

INVENTOPIA 2025

FBM-SEREMBAN INTERNATIONAL

INNOVATION COMPETITION (FBM-SIIC)

INNOVATION IN ACTION: TURNING IDEAS INTO REALITY



Chapter 39

Soluxion Paint

Nurlisa Arina Binti Anuar, Nursyazwana Binti Khairuddin,
Nur Nasywa Hanani Binti Yushadi, Muhammad Faiz Dinie Bin Fatkhuddin,
Nor Ariqah Alia Binti Akashah & Nurul Azrin Binti Ariffin

Universiti Teknologi MARA

2023437696@student.uitm.edu.my

ABSTRACT

Soluxion Paint is a next-generation photovoltaic paint system designed to revolutionize the way industrial buildings harness solar energy. Soluxion Paint presents an innovative alternative to conventional solar panels by offering a lightweight, scalable, and easy-to-apply solution. This paint-based technology consists of a multi-layer structure including an internal insulation layer, a conductive base, a photovoltaic light-absorbing layer, and a weather-resistant transparent coating. As for the uniqueness of this innovative product, such a layer plays a crucial role in ensuring efficient energy conversion, temperature regulation, and long-term durability. The insulation component contributes to reducing heat gain, improving indoor comfort and lowering the energy demand for cooling systems such as air conditioners—especially crucial in warehouses storing temperature-sensitive goods. Additionally, the photovoltaic layer actively converts sunlight into electricity, supporting critical warehouse operations including conveyor belts, electric forklift charging stations, lighting systems, and automated machinery. Soluxion Paint not only simplifies the process of adopting renewable energy but also reduces maintenance costs and enhances aesthetic integration. The application process, using tools like airless spray systems, allows for uniform coverage on various surfaces without extensive modification to existing structures. In a market where sustainability, efficiency, and innovation are becoming essential, this product supports industries in achieving long-term energy goals and environmental compliance.

Key Words: Photovoltaic Paint, Renewable Energy, Industrial Innovation, Warehouse Sustainability, Solar Technology

1. INTRODUCTION

Warehouses are critical to the trade and supply chain industry but face increasing operational costs due to their high electricity consumption (Scullin, 2025). With recent hikes in electricity tariffs and growing pressure to adopt sustainable energy solutions, the need for cost-effective alternatives has become urgent. In response, we introduce Soluxion Paint, an innovative multi-layer photovoltaic paint designed specifically for industrial rooftops. This advanced solar solution featuring an insulation base, conductive

layer, photovoltaic coating, and weather-resistant top coat allows warehouses to generate clean energy directly from their roofs without structural modifications. Soluxion Paint offers a smart, scalable, and eco-friendly alternative to conventional solar panels, helping industries, reduce grid dependence, lower utility expenses, and support Malaysia's shift toward renewable energy.

The primary objective of this innovation is to make a significant advancement in the realm of renewable energy technology, how Soluxion Paint is an eco-friendly innovation compared to the common solar panels. Soluxion Paint is typically composed of less materials than traditional solar panels which require glass and metals that are hard to be disposed of and recycled when it's broken.

This initiative seeks to simplify and cost effective energy solutions. Since the installation of solar panels is quite complicated and includes the complexity of wiring, this innovation intends to achieve a product with the same function but more cheaper and easier. Recognizing the costs associated in traditional solar panel installation, this can lead to the more sustainable energy practices, promoting wider acceptance of solar solutions that are both cost effective and user friendly.

Ensuring both low maintenance and high efficiency, Soluxion Paint enables users to easily refresh its appearance. It allows for a straightforward touch up and maintenance which contributes to a more sustainable approach. Solar panels might need at least twice a year for cleaning activity while for Soluxion Paint has transparent layer coating to reduce the dust accumulation that blocks sunlight which leads to lower energy output.

The key issues identified is that warehouses use a significant amount of energy, which can significantly affect the operational cost and raise concerns about the sustainability goals for certain companies ("Effective Technologies and Practices for Reducing Pollution in Warehouses - a Review," 2023). In order to reduce the operational costs and improve electricity efficiency, switching to renewable energy like solar power can reduce greenhouse gas emissions and improve public health. However, solar panels have the complexity of wiring and are difficult to install and turn out to be more costly since it requires more employees to apply the technology (Maka & Alabid, 2022). Other than that, the way a technology gives a positive impact while it's in use does not always unveil the deeper implications. Disposing activity of any technology can also generate emissions since solar panels have a lot of components to separate in recycling processes (Singh, 2025). In response to these challenges, Soluxion Paint which is photovoltaic (PV) paint was developed to replace solar panels which give the same function and easier installation as it comes in the form of paint.

2. LITERATURE REVIEW

Traditional solar technologies, like rooftop photovoltaic (PV) panels, are widely used in industrial settings for electricity, offering strong return on investment (ROI) through reduced bills. However, their rigid silicon cells, glass encasings, metal mounts, and complex wiring lead to high installation costs, space limitations, and maintenance like manual cleaning. Conventional paint, used for decoration and protection with pigments, resins, solvents, and additives, lacks energy generation. Soluxion Paint, an emerging innovation, bridges this by embedding photovoltaics in a paintable medium. Its multi-layered system includes an internal insulation layer, a conductive base, a light-absorbing perovskite photovoltaic layer, and a transparent weather-resistant top coat. This lightweight and flexible composition is applied with standard spray systems, making it scalable to various rooftops. Unlike conventional panels, Soluxion Paint uses safer materials, avoids heavy metals, and has anti-dust properties for self-cleaning via rainwater, significantly reducing maintenance. This seamless blend of functionality, sustainability, and design flexibility positions Soluxion Paint as a novel solution for industrial-scale renewable energy integration.

3. METHODOLOGY

This section explains the step-by-step process of applying Soluxion Paint to a warehouse rooftop and how it converts solar energy into usable electricity for warehouse operations. Before any paint is applied,

the warehouse rooftop must be cleaned and ensured to be dry, smooth, and free from dust. A clean surface is crucial to ensure strong adhesion of the paint layers and to maintain uninterrupted electrical conductivity. Additionally, an embedded wiring system must be installed across the rooftop in advance. These wires will function as energy collection points and channel the electricity generated into the storage and distribution system.

Once the preparation is complete, the application of Soluxion Paint is carried out using an airless spray system ensuring an even distribution of each layer across the entire rooftop. The painting process begins with the application of the first layer—known as the conductive layer. This layer enables electric current to flow across the surface once the photovoltaic reaction occurs. Then, the second layer which is the photovoltaic (PV) paint layer is applied. This layer contains light-absorbing materials that activate the photovoltaic effect when exposed to sunlight. Sunlight excites electrons within the paint, generating electricity. Finally, a transparent weather-resistant coating is applied as the outermost layer. This protective layer ensures durability by shielding the photovoltaic paint from dust, rain, and UV rays.

After all the layers have been applied, the electrical system is tested to confirm that the current generated by the paint flows correctly through the wiring. Once verified, the electricity generated from the rooftop flows into a charge controller, typically using a Maximum Power Point Tracking (MPPT) system. This device regulates the electrical flow to ensure optimal energy efficiency and safe battery charging. From the controller, the current is stored in a battery system, which serves as a backup power source during periods without sunlight. The stored energy then flows into an inverter, which converts the direct current (DC) into alternating current (AC), making it usable for common electrical systems. From the inverter, the electricity passes through an Uninterruptible Power Supply (UPS), which provides backup during power outages and stabilizes the current. Finally, the converted and stabilized electricity is used to power essential warehouse systems such as HVAC units, lighting and automated conveyor belts. Through this integrated system, Soluxion Paint can generate clean energy and also supports full-scale warehouse operations.

4. RESULTS AND DISCUSSIONS

Our group has conducted a survey on x. 56 people carefully selected responses were analysed and the results as shown below.

Survey Questions	Responses	Discussion
Are you aware that solar energy is a renewable (reusable) energy source?	87.5% said yes, 7.1% were unsure	This strong level of awareness reflects a positive foundation for introducing solar-based innovations such as Soluxion Paint.
Do you believe that increasing public awareness of renewable energy can encourage more businesses to adopt sustainable practices?	92.9% agreed	It highlights that innovations like Soluxion Paint not only meet technical needs but can also benefit from growing public support for sustainability
4. Are you aware that many warehouses are transitioning to solar power systems to reduce energy costs and environmental impact?	64.4% said yes, 25% were unsure	This gap highlights the need for continued education and promotion of sustainable innovations like Soluxion Paint.
If you were a warehouse owner, would you consider it important to explore innovations beyond traditional solar panels to generate solar energy and remain competitive in a sustainable way?	100% agreed	Introducing alternatives like Soluxion Paint, which addresses the need for simpler, lighter, and more adaptable renewable energy solutions for industrial applications

If there were a new innovation such as <i>Soluxion Paint</i> , a paint that functions as an alternative to traditional solar panels by generating electricity when applied to rooftops, would you support its use?	98.2% agreed	It highlights the public's willingness to embrace innovations that can overcome the limitations of conventional solar panels, further validating the potential of <i>Soluxion Paint</i> as a practical and sustainable energy option for industrial and warehouse applications.
--	--------------	---

5. CONCLUSION

Soluxion Paint not only offers a new way to generate renewable energy but also serves as a practical solution to broader challenges faced by industrial areas, especially warehouses located near residential zones. By enabling warehouses to generate their own electricity, Soluxion Paint helps reduce dependency on the central power grid, ultimately easing pressure on the local energy supply during peak hours. This not only cuts down operational costs for businesses but also supports the stability of electricity in nearby rural communities, reducing the risk of power fluctuations and contributing to overall community well-being. In addition, Soluxion Paint stands out as a more affordable alternative compared to conventional solar technologies. While most solar solutions require expensive materials and complex installation, Soluxion Paint maintains a simpler process with minimal wiring, less labor and faster application making it especially suitable for small and economically disadvantaged businesses. This innovation aims to bridge the gap between sustainability and affordability, making renewable energy accessible to a wider market.

6. RECOMMENDATIONS

In light of the findings and the growing demand for sustainable alternatives in the energy sector, we recommend advancing the commercialization of Soluxion Paint, an advanced innovation of photovoltaic (PV) paint that is gaining attention in the renewable energy market. Propelled by the global shift towards sustainable energy solutions, this technology offers a transformative approach to solar energy integration. Unlike traditional solar panels, Soluxion Paint can be applied to various surfaces including rooftops and buildings of warehouses for large firms—turning them into clean energy generators. This versatility addresses the space constraints and aesthetic concerns associated with conventional solar installations. With an emphasis on paints that produce electricity from sunlight, the solar paint business is emerging as a new frontier in renewable energy. Photovoltaic (PV) properties found in Soluxion Paint enable surfaces to function like solar panels, offering creative ways to integrate renewable energy into buildings and infrastructure. According to WiseGuy Reports, although this technology is still in the research and development stage, it could eventually be widely adopted. Given these trends, our recommendation is to target large firms operating across industrial and commercial sectors, including multinational logistics companies, global manufacturing facilities, and expansive retail chains. The global integrated PV solar device market is expanding rapidly, supported by government incentives such as funding and subsidies (Maka & Alabid, 2022). While traditional solar remains less practical for many of these businesses due to high energy costs and structural limitations, Soluxion Paint offers a smart, accessible solution, allowing them to transform building surfaces into energy-generating assets without major infrastructure changes. To accelerate adoption, we suggest a strategic go-to-market approach including direct B2B outreach, partnerships with resellers, and potential licensing models. Demonstrating measurable energy savings and launching pilot programs with innovation-driven firms will build credibility and drive wider acceptance within this high-potential, underserved market. Thus, we recommend positioning Soluxion Paint as a key player in the global shift toward renewable energy, given its widespread applicability and alignment with sustainability policies and market demands.

REFERENCES

- Effective technologies and practices for reducing pollution in warehouses - A review. (2023). In *Cleaner Engineering and Technology* (Vol. 13, p. 100622) [Journal-article]. <https://doi.org/10.1016/j.clet.2023.100622>
- How is paint made?. Community RePaint. (2023, January 31). https://communityrepaint.org.uk/news_and_stories/how-is-paint-made/#:~:text=Paint%20is%20typically%20made%20up,explore%20in%20more%20detail%20below.
- Kuchta, D. M. (2021, October 12). The potential of solar paint: Everything you need to know. Treehugger. <https://www.treehugger.com/the-potential-of-solar-paint-everything-you-need-to-know-5193821>
- Maka, A. O. M., & Alabid, J. M. (2022). Solar energy technology and its roles in sustainable development. *Clean Energy*, 6(3), 476–483. <https://doi.org/10.1093/ce/zkac023>
- Maka, A. O. M., & Alabid, J. M. (2022, June 11). Solar energy technology and its roles in sustainable development. Oup.com. <https://academic.oup.com/ce/article/6/3/476/6606003>
- Photovoltaic effect. Photovoltaic effect - Energy Education. (n.d.)https://energyeducation.ca/encyclopedia/Photovoltaic_effect
- Reports, W. (2024, September 16). The solar paint market: projected 15.76% CAGR and its implications for the future. openPR.com. <https://www.openpr.com/news/3656481/the-solar-paint-market-projected-15-76-cagr-and-its>
- Scullin, C. (2025, April 12). What is Warehouse Management? Definitive Guide - Camcode. *Camcode*. https://www.camcode.com/blog/warehouse-management/?srltid=AfmBOooFrQJfRIR1oNc_deOry97Nt0S2j0k5suAYcRf5W-x_rC5d2j9V
- Singh, A. (2025). Can solar panels be recycled? In *AZoCleantech* (pp. 1–6). <https://www.azocleantech.com/article.aspx?ArticleID=1948>
- Technology, E. (2020, July 27). *What components do you need for solar panel system installation?*. ELECTRICAL TECHNOLOGY. https://www.electricaltechnology.org/2019/10/components-solar-panel-system-installation.html#google_vignette
- What is a solar panel?. What Is A Solar Panel? How does a solar panel work? (n.d.). <https://www.mrsolar.com/what-is-a-solar-panel/>