Brew Buddy

Mid Project Status Report

Prepared by Sam Ward

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Team Members

Name	Student ID	Major
Sam Ward	17004205	BEng – Electronic Engineering BCIS – Software Development
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Jeff Kilby	N/A	BEng – Project Supervisor
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Justin Matulich	N/A	BEng – Lab Technician

Project Description

Brew Buddy is an autonomous control system that allows home brewers and distillers to introduce automation to their set up, utilising their existing equipment. It is designed to be adaptable and scale able from small to medium sized home breweries. It will provide users with automation functions that are not currently available on the market, allowing them to not be tied to the tedious manual brewing process. It will achieve this with a far simpler implementation and at a lower cost than existing market products.

The Brew Buddy project will be completed in 8 Months and will be a viable Marketable product. This will be achieved through a well-documented project method and detailed schedule. The three project team members have 25 years of electronics experience between them and have worked together on many projects in the past, allowing for good team cohesion and communication.

Project Overview

The Brew Buddy project is making good progress, ending the first half slightly behind schedule. Project scope has been completed for both the BEng and BCIS elements, and most of the system components have been ordered ready for integration. Some upskilling is still required but the project team has been working well together with no issues and are ready to dive in to full fledged development for the second half.

Amendments to Project Proposal

Schedule

The project schedule was amended to further break down some of the tasks, and to include the key milestone tasks. More software specific activities were added including upskilling, and a second development task.

Software Development

Greater emphasis on the software elements of the proposal such as requirements and resources.

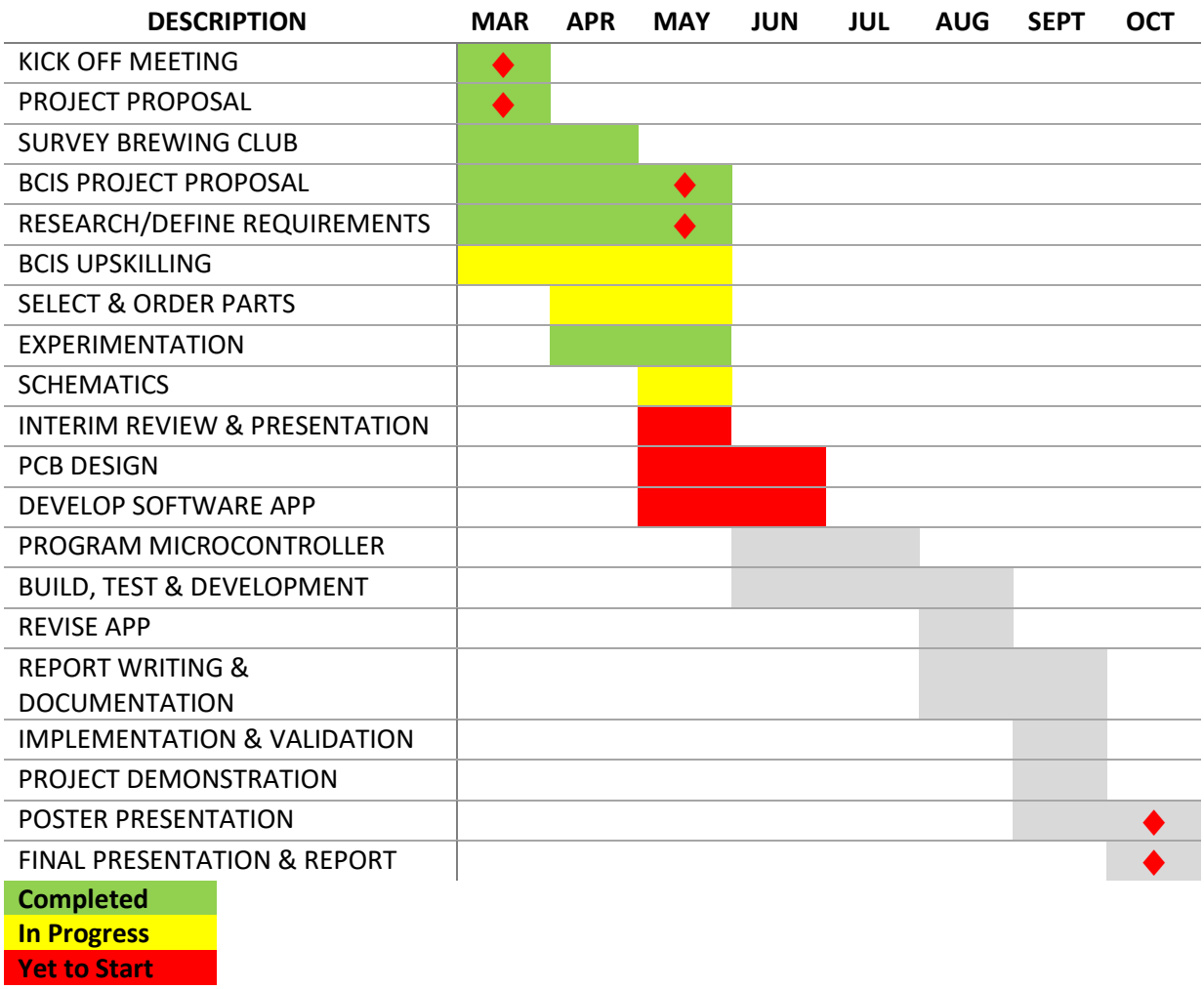
Cost

Hardware cost was increased slightly. The initial estimate was based off ordering things from AliExpress, however there have been a few times where we needed a component quicker so had to source it locally and pay a premium to not hold up the project progress. On top of this it has led us to “order first ask questions later” which has the potential for purchasing of parts that are not required, though this is generally restricted to very cheap parts.

Summary of Project Status

Schedule

The following schedule is an overview of our project tracking so far. As we are coming to the end of May this shows that we are possibly a week or two behind schedule.



Brewing Club Market Research

To help us determine our system requirements and target areas we engaged with the Whenuapai Brew Club to give us some market feedback in the form of a survey. This deemed to be very helpful and highlighted some areas of improvement we had not considered. Using this feedback and our own experience, we decided on the flowing focus points for our project (these are expanded on in a separate requirement document):

Safety

The current status quo of lifting and moving vessels containing hot liquids is dangerous, a closed loop system with integrated cooling functionality will eliminate this danger.

Time

Brew days take 6-8 hours requiring a lot of focus, through automation we aim to make this process more hands off so the user can free up time to utilised elsewhere.

Further Automation than what is currently available

Current “automated” systems on the market still require a lot of manual input, Brew Buddy will go beyond this with the goal of a start to finish brew with no user input.

Temperature Control

Maintaining exact mash and sparge temperatures is difficult in a manual system, this will be automated through sensors and element control.

Sparge Automation

Usually, sparging is done with pre heated water poured over the grain. Our system will heat the water as it is pumped into the mash tun and utilise the fly sparge technique.

Cleaning Automation

Cleaning equipment after a brew is a lengthy and painful process. Using a tap connection our system will heat, cycle, and discharge water through all of the equipment in order to clean it.

BCIS Upskilling

- Arduino prototype for temperature PID control and water flow control.
- Introduction into ESP32 using VS Code.
- Connection of phone to ESP32 via Bluetooth and Wi-Fi.
- Testing of WPS connection to ESP32.
- Research into app development using Xamarin.

Experimentation

Temperature Loss and Efficiency Testing

Used to determine how much energy is lost to the conduction and passive radiation of heat in a “standard” homebrew setup.

Results

- 0.67kWh lost for 25L of water just below boiling (Energy loss decreases proportionally as the temperature is lowered)
- 1.11kWh lost for 25L of water at boil.

In-line Heating of Ambient Temperature Water for Sparging

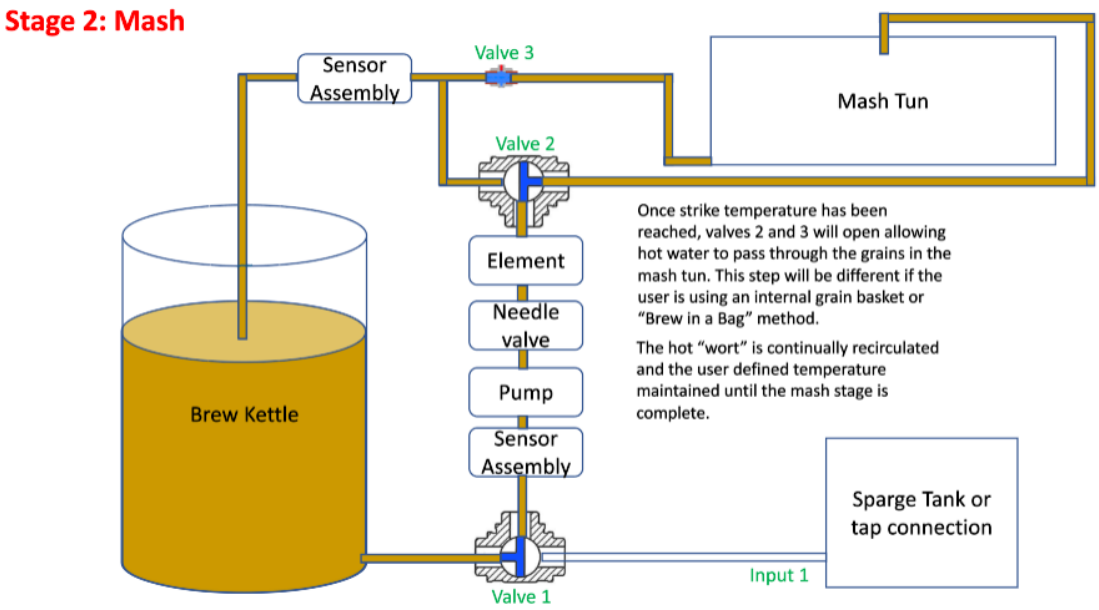
20°C water heated to 75°C in one pass of our 2.2kW RIMS heater element. Utilising a needle valve, the water flow rate was varied until the output temperature remained steady at 75°C (Approx. 0.45L/min) This proved our design methodology allowing for complete automation of the sparge process without the need for costly additional pumps and heater elements.

Ordering of Parts

Research into the major system parts is mostly complete, with most of them already purchased. This includes the ESP32 microcontroller, the magnetic drive pump, the 2.2kw heating element, various sensors, and some valves.

Schematics

We have finalised our design and created an animated system diagram that shows each of the stages. Example:



Research and Requirements

Requirements for the app have been elicited, along with some mock-up drawings.

Recommendations for Improvement

Cohesion of Project Elements

I could do more to teach the other two members about the software aspects of the project, so far, the two project parts have been very segregated. Getting them up to speed and on board will definitely help with the development of the app itself, as well as the integration between the app and micro.

Project Logbook

I need to be more on top of filling out my project logbook, while not recording work immediately has not had any project implications so far, it has added to the workload down the line. There is potential for this to have an impact on the project in the future.

Meeting Agenda and Minutes

We have not been taking very good records of our meetings so far. When we get together to do project work, we do take rough notes but there is area for improvement and the project would benefit from a more structured recording.

Summary of Individual Contributions

As we are a small close-knit team, the majority of the work is carried out together or contributed to by all team members. Some of the stand outs for me would be:

- Distilling expertise
- Component's research and ordering
- Microcontroller prototyping
- In-line water heating experiment
- PWM voltage regulator design

I am also solely responsible for anything relating to the BCIS documentation or software development.