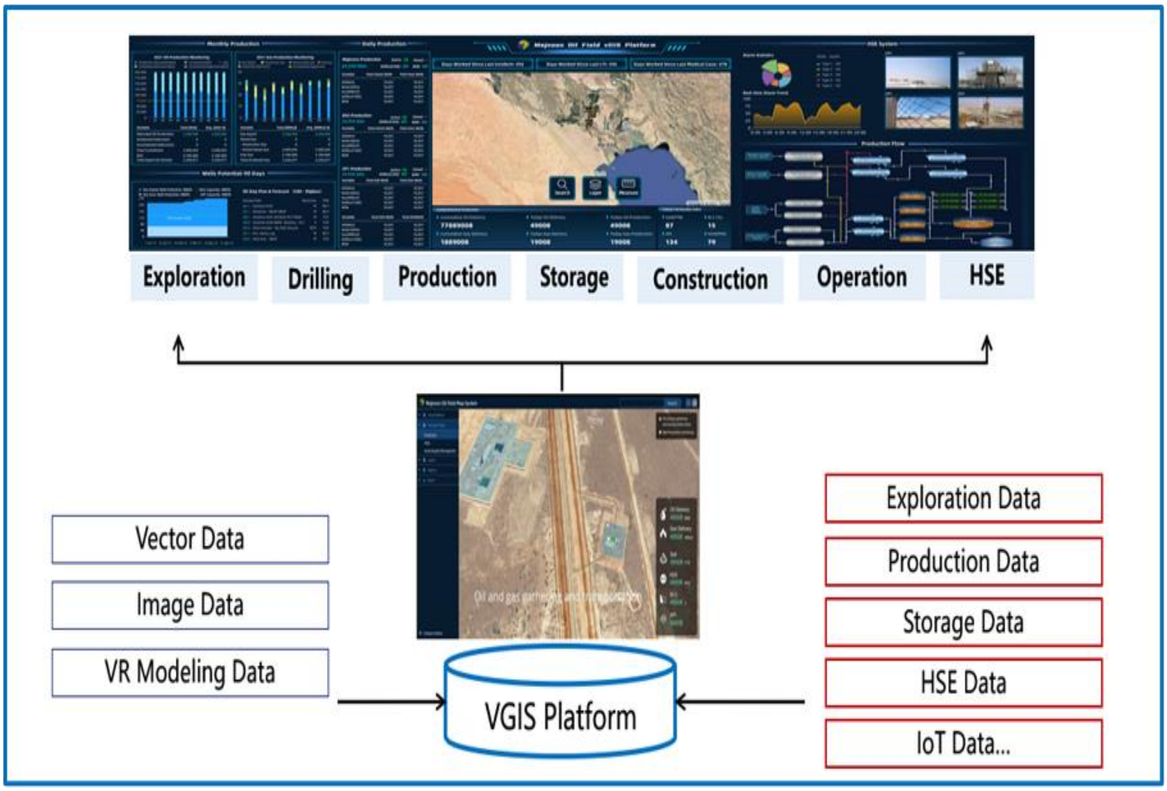

Figure 1: VGIS platform data structure.

3.2 Overview of the platform

The Portal VGIS Platform shown in Figure 2 provides an overview of the Majnoon oil field. It supports the tracking and visualization of critical business metrics for each oilfield management department, allowing managers to keep a close eye on-field operations. Production, safety, process operations, and other aspects of the business are covered.

Figure 2: VGIS platform portal

The following construction procedures are used in the implementation of the VGIS system:

a. Collect SLAM (Simultaneous Localization and Mapping) based Laser Survey, as shown in Figure 3.

Figure 3: SLAM data survey.

b. 3D Modeling, as shown in Figure 4.

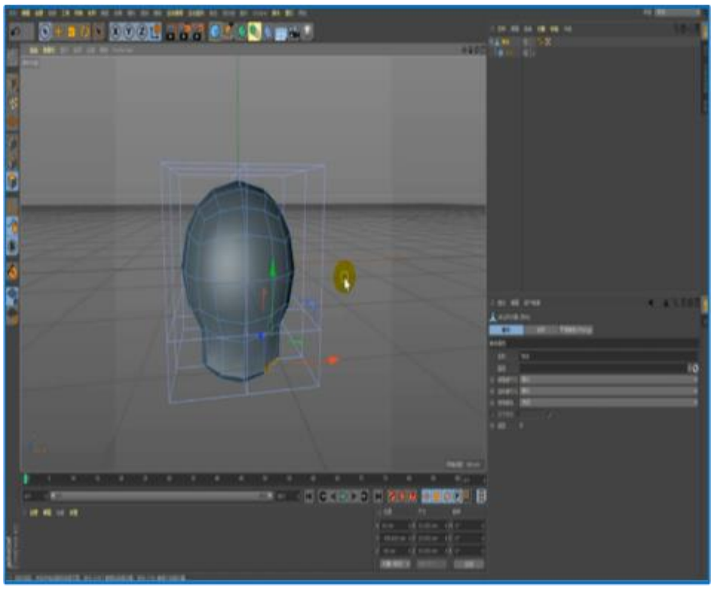

Figure 4: 3D Modelling software.

c. Model Visualization, as shown in Figure 5.

Figure 5: 3D model of the oilfield.

d. UAV (unmanned aerial vehicle) Photography, as shown in Figure 6.

Figure 6: UAV photography controller

e. Go Live System, as shown in Figure 7.

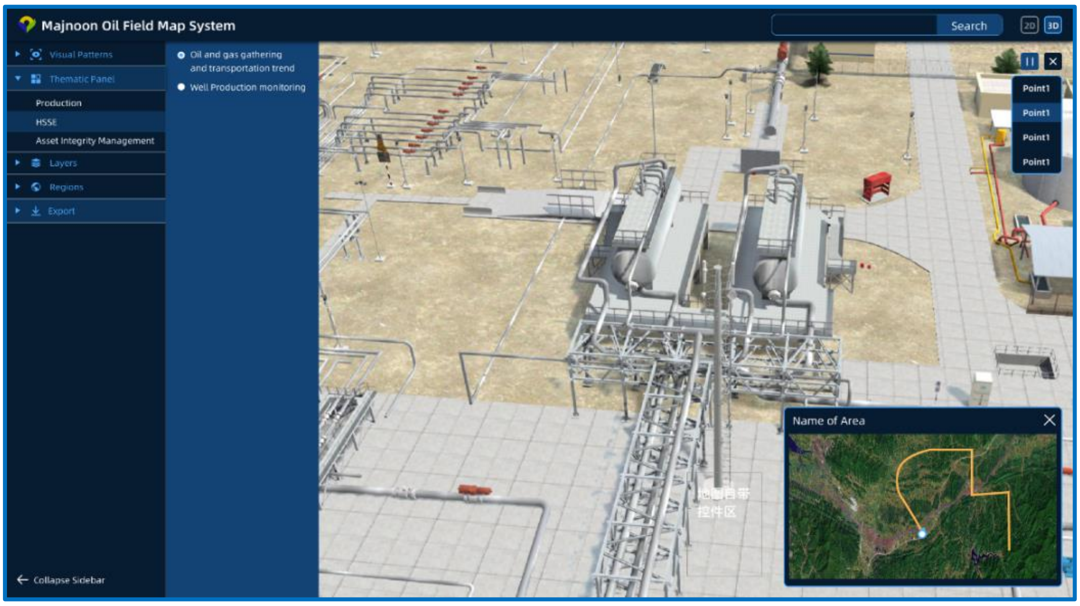

Figure 7: VGIS 3D digital map system

3.3 VGIS platform main functions

3.3.1 Field situational awareness

As ***Figure 8*** shows, Field Situational Awareness (FSA) is the function that integrates individual systems across Value Chain, divided into several systems like production, Health, Safety, Security & Environment (HSSE), Process Flow, and Asset Integrity Monitoring systems, integrating the data from **SAP** (System Applications and Products in Data Processing)/ **OA** (Office Otumation)/ **PI** (Process & Instrumentation)/ **DCS** (Distributed Controlling System)/ **CCTV** (closed-circuit television)/ **EAM** (Enterprise asset management)/ **EDW** (engineering data warehouse) and so on to help make the critical data that may be used in the daily management vitalized on one single screen.

Figure 8: VGIS platform field situational awareness.

3.3.2 Overall oil & gas process flow monitoring

As shown in ***Figure 9***, through integration with the production control system such as SCADA (Supervisory Control and Data Acquisition) system, instrument parameters, environmental information, and personnel dynamic information can be displayed in real time in a digital environment, which can be used for operation, maintenance, control guidance, risk assessment, emergency plan formulation, in comparison with traditional method, on-site operators cannot grasp the status information of the whole process, and remote collaborators have no resources for on-site status, environment, and personnel location. The collaboration working environment built through the VGIS platform can improve the efficiency of the remote operation, improve operation safety, and eliminate incidents and minimize risks.

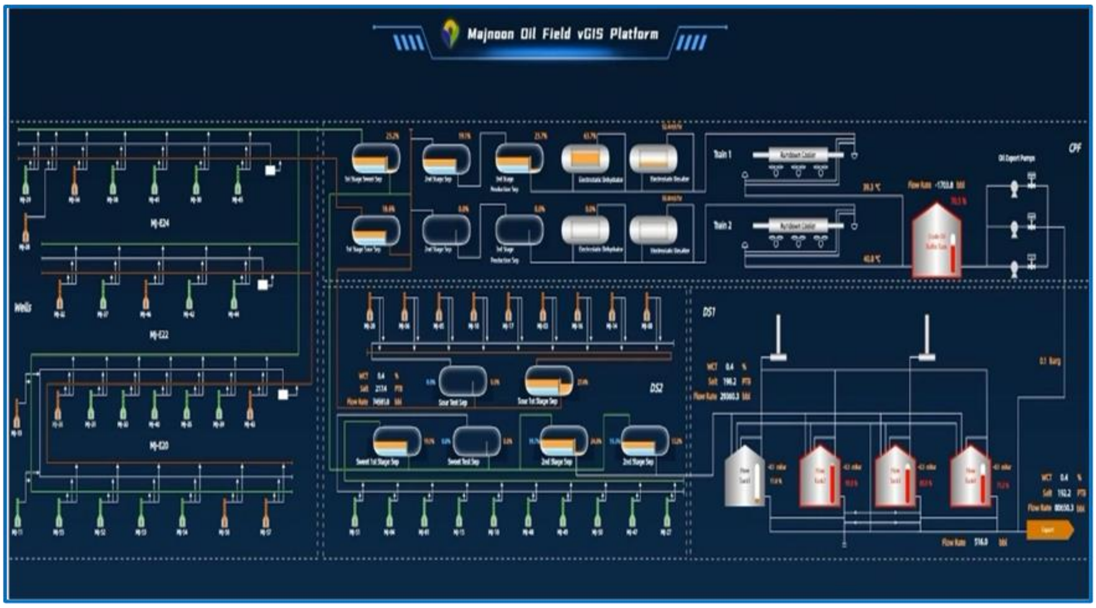

Figure 9: Process flow monitoring and management.

3.3.3 Situational awareness in production

Oilfield exploitation has a long and complex chain from reservoir management, development plan to production process, which brings great difficulties to oilfield scientific management. One of the key challenges is that the data of various departments cannot be shared accurately in real time. Through the VGIS platform, integrated development Planning, process status of each link of production, output report, energy consumption analysis, equipment maintenance progress, through business intelligence analysis, can present the plan completion rate in real time, identify restrictive factors, conduct correction analysis, find bottlenecks restricting production, optimize production process, optimize Maintenance plan, improve energy efficiency management, and improve plan completion rate.

Figure 10 shows the data integration and visualization capabilities of VGIS allow production engineers to generate reports that indicates production volumes, injection rates, and production efficiency which delivering the message whether production meet expected or target in different colors (i.e., red, orange, and green) [7].

Figure 10: Production monitoring and management.

3.3.4 Asset integrity management

As shown in Figure 11, through the use of Asset Integrity Monitoring and Management, the VGIS platform integrates decision planning, minimizes conflicts in field layout planning, supports the development of a centralized database, enables design review using 3D simulations, promotes training, enables review of solutions before order placement, improves understanding between operation owners and EPC contractors, enable life cycle management of key equipment.

Figure 11: Asset integrity monitoring and management.

3.3.5 Health, safety, security & environment (HSSE) situational awareness.

HSSE management, shown in Figure 12, is an integral part of petroleum operations throughout the oilfield lifecycle. By connecting with the local meteorological, firefighting, and public safety information systems, the weather information can be updated and presented in real time, and the information can be pushed to on-site operators for on-site work guidance. By integrating the location information of on-site operators, vehicle information, docking Public information resources can formulate a complete emergency response plan to deal with emergencies and ensure safe production.

Figure 12: HSSE Monitoring and Management.

4 Digital twin for oilfields

The digital twin of the oilfield is the core function of VGIS. Based on the 2D/3D map and 3D models of facilities/wells combined with the images and models produced by drones, a full image of the oilfield is created. As the core of the digital twin, the functions of the VGIS map system are developed including the overview of the production facilities and pipelines, combined with the monitoring of the overall production situation in real-time and the monitoring of the production situation of the wells. In addition, the system can visualize the path of wells, which greatly facilitates oilfield exploration and development.

Furthermore, the system provides a 3D view of facilities and supports 3D roaming of production facilities, living camps, and real-time equipment monitoring to take oilfield management to a new level.

Figure 13 shows the VGIS platform enables the overview and visualization of underground pipelines. The pipeline overview function collects the inventory data of the underground pipeline and ground facilities and creates a special layer on the map system to highlight them. The course of media flow in the complicated pipeline system can be visualized on the map so that the total flow can be easily seen and the connection between stations can be easily found.

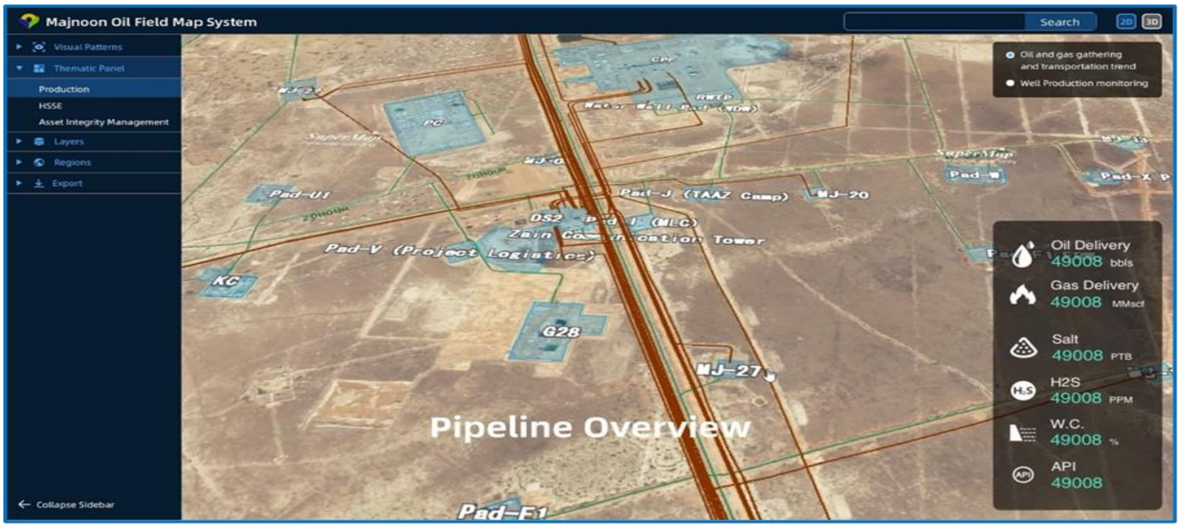

Figure 13: Oilfield pipeline and facilities overview

The VGIS platform allows monitoring of oil production through wells on the 3D map as shown in Figure 14. This function provides the link between the oil production situation and the 3D map to make the management of production simple and clear.

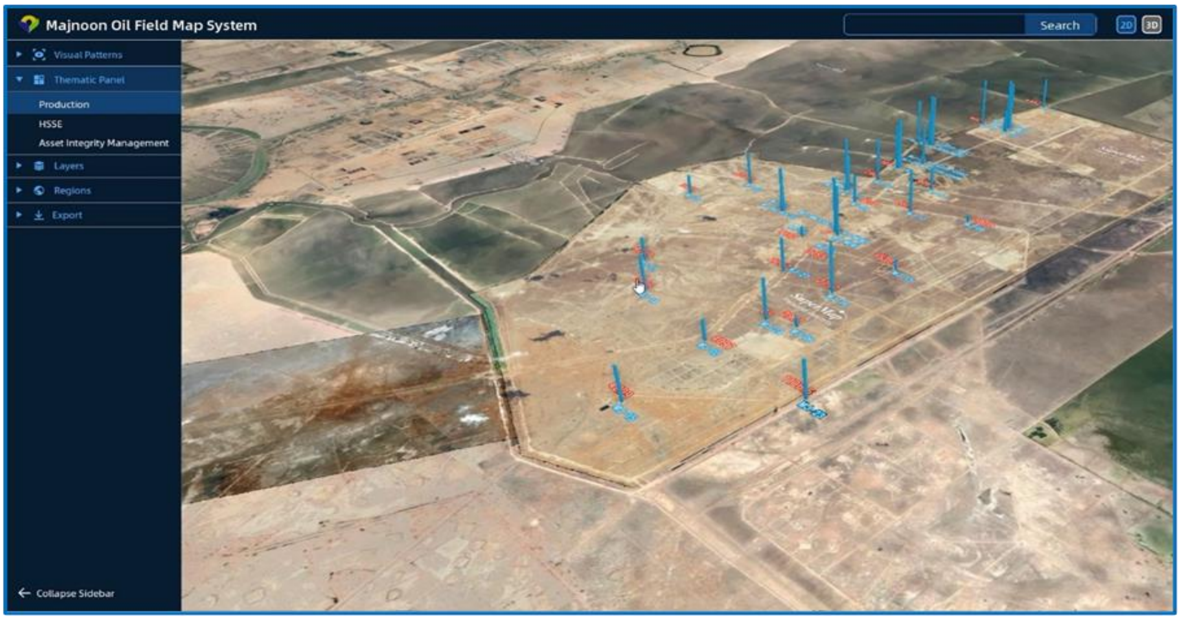

Figure 14: Oil production monitoring by wells.

5 Intelligent Applications with VR/AR

With the VGIS platform and the functions of BI, the overall view of the oil field is created. To make better use of the functions of BI, the functions of VR/AR are developed in the VGIS system. As Figure 15 shows, the VR system can realize real-time monitoring and remote training remotely.

Figure 15: VR function of VGIS platform.

The AR system (See Figure 16) can realize real-time monitoring, inspection, and professional suggestions for operation remotely. The AR system is also combined with drones flying in real-time and transmitting the videos into the AR system as shown in Figure 17, so that anyone using the equipment from AR can get an overview.

Figure 16: AR function of VGIS platform.

Figure 17: UAV Photography and inspection function.

6 Methods and results

The digital twin of the oilfield serves as the central feature of the VGIS (Virtual Geographic Information System). By leveraging 2D/3D maps and models of facilities and wells, along with images and models captured by drones, a comprehensive representation of the oilfield is generated. At the core of the digital twin, the VGIS map system is developed, offering various functionalities such as an overview of production facilities and pipelines, real-time monitoring of overall production, and well-specific production monitoring. Moreover, the system provides visualizations of well paths, greatly aiding oilfield exploration and development efforts, as shown in Figures 18 and 19.

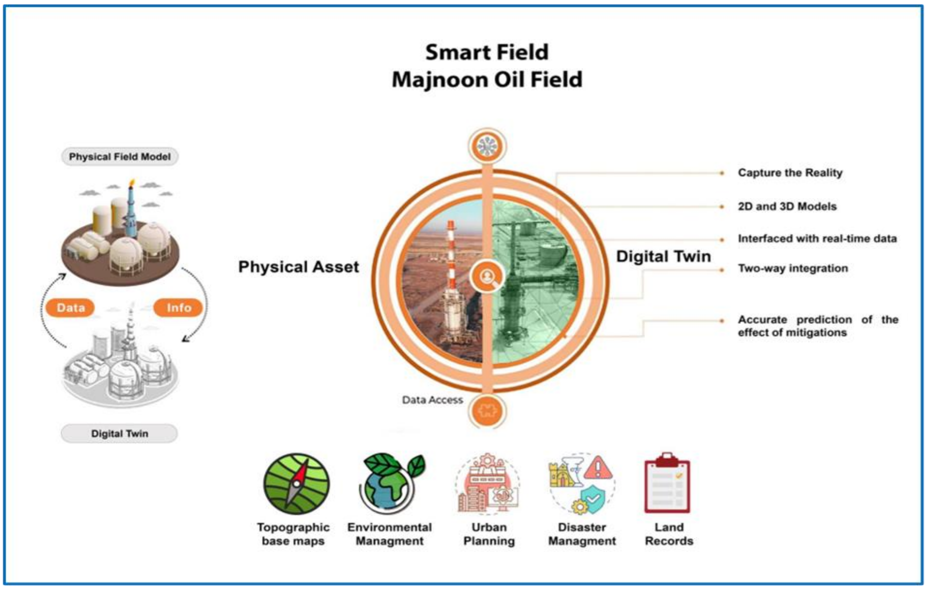

Figure 18: Smart field of majnoon oil field

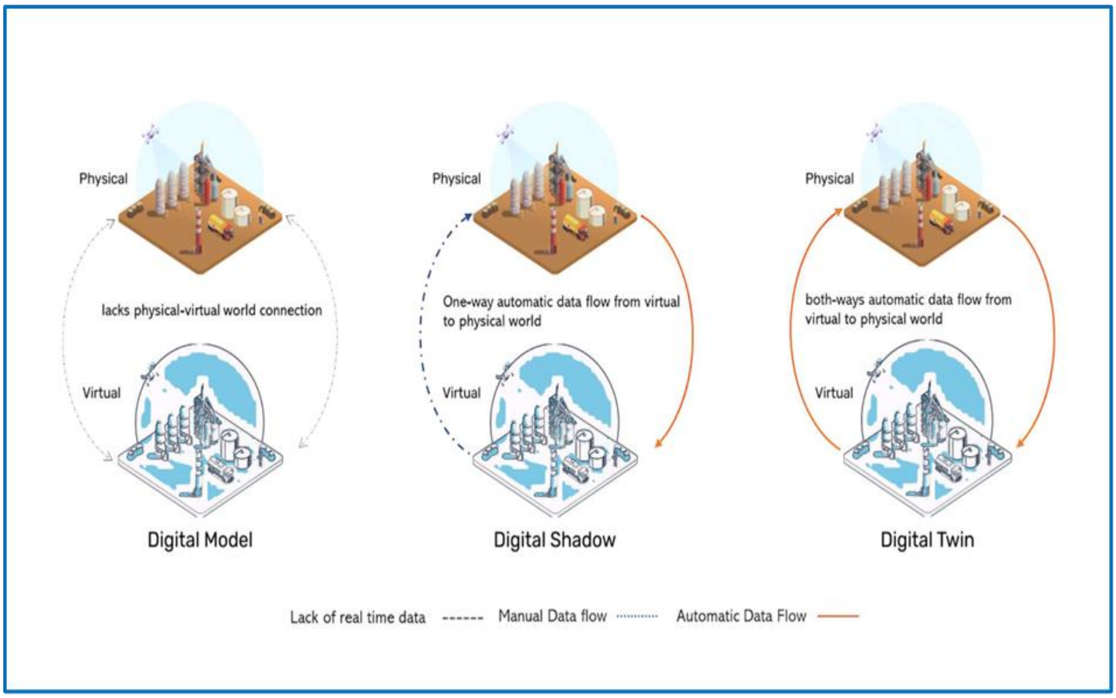

Figure 19: Smart field of majnoon oil field.

The VGIS platform takes oilfield management to new heights by offering a 3D view of facilities and supporting immersive 3D exploration of production facilities and living camps. Real-time equipment monitoring further enhances operational control.

Figure 20 show the cases of VGIS platform's capability to provide an overview and visualization of underground pipelines. The pipeline overview function aggregates inventory data from underground pipelines and ground facilities, creating a specialized layer on the map system to highlight them. This visualization enables easy comprehension of media flow throughout the intricate pipeline network, facilitating identification of total flow and connections between stations.

Figure 20: Oilfield pipeline and facilities overview.

The VGIS platform also enables monitoring of oil production through wells, as depicted in Figure 21. This functionality establishes a connection between oil production data and the 3D map, simplifying production management and providing clear insights.

Figure 21: Oil production monitoring by wells.

6.1 VGIS Project implementation

6.1.1 VGIS Project

The project has constructed the Digital Twin, by producing a real-scene 3D model of assets with drones, connecting disparate data sources/systems, and integrating them into a GIS system.

- **VGIS offers more benefits**

  VGIS can reduce speeds up knowledge transfer & workforce localization [1].

- **VGIS empowers operators**

  VGIS empowers operators with overall situational awareness, and business process visibility to monitor field assets and operations [1].

- **VGIS helps field to decrease the cost**

VGIS enables field to spend less cost on operations, maintenance, training, and traveling. Operators, contractors, and international experts can remotely conduct site visits and monitor real-time field operational status with VGIS [7].

6.1.2 Project execution steps

Challenges steps:

Step 1: 3D Modelling/Design Data. 3D Modelling is totally relying on reconstruction due to missing design Data or clarity (e.g., production equipment grouping) [8]. Some additional information from other partners is hard to get (e.g., KBR GIS data).

Step 2: System & Data Integration Data Readiness & Quality is Late & Poor. Lack of connection API or right authority to connect.

Step 3: Business Process Integration Difficult to engage different department people to understand their business process to design a better user story.

6.2 VGIS code

Is a JavaScript function that initializes a map measurement feature, including measuring distance, area, and height. The following steps listed an explanation of the functionality:

- Creates a Cesium.MeasureHandler instance to handle area measurement, with parameters including viewer and Cesium.MeasureMode.Area.
- Sets properties such as measurement points, fill color, and line attributes.

Adds an event listener to listen for area measurement events. When a measurement is completed, it updates the display with the measured area.

6.3 Corrosion method

The provided equation is related to the calculation of the corrosion rate using a slope calculation method. Here is an explanation of the components and the interpretation of the equation:

$$\text{Slope (Corrosion Rate)} = \frac{\sum_1^m y_i(x_i-\mu)}{\sum_1^m (x_i-\mu)^2} \quad \mu = \frac{\sum_1^m x_i}{m} \qquad (1)$$

Where:

- *yi* is the metal loss at the i-th measurement.
- *xi* is the time of the i-th measurement.

- μ is the mean of the xi values.
- *m* is the number of measurements [7].

- Interpretation:

1. Corrosion rate calculation:
- The corrosion rate is calculated as the slope of the line that best fits the data points (xi,yi) where xi is the time and yi is the corresponding metal loss.
- This method is used to determine how fast the metal is corroding over time by finding the linear trend in the data.

2. Numerator:
- The numerator represents the covariance between the metal loss and time. It measures how much the metal loss varies with time from their respective means.

3. Denominator:
- The denominator represents the variance of the time measurements. It measures how spread out the time values are around their mean.

-**Practical application:**

- Corrosion Monitoring: This calculation is typically used in corrosion monitoring systems to provide a quantitative measure of the corrosion rate.
- Data Analysis: The method is a form of linear regression analysis where the corrosion rate is derived

from the slope of the best-fit line through the metal loss data points.

This approach allows for the systematic and accurate estimation of the corrosion rate, aiding in the proactive management of corrosion in various industrial applications.

- **Data curve fitting algorithm:**

Related to equation (1) above:

Slope is corrosion rate, y_i is metal loss, x_i is fitting period, μ is average of x_i , m is sum of corrosion sample data.

According to the value of x and y, corrosion rate needs to be converted to mil per year(mpy), millimetre per year(mmpy). The following steps is one of the corrosion metal loss example:

While, m=4,

x_i *is 0, 5, 10, 15* y_i is $0.1, 0.2, 0.3, 0.4$

$$\mu = \frac{0+5+10+15}{4} = 7.5$$

Numerator of Slope = (0.1) (0-7.5) + (0.2) (5-7.5) + (0.3) (10-7.5) + (0.4) (15-7.5) = 2.5

Denominator of Slope = (0-7.5)2 + (5-7.5)2 + (10-7.5)2 + (15-7.5)2 = 125

Slope = 2.5/125= 0.02 mil/hour = 175.2 mil/year(mpy) = 4.45 mm/year(mmpy).

Chart 1 illustrates the explains of the results for metal loss with time.

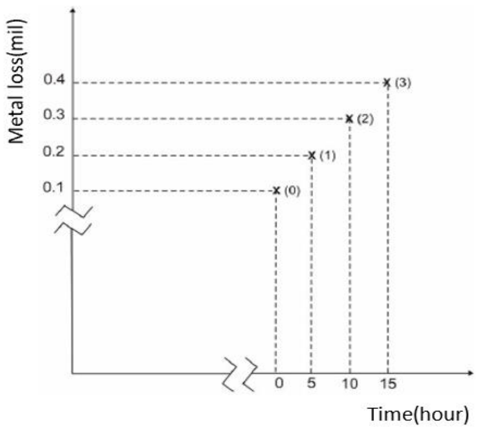

Chart 1: Metal loss

Combination of corrosion monitoring techniques, also known as multi-technique corrosion monitoring, is using to provide more accurate and comprehensive data about corrosion processes. The following steps listed some of the reasons that why they are necessary:

Overcoming limitations: Individual corrosion monitoring technique may only provide an indication of one type of corrosion and may not show another form even if it exists. Multi-technique approach combines various complimentary technologies to provide maximum coverage.

Increase in temperature contributes: Increase the number of active centers of corrosion on the metal surface and accelerates the development of corrosion processes.

Differentiating corrosion types: Some of these additional techniques allow the systems to differentiate between general and localized corrosion processes.

Reliable data: The data from such a combined system is more reliable in identifying a suitable inhibitor for the localized corrosion, thus helps in managing corrosion and providing economic benefits to businesses and the users.

Continuous monitoring: The monitoring enables the detection of changes in the rate of corrosion as well as the variations in corrosion behaviour. The system allows customer to obtain real time data.

6.4 Intelligent applications with VR/AR

By leveraging the VGIS platform and its business intelligence (BI) capabilities, a comprehensive view of the oilfield is attained. To maximize the potential of BI, the VGIS system incorporates virtual reality (VR) and augmented reality (AR) functionalities. Figure 15 illustrates the VR system, which facilitates real-time monitoring and remote training.

The AR system, depicted in Figure 16, enables real-time monitoring, inspection, and professional suggestions for remote operations. This AR system is complemented by drones capturing live videos, which are transmitted into the AR system, as showcased in Figure 22. Users equipped with AR devices can gain an overview of the oilfield through these real-time feeds.

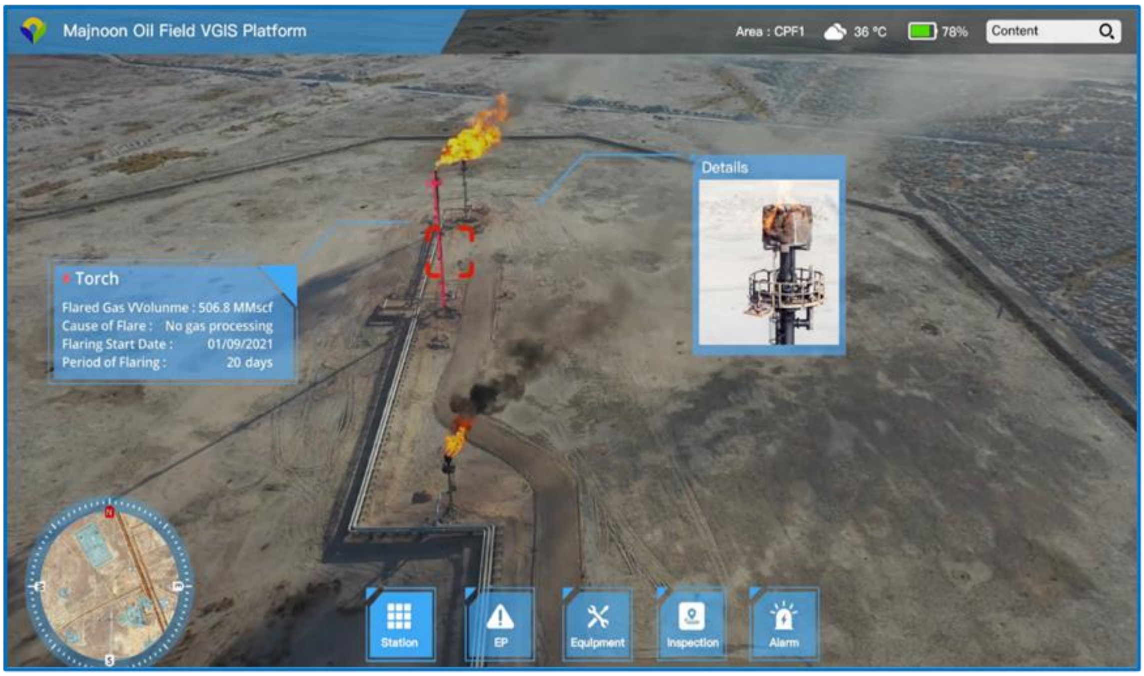

Figure 22: UAV photography and inspection function

7 Discussions

The implementation of the VGIS platform in the oilfield offers numerous advantages, including enhanced profitability, improved operational efficiency, optimised equipment performance, increased personnel productivity, and enhanced collaboration and capacity. The VGIS system, which serves as the central component of the Oilfield Digital Transforming project, addresses the issue of data fragmentation and incompatible systems. This allows the efficient aggregation and use of large amount of Big Data generated throughout the operation and production process. In addition, digital transformation enables the efficient administration of the production process and Key Performance Indicators (KPI), thereby elevating oilfield management to a global scale.

Presenting the existing and planned infrastructure as three-dimensional entities in accurate Augmented Reality (AR) enhances comprehension of the environment, boosts efficiency, minimises mistakes, ensures a safer work setting, and improves overall understanding of the surroundings.

vGIS seamlessly connects with Geographic Information Systems (GIS), Distributed Control Systems (DCS), and Closed-Circuit Television (CCTV) systems, allowing for efficient data exchange and collaboration. In order to generate AR representations of the surrounding infrastructure, this technology collects and combines geospatial data from many sources and process minimises or eliminates the need for manual labour in preparing the digital-twin data. vGIS has the capability to perform this task automatically.

Upon reviewing all previous research, no similar design was founded. However, various studies have focused on specific aspects such as GIS, 3D modelling, DCS, and CCTV. In contrast, the vGIS integrates all these platforms using advanced technology.

This study considers the project presented as the first of its kind globally, making it challenging to find a comparable solution. Although a project in China's Shanghai port utilises similar technology, it does not encompass all the technologies examined in this thesis. Furthermore, the vGIS technology offers high maintenance, monitoring capabilities, and reduces both time and errors, leading to potential future advancements. Consequently, this study represents the most comprehensive and pioneering research on vGIS technology.

8 Conclusion

With the development of VGIS platform, the oilfield can have many benefits, such as increasing profitability, increasing operational efficiency, improving equipment performance, improving staff efficiency, and cooperation and capacity. As the core system of the Oilfield Digital Transforming project, the VGIS system solves the problem of data silos and disparate systems that cause Big Data generated during the operation and production process to be aggregated and release more energy than normal. Moreover, with digital transformation, the production process and KPI are highly managed and bringing oilfield management to a higher level worldwide.

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