Applying RFID Technology into a Tower Crane as an Information Scanner for Improving Material Management

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The objective of this proposed research is to test the feasibility of applying Radio Frequency Identification (RFID) technology into tower cranes in the form of an information scanner that will not only improve materials management and project performance, but also facilitate the use of Building Information Modeling (BIM) to enhance efficiency on construction sites in urban areas with limited space. RFID is a globally accepted technology that has enjoyed great success in the area of supply chain management, particularly for inventory management. Materials management that uses RFID for automated tracking and locating activities are promising to greatly improve construction productivity on construction sites, and sensor technologies and sensing systems enable contractors to identify the locations of different materials as they are moved around the site. However, at present these locations are tracked using GPS devices, with an accompanying lack of accuracy, precision and robustness. The introduction of a smart tower crane system should minimize human intervention and improve the effectiveness of existing materials management systems. In general, a tower crane is fixed to the ground and covers the whole site in projects involving the construction of tall buildings in urban areas. Consequently, an RFID reader installed on the jib of the tower crane will be capable of overseeing the entire construction site and reading the RFID tags attached to all the materials anywhere on the site. Since the typical reading range between the tag and reader for an active RFID system is up to 100 m with the help of batteries (3-5 years battery life), a reader mounted on a tower crane will easily scan tags on materials on the ground, thus providing coherent and continuous real-time materials' information. The scanned data from the reader on the crane will support materials management, providing complete and accurate information for scheduling, planning, resource allocation, and so on. This research will be the first step in the development of an innovative approach that supports better utilization of existing equipment and technology in the construction industry. This smart tower crane system has the potential to have an enormous impact on urban construction management by improving materials management and performance without the need for complicated devices and by maximizing the automated tracking and locating of materials, especially in limited areas such as construction sites. Ultimately, this system could be applied to various types of materials management, including not only tracking and locating but also arrival scans, continuous inventory checks, theft inspection, real-time scheduling assistance, jobsite layout, coordination of trade components, and so on. These applications will be directly compatible with BIM technology.

Key Words: Radio Frequency Identification, Building Information Technology, Information Scanner, Tower Crane, Material Management.