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Defence and Security System Against The Threat of Drone Weapons In The Oil and Gas Industry As a Vital National Object

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Abstract

Ensuring national defense and security is a top priority for every country, particularly when it comes to safeguarding critical infrastructure and strategic resources. Indonesia, being a prominent oil producer in Southeast Asia, is confronted with various threats to its oil and gas sector, including the emerging menace of drone attacks. This research delves into the development of defense strategies through an extensive literature review, shedding light on the potential risks posed to the oil and gas infrastructure. The primary objective of this study is to present recommendations for fortifying defense systems against drone threats targeting national vital assets within the oil and gas industry. The research emphasizes the importance of risk identification, understanding potential impacts, and formulating effective defense strategies. The case analysis of the Saudi Aramco attack serves as a poignant reminder of the critical need to safeguard national vital assets promptly. To tackle this growing challenge, collaboration between the government, relevant institutions, and the private sector becomes imperative. Building an effective and responsive defense system against drone threats in the energy sector necessitates a collective effort. The threat of drone weapons in the oil and gas industry extends beyond mere infrastructure concerns, encompassing potential attacks on facilities and personnel, thereby significantly impacting production and overall security. To strengthen defense mechanisms, the research underscores the importance of leveraging advanced technology, establishing no-fly zones, conducting comprehensive personnel training, implementing stringent regulations, and fostering intelligence information exchange. These measures collectively contribute to a robust defense strategy that can effectively mitigate the risks associated with drone threats in the oil and gas sector. In conclusion, a multifaceted approach that incorporates technological advancements and collaborative efforts is essential to ensure the resilience and security of a nation's vital assets in the face of evolving threats.

Keywords**: **Defense System, Drone Threats, National Vital Object, Oil and Gas Industry

INTRODUCTION

National defense and security emerge as crucial issues for every country, especially concerning territorial integrity, sovereignty, and the sustainability of the economic sector. National vital objects encompass critical infrastructure and strategic resources, garnering attention in the context of national defense. The protection and security of national vital objects are essential priorities for the government and relevant agencies to ensure the continuity of operations and the security of the organization or the country (Soesanto et al., 2023).

As the largest economy in Southeast Asia and a leading oil producer, Indonesia needs to focus on the resilience of energy infrastructure, particularly in the oil and gas sector. Threats to national vital objects, such as military attacks, terrorism, and drone threats, necessitate an effective defense system. IMF data for the year 2022 ranks Indonesia as a growing economic power, placing it first in Southeast Asia and fifth in Asia (Mediatama, 2023). Its strong economic position makes Indonesia a member of the G-20, holding the 16th position globally (Triyawan, 2020). This underscores the need for protection and security in the energy sector as a key pillar for operational continuity and national stability.

Threats to oil and gas infrastructure involve both military and non-military factors, including terrorism, sabotage, and armed conflicts. Drone threats are a primary concern, as acknowledged by the Assistant Security of the Air Force Chief of Staff, Air Marshal TNI Tamsil

Malik, who identified drones as a significant threat (Rastika, 2020). The presence of drones as flying devices capable of carrying dangerous payloads adds complexity to the risks to organizational security.

The need to analyse defence systems involving policy, strategy, technology and personnel. Military and non-military defence play an important role, with a focus on empowering national resources (Defence White Paper, 2015). Based on the Law of the Republic of Indonesia No. 3 of 2002 on National Defence, all national defence efforts are carried out based on awareness of the rights and obligations of citizens through efforts to build and foster the capabilities and resilience of the state and nation, as well as to overcome any threats. This is supported by Presidential Decree No. 63 of 2004 on National Vital Objects and Minister of Energy and Mineral Resources Regulation that regulates the security of national vital objects in the energy sector. Indonesia has an oil and gas company, PT XYZ, as an upstream subholding that plays an important role in oil management, especially in the Rokan Working Area which contributes to one third of national oil production (Guitarra, 2022).

Several countries have regulated the security system of important objects in the oil and gas industry. Norway, Canada, and the United States oversee it. Norway has an Oil and Gas Safety Authority (PSA) that regulates the oil and gas industry with strict standards regarding safety and security. In addition, Canada works with the Canadian Association of Petroleum Producers (CAPP), which sets standards and guidelines to safeguard essential items in the oil and gas industry. Similarly to the United States, the American Petroleum Institute (API) focuses on the safety of control systems of general energy industry activities. The US Department of Energy's Office of Electricity Delivery and Energy Reliability regulates these standards (Cisswg, 2005).

The Saudi Aramco attack was one of several attacks that destroyed oil and gas facilities. The first attack occurred on 25 March 2022, when Houthis attacked Saudi Aramco's crude oil refinery, which processes 8.45 million barrels of oil per day, more than half of Saudi Arabia's daily production (Najmi, 2022). According to Kumar (2019), the attacks utilised ballistic missiles and drones delivered to Saudi Aramco's oil facilities in Khurais and Abqaiq from Yemeni territory. These attacks successfully bypassed Saudi Arabia's air defences and arrived at their destination. This caused significant damage to Saudi Aramco's oil facilities. Structural damage to infrastructure such as refineries and storage tanks resulted in a significant drop in daily production.

In future research, we will discuss how oil and gas energy organisations can develop and implement defence systems, including the use of advanced monitoring and detection technologies and physical security strategies on the ground. In mitigating risks, collaboration between companies and state authorities is also important. Government agencies, such as the police, military and intelligence agencies, are crucial in providing the support and information needed to protect the country's critical assets. This case study can explain how this co-operation is carried out to protect oil and gas industry companies.

RESEARCH METHODS

This research is part of a literature review, where the study is conducted based on the findings from written works. Although it is only a literature review, it is part of the research because research does not necessarily have to involve fieldwork and direct interaction with respondents (Melfaniora, 2019). The required data for the research can be obtained from literature sources, opinions from security experts, and practitioners in the oil and gas industry.

RESULT AND DISCUSSION

Analysis of Drone Weapon Threats to the Oil and Gas Industry

The oil and gas industry plays a vital role in a country's economy, making it a potential target for various security threats, including the use of drone weapons for detrimental activities. Unmanned aerial vehicles (drones), initially designed for surveillance purposes, are now equipped with missile, rocket, and bomb weaponry capable of causing serious damage (Marbun et al., 2016). A thorough analysis of the potential drone threats to national vital objects, especially in the context of the oil and gas industry, is crucial for identifying risks and developing effective security strategies. Drone weapon threats to the oil and gas industry encompass the potential for attacks on infrastructure, facilities, and personnel. In this context, drones can be utilized for reconnaissance, aerial attacks, or sabotage. Such attacks can result in damage to oil and gas production facilities and pose potential threats to personnel safety. Moreover, drone attacks can impact cybersecurity, as drones falling into the wrong hands can be used to access sensitive data or damage systems. Therefore, the oil and gas industry needs to consider comprehensive physical and cyber security measures to protect against drone weapon threats.

Examples of drone threats include:

1. Unauthorized Surveillance: Drones can be used for unauthorized monitoring of oil and gas facilities. Unauthorized surveillance can provide strategic advantages to irresponsible entities, including terrorist groups or business competitors.
2. Physical Attacks: Drones can be modified to carry hazardous payloads such as bombs or explosives (Amin et al., 2022). Such attacks can cause physical damage to oil and gas facilities, threaten workers' safety, and result in serious economic impacts.
3. Intrusion and Data Theft: Drones can also be used to infiltrate sensitive areas and capture images or video recordings. This threat can lead to the theft of valuable data, such as technology and business strategy-related information.

Furthermore, drone weapons pose a serious threat to the oil and gas industry because drones can be used to conduct attacks on production facilities and critical infrastructure such as pipelines and transport lines. Some of the threats that drone weapons can pose to the oil and gas industry include:

1. Attacks on production facilities; Drones can be used to carry out attacks on oil and gas production facilities such as oil wells, production platforms, and processing facilities. These attacks can cause damage to production facilities and disrupt energy supply.
2. Attacks on critical infrastructure; Drones can also be used to carry out attacks on critical infrastructure such as pipelines and transport lines. These attacks can cause damage to infrastructure and disrupt energy supply.
3. Reconnaissance; In addition to direct attacks, drones can also be used to conduct reconnaissance of production facilities and critical infrastructure. This can jeopardise the security and confidentiality of the oil and gas industry.

Case Study: Drone Weapon Threats to the Oil and Gas Industry

Attacks using drone weapons on the oil and gas industry can have serious consequences. One example is the attack on Saudi Aramco's oil facilities in Abqaiq and Khurais in September 2019 (Kumar, 2019). The attack was carried out by remotely controlled drones, causing damage to oil processing facilities and reducing Saudi oil production. The Houthi rebels in Yemen claimed responsibility for the attack, but the United States accused Iran of involvement (Arvirianty, 2019).

The drone attack on Saudi Aramco's facilities was suspected to be carried out by the Houthi group in Yemen. They reportedly used 10 drones to target two Aramco oil refineries,

causing fires and reducing the company's oil and gas production. This attack resulted in a reduction of oil supply by 5.7 million barrels per day and an increase in the world crude oil price by approximately US$10 per barrel (BBC Indonesia, 2019). The attack created tension in the global oil market and highlighted the vulnerability of energy infrastructure to drone attacks. Such attacks demonstrate how drone weapons can be used to launch assaults on oil and gas industry facilities, emphasizing the need for increased security and protection of vital infrastructure.

Analysis of Vulnerabilities in the Oil and Gas Industry

The analysis of vulnerabilities in the oil and gas industry involves a comprehensive evaluation of the potential vulnerabilities of the industry to various threats, including drone weapon attacks. Although specific information on the analysis of vulnerabilities in the oil and gas industry to drone attacks was not found, based on existing knowledge, the analysis would involve assessing the potential impact of drone attacks on critical infrastructure, the effectiveness of existing security measures in detecting and addressing drone threats, and the development of strategies to enhance resilience and response capabilities. Additionally, it is essential to consider regulatory and legal frameworks governing industrial facilities (Faoziah, 2023).

The analysis of vulnerabilities in the oil and gas industry to drone attacks involves evaluating the location and construction of facilities, the effectiveness of detection and defense systems, communication network security, security management, collaboration with authorities, and the formulation of risk mitigation plans. Regular technological updates and periodic evaluations are necessary to ensure continuous improvement in security, involving security experts, engineers, and authorities.

Defense and Security Strategies to Address Drone Weapon Threats

Defense and security strategies to address drone weapon threats to the oil and gas industry involve several steps that can be taken to protect infrastructure and personnel from these threats. Here are some strategies to consider:

1. Advanced Detection and Tracking Systems: The use of advanced detection and tracking technologies, such as radar and optical sensors, can help detect the presence of drones early (Aerial Armor, 2023). These systems need to be integrated with existing security systems.
2. Establishment of No-Fly Zones and Physical Barriers: Creating no-fly zones around oil and gas facilities and implementing physical barriers such as wire nets or anti-drone walls to prevent unwanted penetration. Some anti-drone technologies that can be used to detect and stop drones include DRONE DOME™ by Rafael and various solutions provided by D-Fend Solutions (Rafael, 2023).
3. Training and Preparedness of Personnel: Conducting regular training for security personnel on the identification, detection, and handling of suspicious drones.
4. Development of Regulations: Close collaboration with security authorities and the government to develop stringent regulations regarding the use of drones around oil and gas facilities and other vital national objects.
5. Exchange of Intelligence Information: Collaboration with intelligence and security agencies for the exchange of information regarding potential threats and tactics that may be used by malicious groups.

In addressing drone threats to national vital objects, the oil and gas industry needs to take proactive measures to ensure security, safety, and operational continuity. The integration of advanced technological solutions and collaboration between the public and private sectors is key to creating a secure and guaranteed environment.

Recommendations and Design for Defense System Improvement

In facing drone weapon threats, the oil and gas industry needs to consider recommendations and designs for defense system improvement. Some steps to consider based on the findings include:

1. Strengthening Air Defense Capability Based on Drones: Indonesian Minister of Defense, Prabowo Subianto, has called on the Indonesian Air Force to build air defense capabilities based on unmanned aerial vehicles (Hakim, 2022).
2. Understanding the Proliferation Phenomenon of Armed Drones: It is essential to understand how the proliferation of armed drones occurs in the international system, including in Indonesia (Debe et al., 2022).
3. Use of Artificial Intelligence (AI) Technology: Robotic systems that leverage AI, including drones, can be a crucial part of military power transformation. Therefore, defense strategies also need to consider the use of AI in defense, including autonomous vehicles such as drones (Rahmatika, 2022).

In the face of drone attacks and attacks of any kind, the oil and gas industry may consider upgrading its defence system by using defence drones. This is in accordance with the 6 directions of the Defence policy of the Republic of Indonesia in 2019, where the second point contains guidelines for the vision and mission and priority programs of the government including regional development policies. The implementation of this policy is supported by the use of satellite technology and drone systems. As well as the third point of continuing the development of the military defence posture, the policy leads to the TNI Minimum Essential Force (MEF).

Some examples of defence drones that could be used are the Dan Air Target Drone System from Rosoboronexport (Russian Defence Export, 2023). During combat training and air defence missile trials, this drone system aims to emulate subsonic tactical aircraft, cruise missiles and remote-controlled aircraft. Then there is the Indonesian-made defence drone from BPPT, the drone is called Black Eagle (CNN Indonesia, 2019). In addition, the oil and gas industry can also consider developing their own defence drones or working with other parties to develop defence drones that suit their needs. In addition to the above recommendations, the oil and gas industry should also consider investing in drone detection and countermeasure technology, as well as training security personnel to effectively address drone threats.

CONCLUSION

Protecting national vital objects, especially in the oil and gas industry, is crucial given the increasingly complex drone weapon threats. The case study of the attack on Saudi Aramco demonstrates that such attacks can cause significant damage to oil infrastructure and have serious economic consequences. To enhance security, defense strategies need to involve advanced technology, the construction of no-fly zones, personnel training, strict regulations, and intelligence information exchange. Proactive measures, such as strengthening air defense based on drones, understanding the phenomenon of armed drone proliferation, and utilizing Artificial Intelligence (AI) technology, are also necessary to address these threats.

Thus, collaboration between the government, relevant institutions, and the private sector needs to be strengthened. Investments in cutting-edge technology, adequate regulations, and capacity-building for personnel are crucial to ensuring the security and operational continuity of the country. Indonesia needs to build an effective and responsive defense system against modern security threats, especially in dealing with drone weapon threats to national vital objects.

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