

KEEPING UP WITH DEMAND – THE CHALLENGE OF THE MODERN DAIRY OPERATOR COPING WITH LIMITED POWER INFRASTRUCTURE

By Ian Jackson

The Dairy Industry in Australia has undergone immense consolidation over the past few decades. To improve output and economy of scale many small dairy enterprises have regrouped into a fewer number of larger operations.

Despite this trend, it is the same regions around the country that still provide core milk production. Historically, these are the same regions which have limited power infrastructure to feed the properties. When the herd was only 50 or 100 animals, operators could get away with a modest 240V supply feeding the farm. A small refrigeration system, a few small pumps and a hot water service that warms up through the night is all that was needed.

It is not uncommon to find an operation that has grown to 300-400 head. When this happens it is essential to scale up the equipment to meet the demand. Suddenly the refrigeration plant is a bigger 3-phase system, A selection of small pumps that come with it to sterilise lines and clean yards will all use 3-phase motors. Most milking automation such as carousel plants and feed delivery systems also come with 3-Phase motor requirements that do not lend themselves kindly for conversion back to the basic 240V, Single Phase supply.

THE HIGH COST OF UPGRADING POWER

The fortunate operators consult their power service providers and learn that for \$20,000-\$30,000 they can upgrade the connection to the property to a larger, 3-Phase supply. Then for an additional \$10,000-\$20,000 they can upgrade the cabling around the property and the sub-switchboards to support the new supply. It becomes a commercial decision when and how the upgrade is done and how the costs are dealt with over time. The less-fortunate operators discover a power upgrade tag of \$70,000-\$100,000 with an 18 month lead time, or learn that it simply cannot be done at all. Occasionally the act of upgrading an existing 480V service to a 415V, 3-Phase service will affect other users nearby. Part of the upgrade cost for the dairy operator may be for them to make a compulsory upgrade of plant and switchboards for adjacent neighbours who are presently content with their 480V motors and their Single-Phase power on the same circuit.

For the affected dairy operations where a power line upgrade is not an option, they are forced to deal with the issue using only the resources on-hand. Getting sound advice on this can be difficult and sometimes contradictory. The answer is seldom black and white as there are modern choices and strategies to explore.

GETTING THE MOST OUT OF EXISTING POWER

The issue may be divided into two areas. Firstly by maximising the available energy to prevent the supply from becoming overloaded if too many appliances try to operate at the same time. This can be treated by having an electrician fit various interlocks to control switches making it impossible for Appliance 'B' to operate if Appliance 'A' is already running. For example, inhibit an electric hot water service whenever a refrigeration pump needs to operate. Putting *Start Delay Timers* on various machines will also help here. It can stagger machine operation by a few minutes each. This avoids a particular problem when power is restored after a supply interruption where many automatic systems will try to re-start at the same time.

The second issue is tied to the physical necessity of requiring 3-Phase power where none is available. Generally options are limited to 3-Phase diesel generators or 3-Phase power converters. A generator plant can be semi-portable inasmuch that the plant may be placed close to where the power is needed, but the down side is the operating cost of a diesel plant being 4-5 times higher than equivalent energy

obtained from the utility power grid. In addition is the regular inconvenience of staff having to transport and top-up diesel fuel to generator fuel tanks.

3-Phase Power Converters are a stand-alone box that take available 240V or 480V power and convert it into 3-Phase, 415V power. Energy losses in the conversion are generally under 10%. Quality converter units will support several 3-Phase loads operating simultaneously and may have some of the load-sharing features previously described built in. No new 'energy' is created here, but you get the most out of what you have because 3 phase motors have less impact on a supply line than their single phase equivalents. Machinery suppliers and internet searches will reveal a range of these Power Converters units being sold around Australia starting at \$2,000-3,000.

PLANNING FOR THE FUTURE

Often a dairying enterprise will not had the luxury of a 'planned' approach to power utilisation, instead more and more switchgear and circuits are slowly added. The result can be a complex and untidy array of systems that requires skilled local knowledge to get them up and running in a safe way. From time to time it can pay to get a broad consultation from a skilled electrician to see if an installation can be simplified, allowing *all* the staff on-site to handle the systems and not just the old guard who grew up with the complicated additions over time.

Consider not just what is needed now, but what may be needed 2-3 years in the future and allow for it in the present. Ultimately, this is where the greatest savings are to be made.