MONASH INDUSTRY TEAM INITIATIVE (MITI)

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Clean-In-Place (CIP) Systems Monitoring & Optimisation

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BACKGROUND

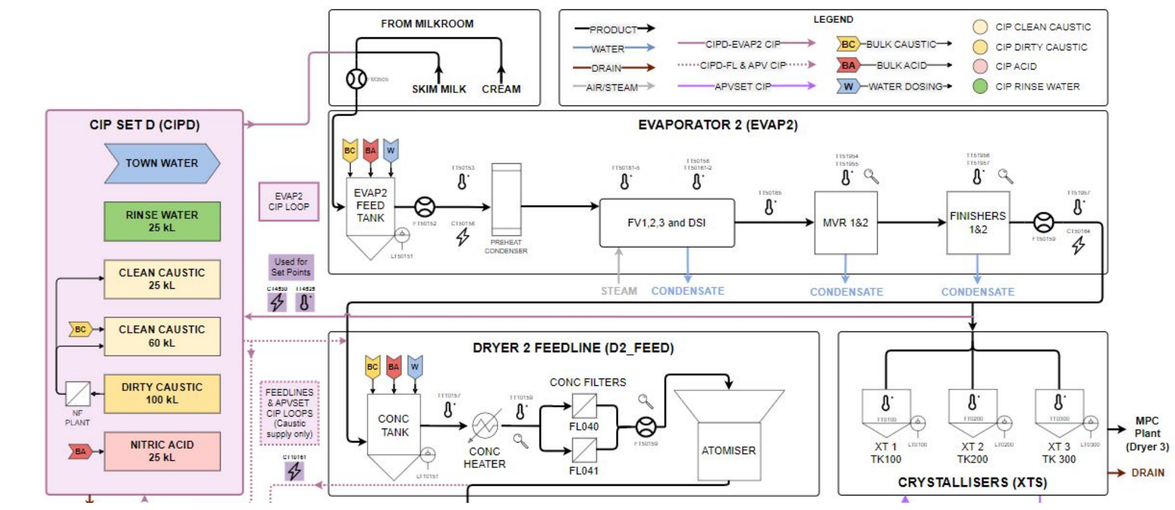
In food manufacturing CIP is a crucial component to producing high quality products. CIP uses substantial quantities of chemicals that can impact wastewater quality and its usefulness in activities such as irrigation. It is important to ensure the CIP processes operate as efficiently as possible to minimise the environmental and financial impact.

OBJECTIVES

- Understand and map the APV Evaporator and Spray dryer operation and CIP process
- Understand the parameters that contribute to an ideal CIP
- Analyse the current CIP and compare with ideal
- Produce recommendations to improve CIP and reduce caustic soda use

CIP PROCESS MAPPING

By investigating the dryer production unit and comparing it to the existing P&IDs, diagrams were constructed to determine how the process worked and what pieces of equipment needed to be tracked.



CIP ANALYSIS & SCORING

A scoring system was created comparing CIPs for each production unit. For each CIP, the key areas of chemical concentration, cleaning time, temperature, and flow were considered, including the amount of extra chemical dosed due to the focus on caustic savings. Grafana dashboards were created with trends of CIP performance over time, hyperlinked to an analysis page for in depth analysis of a specific CIP.

RECOMMENDATIONS AND SAVINGS

Recommendation	Chemical Reduction	Explanation
1. Crystalliser Caustic Wash	~90%	• Caustic is not returned after crystalliser wash. Adjusted default setting in PLC
2. Acid Recovery from Feedlines	~90%	• No pipework to return acid from a feedline wash. • Install new pipework to run acid back to CIP D
3. Buttermilk Standardisation	~65%	• Reduce run frequency through collaboration or buttermilk storage • Use CIP D rather than inconsistent bulk dosing for Caustic
4. Evaporator Bulk Dosing	~15% Caustic ~1.45% Acid	• PLC program change to add the minimum caustic to prerinse • Operator training
5. Feedline Concentration Reduction	~54% Caustic ~75% Acid	• Concentration of chemical usage is unnecessarily high. • Complete CIP validation and implement PLC setpoint change

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