FINAL REPORT- 2020 1058

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1.0 EXECUTIVE SUMMARY

A meat processing plant identified that one of the major consumers of hot water on site was “dip” type sterilizers, which due to its continuous and unregulated flow had the potential to be an easy target in its quest to reduce water usage. As with many of these sterilizers, the hand wash basins in its close proximity also were often found to be continuous flow in nature purely because correcting this was never set as a priority.

The meat processing plant was fortunate enough to attend several protein harvesting facilities, and during these visits found that many operators had the same issues inherent to their facilities. Some of the producers had affected solutions, but none of the solutions were a good fit for the outcomes required by the meat processor.

The fact that a single knife system is employed at the meat processing plant meant that a spray system, which is used throughout European facilities, could not be rolled out in our production due to time constraints at the generally higher throughput rate of Australian operations. Historically the meat processor attempted many primitive concepts such as needle valves, orifice plates and throttled ball valves, but always found these solutions short lived due to blockages of these solutions.

The meat processor investigated many alternatives and found a solution from the USA that could regulate flow based on sterilizer temperature requirements. This innovative solution has not been used in this application, thus a unit was ordered for testing. This unit ran in production for over 3 months before a level of confidence was reached that the solution had a trouble-free operation.

The sterilizer unit developed by the meat processing plant in conjunction with an industry contractor was then fine-tuned and settled upon for manufacturing.

The existing sterilizer infrastructure on the smalls processing floor numbered 32, and the new layout called for 50 stations. The units were installed and ran in production for almost two months with immediate realization of savings.

A reduction of 70% hot water usage was realized by the implementation of these new sterilizers for the particular small goods processing floor, with a further reduction of 18% of overall plant water usage reduction due to the automated faucets incorporated in the unit.

Not only did the implementation of these units realize an immediate effect on water usage, but the flow on benefit included reduction in energy cost theoretically calculated to 12.5% reduction in Natural Gas usage, and the very important reduction of irrigation requirements for the site.

The units developed by the industry contractor have proven reliable and efficient, with retro fitting opportunity easily executed. This solution is cost effective and has shown promise in developing further units for a complete retro fitting program at the meat processing plant and take up in the wider processing industry.

2.0 INTRODUCTION

The objective of this project was to design and evaluate a knife sterilizer that was conventional ("dip") in terms of immersion process with a single knife operation. The Knife sterilizer and Hand basin unit which was to be self-regulated at continuous flow temperature of 86 degrees Celsius had to deliver substantial water savings as part of this program. The unit had to be easily retro fitted to make further implementation viable throughout the operation and had to conform the QA/QC requirements.

The solution had to include measurable outcomes in terms of usage reduction, whilst maintaining current work methodologies. The main measurable outcome was limited to water consumption, but realized other benefits in nexus.

Alternative control devices were investigated, and ultimately the solution chosen for the meat processor showed the most promise in terms of reliability and implementation. The actual manufacturing of these units was executed by the industry contractor.

3.0 PROJECT OBJECTIVES

The Project entailed the design, build and evaluation of a new design concept and operation for a knife and equipment sterilizer that could deliver a targeted water saving of up to 70% and associated energy saving. This was to be realized by providing:

- A new design solution for Australian processors to purchase upon successful implementation and
- Proven statistics of reduction in water and energy use.

4. METHODOLOGY

4.1 Evaluation of Opportunities

4.1.1 Market Research

The meat processor did extensive research into available products and technologies currently employed in the meat industry. These generally involved spray systems that have not always passed the strict quality control measures required with a single knife operation. Most of these sterilizers required the use of two knives, which restricts speed of operation, with often inconsistent temperature measurement methodologies. At the same time, many of these units were quite expensive with inconclusive reductions in water usage combined with critical quality standards employed in the Australian Meat Industry.

4.1.2 Design and Development

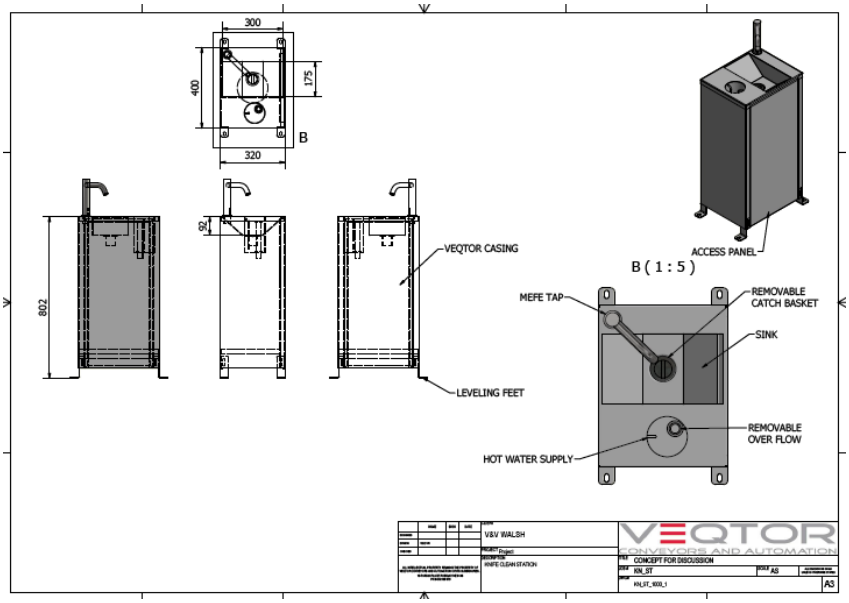
The meat processor maintains that the best sterilizer operation is a continuous flow unit that incorporates marked reduction in water usage, together with practical design both in terms of ergonomics and aesthetics. No such unit could be identified in the market, and thus the Plant Engineer vested time and resource into developing a purpose built unit that would have highest impact in terms of requirements of the meat processing operation and systems.

Ultimately, the identification and testing of an appropriate thermostatic technology formed the baseline to developing the trial unit. For this purpose, two technologies were employed, of which one stood out in terms of simplicity and operation. The specialized thermostatic control valve together with a battery operated auto faucet sourced in Australia formed the baseline of design.

The external contractor was chosen as a local supplier to incorporate the fundamental operational components to a usable platform, to which design iterations were performed for a final unit of production.

4.2 Construction, Design Iterations and Testing

The meat processor partnering with an external contractor developed two prototypes in order to commence practical evaluation. The third iteration of design was approved for installation onto the current Sheep Processing Floor, with continuous and intensive monitoring of temperature and flow.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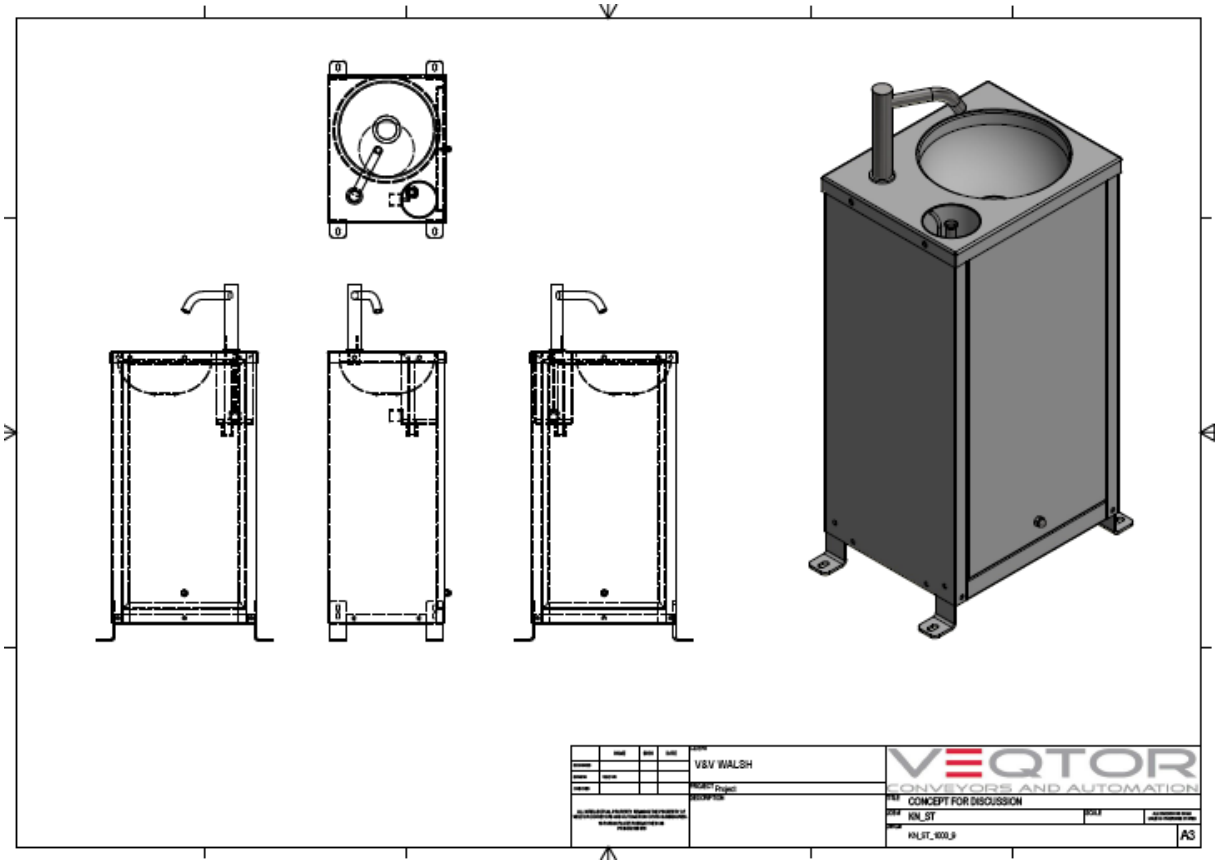
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Simple bucket flow tests were performed, and savings were successfully gauged at around 70% with usage reducing from 7 l/min (existing) to 3 l/min. These results were significant, but reliability was yet to be proven with nay previous opportunities failing due to fouling.


5. PROJECT OUTCOMES

5.1 Measurement Hot Water

As part of the execution of this project, Hot Water metering units were installed to accurately measure usage reductions in the particular area of implementation. Upon utilization of these units, an immediate flow reduction was evident.

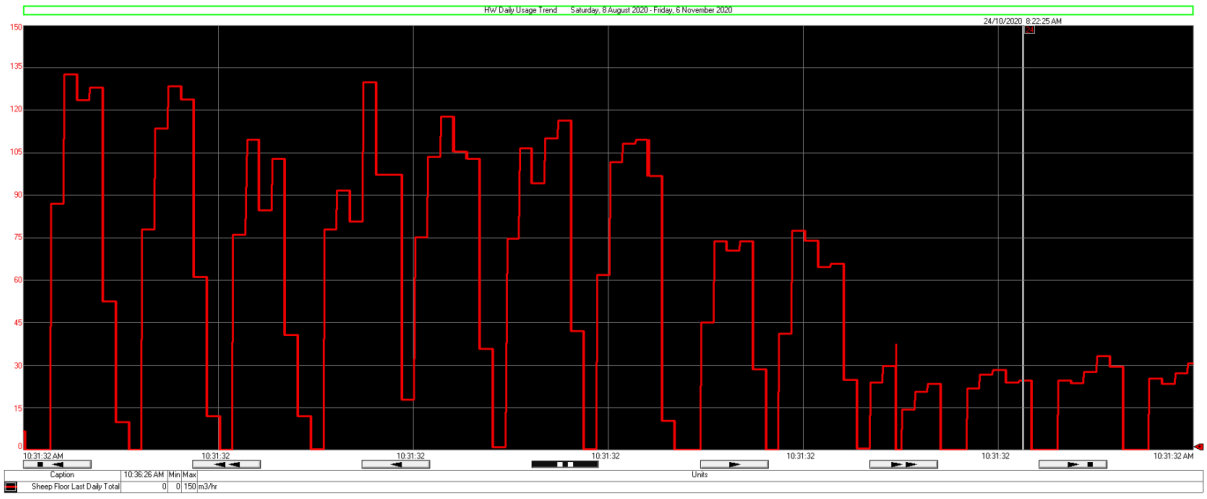
Overall Hot Water reduction on the floor had been established as approximately 60%. The original processing floor layout (32 sterilizers) with conventional sterilizers used 11m^3/hr, and the new system utilizes (50 Sterilizers) approximately 4m^3/hr. This overall measurement unfortunately included measurements of evisceration table cleaning equipment, tripe washing equipment and sterilizers.

By deduction and further taking into account the number of sterilizer units installed had been increased by almost 60%, the units are performing better than predicted and hot water savings have been realized. Calculation shows that each sterilizer consumes approximately 2 l/min, which correlates with original predictions from the old sterilizers that consumed approximately 7l/min. **70% reduction in water usage.**

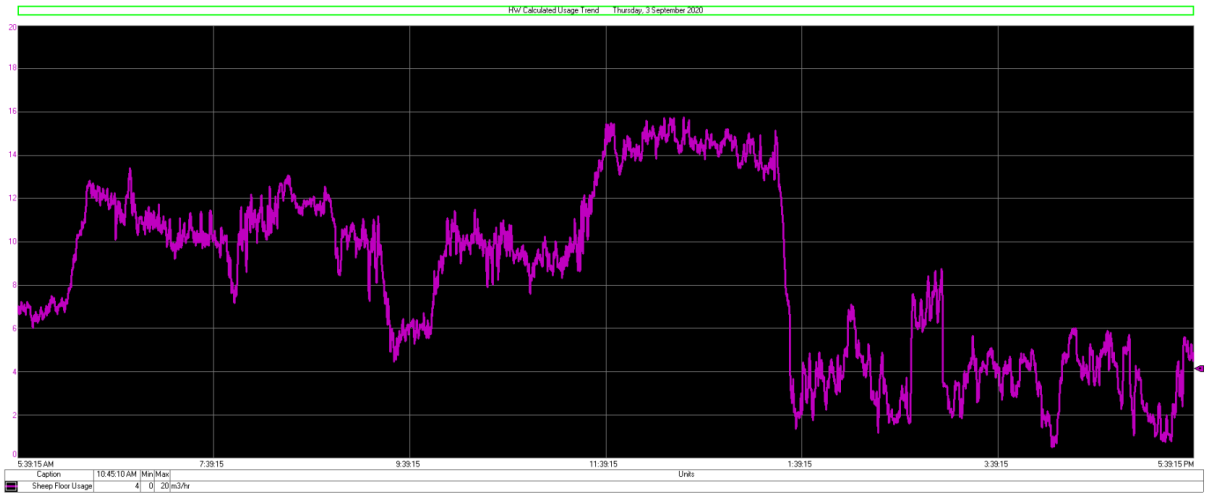
In addition to this, the incorporation of sensor faucets on these units has further reduced overall water usage for the plant by approximately 18%. These results are significant and in terms of volume a reduction of approximately 110kl per day has been realized for overall water usage on the plant.

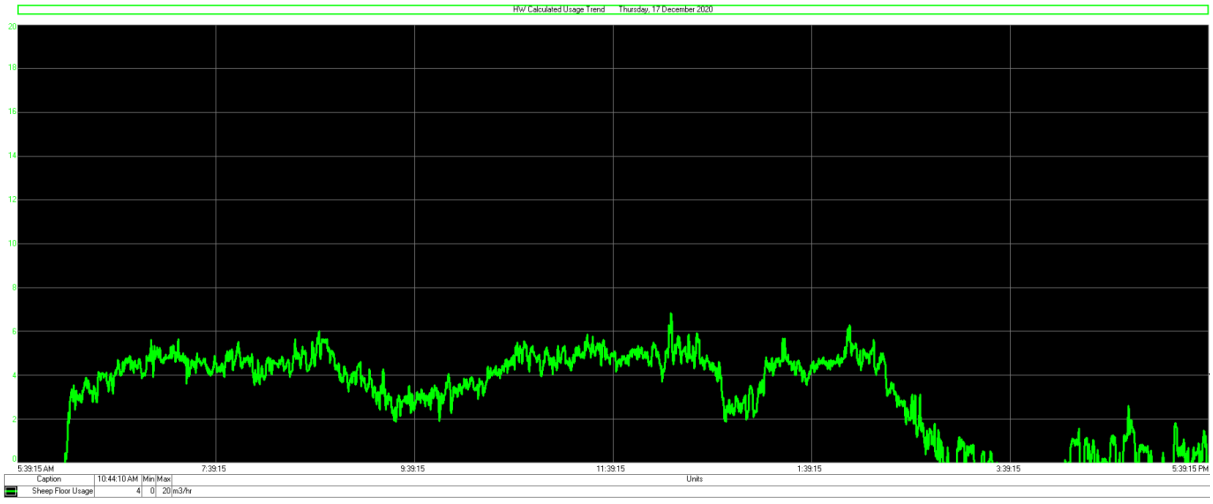
It seems that overall water usage of water on the small stock slaughtering floor has been reduced by approximately 40%.

The simple graph below shows the immediate change in water usage on the small stock processing floor, peaking at an average consumption of 100m^3/day on the original system, down to an average of less than 30m^3/day



Furthermore, a detailed evaluation of real time flow also suggests that the usage has also maintained a greater degree of consistency from the old system (purple) to the new (green). This has a marked effect on boiler performance and load profile.





5.2 Implementation

As with any operation, the detailed implementation will differ from site to site. In this project, implementation was easily executed due to the unit being specifically designed for this project, but the unit has been developed simplistically enough to enable modifications to any particular requirement.

Fundamentally the baseline components are inherent to the success of implementation, and the meat processor has already modified units to accommodate proprietary pieces of equipment such as hock cutters to be sterilized.

6.0 CONCLUSIONS/RECOMMENDATIONS

Ultimately this project has proven successful, and has shown that the technology utilized can be adapted to suit different applications.

Sites wishing to progress this solution would have to identify the specific build that suits their operations. The technology lends itself to all operations including large stock processing and boning operations.

7.0 BIBLIOGRAPHY

None