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| Solent University |
| Project Initiation Document |
| Transmitter Power Measurement |
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| **April 2021** |
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# Introduction

## Background

Arqiva operate the terrestrial broadcast TV and radio network of transmitters in the UK. These transmitters are controlled and monitored from a central location in Yorkshire. High power VHF transmitters are tested by connecting them to a 'test load' instead of an aerial. The transmitter functions at full power, but the radio frequency energy is sunk in a test load instead of being transmitted. Operating at full power can cause the test load to become extremely hot. Currently the temperature of the test load is calculated using a thermostat locally.

The vision for the project is to create a mechanism to allow the temperature to be measured using a thermocouple and reported remotely.

# Objectives and Benefits

The project will need to achieve the following to meet its goals:

* Develop a process to change the glass thermometers for ‘calorimetry’ power measurement at high power VHF sites on the Test Loads, using two-input digital thermometers, thermo-pockets and suitable temperature probes.
* Chosen temperature probes should have a temperature range – 0 – 100C not -300C to +3000C and a differential, not absolute, accuracy of 0.05C would be acceptable.
* The digital thermometer will be required to do the temperature difference calculation T1 – T2.
* Testing will be required to prove it is immune from VHF interference and checked against known good glass thermometers.

*It has been advised to use commercially available parts, with industry standard probes. If plugs/sockets are used, they must be reliable so that means good quality and probably capped/sealed (either with two handheld meters, one per ‘side’, or the meters could be permanent).*

# Requirements

## Requirements

The functional requirements within the scope are as following:

1. Gather thermocouple readings from sensors
2. Gather flow-rate reading from the flow-rate sensors
3. Power should be calculated from the sensor data
4. On-site hardware should be able to be individually calibrated
5. On-site hardware should be secure
6. On-site hardware should transmit sensor readings/calculations securely
7. Sensor readings should be stored securely
8. A remote user should be able to view stored sensor readings for each transmitter
9. The visualisation software should be secured against unauthorised access
10. Thermocouples should be able to withstand temperatures of up to 100˚C.
11. Thermocouples should have a differential accuracy of 0.05˚C.
12. Hardware should cost no-more than £200 per test load.

Whereas the non-functional requirements of the project are as following:

1. Visualise the sensor readings for each transmitter
2. Display historical sensor data for each transmitter
3. Thermocouples should be able to be simulated for testing purposes.
4. There should be a test harness
5. The system should detect and raise alerts for anomalies in power/temperature readings, including response timeouts.

## Scope

# Key Stakeholders

## Team

|  |  |
| --- | --- |
| Name | Role |
| Mark Hartop | Project Owner |
| Matthew Dear | Scrum Master |
| Matt Brook | Front End Lead |
| Kieron Gillingham | Communication Lead |
| Klea Cengu | Documentation Lead |
| Joahua Alsop-Barrell | Back End Lead |

## Other Stakeholders

|  |  |
| --- | --- |
| Name | Role |
| Peter Katic | Sponsor |
| Craig Gallen | Mentor |
| Temperature Monitoring Attendant | The end user who will monitor the incoming messages through the provided visualisation software. |
| On-Site Engineer | An engineer who may be required to recalibrate the hardware on-site. |
| System Administrator | An administrator who will need unrestricted access to any component of the system including data storage. |
| Governing Body | An organisation that requires the system to adhere to safety guidelines and policies. |

# Plan

## Approach

The proposed intention is to create custom software for Arqiva to ensure that they will be able to report remotely. The architecture diagram also includes the software we are intending to use.

Diagram

Description automatically generated

## Assumptions

Some assumptions for the project include:

* The team will be available for the required period 01/02/2021 - 21/05/2021
* Key stakeholders will be available for the required oversight/governance
* Team have the necessary technical skills

## Constraints

Some limitations are as following:

* Completion of the project
* Working remotely, we can’t physically attend site

## Schedule

The project milestones and tasks are displayed in the table below:

Table

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# Governance and Controls

The link provided below will provide you access to the documentation of our Wiki page on GitHub:

Wiki: <https://github.com/mattdear/temperature_transmitter/wiki>

Our project register of issues can be accessible with the link provided below:

<https://github.com/mattdear/temperature_transmitter/issues?q=is%3Aopen+is%3Aissue>

The governance of the team can be depicted in the team structure diagram. It was initially agreed that there would be 2 team meetings a week that are scheduled on Tuesdays and Thursdays.

Diagram

Description automatically generated

# Initial Risks

*Provide an initial view of project risks. The purpose of this is to promote discussion amongst the team, and to ensure that the approach and schedule mitigate significant risks.*

*It is likely that not many risks will be known at this stage, but describe the ones that you can, and transfer them to the main project risk log.*

*Below is an example format.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Description | Impact | Probability | Actions |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

# Deliverables

# Implementation

# Conclusion

## Recommendations

# References

# Appendices