

Project Proposal

by Shaun Galsworthy

Submission date: 20-Oct-2023 11:35AM (UTC+0100)

Submission ID: 213763397

File name: 41370_Shaun_Galsworthy_Project_Proposal_525085_197416968.docx (1.74M)

Word count: 1498

Character count: 7843



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

PROJECT PROPOSAL

SHAUN GALSWORTHY 2218900

Supervisor: Stephen Mosey

Module: ACCA6020 Independent Project
BEng (Hons) Electrical and Electronic Engineering

20th October 2023

TABLE OF CONTENTS

Figures & Tables	2
Introduction	3
Project Title.....	4
Project Aims & SMART Objectives	4
Aim 1.....	4
Aim 2.....	4
Aim 3.....	4
Aim 4.....	4
Aim 5.....	4
Project Benefits	5
Background	6
120T Casting Crane	6
Current monitoring systems	6
Project Design	7
Monitoring System	7
recordable Data	7
Overview of Components	7
Resource / Planning	8
Stakeholders	8
GANTT Chart	9
References	10
Appendix	11

FIGURES & TABLES

Figure 1 - 500T hot metal crane carrying out the charging process. 3

Figure 2 - An example of overhead crane with double girders 6

Figure 3 - GANTT chart of overall project 9

Table 1 - Stakeholders 8

INTRODUCTION

The Steel & Slab department within Tata's Port Talbot Steelworks has thirty-eight service and production cranes with lifting capacities ranging from 1 to 500T, these cranes require maintenance and breakdown cover twenty-four hours a day. This service is provided by the mobile task force cranes department (MTF).

The MTF previously consisted of forty-one personnel made up with electrical, mechanical engineers and tradesmen. Recently the manning has been reduced by approximately 40% following the company's restructuring process. The current maintenance program for these assets has been in place for approximately thirty years and requires the MTF's full resources to complete.

A requirement is that this maintenance program needs to be reconditioned, enhanced yet still be functional for the department's new manning quota to be able to achieve. For this to be practical a smarter way of carrying out maintenance will have to be created, where real-time and historical data can be used to drive better results.

To achieve this, it has been decided that the cranes need to be monitored remotely. Michael Healey (Works Engineer Steel & Slab) wants a business case produced to acquire funding for the overall improvement. This project has been set up with the overall aim to design, prove the concept, install and commission on one crane. If successful, this project will allow a future plan to be created to illustrate to the company of its costs, timescales and mainly benefits of having all thirty-eight cranes on this network in the future.

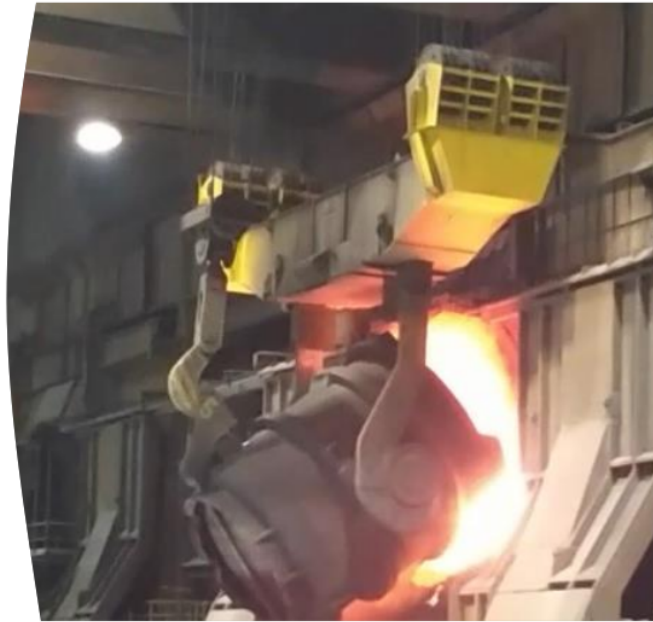


Figure 1 - 500T hot metal crane carrying out the charging process.

PROJECT TITLE

Crane Information System

PROJECT AIMS & SMART OBJECTIVES

AIM 1

To design a monitoring system that can be remotely accessed.

OBJECTIVES

Must be a stand-alone system using WIFI, controlled by a central PLC with analogue and digital inputs from various sources on the crane. Would need to be designed with voltages ranging from 415V AC – 24V DC.

AIM 2

The system must be able to measure and record 3 phase 415V AC motor currents.

OBJECTIVES

The crane has four motions which are operated by different sized wound rotor induction motors. These operate independently with the speed control either governed by thyristor control or by older contactor panels and banks of resistance. A total of five motors needs to be monitored.

AIM 3

The system must be able to store the duration of use of both hoist and travel operations whilst also recording a total usage time.

OBJECTIVES

Total running hours of each of the four motions individually and as a collective. Create a RAG system which would indicate when the crane needs to be taken out of service for maintenance checks.

AIM 4

The system must be able to record the number of operations of all service and emergency brakes.

OBJECTIVES

The mechanical brake operations of each motion will help determine the expected wear of the brake lining. This safety feature would prevent catastrophic failures where loss of load could occur.

AIM 5

Record the number of lifts and how much weight in Tonnes the hoist has transported.

OBJECTIVES

Ensure that the duty cycle of the crane is not being compromised and if overloaded an alarm sent to maintenance team so that thorough inspection could be completed.

PROJECT BENEFITS

Some benefits for the Steel & Slab department by the completion of this project would be.

- Improved crane utilisation
- Reduced downtime.
- Increased mean time between failure of crane's subcomponents.
- Smarter maintenance driven by usage rather than frequency of time.
- Remote access to the crane
- Ability to monitor the crane's real time data without the need to remove crane from service.

When the monitoring system is live enabling remote access, the estimate is the yearly maintenance man hours for this crane could be reduced from 674 to 336 meaning an approximate cost saving of £5K pa. Added to this is the cost of preventing major breakdowns before they occur which would save on production down times and the cost to replace the damaged component.

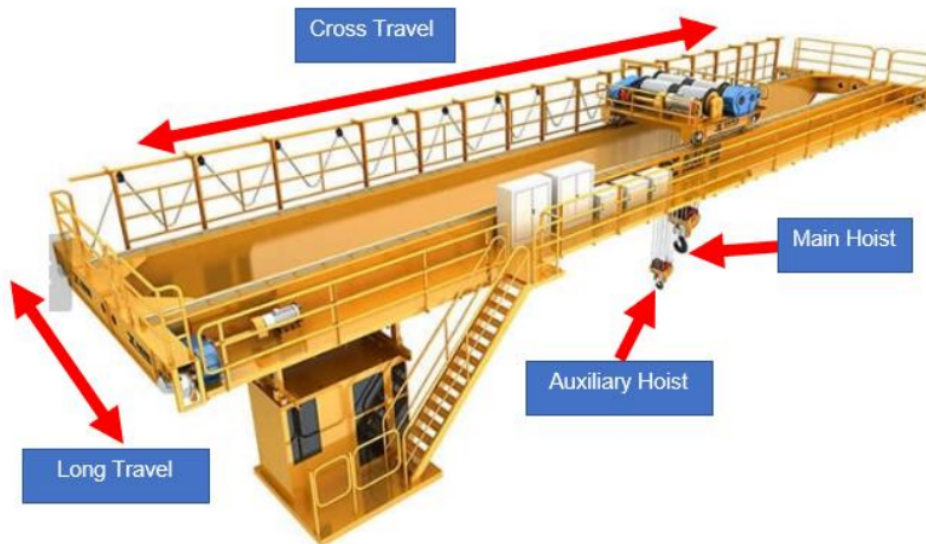
The overall cost savings if this system could be installed onto the other thirty-seven cranes in the department would be quite significant.

BACKGROUND

The overall system will need to be retro fitted to a wide range of drives, motors and panels due to the age range of the technology present. A majority of the cranes were built over 50 years ago, some having electrical upgrades while others are built within the last two years.

120T CASTING CRANE

The system will need to be installed on the 120T Casting (appendix 1) crane first, this crane is an overhead gantry crane with a main hoist lifting capacity of 120T and an auxiliary hoist lifting capacity of 10T. It is controlled by two different speed control systems. The main hoist and long travel are controlled by 'Thyromat' drives which uses thyristor control (appendix 3) and the auxiliary hoist and cross travel are controlled by 'Speedomat' contactor panels and rotor resistance (appendix 2).



[1]

Figure 2 - An example of overhead crane with double girders

CURRENT MONITORING SYSTEMS

After carrying out some initial research there are monitoring systems currently in service, the number seems to be limited for gantry cranes and more frequently used for Tower cranes.

Kone cranes use a 'Truconnect' [2] system which monitors similar data, this is connected to Kone supplied variable frequency drives not the older technology on most cranes currently at Tata.

PROJECT DESIGN

MONITORING SYSTEM

The project is to design, manufacture and install a monitoring system which can be fitted to an overhead gantry crane, to capture and store live data. Whilst also being able to access remotely when crane the is in operation for live data.

This will record a variety of different data which will be used to reduce the frequency of maintenance and prevent component failures before they occur.

RECORDABLE DATA

Some of the data that could be recorded are:

Operating Hours of four separate drives that record which direction the motor is rotating and also the overall running time of the crane.

Motor Currents of one main hoist, two auxiliary hoist, one cross travel and four long travel motors

Brake operations of a total of six mechanical brakes

Load limit activations of the main hoist.

Temperatures of gearboxes, motors, bearings or electrical rooms.

OVERVIEW OF COMPONENTS

The use of a PLC and SCADA screen mounted on the crane with different types of sensors relaying data to an access point installed to the crane which will communicate to the Con Cast WIFI network.

The environment in which this equipment will be installed is very harsh, it will be taken into account when selecting components for this project, as they will need to withstand the high temperatures and dust and vibration present.

RESOURCE / PLANNING

For the project to be successful there will need to be cooperation from a number of departments across the engineering and production teams at Steel & Slab. Meetings will be set up to discuss timelines, costs and resource, and also the most appropriate times to remove the crane from service to complete the installation so that it has the least impact to production.

STAKEHOLDERS

STAKEHOLDER	ROLE
Shaun Galsworthy	Electrical Engineer
Michael Healey	Works Engineer
Craig Phillips	MTF Manager
Chris Logan	Electrical PC&A Engineer
Luke Duggan	Area Production Manager
John McDyer	Cranes & Lifting Manager
Con Cast Crane Drivers	Crane Movements & Commissioning
MTF Electrical/Mechanical Personnel	Assistance with Install & Commissioning

Table 1 - Stakeholders

The GANTT chart in figure 2 displays the overall project timelines which will need to be met, once the project is started a more detailed GANTT will be produced to track specific tasks.

GANTT CHART

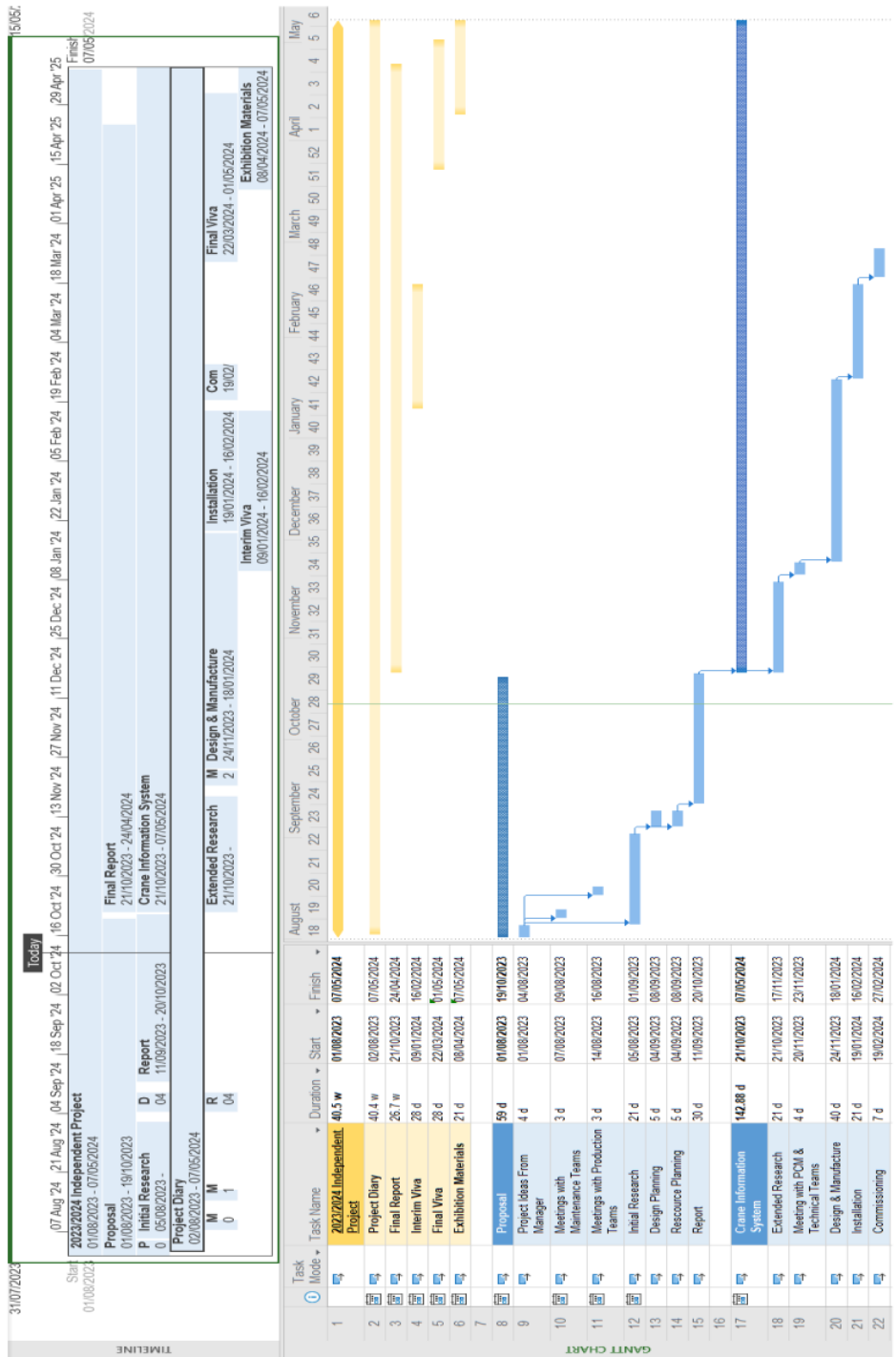
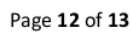
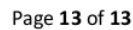


Figure 3 - GANTT chart of overall project

REFERENCES

- [1] <https://overheadcranemanufacturer.com/overhead-cranes/double-girder-overhead-crane>, "overheadcranemanufacturer.com," WeiHuacrane, 2023. [Online]. Available: <https://overheadcranemanufacturer.com/overhead-cranes/double-girder-overhead-crane>. [Accessed 18 10 2023].
- [2] K. Cranes, "TRUCONNECTRemoteService_brochure_Jun2021_Konecranes.pdf," *Truconnect remote service*, pp. 2-4, 2021.
- [3] N. Hashim, "Crane monitoring system based on internet of things using long range," *International journal of electrical and computer engineering (IJECE)*, vol. 13, no. 2, pp. 2228-2230, 2023.
- [4] J. Jota, "Understanding Load Cells and Load Monitoring for Overhead Cranes," *Unique Group*, p. 1, 2023.
- [5] C. Clement, "CRK Technologies Smart Remote Crane Monitoring Solution and Software," *CRK Technologies*, p. 1, 2019.





Project Proposal

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

70/100

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14