

# MONASH INDUSTRY TEAM INITIATIVE (MITI) 2018-2019

## Loss Monitoring Project

Ali Rizvi (MDataSc)  
Fahad Mubashshir (BChemEng)

Danielle Jackson (BChemEng/BCom)  
Keyura Shah (BChemEng)

### PROJECT BACKGROUND

The concept of loss monitoring is a way to identify and prevent process losses. The project focused on developing a consistent method of data acquisition across all sites.

### METHODOLOGY

- Project planning and research
- Visiting sites (Coburg, Tatura, Lagoon St and Koroit)
- Documenting observations and comparing findings
- Identifying and analysing areas of high loss potential
- Implementing various BI tools to determine trends and analysing reasons causing the trends
- Investigating effluent testing procedures at each site

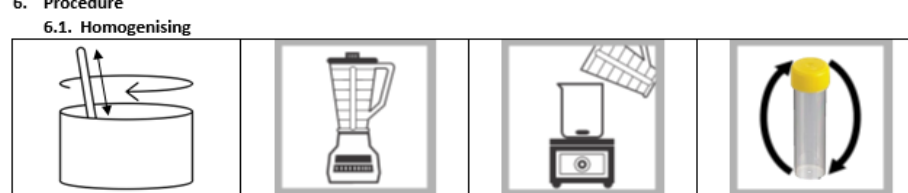

### PROJECT OUTCOME

- Derived solutions which could reduce effluent testing costs by 50%
- Designed an application that automates the manual data collection for the Loss Monitoring System
- Identified new biotechnologies to help reduce effluent going into trade waste
- Developed standardised SOPs based on industry best practice for effluent testing
- Implemented data visualisation tool to analyse data and provide new insights

### FINDINGS

- Initial loss monitoring system
- On site sampling and effluent testing procedures which comprises of sample extraction and collection
- Data trends
- Theoretical yield and process efficiency

Laboratory	Standard Operating Procedure (SOP)	Bega
Chemical Oxygen Demand (COD)		
Approved date:	Supersedes:	23 Aug 2016 Page 1 of 5
Legends		
Good Manufacturing Practices	Critical Activity	PPE Required
<p><b>1. Purpose</b> To ensure COD testing is performed correctly by using the appropriate equipment and reagents.</p> <p><b>2. Scope</b> The scope applies to all dairy manufacturing sites across Bega.</p> <p><b>3. Responsibilities</b> It is the responsibility of all Laboratory Technicians, Leading Hands and the Laboratory Manager to ensure the procedure is carried out as per documented. All appropriate safety precautions should be taken including the wearing of appropriate PPE and that wastes are disposed off correctly.</p> <p><b>4. Application</b> This method is used to determine the chemical oxygen demand (COD) of liquids, particularly waste water (effluent). This test is used to indirectly measure the amount of organic compounds contained in effluent. The value is reported as milligrams per litre (mg/L) and it indicates the mass of oxygen consumed per litre of solution.</p> <p><b>5. Apparatus</b></p> <ul style="list-style-type: none"> <li>Digital reactor block (DRB 200)</li> <li>Portable data logging colorimeter (DR/850), DR1900 colorimeter</li> <li>Pipette and pipette tips</li> <li>Digestion solution for COD 0-1,500 range – Part 21259-15</li> <li>Digestion solution for COD 0-15,000 range – Part 24159-1</li> </ul>		
<p><b>CAUTION:</b> Reagents used in this test are classified as hazardous. Please read all warnings and the MSDS appropriate for the test vials. Wear your PPE for the following procedures.</p>		

Laboratory	Standard Operating Procedure (SOP)	Bega
Chemical Oxygen Demand (COD)		
Approved date:	Supersedes:	23 Aug 2016 Page 2 of 5
<p><b>6. Procedure</b></p> <p><b>6.1. Homogenising</b></p>  <p>1. Stir the collection jar with a mixing stick or mix it well by shaking the jar. <b>Note:</b> It is important to ensure this so that a good representative sample is collected.</p> <p>2. Put 100 mL of sample in a blender. Blend for 30 seconds or until homogenized. For samples with large amounts of solids, increase the homogenization time. If the sample does not contain suspended solids, go to step 3.</p> <p>3a. For the 200-15,000 mg/L range or to improve accuracy and reproducibility of the other samples, pour the homogenized sample into a 250-mL beaker and gently stir with a magnetic stir plate.</p> <p>3b. Hold the sample container by over a sink. Invert gently several times to mix.</p>		
<p><b>6.2. Reactor digestion procedure</b></p>  <p>4. Set the DRB200 reactor power to on using the toggle switch at the back of the unit. It will beep once when it has completed its validation. Preheat to 150 °C by pressing START and once the temperature has reached it will beep twice.</p> <p>5. Prepare the sample: Remove the cap from a vial for the selected range. Hold the vial at an angle of 45 degrees. Use a clean pipet to add 2.00 mL of sample to the vial. For 200-15,000 mg/L vials: Use a TenSettle Pipet to add 0.20 mL of sample to the vial.</p> <p>6. Prepare the blank: Remove the cap from a second vial for the selected range. Hold the vial at an angle of 45 degrees. Use a clean pipet to add 2.00 mL of deionized water to the vial. For 200-15,000 mg/L vials: Use a TenSettle Pipet to add 0.20 mL of deionized water to the vial.</p> <p>7. Close the vials tightly. Rinse the vials with water and wipe with a clean paper towel.</p>		



### FUTURE SCOPE

- Segregated real time monitoring for unit operations (eg: Turbidity meters)
- Acquire more data points in the future years to increase modeling accuracy
- Implementing loss monitoring system for other non-dairy based Bega sites

