

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui



School of Engineering and Computer Science
Te Kura Mātai Pūkaha, Pūrorohiko

PO Box 600
Wellington
New Zealand

Tel: +64 4 463 5341
Fax: +64 4 463 5045
Internet: office@ecs.vuw.ac.nz

**Instrumentation System for Liquid
Drop Impact and Evaporation**

Daniel Eisen

Supervisor: Gideon Gouws

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Bachelor of Engineering with Honours.

Abstract

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1 Introduction

Will be an executive summary of following sections, mention who's research this fits into, requirement for budget to cover manufacturing cost etc, and that Will will be a contributor to an auxiliary project that affects this.

2 The Problem

This project is concerned with the development of a instrumentation rig for the study of droplet impact and drying. It is primarily/initially motivated by the powdered milk production process, specifically the behaviour of the drying and collision of concentrated milk droplets. Furthermore, the research, and developed method and procedure can be applicable to various industries.

To effectively investigate the behaviour, a variety of aspects can be tracked and characterised during a microscale equivalent lab process, from differing temperatures, substrates, volume, and concentrations.

Currently there is an existing platform for the dispensing of droplets and data capture using high speed cameras and other various sensors. It has limitations due to manual control of starting the cameras capture and temperature capturing as well as requiring the operator to position and dispense the droplet by hand.

This project will therefore, focus on the design and evaluation of the third generation of this platform with the aim to design and integrate various new subsystems and evaluate their performance against the criteria of improving the reliability and repeatability of the experiments as much as possible.

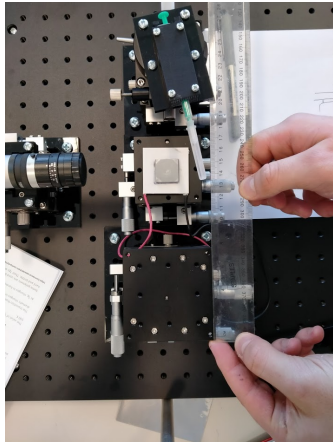
2.1 Background and Applications

...

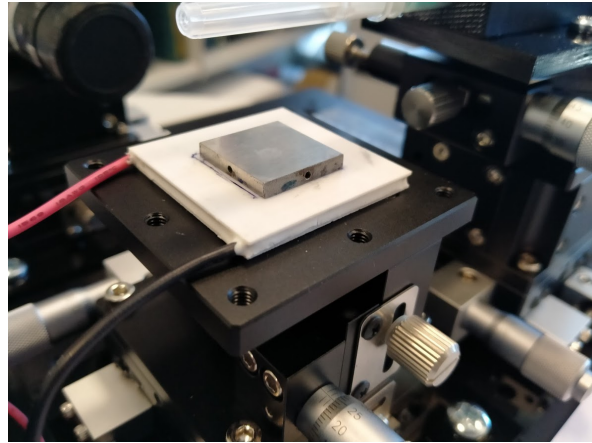
3 Proposed Solution

Evaluate current systems results and identify its short comings. Produce evaluation data and bibliography (est. x wks)

- Repeatability of dispensed droplet parameters (position, volume (size), contact angle) and correlate and/or see how the variation in these parameters effects the observed temperature profile and physical behaviours of the droplet throughout the evaporation process.
- Identify other sources of variation, such as humidity etc and their weight of influence (whether perusing a solution is worthwhile)
- Compare with similar solutions in literature to gain more insight into required design consideration and constraints.



(a) Full Top View



(b) Substrate Stack close-up

Figure 1: Previous Rig Assembly (bar top camera)

3.1 Base Deliverables

- Mechanical designs to hold, centre, and clamp the substrate stack (fig 1) together.
- Synchronous data collection, ie cameras, temperature, droplet
- Investigate different droplet release possibly electronic pipette *other I've forgotten*
- Control Code
- ...

3.2 Stretch Goals

- Motorised droplet stage
- Atmospheric control enclosure
- ...

3.3 Milestones

- ...

3.4 Timeline

4 Evaluating your Solution

The work done will be evaluated based on the comparative performance of the development subsystems to improve reliability and repeatability of experimental data and how the work provides a significant contribution the process.

Gantt Chart

Task Name	Q1 2019			Q2 2019		Q3 2019
	Jan 19	Feb 19	Mar 19	Apr 19	Jun 19	Jul 19
Planning						
Research						
Design						
Implementation						
Follow up						

Figure 2: Example Gantt Chart filler, will be replaced with actual timeline

5 Resource Requirements

5.1 Facilities and Tools

- Labs AM219 and LB207
- Computer with SolidWorks, LabView, *other data processing tools*
- Electronics Test bench (PSU, signal gen, scope etc)
- Access to fab workshop

5.2 Budget

We are starting with an initial budgetary restriction of \$500 to cover workshop manufacturing cost, cost of acquiring components, PCB design (for possible interfacing with electronic pipette).

Note that most base components have been already acquired and there is the possibility to access further funding from the research project if absolutely necessary and will have to discussed.

6 COVID-19 Alert Level Management

Level and planned work that can be achieved and undertaken at the various levels.

6.1 Level 1

6.2 Level 2

6.3 Level 3

6.4 Level 4

Bibliography