

## ARTIFICIAL INTELLIGENCE AS A GAME-CHANGER FOR THE INDONESIAN NAVY: TACKLING THE FUEL CHALLENGE

**CDR Indra S. Putra, M.Sc.**  
Indonesian Navy Planning Office  
*Mimpikaliyee1000x@gmail.com*

### ABSTRACT

Supporting the operational tasks and training of the Warship, sufficient fuel is the crucial things to fulfill. Nevertheless, faced with budget availability, innovation is required in order to the Indonesian Navy conduct the task successfully. One effort that can be implemented is to implement Artificial Intelligence (AI) which offering innovative solutions to optimize fuel consumption and enhance the navy's operational efficiency.

### A. INTRODUCTION

The Indonesian Navy (IDN) faces a significant challenge in managing its fuel consumption for warship, particularly in its vast and diverse operational areas. Fuel costs represent a substantial portion of the navy's budget and optimizing fuel usage is crucial for maintaining operational readiness and ensuring cost-effectiveness. Currently the Indonesian Navy is only able to deploy 50 ships in the operational area and need more budget for more ships<sup>1</sup>. On the other hand, it is quite difficult to provide more fuel for operational because of the budget availability. Thus, it is necessary to have the innovation to allow the operational continuity in this situation. One effort that can be attempted, by implementing the cutting-edge technology of digitalization known as Artificial Intelligence. **It can be argued that Artificial Intelligence (AI) has emerged as a game-changer in addressing this challenge**, offering innovative solutions to optimize fuel consumption and enhance the navy's operational efficiency.

There are some reasons why Artificial Intelligence could figure out the fuel's problem. First, AI provide the data to be analysed by learning machine for efficiency. Then, AI could

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<sup>1</sup> Wakasal Tantang PT. CMS Bangun Kapal Hemat Bahan Bakar, <https://peloporwiratama.co.id/2022/12/10/wakasal-tantang-pt-cms-bangun-kapal-hemat-bahan-bakar/> accessed on November 27<sup>th</sup>, 2023.

prevent fuel wastage by providing predictive maintenance and fault detection. Another possible reason is AI has the capability to reduce fuel costs with optimizing fleet deployment and logistics. Nevertheless, it to be carefully considered and addressed, such as how to collect and integrate the data, the cost for AI Application and how to deal with emergency situation to deploy the fleet.

The arguments above will be explored deeply to examine to what extent AI tackling the fuel challenge. The essay will be divided into four sections, in which every single part consists of the argument to support the thesis statement, and in the last part, there will be a summary to conclude the paper.

## **B. METHODOLOGY**

AI provide the data to be analysed by learning machine for efficiency, could prevent fuel wastage by providing predictive maintenance and it has the capability to reduce fuel costs with optimizing fleet deployment and logistics. However, there are still other challenges in the employ of AI had to cope. This must be addressed properly in order to the Indonesian Navy continue to conduct its very complex duties while operating in a cost-effective. For research, it is used **qualitative methodology** with library approach.

## **C. DISCUSSION**

### **A. Artificial Intelligence**

Artificial Intelligence is a term coined by emeritus Stanford Professor John McCarthy in 1955, was defined as “the science and engineering of making intelligent machines”. Much research has humans program machines to behave in a clever way, like playing chess, but, today, we emphasize machines that can learn, at least somewhat like human beings do.<sup>2</sup> Another definition by Prof Arwin, Human intelligence is emulated through mathematical models translated into instruction codes by programming language to make them understandable by computers and shows intelligence as a human does<sup>3</sup>. AI is the study of computations that make

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<sup>2</sup> Artificial Intelligence Definition, <https://hai.stanford.edu/sites/default/files/2020-09/AI-Definitions-HAI.pdf> accessed on November 26<sup>th</sup>, 2023

<sup>3</sup> Seminar Nasional STTAL on November 16<sup>th</sup>, 2023

it possible to perceive, reason and act<sup>4</sup>. AI is an effort to build intelligence from machines/computers and think like humans. In its development, AI with new methods can then learn on its own with the data provided. This machine learning is what causes AI to develop very rapidly.<sup>5</sup> With its capabilities and sophistication, it is hoped that AI assist in making the utilize of fuel effectively for warships.

## **B. Harnessing Data for Efficiency**

In an effort to make fuel use more efficient, accurate and comprehensive data is required. AI provides data and inspect it regarding fuel use by warship. The analysis is needed to know fuel usage over a certain period of time, to develop options and further steps to put good use.

AI has the ability to display data that has been analysed and processed regarding fuel consumption of all Indonesian Navy warships. The data will be displayed on the software application of AI fuel management systems. It will revolutionize the way the Indonesian Navy manages its fuel consumption by providing real-time insights and predictive analytics. These systems collect and analyse vast amounts of data from ship sensors, including engine performance, operational patterns and weather conditions. AI, together with other innovations like quantum computing, could provide the “immense computing power” necessary to interpret large amounts of data coming in from a wide variety of sensors and other resources<sup>6</sup>.

The software of fuel management system is a tool can used to track fuel usage, monitor fuel consumption and identify fuel-saving opportunities. The data collected this way generates the fleet’s fuel usage reports. This information can be used to improve fleet fuel efficiency and optimize routes. It can also identify fuel theft and wasted fuel<sup>7</sup>.

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<sup>4</sup> Winston, Patrick Henri. *Artificial Intelligence Third Edition*.p.5.1992.

<sup>5</sup> CNN Indonesia, *Artificial Intelligence: Ancaman atau Potensi?* Filmed July 7<sup>th</sup>, 2023, Youtube Video, <https://www.youtube.com/watch?v=ZuGmHtGTgBc>.

<sup>6</sup> Bitzinger, Richard A. *Artificial Intelligence: Emporing Smaller Navy*. 2020. RSIS Commentary.

<sup>7</sup> Efficient Fleet Fuel Management System. Cut on Fuel Costs with an AI-Based Fleet Refueling Strategy, <https://nexocode.com/blog/posts/fleet-fuel-management-system-cut-on-fuel-costs-with-fleet-refueling-strategy/> accessed on November 27<sup>th</sup>, 2023

These technologies will facilitate performance improvements and cost savings through a combination of automation, optimization, and operational models both within and beyond the traditional value chain of generation, transmission, distribution, and consumption<sup>8</sup>.

Furthermore, Advanced AI algorithms is able to then analyse the data to identify inefficiencies, predict fuel consumption trends, and recommend optimal fuel-saving strategies. This real-time analysis enables the navy to make informed decisions about route planning, speed adjustments, and power management, leading to significant reductions in fuel consumption.

However, data input is required from each warship and sent to the data processing center. This can be a challenge in itself.

### **C. Preventing Fuel Wastage**

Predictive maintenance, a proactive approach to warship upkeep, is a revolutionary application of AI in fleet management. The system uses AI algorithms to analyse data from various warship sensors, predicting potential failures before it occurs. The ability to foresee mechanical issues allows officers to schedule repairs in advance, preventing costly breakdowns. The cost savings from this approach are significant, with a study by McKinsey estimating that predictive maintenance could reduce maintenance costs by 10-40%<sup>9</sup>.

AI also play a crucial role in predictive maintenance and fault detection, further optimizing fuel consumption by preventing unnecessary breakdowns and downtime. AI algorithms analyse sensor data and identify patterns that indicate potential equipment malfunctions or inefficiencies. It has been experimenting with data analytics to help with predictive maintenance and to maintain the operational readiness of the platform<sup>10</sup>.

Predictive maintenance allows the navy to schedule maintenance proactively, avoiding unexpected breakdowns that could disrupt operations and lead to increased fuel consumption. Early detection of faults can also enable timely repairs, preventing further damage and ensuring

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<sup>8</sup> Harnessing Artificial Intelligence to Accelerate the Energy Transition, p.5, White Paper, September 2021

<sup>9</sup> The Power of AI in Fleet Management: From Predictive Maintenance to Route Optimization, <https://ts2.space/en/the-power-of-ai-in-fleet-management-from-predictive-maintenance-to-route-optimization/#gsc.tab=0>, accessed on November 28<sup>th</sup>,2023

<sup>10</sup> Singapore Navy to use more of AI, unmanned tech as new chief urges young 'digital natives' to hop on board, <https://www.channelnewsasia.com/singapore/singapore-navy-use-more-ai-unmanned-tech-new-chief-urges-young-digital-natives-hop-board-3463236>, accessed on November 28<sup>th</sup>,2023

optimal engine performance. Regular maintenance can ensure that the engine is operating efficiently and can reduce fuel consumption<sup>11</sup>.

#### **D. Reducing Fuel Costs**

AI examine the effectiveness of warship operations accompanied by data input regarding the operational plans being implemented and the size of the operational area. With certain algorithms created in the AI application, it will be able to provide suggestions on which operations can be preceded to achieve more effective outcomes and it will save fuel usage.

AI optimize fleet deployment and logistics, reducing fuel consumption by minimizing unnecessary move and optimizing resource allocation. AI algorithms can analyse operational requirements, weather patterns, and fuel availability to determine the most efficient routes and deployment strategies for naval vessels. It combines with the operational and exercise planning.

This optimization reduces unnecessary sail distances, minimize idle time, and ensure that warship is deployed in the most efficient manner, leading to significant fuel savings. AI can also optimize logistics operations, ensuring that fuel supplies are delivered to the right warship at the right time and reducing unnecessary voyage costs.

#### **E. The Challenge of Ai Implementation**

While AI offers immense potential for the Indonesian Navy to address its fuel challenge, it also presents challenges that need to be carefully considered and addressed, such as:

How to collect and integrate the data from the warship. Making integration and interoperability data as a source for computing. Integrating and harmonizing this data can be challenging, requiring robust data management infrastructure and protocols. Machine learning algorithms, which are currently the main technology in AI, are very dependent on the availability of data<sup>12</sup>.

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<sup>11</sup> Ship operators are using these techniques to reduce fuel consumption and emissions, <https://sailplan.com/top-techniques-ship-operators-reduce-fuel-consumption-and-emissions/>, accessed on November 28<sup>th</sup>, 2023

<sup>12</sup> Tantangan dalam Pengembangan Teknologi Artificial Intelligence di Indonesia, <https://binus.ac.id/malang/2022/08/tantangan-dalam-pengembangan-teknologi-artificial-intelligence-di-indonesia/> accessed on December 1<sup>st</sup>, 2023

The cost of creating AI applications is not cheap and easy. All in all, the cost of building an AI application depends on the complexity and functionality of the AI application, as well as the expertise and experience<sup>13</sup>. Moreover, for use in the navy, it requires additional features in the form of adequate security guarantees because the fuel usage can be classified as confidential information.

Lastly, how to deal with the emergency situation. There is a sudden order to conduct OMSP operations, for instance natural disasters which happen frequently in recent years. It requires more fuel for deployment of fleet where it was not planned in advance.

#### **D. CONCLUSION**

To sum up, even though there are several technology innovations in saving the consumption of fuel, somehow the Artificial Intelligence could be as one of optional to be implemented. Artificial Intelligence has the potential to revolutionize the Indonesian Navy's fuel management practices, leading to significant reductions in fuel consumption, and enhanced operational efficiency.

By embracing AI applications, the Indonesian Navy leverage the technology to optimize its fuel usage, maintain a sustainable operational posture, and ensure the long-term effectiveness of its naval fleet. As AI continues to evolve, the navy must remain at the forefront of innovation, adapting its strategies, and integrating AI seamlessly into its operations.

However, there are still other challenges in the employ of AI had to cope. This must be addressed properly in order to the Indonesian Navy continue to conduct its very complex duties while operating in a cost-effective.

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### Indra Sari Putra



As a navy, Commander Indra Sari Putra has served on several warships especially in electronic and weapon department. He graduated from Naval Academy in 2001 and hold a bachelor degree from Indonesian Naval Technology College in 2008 and Master of Science degree from NTU Singapore (RSIS) in 2020. His educational background and assignments provided him to contribute the idea to the Indonesian Navy through the paper. He was also deployed to UNIFIL in 2012 as a J6 Naval

Communication officer.