

DriveLink

Serial communication from



summary:

- Welcome
- Sinexcel SVG Power Factor Correction Delivers...
- International News
- SD700FR Active Front End Technology - what is it all about?
- Central Plains Water Using SD700 series VSD's.
- New Staff
- Drive Tips

Welcome to the latest edition of DriveLink.

It has been an exciting start to the year for Power Electronics with more growth dictating the need for additional staff in both the North and South Islands. The launch of the Sinexcel power quality products has also been a tremendous success and this market sector is developing rapidly for us.

We would also like to take this opportunity to remind you about the Power Electronics website www.power-electronics.co.nz. A wealth of information is available for download including user manuals, datasheets, and application notes. Our online section also features product training videos, energy savings estimators, and PDL VSD conversion tools. Please have a browse at your convenience.

We trust that you find this newsletter informative, and as always, if we can be of any assistance then please don't hesitate to ask.

SVG - Revolutionary new power factor control system. Finally a system for life

Late last year Pan Pac Forest Products purchased the assets from the receiver of Southern Cross Forest Products, which operated several mills in the Otago region.

Pan Pac's plan is to amalgamate operations onto the Milburn site over the next 2 years.

Kevin Burgess, Electrical Coordinator for Pan Pac is responsible for the electrical refurbishment and start-up of the Milburn site which ceased operation under its previous owners in June 2014.

Investigations revealed that whilst the mill had an automatic Capacitor based Power Factor Correction system the previous operators were at risk of being penalised by the Electricity Supplier for poor power factor. Furthermore, enquiries with the system manufacturers revealed that the PFC unit contained a "bad batch" of capacitors, which they recommended be changed out before reinstating the PFC unit.

The dynamic load changes of the sawmill were such that the conventional step controlled PFC was too slow to respond to the constantly changing loads and the site had a typical PF of 0.69 Cos Phi.

The Electricity supplier identified that by improving the power factor to 0.95 Cos Phi the site would achieve electricity savings of \$15,000 per year. In addition, the site was advised that should it elect to make no improvements to the power factor the Electricity supplier could impose penalties of \$20,000 - \$25,000 per year.

Faced with the challenges of the poor performance of the existing system and recognising that the site PFC requirements were going to increase as the site grew, Kevin enquired with Power Electronics whether the Sinexcel SVG (Static Var Generator) would be suitable.

A demonstration of a 100kVAr Sinexcel SVG was arranged at Panpac's Whirinaki mill and the Mill Engineers were impressed with the stability and response time of the system. This demonstration saw the full 100kVAr capacity being utilised and a PF of 0.99 being maintained.

Unlike conventional Capacitor Based PFC systems that switch in banks of capacitors the inverter based unit measures and "injects" the required VARs within the same cycle – ensuring no undershoot or overshoot. SVG will also correct for lagging or leading Power Factor.

The modular nature of the SVG system was ideal for the Milburn site. The site initially required 600kVAr of correction capacity, but a further 300-400kVAr would be required to accommodate the projected site expansion.

Power Electronics supplied two SVG cubicles, each with 3 x 100kVAr rack mount modules. The remaining slots will allow for the projected site expansion.

The new SVG system was commissioned in March and in Kevin's words... "Works unbelievably well. The site Power Factor is totally stable and a Power Factor of 0.99 is being constantly maintained".



Kevin Burgess checking the operation of the SVG system

International News

Solar Inverter sales increasing at exponential rates

Power Electronics continue to make massive growth in their solar inverter sales as the renewable energy sectors in both the USA and UK continue to strengthen.

The power generation market in the US is changing dramatically and quickly. The US has more electrical generation on-line than all of Europe combined. Within 6 years the US government will close 353 coal plants in 31 states totalling over 60 GW's of lost electrical generation. With no new nuclear plants on the horizon,

no hydro plants being built, and natural gas prices preparing to double the US power generation market will need to relay on Solar and Wind to replace 60 GW's of lost power.

In the UK, Power Electronics hold a 60% share of Britain's inverter market for utility-scale projects and currently have 400MW of solar projects in the pipeline.

Current demand is so high that during the month of February Power Electronics production was peaking at 12MW per day!



Power Electronics secures contract for supply of 26 Medium Voltage VSDs for PEMEX

Power Electronics International Mexico have supplied 26 medium voltage XMV660 series variable speed drives to modernize the electrical systems of the Nueva Teapa-Veracruz pipeline for Pemex. Pemex is the only state oil company in Mexico. Pemex Refining division has been commissioned to develop this particular project and has relied on the extensive experience of Power Electronics in the AC motor control sector.

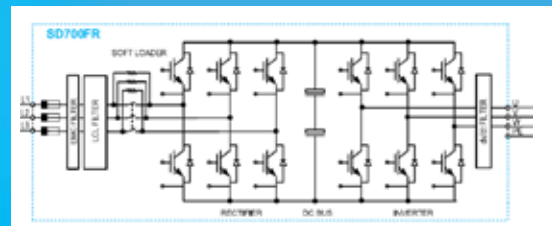
This XMV660 variable speed drive range is equipped with external bypass to ensure continued operation of the

equipment under all eventualities. Customized solutions have been developed jointly by Pemex and Power Electronics to adapt standard equipment for the requirements of the installation. Fully tested solutions that provide flexibility and reliability.

This is the first Pemex plant pumping crude oil to be modernized. Director Pedro Berriel, Power Electronics Mexico quotes "This project firmly places our brand as a market leader in medium voltage solutions"



SD700FR Active Front End Technology – what is it all about?



With electrical network companies placing tight limits on the amount of harmonic distortion that variable speed drives can produce a new level of variable speed drive technology has been developed to assist with providing a simple and cost effective low harmonic variable speed drive solution for high power applications.

The traditional low harmonic solution has been to install standard six pulse variable speed drives fitted with either an external passive filter or an external active harmonic filter. This requires extra switch room real estate, labour to connect and install these devices and associated wiring. For high power applications these external filters are physically large and connections can consume a large amount of time. The SD700FR range is a “one stop shop” with the harmonic mitigation being built into the “front end” of the VSD. Once the drive is in situ and connected as per normal there is no additional filtering equipment to install or electrical connections to undertake.

How do we do it?

The basic operating principle of most AC variable speed drives is an AC voltage supply, in our case normally 400V 50Hz that is rectified to DC. This DC is stored in the DC bus within the variable speed drive. It is then turned back to a synthetic AC voltage waveform by a series of Insulated Gate Bipolar Transistors (IGBTs). This last part of the process is known as Pulse Width Modulation or PWM.

The rectification of the AC to DC from the input voltage source is done with a combination of silicon controlled rectifiers (SCRs) and diodes. During the rectification process a number of harmonic currents are drawn from the supply as well as current at 50Hz. The harmonic currents are sinusoidal currents that are a multiple of the fundamental (in our case 50Hz). These currents are drawn as the SCRs and diodes cannot be controlled during rectification hence, the term uncontrolled bridge rectifier.

The SD700FR series use a completely different technology to rectify the AC supply to DC. The SCR-diode rectifier of a standard variable speed drive is replaced with IGBTs. These IGBTs can be turned on and off at will. It also has two control

cards – one dedicated to the rectifier the other to the output. An algorithm on the SD700FR rectifier control board optimises the current that is being sourced from the supply by switching the IGBTs on and off to conduct current that is in phase and with a very low harmonic content. This is termed a controlled rectifier.

Other benefits

Being able to switch the rectifier also introduces two other significant benefits:

- 1) Loads that have regeneration occur such as crane hoists, downhill conveyors, high inertia loads during braking periods can now “inject” that regenerated energy back into the mains. Traditionally this energy would have been wasted and dissipated with a dynamic brake.
- 2) During periods of low voltage on the input the SD700FR can optimise its switching algorithm to increase the voltage levels in the DC bus ensuring maximum output and efficiency for the VSD operation.

The SD700FR is available for applications ranging from 110kW to 630kW in both 400V and 690V variants.

Central Plains Water Using SD700 series VSD's.

Canterbury's massive Central Plains Water (CPW) irrigation scheme is well under construction with electrical/automation contractor Millennium Electrical electing to use Power Electronics SD700 series VSDs on the project.

Stage 1 will irrigate 23000ha of farm land from 10 pump stations containing

44 pumps totalling >3.2MW of SD700 controlled motors. Power Electronics have also supplied 1340amps of Sinexcel active harmonic filters. Future stages 2 and 3 will irrigate a further 37000ha.

The SD700 has a well proven record in the irrigation industry being the most broadly applied VSD in this sector within NZ. Solid

product performance backed up with local Christchurch based support was important for the CPW project - all things Millennium Electrical took into consideration when selecting Power Electronics and the SD700 series.

New Staff

Auckland Office Bolstered

Power Electronics are pleased to announce the appointment of Mark Leaning as an Auckland based Sales Engineer. Mark has relocated from the Power Electronics Australia office in Brisbane where he worked as a Business Development manager for three years. He has an intimate knowledge of the Power Electronics product range and AC motor control and application. Prior to working at Power Electronics Mark spent time at Rockwell and SEW. Mark is a Kiwi at heart returning back to NZ after a hiatus in Australia of 5 years, so is returning home to Auckland. Mark will be supporting customers in the Northern region and can be contacted on 021 226 5887 or mleaning@power-electronics.co.nz



New Appointment Napier Office

James Laugesen has joined the Power Electronics Napier team, as Trainee Sales Engineer. James, originally from Christchurch, is an industrial electrician who has been working in the Hawkes Bay for the past 18 months as an electrical contractor. James also spent time playing rugby in the UK as a semi-professional. He will initially be cutting his teeth in the Napier office alongside Jason Curtis and Andy Buckley in the engineering department. Once James is up to speed expect to see him out and about in the central north island. James can be contacted on 021 449 346 or jlaugesen@power-electronics.co.nz



SVG - Revolutionary new power factor control system. Finally a system for life



- **Never change PF Capacitors again**
- **No contactors to maintain**
- **No requirement for harmonic blocking chokes**
- **Infinitely variable so no compromised PF tuning or stage cycling**
- **Eliminate the risk of leaking capacitors and capacitors catching fire**
- **Available in wall mount or rack format**

Drive Tips

How does the Sinexcel Active Harmonic Filter deal with resonance?

The AHF is constantly monitoring the grid and its own performance to ensure resonance does not happen. If the AHF senses it approaching a resonance point then a unique algorithm shifts the operation point away from this region. Essentially the AHF is always tuning itself to the grid.

My electrical network company are insisting that I install a low harmonic Variable Speed Drive. What is the best solution?

Power Electronics can offer several different low harmonic solutions to meet the requirements set. This includes passive harmonic filtering, active harmonic filtering, 12 or 18 pulse variable speed drives, active front end variable speed drives, or special engineered solutions for specific sites. There is no hard and fast rules on the best solution. Consideration needs to be given to space, cost, the number of variable speed drives being filtered, so each application is best looked at on a case by case basis. Contact your Power Electronics office to advise what solution is best for you.

Why does the thermal model in the VSD offer better protection from an overload situation than a standard motor overload?

The main purpose of a VSD is to change the speed of the connected motor and load.

When the motor speed is altered the cooling fan attached to the motor shaft is also altered. Thus a reduction in motor speed also equals a reduction in motor cooling. As well as monitoring the motor current, the thermal model within the VSD also calculates the amount of cooling the motor is receiving from the shaft mounted fan. This offers thermal protection for the motor at any operating speed.

A standard motor overload is not able to take the change in motor cooling into consideration when operating at speeds other than 50Hz.

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