

2320269

by Owen Davies

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The logo for QINETIQ, featuring the company name in a white, sans-serif font. It is positioned within a dark blue, semi-circular graphic element that is part of a larger abstract design on the right side of the slide. The background of the slide is a dark navy blue with abstract, flowing shapes in lighter blue and white on the right side.

QINETIQ

Owen Davies: HNC Project
Presentation
Cooling system for test room

QinetiQ Aberporth

Company Background

QINETIQ

- One of the largest defence companies in the UK which has Test and Evaluation (T &E) sites across West Wales including Aberporth.
- T &E funded by Long-Term Partnering Agreement (LTPA) with UK Ministry of Defence lasting till 2028.
- Home to 200+ employees.
- Aberporth provides a large safety area of approx. 6,500km for testing of the following:
 - Air to Air missiles
 - Surface to Surface projectiles
 - Short- and long-range weapons
 - Unmanned Aerial Vehicles (UAV)
 - Unmanned Surface Vehicles (USV)

Good background information



Image of Aberporth Rangehead

The Project: Relevance

- The project is designed to monitor ambient temperature conditions in a test room and control a fan based on predefined temperature thresholds. The system aims to activate the fan when high temp is detected, ensuring optimal environmental conditions.
- Several trials in Aberporth have been completed involving temperature sensors on different missiles providing telemetry data.

Good argument for project

Project Objective - Purpose

- **Cooling system for test room**

- Temperature monitoring system using analogue temperature sensor (0-20mA) PID control with heavy duty fan and driver.
- The temperature system sensor will allow for low temperature and high temperature to be detected which will send a command accordingly to heavy duty fan and driver. The need for this is to be able to detect high heat and act by putting on the fan ensuring optimal environment for components.
- Practical aspects of project will be undertaken in Graig Campus, Llanelli due to the sensitivity of equipment in MOD Aberporth.

Objective has been realised

Specification : Functional Design

- 1. Initialisation :
 - System boots up, initialises the temp. sensor and fan driver.
 - Establishes communication between components.
- 2. Monitoring Loop:
 - Read temp. data from the sensor at regular intervals
 - Compare the current temperature to the defined thresholds
 - If temp > High Threshold, Activate the fan
 - If temp < Low Threshold, Deactivate the fan
 - Log temp readings for monitoring and analysis.

Good FD spec

Health and Safety



- Risk assessment will be carried out before any work is begun
- Sufficient interlocks present in order to prevent any risk to injury
- All wiring will be done to the current legislations with respect to electrical and industrial safety
- The driver circuit will be rated for the fan's power requirements to prevent overheating
- Considering adding a manual override switch for the fan operation.

Why must this project be done?

- Cut down costs
- Saves money for QinetiQ
- Ensures optimal environmental conditions for components

Good argument

Testing and Planning

- Test the system under various temp conditions to ensure accurate detection and fan activation.
- Validate the responsiveness of the control logic to changing temp conditions
- Ensure the fan operates within safe temp limits without causing overheating
- Maintain a log of data for temp sensor and fan specifications.

Alternative Solutions: Solution One

- Siemens PLC with cooling fan and encoder
- Fan speed can be controlled using the feedback from the encoder.
- The encoder is built into the fan structure



Siemens PLC



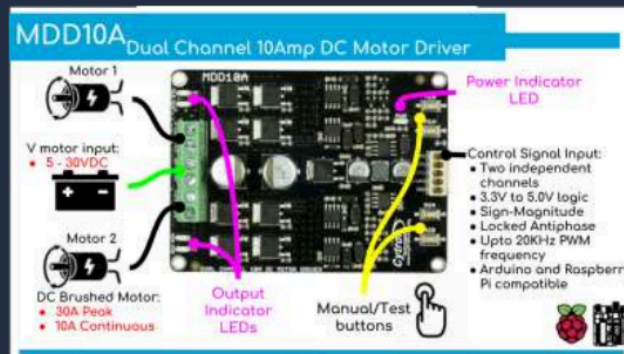
Good relevant solution

Cooling Fan

Solution two

- Arduino Control – this controller uses a text-based program language (C++) that can control the process using a PID built in library with PWM dedicated outputs on board.
- Some complex registers will have to be configured and the PWM frequency will need to be increased as the default frequency is 470HZ. This would cause the fan to appear to stall.

Good relevant solution



Cytron Driver Board



Arduino Mega



Fan wired to Arduino

Solution three

- Relay and timers



Industrial bank of relays

Good relevant alternative



Industrial Timer

Chosen Options:

Solutions	Pros	Cons	Notes
<u>Siemens PLC – CHOSEN OPTION</u>	Powerful, multiple inputs and outputs, room for expansion and relatively durable	Expensive, fairly large, infrastructure required	Strong knowledge in TIA which is the chosen software for the system
Arduino	Flexible, cheap, small, highly modifiable	Requires external components, needs to be constructed	Requires knowledge of LabVIEW
Relays + Timers	Relatively simplistic, cheap and easy maintenance, no software required	Large area needed, design will be complicated, not very flexible	Requires decent amount of knowledge of electrical design and logic

Costs the costs for the project have been calculated below:

Product	Cost
HMI	£850
PLC	£500
Heavy Duty Fan	£200
Sensor	£150
Total	£1,700

Good costs comparison carried out



PLC



PID Temp Sensor

Gant Chart

The gantt chart displays the project milestones throughout the 31 weeks.



Thanks For listening – Any questions?

QINETIQ

FINAL GRADE

GENERAL COMMENTS

80/100

PAGE 1

PAGE 2

Text Comment. Good background information

PAGE 3

Text Comment. Good argument for project

PAGE 4

Text Comment. Objective has been realised

PAGE 5

Text Comment. Good FD spec

PAGE 6

Text Comment. Good safety points relevant to the industry

PAGE 7

Text Comment. Good argument

PAGE 8

PAGE 9

Text Comment. Good relevant solution

PAGE 10

Text Comment. Good relevant solution

PAGE 11

Text Comment. Good relevant alternative

PAGE 12

Text Comment. Good use of comparison table

PAGE 13

Text Comment. Good costs comparison carried out

PAGE 14

Text Comment. Plan is realistic with comparison timeline

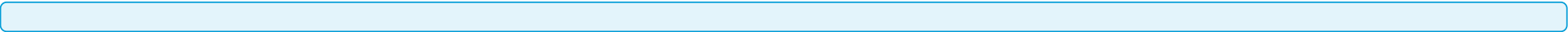
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GRADING FORM: CSG-RUBIC

OWEN DAVIES

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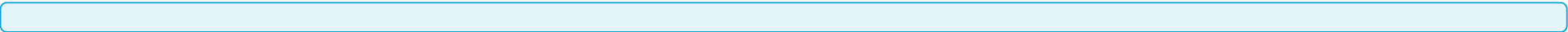
RESEARCH-INFORMED LITERATURE



 Project background has been effectively presented with sound knowledge of the problem to solve. 8.5/10
Very good evidence of research demonstrated with good information on solutions. 8.5/10

17/20

KNOWLEDGE AND UNDERSTANDING



 Project definition has been effectively presented with sound knowledge of the specific problem to solve. 4/5
Constraints, codes of practice and standards have been appropriately covered. 3.5/5
Environmental and sustainability issues have been covered effectively with good arguments. 4/5
Functional design has been explained in detail. 4/5
Very good response to questions that demonstrated knowledge and confidence. 8.5/10

24/30

ANALYSIS



 Problem definition has been clearly identified and explained in detail. 4/5
Functional design spec has been explained using block diagram. 8/10

16/20

Justification of final solution is justified from the comparison. 4/5

PRACTICAL APPLICATION AND DEP.

- ✎ Design spec has been explained and each component in the system has been covered. 3.5/5
- Critical choice argument has been effective with good relevant points and use of comparison table in slides. 7.5/10
- Critical choice argument has been effective with good relevant points. 4/5

15/20

SKILLS FOR PROFESSIONAL PRAC.

- ✎ Project plan has been created and includes all the significant parts of the project from start to completion. 4/5
- Delivery of presentation was very good and confident.4/5

8/10