Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Water reduced small stock evisceration table wash

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1.0 Executive Summary

As part of a wider improvement and upgrade project related to the V&V Walsh's Small Stock Slaughter floor, a need was identified to reduce water usage across the facility. A purpose-built evisceration table cleaning system was designed to complement the facilities small stock slaughter floor upgrade in 2020.

Evisceration cleaning technology was identified as an area of high hot and cold water usage across the industry, resulting in unnecessary costs associated with water usage, treatment, and power consumption. The initial instillation of the small stock slaughter floor evisceration table was a success.

However, the possibility to verifying water savings and a need to optimise the system regarding operation reliance was identified post commissioning. Due to water quality and flaws in initial controls and design, the project aims were to improve reliability outcomes whilst maintaining initial water saving performance. The upgrades intended the inclusion of SCADA and PLC script improvements, trial of an innovative positive displacement pump and addition of associated measuring devices to enhance control and measurement.

The change to a Warble Plate Positive Displacement pump from original OEM pumps was made mid-2021 with the aim of improving system operations, efficiencies, and robustness after experiencing several faults and failures with the original hot water OEM system. This installation was to occur with integration into the plans SCADA system to provide real time monitoring and alarming of an operation critical technology.

Application of the Warble Plate Positive Displacement pump revealed similar challenges faced by the OEM pump. This led to a project review of pump technology and alternative solutions regarding the pump internal components instead of new pump technology.

Internal solution was sourced for the OEM pumps by modifying the pumps spring cage mechanisms with a teflon replacement. This has resolved evisceration table spray system issues of inadequate pressure, system leaks and degradation of internal components due to water mineral content and temperature.

The project was unsettled with a large obstacle when project lead (plant engineer) resigned in June 2021. As a result of this and a rushed handover of several project, several SCADA and instrumentation systems were unable to be implemented.

Regardless of this large setback, V&V Walsh has subsequently operated this system with great success since the September 2021 with the following major outcomes:

- Reduced man hours required to service and repair pumping
- Improved operational reliance of evisceration table
- Improved external monitoring of evisceration table through SCADA integration
- Maintained initial system upgrade water saving

2.0 Introduction

The objective of this project was to modify, integrate, and evaluate the upgraded evisceration system to prevent ongoing maintenance demands, production stops and excessive water leaks through new pump technology and SCADA integration.

Initial implementation of the new Small Stock Slaughter floor evisceration table saw a 70% reduction in hot water usage. After several weeks of use however several issues began to arise with the cleaning system. Due to the evisceration table being a trail of new technology and systems, faults were expected to be encountered during a commissioning period, however faults continued to cause difficulties with production and water usage post commissioning.

Continued failure of pump seals saw multiple hot water leaks occur, increasing water usage and associated operational

costs. Ongoing process halts resulted directly because of low pressure or cessation of hot water flow to the evisceration table or direct increased water usage through the utilisation of hoses directly located on the floor to improve cleaning.

The decision was made to devote a specific project to optimise the existing technology associated with the evisceration table cleaning system and monitoring of pressure, temperature, flow, and pump status. These would aid in preventing ongoing process halts associated with the evisceration table through preventative maintenance monitoring and modifications performed in correlation with a reduction in performance.

3.0 Project Objectives

The Project entailed the diagnostic, modification, and evaluation of a new water distribution system to the Small Stock Slaughter evisceration table as well as specific instrumentation monitoring of key system parameters critical for efficient operations.

Specific objectives for the project to be successful were deemed to be

- Maintaining water savings achieved with initial instillation of Small Stock Slaughter evisceration table
- Proven reduction in time and labor required associated with ongoing break downs of Small Stock Slaughter evisceration table cleaning system
- Identify pump technology capable of operating at temperatures >110°C
- Proven reduction in processing down time associated with Small Stock Slaughter evisceration table
- SCADA integration of parameters of performance data and operational status.

4.0 Methodology

4.1. Diagnostics

The first step in design was to establish an understanding as to what was causing the ongoing faults of the system. Regular internal seals were failing within the OEM pump used for the hot water component of the cleaning system.

On several occasions, seals were replaced, achieving a shot period when no process halts occurred. During this time a replacement a Warble Plate Positive Displacement pump was purchased for instillation. The Warble Plate Positive Displacement pump was selected on the basis it was rated for the appropriate water temperature, low power consumption and SCADA integration ability.

Further assessment of the OEM pump internal components revealed the failure of internal seals. Failure was a result of ongoing degradation due to high water temperatures on the pumps internal cage and seal mechanisms. This failure was the cause of reduced system output pressure, pump overheating from water infiltrating the pumps oil system.

Several spray nozzles were also tried during the initial phase of diagnosing the reasoning for the evisceration tables inefficient operation. Low pressure cleaning was believed to be a combination of poor pump performance as well as poor water delivery from the evisceration table spray nozzles themselves. Once the issue was identified regarding internal seals breakdown in the OEM pump, exploration into spray nozzle modification was ceased and resources were redirected towards the water delivery system.

Several intrumentations were identified as being useful to interagte to the SCADA sytem for monitoring and fault

indication of the system. Water temperature, pressure, system run indication and viscery table process haults.

5.0 Project Outcomes

5.1 Implementation and Operation

Euro pump system upgrades

Implementation of the new Warble Plate Positive Displacement pump occurred for a short period of time before challenges were encountered. Inconsistent pressure was found when using the pump. On several occasions, steam build up was found to occur in the discharge pipe, resulting in inefficient cleaning of evisceration table.

During the time of inconsistent operation of the Warble Plate Positive Displacement pump, the plant maintenance manager sourced Udor Teflon pump cage replacement parts for the OEM hot water pump as a trial while fault diagnosis was being performed on the Warble pump.

The new Teflon Udor valve kit cages resulted in the OEM pumps output returning to a consistent operation. Since implantation of the Teflon pump cage kits, the OEM pump has had no further issues with loss of pressure, water infiltration into the oil cooler or overheating. As a direct result of this and leading into high production period, the decision was made to continue using the OEM pumping system over the Warble pump.

The Warble pump however has not gone unused. The discharge line was fitted with a spirex air trap to prevent build-up of steam within the discharge line. The Warble Plate Positive Displacement pump now serves as a redundancy for the system should further complications occur from the OEM pumping system.

Image 1: Udor Teflon Cage Valve Replacement

Image 2: OEM and Warble Pump Station

SCADA integration

Initial project SCADA integration consisted of several parameters, these being

- Process halts associated with the evisceration table specifically
    - E-Stop used to stop the evisceration table cleaning system (OEM/Warble pumps)
    - Counter to identify number of stops per day.
- Bypass notification of evisceration table
    - Notifications when the OEM system has been bypassed to allow the evisceration table to operate without the OEM system.
- Euro pump system run indication
    - Notifications when pumps are running to identify if pump is running outside of production or without flow

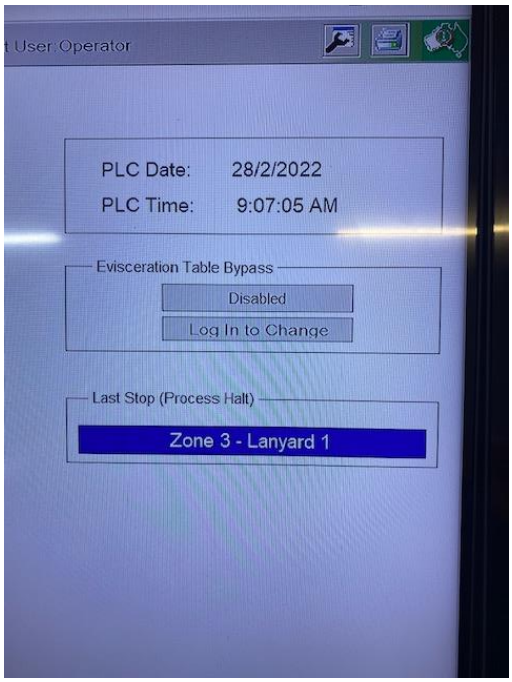

Image 3: SCADA Evisceration table europump bypass notification

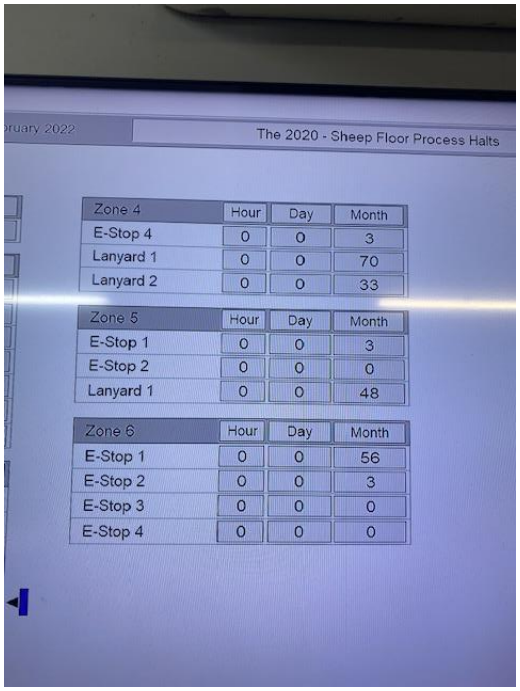

Image 4: Zone 4 E-Stop SCADA notification (Estop dedicated to evisceration table for euro pump system)

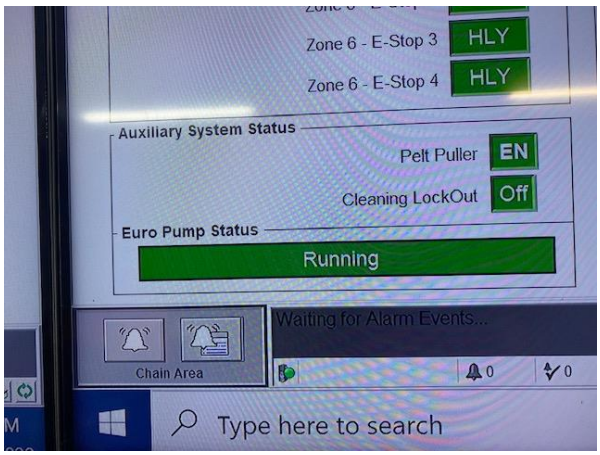

Image 5: SCADA Euro pump run status

Several pieces of monitoring hardware were initially installed in the OEM pumping system, that had been planned to be integrated into the SCADA system. The decision to cease this intergration was made due to the trial of the new Warble pump.

When the Warble Plate Positive Displacement pump was indicated to be a solution to the troubles experienced by the OEM system post commissioning, further SCADA intergration was planned. However, the project engineer, whilst identifying items of equipment needed to allow for further integration, resigned prior to ordering or providing the instrumentation contractor with a detailed project plan of how the instrumentation would be implemented.

As the Warble pump also experienced commissioning issues, further intergration into the SCADA system was not prioritised. The Udon cage solution took priority as well as solving the operational problems experienced with the Warble pump prior to revisiting the instrumentation upgrades to the Warble system. Once the decision was made for

the Warble pump to be utilised as a redundancy, no further resources were put to upgrading the Warble SCADA integration.

5.2 Efficiencies

Water Savings

Water efficiency has been improved with the implementation of the Udon teflon cages. Previous flow was at times detected at 3L/min for the OEM hot water pump prior to Udon instillation and when other parts were faulting because of the water temperature. After several trails of replacements, the Udon cages proved to be the most reliable and reduced water usage to 2L/min during operation.

This 1 L/min reduction in hot water usage has resulted in a further 33% reduction in hot water usage associated with the system from when the pump was faulting due to degradation seals. Since correction in late September, the sheep floor has operated for 18,638 hrs. Water savings of 60L/hr for this time has saved the facility 1,118,334 liters of hot water.

This water savings directly has a flow on effect to savings associated with water treatment and irrigation costs. Chemical treatment costs have been reduced by $2833 with this water saving, as well as preventing 14 hours of irrigation, saving upto $1200 in wages associated with operation of the irrigation system.

Operational Savings

The constancy in operation further reduced water usage, as well as operation down time. For every hour lost on the small stock processing floor, the business incurs an average cost of $3000. This conservative cost has been estimated based off all staff affected by the cessation of the small stock processing floor.

Since instillation of the Udor teflon cages, down time directly linked to evisceration system has been greatly reduced. In the month of February, only 3 process halts were a direct result of the evisceration table (Image 4: Zone 4 Estop 4 table). Maintenance job card historical data indicates throughout the months of October 2021 to February 2022, down times associated with the evisceration table have been greatly reduced compared to prior October 2021.

Power Savings

Instrumentation was not installed to monitor power outputs from the system.

6.0 Conclusions / Recommendations

The project overall has been seen as a success. Costs associated with operations and water savings have been seen since implantation of Under pump cages. Lost time to operations has also reduced.

The project was plagued with several difficulties. The main being the departure of the project manager, plant engineer, mid project. As a direct result, minimal hand over of the project occurred and the maintenance manager sourced alternative solutions to modify existing and new pumps to achieve adequate operation of the evisceration table cleaning system.

In future projects, multiple onsite personnel should be allocated managers of projects in the event staff are absent during deadlines or depart the company. It is suggested a project lead and a project assistant are dedicated to projects with lead managing financials, timelines and desired outcomes, and assistant aiding the lead with project management and reporting when required.