Monash Industry Team Initiative (MITI) 2015-16
Whey Process – Reduction of Waste and Resources

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About Devondale Murray Goulburn

Devondale Murray Goulburn (DMG), formed in 1950, is Australia's largest dairy foods company and a co-operative of Australian dairy farmers. They process roughly a third of Australia's milk and produce a range of products including butter, cream, milk powders, whey powders, cheese products, lactose, protein concentrates, and infant formula.

Project Aims

A significant amount of effluent (waste) was believed to be produced in the whey processing area at the DMG site located in Cobram. The aims of the project thus focused on the whey processing plants and involved the following:

- Investigating the sources of the whey waste

- Building real time models of whey processing units to quantify the amount of effluent from significant operations

- Make recommendations based on findings and implement them if feasible

Whey Processing

Whey is the liquid by-product in cheese production. It contains lactose, fats, minerals and proteins. DMG Cobram makes several products from whey including whey cream, whey protein concentrate (WPC) powder, and lactose powder.

A simplified process flow diagram of the whey processing area is shown below in Figure 1.
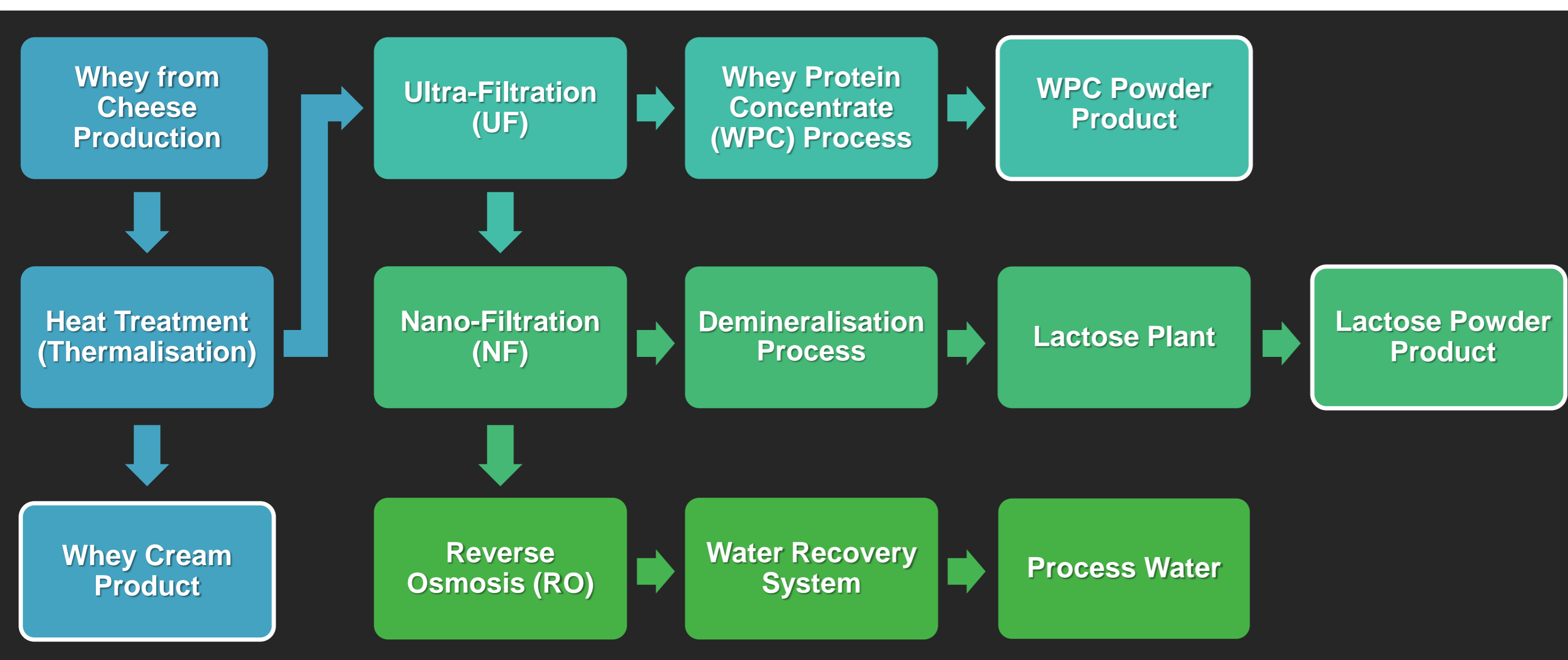

Figure 1: Simplified process flow diagram of the whey processing area in the Cobram site.
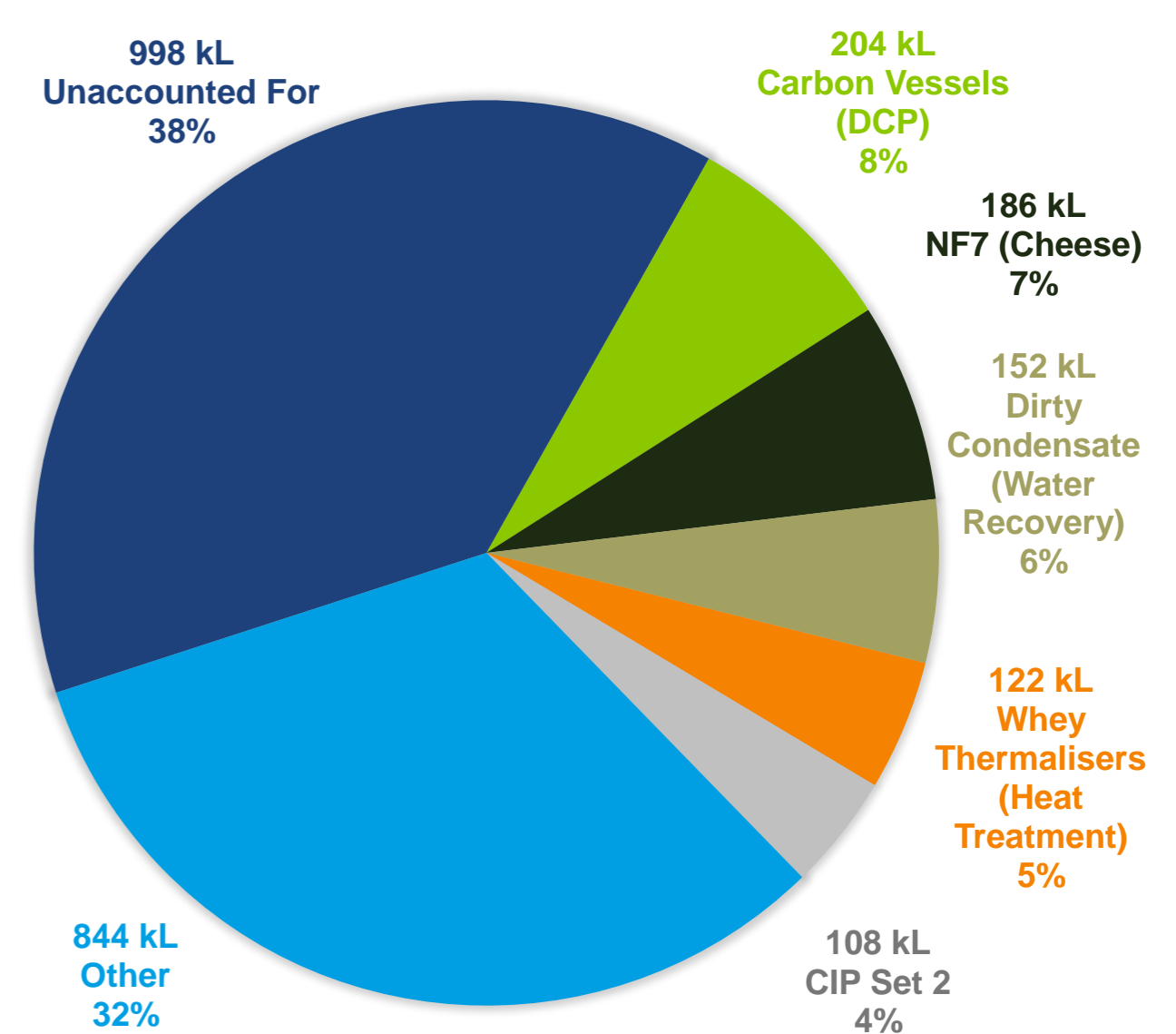

DAILY EFFLUENT WHEY PIT CONTRIBUTIONS

- 998 kL Unaccounted For 38%
- 204 kL Carbon Vessels (DCP) 8%
- 186 kL NF7 (Cheese) 7%
- 152 kL Dirty Condensate (Water Recovery) 6%
- 122 kL Whey Thermalisers (Heat Treatment) 5%
- 108 kL CIP Set 2 4%
- 844 kL Other 32%

Figure 2: Waste identification results based on a week of data.

Outcomes

1) Modelling of Whey Processing Units

A total of 25 models were developed. All significant sections of the whey processing area was covered including the Cleaning In Place (CIP) sets.

The models use real time inputs from the DMG control system and quantifies the amount of waste for a specified day or week. The waste due to production and CIP are identified. It also displays the unit's effluent contribution to allow for the identification of irregularly high waste production.

2) Identification of Waste

Using the 25 models developed, 55-65% out of an average flow of 2.6 ML/day of the effluent was identified. Figure 2 shows the largest effluent contributors based on a week of averaged data.

Despite modelling all the significant whey processing units, 35-45% of the effluent still remained unidentified. This suggested that the remaining effluent was due to processes outside of the whey processing area.

A map of the drainage system at the Cobram site later confirmed this. It showed that the whey effluent pit not only received waste from the whey area but also serviced other areas of the site including processed and retail cheese. These additional areas would contribute to the unidentified effluent.

3) Master Whey Room Report

A reporting tool for DMG employees was also developed to automatically gather all the data from the 25 models and report the information in a single file. It displayed both daily and monthly information making analysis of the whey processing area simple and user friendly, while individual models existed for more comprehensive analysis.

4) Recommendations

Recommendations were made that would identify the unaccounted effluent contributions, recover water, and reduce effluent volumes. In total, the recommendations had the potential to recover 200-750 kL/day of water and prevent this volume from being sent to the effluent pit.