

## **CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT**

### **Tower Cranes – Telematic Data Analysis to Unlock Their Full Potential in the Modern Era of Construction**

Low productivity levels within the construction industry have been a constant theme for decades. With the implementation of new technologies on construction sites, a vast array of data is being collected and analysed in an attempt to increase productivity levels. One such technology is the introduction of data loggers to record the daily operations of a site's tower cranes. Tower cranes on construction sites can be considered the most critical piece of machinery that enables the efficient and timely construction of the project. They are used widely in the industry on infrastructure projects, high rise residential apartments and mixed-use building projects. Cranes are involved in several different tasks and are often the most expensive and frequently shared resource on a construction site. As a result, crane utilisation is often underestimated during the pre-construction phase, which contributes to programme delays during the construction delivery phase. An industry assumption is that the over-utilisation of site cranes can create a bottleneck on construction sites. An accurate understanding of real-time crane utilisation will lead to both programme and cost benefits.

Building on existing studies, this research paper will analyse tower crane telematic data to accurately establish key performance metrics of the cranes' daily operations, examining the crane utilisation on a live construction project over the duration of one year. Data was collected in real-time from a number of the site crane data loggers. The research method included capturing information relating to the site tower crane operations on a data logger. The raw data sets were then imported into Excel, where they were reviewed, cleansed, and formatted, to allow statistical analysis. The analysis investigated key performance metrics that site management, project planners and operations staff deemed suitable for site productivity analysis. These key performance metrics included lifted load weights and frequency, the number of lifts undertaken each day, lift durations, operating mechanisms durations, periods of crane activity and inactivity, and crane utilisation daily and weekly.

The analysed results were compared with existing research findings and the pre-construction estimates of the crane utilisation for the live construction site that was chosen for this research paper. The tower crane utilisation percentages calculated through this research were comparable to similar research studies.

However, there are some noticeable differences between the site conditions of these studies. On average, the analysed tower cranes had a lower utilisation percentage than what was considered during the pre-construction planning. The utilisation percentages calculated through this research paper can be used to more accurately inform future construction projects of a similar nature to ensure greater programme certainty. As key performance metrics for tower crane operations are now being implemented in commercial construction contracts, it is imperative for main work contractors, tower crane suppliers and tower crane operators to have accurate data analysis on the site cranes' performance and utilisation.