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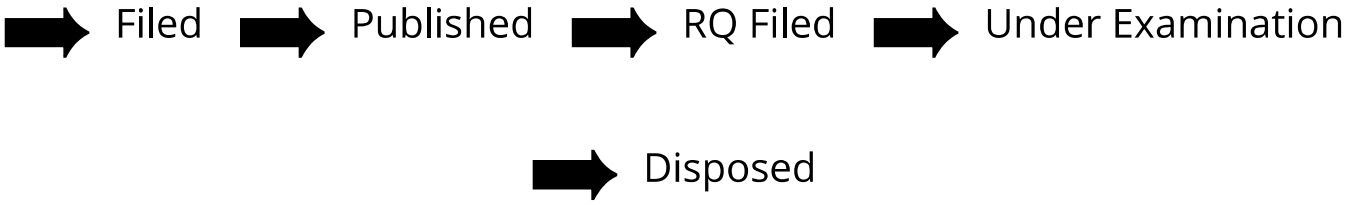


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(57) Abstract :
Abstract The invention discloses a Blockchain-Integrated Supply Chain System for Sustainable Manufacturing that ensures end-to-end transparency, traceability, and sustainability compliance across manufacturing operations. The system leverages a permissioned blockchain network where each stakeholder node is authenticated and participates in recording immutable transaction data. Smart contracts embedded in the blockchain automatically enforce sustainability parameters such as carbon emissions, ethical labor practices, and resource utilization. IoT sensors collect real-time data throughout the supply chain—from raw material sourcing to final delivery—which is validated and stored on the blockchain. An AI analytics engine interprets this data to predict non-compliance, generate sustainability scores, and support decision-making. The system includes user interfaces tailored to suppliers, manufacturers, regulators, and consumers, enabling access to verified product histories and compliance credentials. The invention fosters ethical sourcing, regulatory adherence, and consumer trust while reducing fraud and operational inefficiencies in manufacturing ecosystems.

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