

# PVC Analyser

Melissa Skidmore | July 2024



# PVC

- Polyvinyl chloride (PVC) is a cost-effective, versatile, light weight, durable, chemically resistant and versatile polymer.
- Applications across various sectors including windows, flooring, cables, sheeting, medical supplies, and construction.
- PVC reputation as a problematic polymer, production process, additives, contaminates other polymer streams, recyclability.
- PVC is one of the top four polymers consumed in Australia by weight.
- PVC has one of the lowest reported recovery rates, sitting at a mere 2%.





# Background

## Current state of PVC recycling in Australia

Without an adequate understanding of the precise chemical formulation of the feedstock, recycling is challenging indeed.

- Most methods for uPVC currently in use that have the capability of analysing the components of PVC rely heavily on **specialised knowledge, equipment,** and often **libraries** of existing standards
- Develop a SIMPLE prototype device that will analyse the composition of PVC recycle

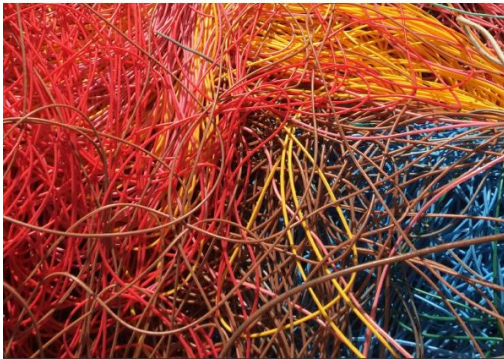


Australia's National  
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### PVC recycling in Australia

Current status, barriers, and opportunities

February 2022



# How is it currently done?



- Visual characteristics of the output material to understand the additive present
  - shape of the material
  - presence of surface features
    - bubbles
    - roughness
  - colour
  - edge
- Adjust the processing and add additives conditions to create the desired grade
- Meets the required grade
- Could we apply AI/ machine learning?

# Analysis software

- Image analysis software was designed to analyse video of extruded recycled PVC



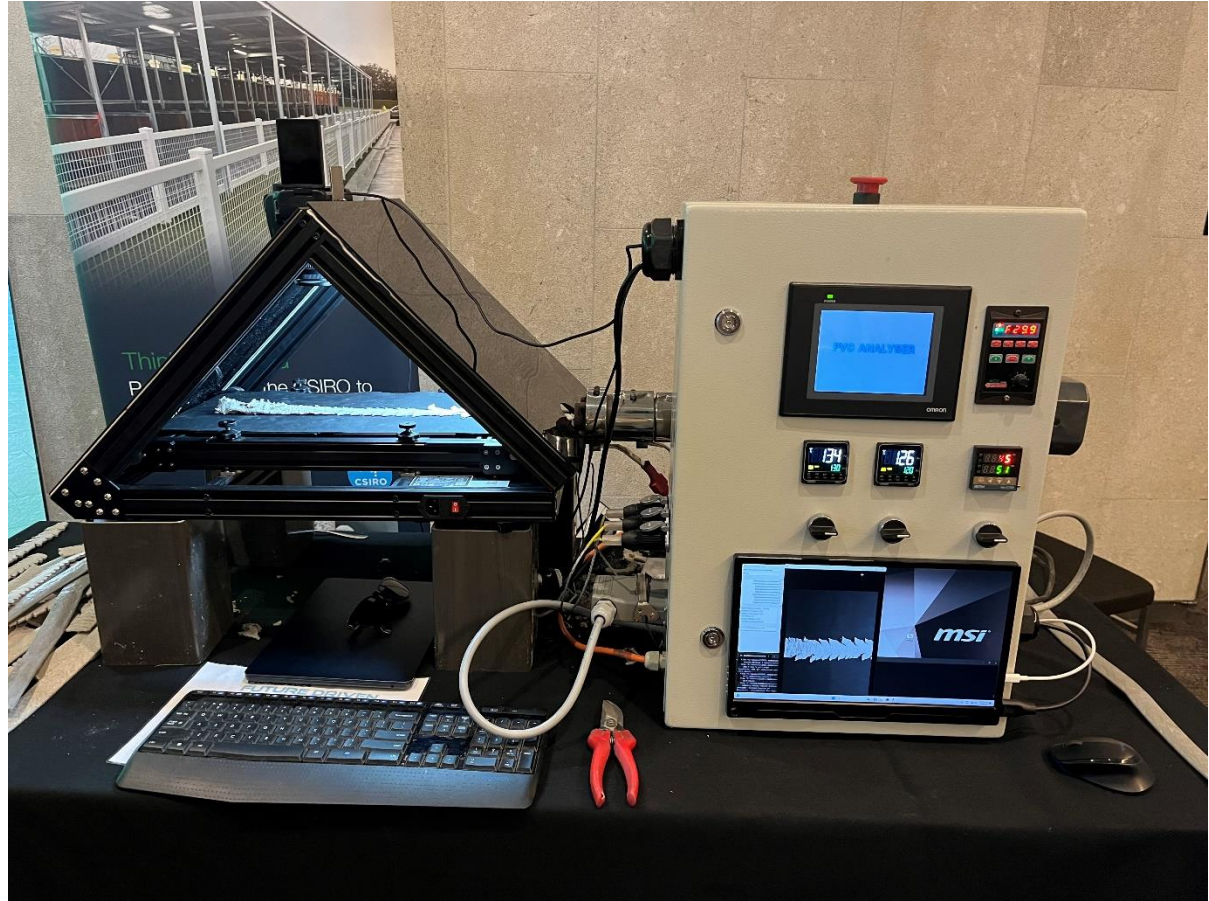
The screenshot displays the 'PVC visual analysis - v0.4' software interface. The main window shows a video frame of the PVC profile with red circles indicating detected bubbles. Text overlays include '74 bubbles', '1.29', '1.20', and 'max. color diff 57.0'. A settings panel on the right lists parameters such as 'Bubble Detection cannyThreshold1: 30', 'minBubbleArea: 5', and 'minCircularity: 0.5'. A terminal window on the right shows a Python traceback error: 'ValueError: The edges of the product is extremely distorted. Unexpected condition.' The terminal also displays real-time data from an Arduino sensor, including 'Counter: 1/7' and 'Temp range: 3'.

# PVC Analyser

- Extruder, conveyer belt, camera and computer
- Graphical user interface (GUI) developed for the image processing software.
- Development of a temperature control program that facilitated real-time adjustments to the extruder's temperature
- Manual adjustments
- Temperature control program that facilitated real-time adjustments



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## Today

- Prototype working device
- Semi-automate process
- Proof of principle with fully automated temperature control.
- Submitted a provisional patent

## Future

- Fully-automated process
  - Device control
  - Additive addition

**This device allows for the processing of unknown samples of PVC, knowledge of the formulation or origin of the granulated PVC material is not required.**



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# Thank you

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