

Lean Carbon Mapping Approach to Optimize Paper Usage in Offset Printing Industries

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Abstract

Paper waste in offset printing industries contributes not only to economic inefficiencies but also to environmental degradation through increased CO₂ emissions. This study explores the integration of Lean Carbon Mapping (LCM) with traditional Lean tools to optimize paper usage and reduce the carbon footprint associated with printing operations. A case-based research design is applied across selected offset printing units in Tamil Nadu, India. The methodology involves Value Stream Mapping (VSM), identification of high carbon-emitting activities, and targeted interventions using Lean practices such as 5S, Kaizen, and Standard Working procedures. The implementation of Lean Carbon Mapping resulted in a 45% reduction in paper waste and a 45% decrease in estimated carbon emissions linked to material handling and print defects. The findings demonstrate the potential of LCM as a strategic tool for advancing both operational efficiency and environmental sustainability in the printing sector.

Keywords

Lean Carbon Mapping (LCM), Offset Printing Industry, Waste Reduction, 5S, Value Stream Mapping (VSM).

Biographies

Mrs. T. Miruthubashini obtained Bachelor's degree in Printing Technology (2011–2015) and subsequently completed Master's degree in Industrial Engineering (2015–2017). And served as an Assistant Professor for three years, gaining valuable academic and research experience. Currently, pursuing Ph.D. in Mechanical Engineering at Anna University, Chennai. Her research interests include lean manufacturing, sustainability, process optimization, and carbon footprint reduction in the printing and manufacturing sectors.

Dr. M. Balaji is an Associate professor in Department of Mechanical Engineering at Kumaraguru College of Technology, Coimbatore. He obtained his Under graduation in Mechanical Engineering (1995-1999) and Postgraduation in Industrial Engineering (2001-2002) and an additional qualification of an MBA through distance education from Bharathiar University. His Doctoral program (2010-2015) entitled 'Studies on evaluating and enhancing Supply Chain Agility of SME's using Total Agile Design Systems' was from Anna University, Chennai. He is also a life member of prestigious society of Indian Institution of Industrial Engineering (IIIE), Mumbai and possesses a Google Scholar Citation of 572 and 249 Scopus citations to his credit.