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120T Casting Bay Crane Monitoring System

TATA

BEng (Hons) Electrical and Electronic Engineering

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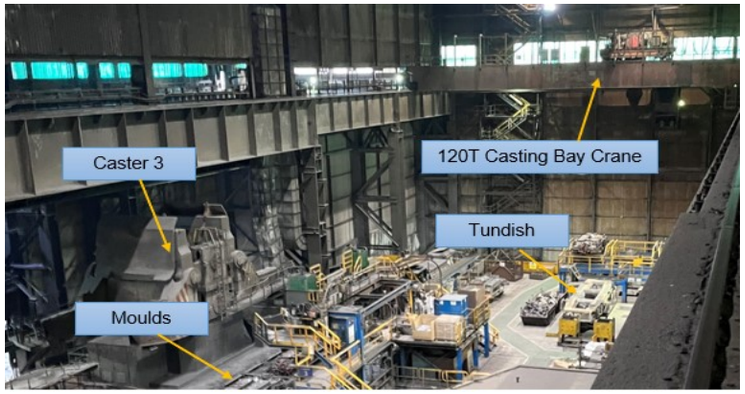
1. Introduction

The aim of the project was to design and construct a remotely accessible crane monitoring system which was controlled by a central PLC to carry out live plant condition monitoring of the 120T Casting Bay crane, located at the Continuous Casting plant at Tata Steel.



2. Project Aims

Implement a system to record crane usage

- To be resettable after each panned maintenance
- To be resettable when the motors are changed

Create a system that alerts the maintenance team of issues

- Preventing high-cost component failures
- Allowing the crane to work in a safer manner
- Reducing downtime of the crane

Advantages of the system

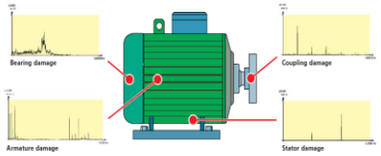
- Less downtime
- Increase the MTBF
- Remote analysis of faults
- Smarter maintenance driven by usage rather than time
- Prevent expensive component failures

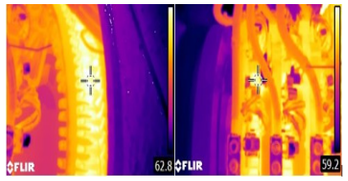
3. Research Overview

Research into other monitoring systems and crane failures was carried out to capture what data would be advantageous to record to improve the cranes' reliability, whilst making it safer to operate.

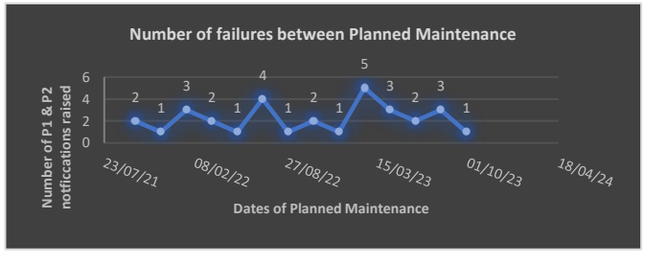
Some areas of the crane to monitor were:

1. Vibration and temperature of motors and gearboxes to prevent failures of expensive components.





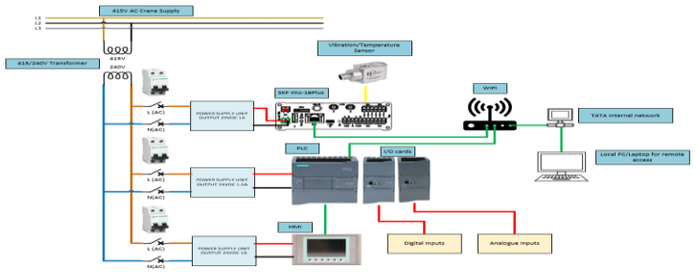
2. Mechanical brake operations to prevent brake run throughs and loss of loads.
3. Running Hours of each motor to increase the mean time between failure of crane and reduce maintenance inspections.



4. Design & Implementation

The system uses a Siemens S7-1200 PLC with different inputs from around the crane. Creating different user-friendly screens on the HMI to provide feedback/interaction for the user. A total of 24 analogue and 16 digital inputs were required so additional I/O cards are used to receive data from the crane.

The overall design of the system is shown below.

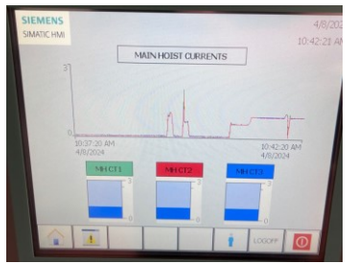


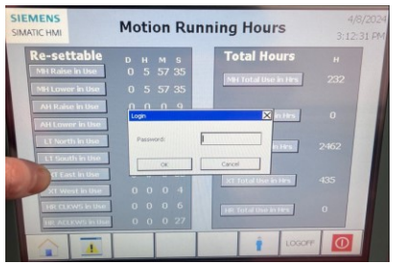
5. Testing & Results

During the project Tata steel announced that they will be closing the heavy end at Port Talbot so the project funding and availability of the 120T Casting Bay crane was stopped. A contingency plan was required, so a simulation test rig was set up to mimic the inputs from the crane.

As can be seen below a variable frequency drive, motor, current transformers and signal conditioners were set up so that the current monitoring could be demonstrated.

Two push-button stations were created to mimic all the digital inputs located around the crane to record running hours and brake operations. All tests and HMI designed screens worked as desired.





6. Conclusion

The project overall has been a success, although being slightly disappointing and frustrating that the installation of the system on the crane could not be completed. If future circumstances allow this, it will have the potential to dramatically modify the out-of-date maintenance schedule that is currently being undertaken by Tata on its crane assets.

By gathering the real time data in different fields, it will allow the maintenance team to act on any potential future breakdowns at the earliest possible stage. This will prevent high-cost components failing in service and increase the crane's availability to production. It will also reduce the amount of physical and visual inspections currently being undertaken.