SNAPSHOT

INVESTIGATION INTO VOLTAGE OPTIMISATION TECHNOLOGY FOR ABATTOIRS

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Project Description

Energy costs are one of the major operating costs in the red meat processing industry in Australia (AU$1M to AU$2M per year each in the top 25 processing plants), with primary energy sources including electricity and natural gas. In sites with rendering electricity is usually about one quarter of the energy consumed, and a higher proportion in sites without rendering. Generally, the supply voltage maintained by the network operator is higher than the optimum operating voltage required for most of the equipment in meat processing facilities. To ensure adequate power quality and reduce energy costs, it is essential to maintain a regulated electricity supply that is optimal. As well as leading to inefficient use of energy in electrical equipment, over-voltage tends to cause overheating and shorten equipment life. Voltage optimisation (VO) technology has been widely used in many different industries locally and internationally, but not to a large extent within the red meat processing sector in Australia.

AMPC and Murdoch University have recently concluded a research project on the feasibility of using voltage optimisation technologies to provide cost effective energy reductions and improved electrical equipment lifetimes in Australian red meat processing facilities. The project has produced a voltage optimisation guide that assists staff at red meat processing sites to determine whether voltage optimisation is technically and economically suitable for their site. The output of the project will enable engineering and operations staff to be better informed about the economic and technical benefits (and possible issues) of using voltage stabilization and optimization technologies in a current ready to use manner.

Project Content

The first part of the study, entailed a desktop review of voltage optimisation technology suitable for red meat processing facilities, with a focus on Australian abattoirs. The review included different types of voltage optimisation technologies currently available and entailed an examination of their technical performance characteristics and corresponding economics.

The review highlighted the techno-economics of various case studies in which voltage optimisation devices were deployed in similar processing industries as well as meat processing industries/abattoirs in other countries.

The second part of the study investigated electricity usage data at two case study red meat processing sites and performed a site analysis of electrical load with power quality analysis to determine whether voltage optimisation could be applied. Then, using these sites as examples a techno-economic analysis of the use of voltage optimization in the Australian red meat processing industry was undertaken. Using measured power and voltage profiles the analysis determined the potential electricity savings and payback periods for using voltage optimization. The results also included a sensitivity analysis around key factors including price of electricity, facility/electrical feeder size (electricity consumption) and load type, supply voltage and optimizer type (dynamic or static).

Finally, the project developed a Voltage Optimisation Guide tailored to Australian abattoirs with the aim to provide the necessary tools and guidance to support a preliminary assessment of VO technology across the red meat sector.

Project Outcome

The project has been able to determine that voltage optimisation technology is suitable for use in the Australian red meat processing industry, and in some cases, could lead to significant energy and cost savings. Through the analysis of collected electricity characteristics and power quality data over time at case study sites it was found that most larger feeder transformers on a typical red meat processing site would be able to save energy and ensure enhanced power quality with the targeted implementation of voltage optimisation equipment.

The techno-economic analysis has shown that there are no technical reasons why voltage optimisers should not be installed in red meat abattoirs, and there are in fact many economic and other advantages in doing so. The economic analysis has shown that for a typical mid-sized (600 head a day) abattoir with a supply voltage of 240 volts and an electricity price of $0.15 a kWh installation of a voltage optimizer will have a payback period of between 3 and 6 years, depending on the supply voltage, type of feeder line and number of VSDs installed.

The project has developed a Voltage Optimisation Guide to provide guidance for Australian abattoirs in doing an initial assessment of the suitability of voltage optimisation for their site.

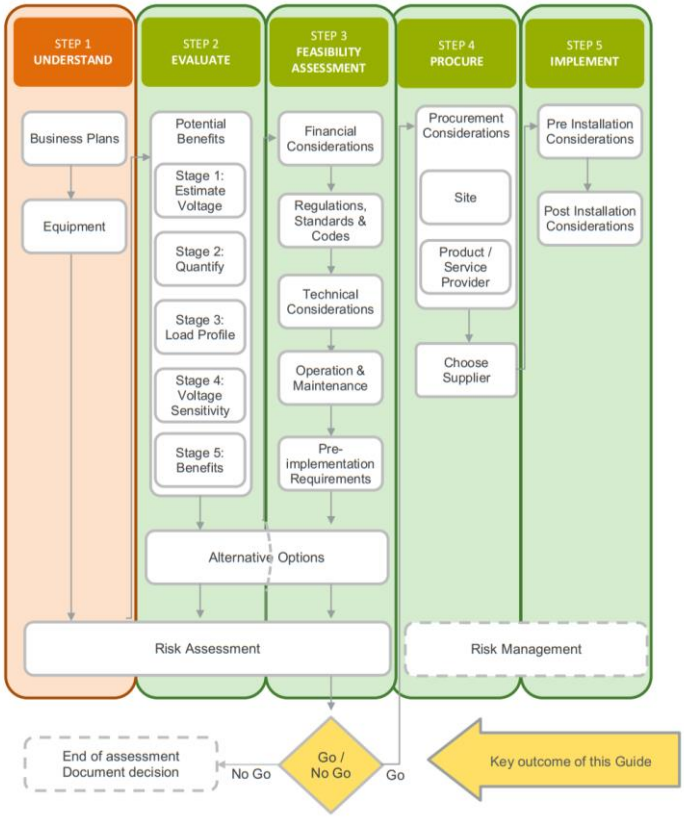

Figure 1: A step-by-step decision-making process for a voltage optimisation investment opportunity from the Voltage Optimisation Guide.

Benefit for Industry

The benefits for the red meat industry of installing voltage optimisation technologies in processing plants include savings in energy, resulting in reduced costs and greenhouse gas emissions, and less stress on electrical equipment and therefore improved lifetimes with less maintenance. The implementation and trialling of voltage optimisation technology at one or more abattoirs could serve as the catalyst for widespread installation at meat processing facilities throughout Australia.

The development of the Voltage Optimisation Guide tailored to Australian abattoirs provides the necessary tools and guidance to support site staff in undertaking a preliminary assessment of the suitability of voltage optimisation technology specifically for their site.

USEFUL RESOURCES

The NSW Office of Environment and Heritage has produced a general voltage optimisation guide for business, "I am your guide to voltage optimisation: is it right for you?" which is available from http://www.environment.nsw.gov.au/resources/business/160226-voltage-optimisation-guide.pdf.

Voltage Optimisation: Beyond the hype, Utility Systems Technologies, Inc., 2016 which is available from http://www.ustpower.com/wp-content/uploads/2014/12/UST_White_Paper_Voltage_Optimization_v1dot1.pdf