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INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



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23 January 2025
PTDI, UiTM Cawangan Johor
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Kampus Pasir Gudang
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A-ST062: AIR-SENSOR CONCRETE POKER VIBRATOR

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ABSTRACT

Vibrating concrete is a crucial process of compacting, that impacts the quality of concrete. The existing monitoring method relies on workmanship. Concreter measures based on visual inspection and experiences. This approach is subjective and can be easily manipulated. Rectifying works can only be done after the concrete hardened, which is impossible to identify inadequate compaction alongside poor workmanship right away. Therefore, this study offers an idea of how to tackle the monitoring system for concrete compaction and workmanship quality. The development of an Air Sensor Concrete Poker Vibrator is focused on addressing the challenges in the construction, especially for Industrial Building System (IBS) Formwork Panels. The objectives proposed are to prevent defects and reduce repair work. Data collection was done by applying literature reviews and simulation studies. The marketability potential of the innovative product aligns with Sustainable Development Goals (SDGs) and offers technological advancement that can benefit the construction industry globally. This research methodology is intended to provide a structured approach to developing and evaluating the proposed technological innovation. The research concludes that the Air Sensor Concrete Poker Vibrator is a valuable addition to the construction industry for achieving higher standards of quality and sustainability.

Keywords: Concrete Compaction, Poker Vibrator, Air-Sensor Technology, Sustainability Built Environment, Innovation

1. Product Description

The Air-Sensor Concrete Poker Vibrator applies advanced air sensor technology that actively detects air voids during the compaction process, ensuring optimal density and quality of concrete. It is engineered for use with Industrial Building Systems (IBS), enhances the efficiency of concrete placement and also aligns with Sustainable Development Goals (SDGs) by promoting better quality control and reducing waste. Its user-friendly design facilitates ease of operation. By integrating this innovative tool into construction practices, contractors can achieve superior compaction results, minimize repair costs associated with poor workmanship, and ultimately contribute to a more sustainable built environment.

2. Materials and Method

Figure 1 shows the research methodology process of the innovation project. The research methodology begins with brainstorming ideas with the supervisor to identify a relevant topic, followed by a comprehensive literature review to understand existing studies and pinpoint research gaps. From this, specific issues and problems are identified, leading to the formulation of research questions, aims, and objectives. Next, the conceptual and theoretical framework is developed, providing a structured foundation for the study. The data collection methods are then determined, ensuring appropriate tools and techniques are chosen. After collecting the data, it is analyzed to draw meaningful insights, and the process concludes with writing the findings, conclusions, and recommendations for future research.

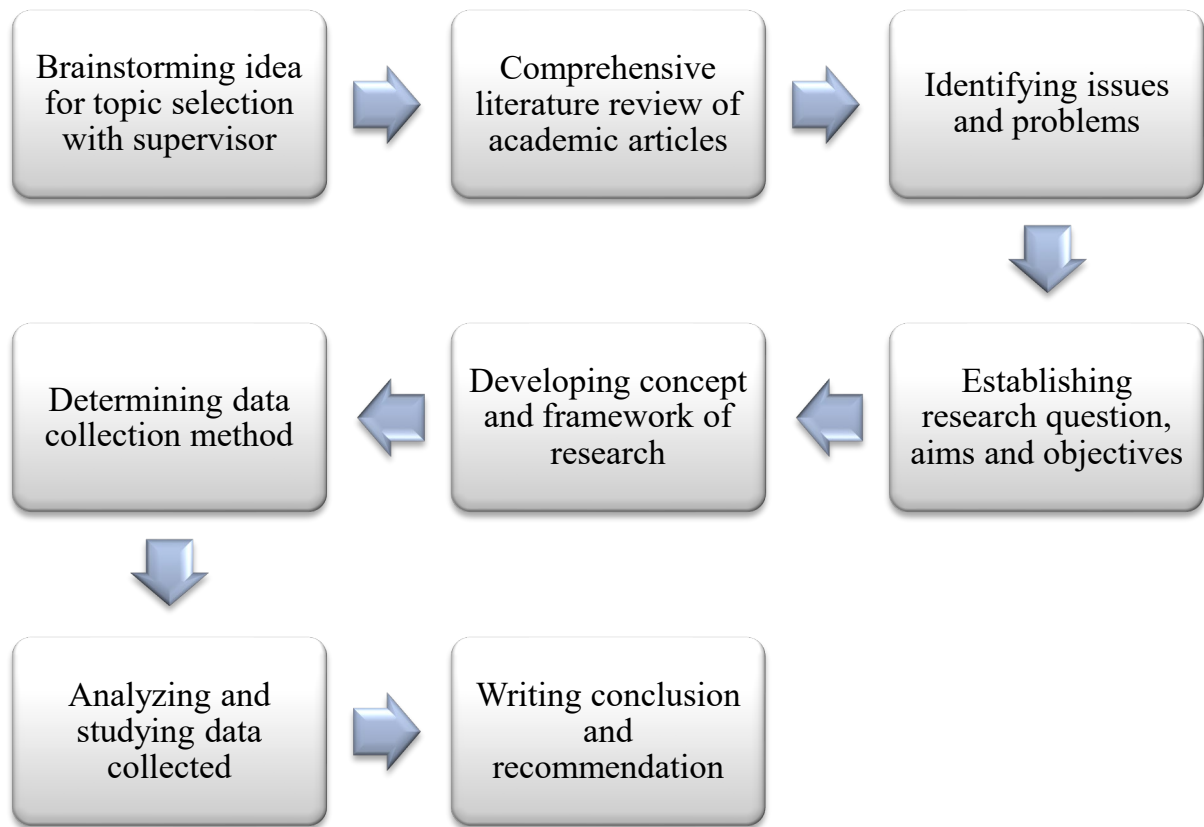


Figure 1. Research Methodology

Table 1 shows the product features comparison between existing concrete poker vibrators and Air-Sensor Concrete Poker Vibrator. The Air-Sensor Concrete Poker Vibrator surpasses traditional models by offering superior quality control through real-time feedback, which ensures consistent monitoring of air voids. Although its maintenance and price are higher due to advanced technology, it is more marketable as it aligns with sustainability goals, SDGs, and IBS requirements, making it a more relevant and forward-looking choice for the construction industry.

Table 1. Product Features Comparison

<i>Features</i>	<i>Existing Concrete Poker Vibrators</i>	<i>Air-Sensor Concrete Poker Vibrator</i>
<i>Technology</i>	Traditional vibrators	Air sensor technology
<i>Quality control</i>	Manual operation based on experience and visual inspection, which can be inconsistent	Real-time feedback data for monitoring air voids
<i>Maintenance</i>	Lower due to only for the typical needs of mechanical components	Higher due to the advanced technologies; power supply, sensors and data logger
<i>Price</i>	Potentially lower than the innovative model	Potentially higher than the existing model
<i>Marketability</i>	Varies potential due to the models do not offer technological advancements and sustainability	Sustainability-focused industry; aligns with SDGs and IBS needs

3. Novelty and uniqueness

The idea of the Air-Sensor Concrete Poker Vibrator is a groundbreaking advancement in concrete compaction technology, integrating air sensor capabilities to enhance the quality control process. Traditional methods of monitoring concrete compaction are often subjective and reliant on the experience of workers. It leads to inconsistencies and potential structural defects. In contrast, this innovative product utilizes real-time data from the sensors, allowing for immediate adjustments and ensuring optimal compaction. This improves the integrity of the concrete, promotes efficiency, and reduces waste in construction practices. The Air-Sensor Concrete Poker Vibrator stands out as a significant leap forward in construction technology, providing a solution that addresses long-standing challenges in the industry. It also develops a commitment to sustainability and quality assurance.

4. Benefit to mankind

The Air-Sensor Concrete Poker Vibrator represents a significant advancement in construction technology by offering numerous benefits to mankind, particularly in terms of sustainable building practices. This innovative device addresses critical challenges in concrete compaction. It is essential for ensuring the structural integrity and longevity of concrete structures. By integrating air sensor technology, allows for real-time quality assurance and reduces reliance on subjective visual inspections. This capability enhances the quality of construction and also minimizes waste and rework. It leads to cost savings and improved resource efficiency. Furthermore, the Air-Sensor Concrete Poker Vibrator aligns with the Sustainable Development Goals (SDGs) by promoting environmentally friendly practices within the construction industry. It contributes to safer, more resilient infrastructure that benefits communities globally. As such, this innovation supports broader efforts toward sustainability and responsible resource management in urban development.

5. Innovation and Entrepreneurial Impact

The entrepreneurial impact of this innovation is profound to enhance the quality control measures within construction projects. Also, it promotes efficiency and sustainability in building practices. As the construction sector increasingly seeks to adopt advanced technologies, the Air-Sensor Concrete Poker Vibrator positions itself as a vital tool for contractors. It is aimed to improve operational standards and reduce material waste. Therefore, creates developments of a more sustainable future in construction practices. Overall, the innovative product exemplifies how technological advancements can drive entrepreneurial growth by meeting the evolving demands of modern construction projects while promoting higher standards of safety and performance.

6. Potential commercialization

The potential commercialization of the innovative air-sensor concrete poker vibrator lies in its ability to enhance the efficiency and quality of concrete compaction processes. The market for this product is substantial, including both private and civil engineering sectors, where there is a growing demand for durable and mechanically resistant concrete structures. As sustainability becomes increasingly important in construction practices, this innovative product contributes to be an attractive option for contractors and builders seeking competitive advantages in a rapidly evolving market.

7. Authors' Biography



Muhammad Nazhan Hadi Bin Hassan is a degree student in Bachelor of Science (Honours) Construction Technology, at the Universiti Teknologi MARA (UiTM), Seri Iskandar Campus, Perak. With academic interest and more than a year of site working experience, he has pioneered methods for detecting the issues and problems in concrete compaction, which leads to the current research for air-sensor concrete poker vibrator. Dedicated to contributing to sustainable and urban development through the integration of advanced technologies in construction.



Dr. Noor Rizallinda Ishak is a highly accomplished Senior Lecturer at Universiti Teknologi MARA, Seri Iskandar Campus, Perak Branch, with over 13 years of expertise in the Built Environment area. She earned her Ph.D. in Design and Built Environment in 2023, demonstrating a profound commitment to academic excellence. A prolific researcher and author, she has made significant contributions to scholarly literature and is renowned for her dynamic presentations at conferences and her leadership in training initiatives. Her unwavering dedication to innovation, education, and professional growth positions her as a visionary in shaping the future of the built environment.