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POWER ELECTRONICS®

POWER NEWS

SUMMARY

Welcome

to the latest edition of Power News and our last for 2016.

The year has gone by in a blur!

2016 has been a year filled with challenges for many NZ businesses, particularly those affected by the recent earthquakes in Kaikoura, Wellington and surrounds. Power Electronics have been in the fortunate position to be able to continue our strong growth despite the testing economic conditions.

The Power Electronics office will be open on all normal business days throughout the Xmas/New Year period. We hope that you will have the opportunity to enjoy some respite, and the summer weather, over the festive season.

Thanks for your support to date and we look forward to serving you in 2017.

POWER ELECTRONICS STRIVE FOR PERFECTION

The ultimate challenge for man and machine – over 9000km of terrain that belies belief, at altitudes often in excess of 3000M. The Dakar Rally (formerly known as the Paris to Dakar) 2017

This year Power Electronics sponsors the Toyota team with drivers Nasser Al-Attiyah, the current world champion, and Nani Roma, double Dakar winner in 2004 in the motorcycle class, and 2014 in the car class. The pair are both driving highly modified Toyota Hilux Evolutions powered by a thumping, naturally aspirated, 5.0l V8 Lexus engine.

"There is a common connection between Power Electronics and the Toyota team. We both strive for the technological advancement, innovation, competitiveness, and high performance in the most challenging of conditions – perfection where possible!" states Amadeo Salvo, Director General of Power Electronics.

SD700 LOWERS HARMONICS ON LARGE IRRIGATION SCHEME

ELECTRASERVE AND TERRACE WATER

"We use Power Electronics VSDs for all of our irrigation pumping. The new active front end SD700 provided us the very latest state of the art low harmonics VSD all in one without the need for mounting up separate filters, cabling etc. Installation and commissioning was so simple"

Blair Watson, Managing Director, ElectraServe

FEATURES

Low Harmonics
Improved power factor
Pump Macro controls
Robust construction

With the ever increasing tightening of harmonic limits by South Island power authorities, smarter low harmonic VSD solutions are being needed – enter the SD700 active front end range.

Based in Ashburton, ElectraServe is the largest electrical contractor in mid Canterbury and boasts 46 years of service to the irrigation industry. It was ElectraServe's proven record and constant innovation based on Power Electronics product that secured them the electrical development of the Terrace Water Irrigation Scheme in Tarras.

Terrace Water is an irrigation scheme privately owned by a group of farmers in the Tarras area. The scheme comprises 1360kW of submersible pumps lifting water from the terraces of the Clutha River to a 31377m2 area, 73 million litre storage lake located 7km away. Water is pumped at a rate of 883l/s over a 60m head.

Aurora Energy, the local power authority imposes tight harmonic limits on their network so it was important to provide a low harmonic variable speed drive solution that would meet these limits and would work well on a rural network. Power Electronics has the broadest low harmonic product offer in NZ with options of 12,18,24 pulse, passive filters, active filters and active front end (AFE) technologies. The SD700 FR AFE series drives were selected by Electraserve because they provide a compact all in one offer without the need for external filters that require mounting, cabling etc. Because the project was remote it meant transportation of single units was easier too.

The SD700FR AFE series synchronise to the mains as part of the AFE technology. Initially the SD700FRs were too 'aggressive' with their synchronisation and with eight 170kW units running at the same time, were able to pull the weak 11kV network around. Fortunately the SD700FRs are very programmable so were 'softened' thus dampening the AFE response to a level more suitable to the network conditions. A later local substation upgrade also helped 'stiffen' up the network.

The low harmonic performance of <5% THDi, unity displacement power factor at all loads combined with IP54 ratings, ultra-low dV/dT and the hugely powerful on board pump macro have provided Terrace Water the ideal VSD for their irrigation scheme.

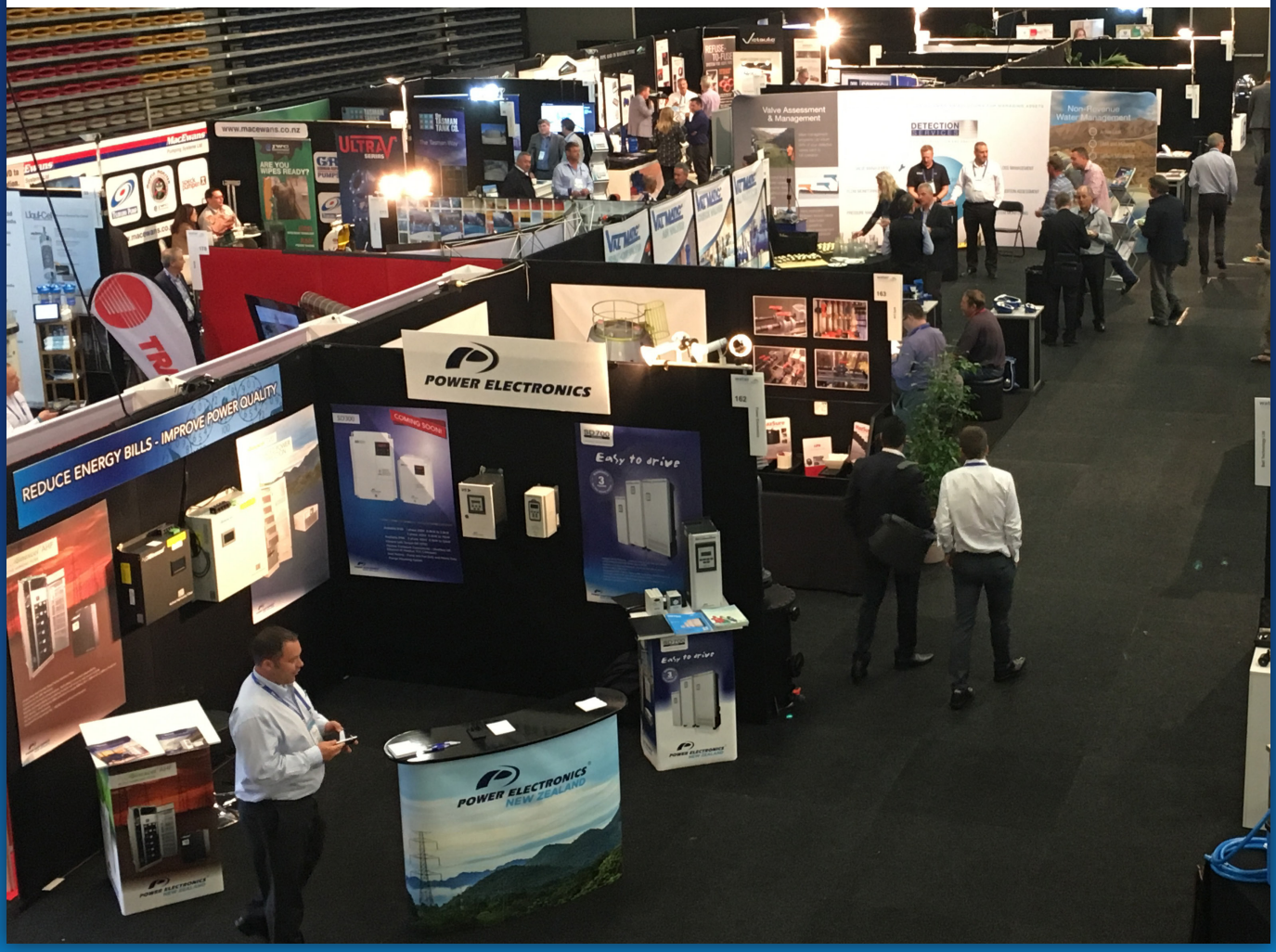
The 73 million litre storage lake and some of the SD700 "Active Front End" at Terrace Water, Central Otago.

POWER ELECTRONICS EXHIBIT AT THE 2016 WATER NZ CONFERENCE

Power Electronics continue to profile their AC motor control and power quality equipment at the 2016 Water NZ Annual Conference, held in Rotorua.

With delegates from local bodies, consulting engineering, and the water and wastewater industry, the sector was well represented with participants from New Zealand and the greater pacific region. This year the Power Electronics stand was focussed on power quality and reducing energy costs for pumping, and water and wastewater processing. The stand created significant interest - particularly around the new inverter based StaticVar Generator power factor system.

Northern Area Sales Manager, Alan Miller, commented "With electrical networks reaching near capacity many of the network and energy companies are imposing hefty penalties on consumers for poor power factor. This has driven a resurged interest in improving site power factor and the Sinexcel inverter based StaticVar Generator from Power Electronics is proving the best solution for many customers."



Visit our fresh new website

www.power-electronics.co.nz

to view the latest in product specification, case studies, and online tools

POWER FACTOR CORRECTION – UNDERSTANDING THE ISSUES

In our third and final article in this series we will delve into the effects of voltage transients and resonance on traditional power factor systems.

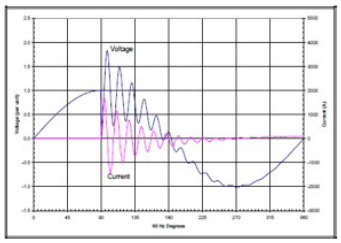
Voltage Transients – The Hidden Capacitor Killer

We often think voltage transients are limited to momentary peak voltage that come via the network or a high voltage spike that has occurred following an event on site. This is not the case. Capacitor based power factor systems are also responsible for generating significant voltage transients simply by the staging in and out of capacitors.

Traditional power factor control systems use a very simple philosophy for adding and removing correction to the system. A PF controller measures the power factor then dynamically adds and removes system capacitance by staging in a number of contactors with a fixed capacitor connected to each one to meet as closely as possible the PF setpoint. To provide some fine tuning a half step of capacitance (lower value capacitor) is often added to the system.

The physical act of switching these contactors in and out has massive impact on capacitor life and can create transients on the supply. On initial application of voltage to a de-energised capacitor the capacitors appears momentarily as a short circuit with almost no impedance. This results in a high current inrush followed by a high voltage transient until the capacitor reaches full charge and impedance.

The worst case scenario is when a capacitor is switched with the system voltage at peak voltage, but the capacitor is still partially charged with its residual charge at peak voltage level but in reverse polarity.



Voltage transients and inrush current levels on a capacitor.

Transient voltages break down the capacitor di-electric leading to premature failure. If the transient voltage is high enough (relative to capacitor voltage rating) the capacitor can experience immediate failure. Obviously this high voltage can also damage other items of plant or equipment connected to the same network.

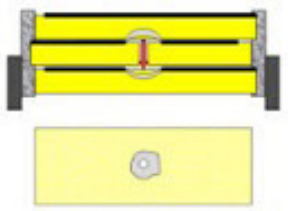
An inverter based StaticVar generator is infinitely variable within its own rating. There are no correction "stages" there is no requirement for switching or AC capacitors so hence no associated voltage transients. This technology completely eliminates the risk of self-generated transient voltage damage.

Harmonic Resonance – An ever growing issue

Non-linear loads in a power distribution system create harmonic currents that flow throughout the power system. The inductive reactance of that power system increases and the capacitive reactance decreases as the frequency increases, or as the harmonic order increases. At a given harmonic frequency in any system where a capacitor exists, there will be a point where the inductive and capacitive reactances are equal. This point, called the parallel resonant point, is where the power system has coincidental similarity of system impedances (XL = XC). Every system with a capacitor has a parallel resonant point.

When resonance occurs the result is extremely high voltage and current flowing at that resonant frequency. Power factor correction capacitors act as a low impedance device to these resonant currents and simply try to "absorb" them, overloading the capacitor and causing either premature or catastrophic failure.

With a traditional capacitor based power factor system engineering this issue out, or even identifying this, is very difficult as there are so many site specific variables. Resonance may only occur when a specific combination of non-linear loads and power factor correction capacitors are operating. To make this even more complicated modern metallised polypropelene capacitors are "self-healing". That is they are designed to continue to repair themselves and continue to operate after damage to the di-electric. The problem with this is that the capacitance value of the capacitor changes when this occurs.



A simplified cross-section diagram of self-healing capacitor after a short-circuit between the metallized electrodes. Lower diagram shows top view of foil after the short circuit. The capacitor has self healed but the capacitance is now different

An inverter based StaticVar generator does not use AC capacitors to introduce leading kVAR so hence the risk of resonance caused by your power factor equipment is completely eliminated.

Inverter based StaticVar Generators, like the Sinexcel SVG, have proven to be the greatest improvement in power factor correction technology for the past 50 years. The precise correction make it the perfect solution for sites with a shifting power factor target. The dynamic response means that it is possible to correct power factor on sites where rapidly changing power factor has meant this has been impossible in the past. The removal of AC capacitors and electromechanical switching devices removes the risk of premature failure and fire. **The Sinexcel SVG is the power factor technology of tomorrow, available today.**

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