



Lean-Integrated Clean Hydrogen Adoption in Aged Care Facilities: Balancing Sustainability and Occupational Safety

Dr Faisal Ahmed
University of Moulay Ismail
Occupational Safety & Health Specialist | Sustainable Aged Care Advocate

Editorial Note:

The global shift toward clean energy has highlighted hydrogen as a pivotal resource for achieving sustainable practices. While industries like manufacturing and transportation are rapidly adopting hydrogen technologies, the aged care sector lags. Implementing clean hydrogen systems in these facilities could transform energy consumption patterns, lower carbon emissions, and improve air quality for elderly residents. However, this transition demands careful alignment of environmental goals with workplace safety imperatives.

Aged care centers require substantial energy for climate control, lighting, and medical devices.

Hydrogen-based energy systems offer a pathway to reduce reliance on fossil fuels while enhancing operational resilience. Yet safety concerns persist, particularly in environments housing vulnerable populations and healthcare workers. Effective adoption hinges on workforce preparedness, facility retrofitting, and robust safety frameworks to mitigate risks such as leaks or mishandling.

Recent studies emphasize human-centered strategies for hydrogen integration (Henry et al., 2022).

Training programs, hazard assessments, and emergency protocols are vital to minimizing risks.

Lean methodologies, which prioritize efficiency and iterative refinement, can further optimize hydrogen deployment by reducing operational redundancies and costs (Olajide, 2024). For instance, streamlining workflows through Lean tools like value stream mapping could accelerate facility upgrades while maintaining safety standards.



Worker safety remains a cornerstone of successful implementation. Research demonstrates that employee engagement in safety initiatives correlates with higher productivity and reduced accidents (Juba, 2024). In hydrogen transitions, this requires targeted upskilling to address risks like flammability or equipment misuse. Proactive measures, including mental health support and safety drills, must be embedded into adoption plans to protect staff and residents (Juba et al., 2024b).

Technological innovation also plays a critical role. Smart sensors, hydrogen-fueled backup systems, and AI-driven monitoring tools can enhance operational reliability while preempting hazards (Juba et al., 2024a). For example, IoT devices could detect leaks in real time, ensuring rapid response to potential threats.

Challenges such as funding gaps, regulatory complexity, and public skepticism persist.

Collaborative efforts between policymakers, industry experts, and healthcare providers are essential to develop scalable, safe, and economically viable solutions (Juba et al., 2022). Transparent communication about hydrogen's benefits and risks will also foster trust among stakeholders.

The aged care sector stands at a crossroads. By adopting Lean-driven hydrogen systems, facilities can achieve dual objectives: reducing environmental harm and safeguarding occupational wellbeing. The critical question remains: Is the sector prepared to undertake this essential shift?

References

1. Henry, E. O., Oluwafunmise, F., & Ogungbeje, O. (2022). People-centric approaches to accelerating clean hydrogen deployment: Bridging the gap between technology and workforce readiness. *Multidisciplinary Science Journal*, 1(1), 12-23.
2. Juba, O. O. (2024). Impact of Workplace Safety, Health, and Wellness Programs on Employee Engagement and Productivity. *International Journal of Health, Medicine and Nursing Practice*, 6(4), 12-27.



3. Phiri, A. K., Juba, O. O., Baladaniya, M., Regal, H. Y. A., & Nteziryayo, T. (2024). *Strategies for Quality Health Standards*. Cari Journals USA LLC.
4. Juba, O. O., Lawal, O., David, J. I., & Olumide, B. F. (2023a). Developing and Assessing Care Strategies for Dementia Patients During Unsupervised Periods: Balancing Safety with Independence. *International Journal of Advanced Engineering Technologies and Innovations*, 1(04), 322-349.
5. Oluwafunmise, F., & Olajide, H. E. (2024). *Addressing Food Waste through Innovative Industrial Management and Technological Solutions*. Available at SSRN 4980497.
6. Juba, O. O., Olumide, A. F., David, J. I., & Adekunle, K. A. (2024a). The role of technology in enhancing domiciliary care: A strategy for reducing healthcare costs and improving safety for aged adults and carers. *Unique Endeavor in Business & Social Sciences*, 7(1), 213-230.
7. Olajide, H. E., & Oluwafunmise, F. (2024). *Leveraging Industrial Management Principles To Improve Sustainability and Efficiency in Food Processing*. Available at SSRN 4969362.
8. Juba, O. O., Olumide, B. F., David, J. I., Olumide, A. O., Ochieng, J. O., & Adekunle, K. A. (2024b). Integrating Mental Health Support into Occupational Safety Programs: Reducing Healthcare Costs and Improving Well-Being of Healthcare Workers Post-COVID-19. *Revista de Inteligencia Artificial en Medicina*, 15(1), 365-397.
9. Olajide, H. E. (2024). IMPLEMENTING CONTINUOUS IMPROVEMENT TO REDUCE THE CARBON FOOTPRINT IN HYDROGEN PRODUCTION. Chicago
10. Juba, O. O., Olumide, A. O., Ochieng, J. O., & Aburo, N. A. (2022). Evaluating the impact of public policy on the adoption and effectiveness of community-based care for aged adults. *International Journal of Machine Learning Research in Cybersecurity and Artificial Intelligence*, 13(1), 65–102.
11. Olajide, H. E. (2024). *Application Of Lean Methodology To Reduce Production Costs And Improve Efficiency In Clean Hydrogen Production*. Available at SSRN 5028595.
12. Olajide, H. E., Oluwafunmise, F., & Ogungbeje, O. (2023). Creating equitable workforce development models for clean hydrogen transition: Insights from industrial management. *Journal of Multidisciplinary Research*, 9(1).
13. Olajide Henry Ebini. "Fostering Workforce Readiness for the Green Hydrogen Economy through People-Centric Training Programs." Volume. 9 Issue.11, November-2024 *International Journal of Innovative Science and Research Technology (IJISRT)*, 773-788, <https://doi.org/10.38124/ijisrt/IJISRT24NOV038>
14. HENRY, E. O. (2024, December). THE OVERLOOKED ELEMENT IN CONTINUOUS IMPROVEMENT: WHY PEOPLE ('MAN') MATTER MORE THAN EVER IN THE 4MS



FRAMEWORK. In *DAKAM FALL 2024 CONFERENCES IN HUMANITIES PROCEEDINGS* (p. 96).

15. Oluwafunmise, F. (2024). The Role of Industrial Management in Enhancing Food Security Through Efficient Supply Chains. Available at SSRN 4969770.
16. Olajide, H. E. (2024). Community Engagement and Social Acceptance of Renewable Energy Projects in Agricultural Regions. Available at SSRN 4969730.
17. Olajide, H. E. (2024). The Role of Social Dynamics in the Implementation of. Available at SSRN 4968246.
18. Oluwafunmise, F., & Olajide, H. E. (2024). The Influence of Sociocultural Factors on The Adoption of Sustainable Practices In The Energy and Agricultural Sectors. Available at SSRN 4980499.
19. Juba Omolara; Jeffrey Ochieng. "Occupational Health and Safety Challenges Faced by Caregivers and the Respective Interventions to Improve their Wellbeing." Volume. 9 Issue.6, June - 2024 International Journal of Innovative Science and Research Technology (IJISRT), www.ijisrt.com. ISSN - 2456-2165, PP:- 3225:-3251
<https://doi.org/10.38124/ijisrt/IJISRT24JUN1000>
20. Juba, O. O., Olumide, A. O., & Azeez, O. (2023). *The Influence of Family Involvement on the Quality of Care for Aged Adults: A Comparative Study.*