edition 12 | April 2019

POWER ELECTRONICS®

POWER NEWS

SUMMARY

Welcome

to the latest edition of PowerNews.

The start of 2019 has been an exciting period for the team at Power Electronics. We are in the process of supplying our first outdoor medium voltage VSD, which also happens to be our highest power rated device supplied to date. We are also seeing a significant increase in the uptake of power quality equipment to reduce network company tariffs, and customers progressing with projects to increase and improve overall plant efficiencies.

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.

OUTDOOR MEDIUM VOLTAGE VARIABLE SPEED DRIVE

Power Electronics will be supplying an 11,000 Volt, 1.0 Megawatt XMV660 Variable Speed Drive to a New Zealand customer later this year. This unit will be the second XMV660 installed in New Zealand – the first was supplied to Golden Bay Cement and was profiled in an earlier edition of Power News.

Details of the customer and project are presently under wraps - but the project presented some challenges;

- The application is arduous and extremely heavy duty
- The site location and nature of the process presented environmental challenges

The customer has elected to purchase an Outdoor XMV660 Variable Speed Drive for the project.

The concept is unique in that the XMV660 comes built up and fully load tested from the factory and is craned from a 40 foot open-top shipping container on to a concrete slab at the site. There is no need for a purpose built structures to provide a clean switch room environment with air-conditioning etc.

The outdoor inverter is designed to handle temperatures sub-zero, to +50 Degrees Celsius and is suitable for the harshest of environments – ranging from desert sand storms to snow and blizzard conditions.

At the heart of the design is the innovative filter-less "cyclone drive" cooling system which delivers a constant stream of clean air to the XMV660. At the air intake, the labyrinth sifts the larger dust particles from the air stream enabling the cyclone drive to eject the remaining contaminants, ensuring a constant flow of clean air into the electronics chamber and transformer cubicle without the need for cumbersome and maintenance intensive air filters.

OUTDOOR MEDIUM VOLTAGE VARIABLE SPEED DRIVE CONT.

The XMV660 MV drive goes one step further in achieving high performance by implementing proven low voltage technology within a rugged, modular, multi-level configuration. The multistep quasi-sinusoidal output voltage produced by the cascaded H-bridge power modules is low in dV/dt and supplies sinusoidal current to the motor. The multi-pulse phase shift transformer at the input minimises harmonic current drawn from the grid ensuring compliance to international THD standards.

The XMV660 Outdoor VSD at a glance;

- Rugged design: NEMA3R | IP55–outdoor rated stainless steel enclosure with mineral isolation
- Multi-level, pulse-width modulation with phase shift transformer
- High efficiency and power factor at partial loads
- Low harmonics - IEEE 519 compliance
- 50°C operation
- C5m exterior coating
- Non-stop innovative cooling – smart and reliable air filtering that withstands extreme desert conditions
- Low dv/dt - no motor derating or motor cable length restriction
- Output voltage boost transformer tap adjustment
- Redundancy

Power news will profile the full project once the system is installed and commissioned – watch this space.

THE AGILITY TO DELIVER WHEN YOU NEED IT MOST

Downtime prevents your business from achieving goals. At Power Electronics we pride ourselves on having the agility to respond when the unexpected occurs. Minimising customer downtime is our priority and we have what it takes to cater to your individual needs to get your plant systems back up and running. Whether it be new product, spare parts or site visit from one of our trained service technicians you can rest assured that the team at PENZ have it covered.

A recent request from an Invercargill customer required a VSD with Safe Torque Off for a safety critical application that had been overlooked. Production was offline and a timely response was required. A SD300 series drive was selected for the application and the team at PENZ set about finding the quickest way to get the VSD from the PENZ head office in Christchurch to Invercargill. With the call for a new drive received at 13:45 the result was an SD300742F VSD delivered to the client by 18:00.

Another recent example of our ability to respond in a timeframe that meets our customers unique needs was a mission critical SD700 VSD on ship that required replacement components urgently. This ship was in port in Southern Australia. The resourcefulness and quick organisation of the team at PENZ enabled these parts to be delivered the next day into Sydney for collection by the customer enabling the ship to get back to sea with minimal downtime.

CONTROL AND EFFICIENCY.... KEY DRIVERS FOR THE ANZCO WAITARA VSD PROJECT

Situated alongside the lower reaches of the Waitara River in Taranaki the ANZCO Foods Processing site has a rich history dating back to the earliest New Zealand meat export trade. The site was originally established in 1885 by Thomas Borthwick a UK entrepreneur who saw the opportunity to ship frozen meat to his homeland. His first shipment was a failure after the refrigeration system broke down mid voyage and the spoiled cargo had to be thrown overboard. The ship returned to New Zealand for repairs and a new cargo of frozen meat was loaded and successfully delivered to England. Borthwick was not the first to achieve this though; William Davidson had successfully delivered a consignment of frozen meat to England meat 3 years earlier in 1882. Both men were pioneers in what is today New Zealand's second largest export industry.

The site has been known as Borthwicks, Waitaki and Affco after its various owners. In its heyday, it employed 1200 people but freezing industry restructuring in the mid-90s saw the site close in 1997.

Lying idle for a number of years, ANZCO Foods saw the Waitara site as a strategic location to establish a processing plant. A very large investment in 2005 saw the site transformed to a state-of-the art food manufacturing plant. Today the site manufactures meat patties, and beef jerky using premium meat sourced from elsewhere in the ANZCO group, and employs around 250 people who operate the site 5 days a week 24 hours a day. The site also provides cool store and freezer space for the wider ANZCO group.

ANZCO has made considerable investment in the site since it was reopened. Greaves Electrical Ltd has been instrumental in completing a major electrical reticulation redevelopment which has involved the design, planning, construction of a new 11KV switch room complete with transformer bays and two new 3.3KV motor starters, installation of a ring main connection cable, removal of the old Magnafix switch gear, installation of new switch gear and refurbishing 3 x 1.0mVA supply transformers.

Tim Reid, Managing Director of Greaves Electrical said maintaining plant production during the project was a major focus and one that they successfully delivered.

The most recent stage of the project was to fit Power Electronics SD700 Variable Speed Drives (VSDs) to existing fixed speed ammonia compressors. The large machine is a 465kW Mycom and the smaller machine is a 185kW Howden Compressor. Both compressors had ageing soft starters that were due for replacement.

Tim Reid checks some parameters of the smaller 185kW Howden VSD. The 465kW Mycom compressor SD700 is on the right.

CONTROL AND EFFICIENCY.... KEY DRIVERS FOR THE ANZCO WAITARA VSD PROJECT CONT.

The benefits of VSD driven refrigeration compressors include:

- Allowing the equipment to be controlled to match the demand while maintaining maximum compressor efficiency. Traditionally compressor output is managed by mechanical control devices that have poor operating efficiency when regulating reduced output.
- More flexibility in matching the compressor capacity to demand.
- The ability to over speed compressors to get more capacity from a given unit (which saves starting additional compressors)
- Reduced stress on the machinery and electrical distribution system when starting.

Bennie Prinsloo ANZCO's Waitara site Engineering Manager says the installation of the VSDs on the refrigeration compressors has been a major success. "Not only do we have much better control than before, we've also upgraded our control and SCADA system which enables us to see what the plant is doing at a glance and the most significant benefit of all, is the control and efficiency gains we've achieved."

The SD700 series of drives is ideally suited to large compressor retrofits:

- dV/dt output filtering provides a waveform that is compatible for older motors that may not have been designed for use with VSDs
- The ability to use existing unscreened output cables and yet comply with relevant EMC standards. Greaves Electrical needed to install new cables to suit the new switchboard room location and elected to use VSD screened cables.
- The SD700 IP54 enclosure rating allows for installation of the VSD in the plant room alongside the compressor if necessary.

ANZCO FOODS

greaves ELECTRICAL

Tim Reid (right) and Bennie Prinsloo observe the operation of the 465kW compressor.

VARIABLE SPEED DRIVE SELECTION – GETTING IT RIGHT – UNDERSTANDING THE APPLICATION

It is that age old dilemma – You have got pricing for two variable speed drives from different manufacturers but how do you know you're comparing "Apples for Apples" and how do you make sure the VSD you purchase will actually do the job!

VSD manufacturers complicate the situation further by using different terminology and marketing "gobbledy gook" to describe their products.

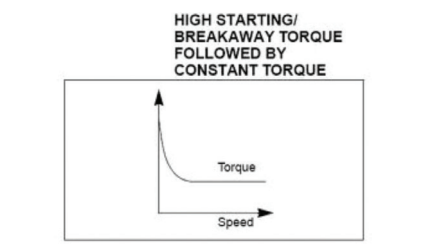
Believe it or not, this is actually a very simple problem to overcome. It comes down to understanding the application and then selecting a VSD that has the specifications to suit. This article is designed to try and help clarify some of the mysteries of VSD selection.

Application Type

As VSD manufacturers we broadly categorise all applications into two types – they are constant torque or variable torque.

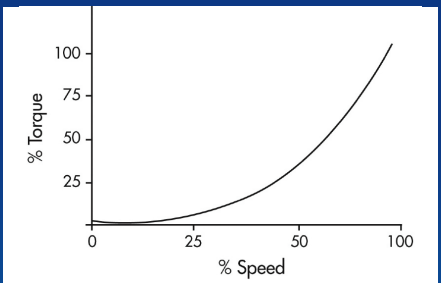
Constant torque loads – a constant torque load is an application where the torque requirement, and motor current, is the same right through out the speed range. An example of this type of load is items such as conveyors, positive displacement pumps, crushers, mills, sifters.

These loads often require high break away torque so a variable speed drive with a minimum of 150% overload capacity for 60 seconds is important. It is this overload current capacity that makes sure the load has sufficient torque to accelerate away correctly. VSD manufacturers typically refer to this as a "heavy duty" rating.



Variable torque loads – a variable torque load is an application where the torque requirement, and motor current, are low at lower speeds and high at higher speeds. An example of this type load is centrifugal and axial pumps or fans.

These loads do not require high break away torque so a variable speed drive with a minimum of 110% overload capacity for 60 seconds can be utilised. VSD manufacturers typically refer to this as "pump", "fan", "light", or "normal" duty.



As you can see the selection of the correct rated VSD for the correct application is imperative. VSD manufacturers approach their product design for these different applications in a number of ways. As you can imagine a "heavy duty" rated VSD carries an overload capacity that is not required for "light duty" applications. To supply a "heavy duty" VSD for a "light duty" application would impose a commercial penalty on "light duty" customers. On the other side of the coin - using a "light duty" VSD on a "heavy duty" application may result in the application not operating correctly due to insufficient torque resulting in the motor stalling or not braking away under load.

This is why manufacturers make a separate heavy duty or industrial VSD range, and a light duty or HEVAC/ Pump range. Another solution to this problem is for a manufacturer to release their product range with two different ratings and the customer selects the correct model on application type. This second solution is very common as it has the benefit of common spare parts and stock. This is the method employed in the SD500 and SD700 ranges of VSD.

If you are unsure about your application type, and what is the correct rated VSD, just give one of the Power electronics sales team and call and they will set you straight!

380Vac - 480Vac (-15% to +10%)

FRAME	CODE	Operation Temperature 50°C HEAVY LOAD				Operation Temperature 40°C NORMAL LOAD			
		Rated Current (A)	Motor Power at 400Vac kW	HP	150% Overload for 60s	Rated Current (A)	Motor Power at 400Vac kW	HP	Overload ≥ 110% for 60s
1	SD5002 4 2	2.8	0.75	1	4.4	4	1.5	2	4.4
	SD5004 4 2	4	1.5	2	6	5.4	2.2	3	6
	SD5006 4 2	6	2.2	3	9	8	3.7	5	9
	SD5008 4 2	8.5	3.7	5	13.2	12	5.5	7.5	13.2
2	SD5012 4 2	12	5.5	7.5	18	16	7.5	10	18
	SD5018 4 2	16.5	7.5	10	25	23	11	15	25
3	SD5024 4 2	24	11	15	36	32	15	20	36
	SD5030 4 2	30	15	20	45	40	18.5	25	45
4	SD5039 4 2	39	18.5	25	58	48	22	30	58
	SD5045 4 2	45	22	30	67	61	30	40	67
5	SD5060 4 2	61	30	40	91	78	37	50	91
	SD5075 4 2	75	37	50	112	100	45	60	112
	SD5090 4 2	91	45	60	136	115	55	75	136
6	SD5110 4 2	110	55	75	165	150	75	100	165
	SD5150 4 2	152	75	100	228	180	90	125	228

The SD500 selection table clearly showing "heavy load" and "normal load" ratings, overload capacity, and temperature ratings.

FREQUENTLY ASKED QUESTIONS

If I am using a VSD which requires screened cable on the output how should I terminate the screen?

Correct termination of a variable speed drive output cable is critical to ensure that any potential EMC (often referred to as RFI) issue is minimised.

If a VSD which requires a screened output cable is used then the screen forms an integral part of the circuit, allowing the RFI to travel through it back to the VSD. To this extent the screen should be terminated at both the VSD gland plate or earth terminal, and at the motor terminal box. The screen should have no connection to earth between these two points (for example the MCC gland plate or an isolator prior to the motor). It is also important to ensure that you use the correct glands or a low impedance connection to the earth terminal. Do not "piggy tail" the screen.

Alternatively you can use a VSD like the SD700 range which meets the EMC regulations using unscreened output cables. This is often easier and can offer a substantial cost saving.

Once I have finished programming my VSD or soft starter will the parameters be lost when I turn the power off?

All VSD and soft starter products supplied by Power Electronics store their parameters in non-volatile memory. Once you have finished setting a parameter in the VSD or soft starter it will retain the parameter setting even if the power is removed for an extended period.

If I am using multiple sets of CTs for Static Var Generator or Active Harmonic Filter do they need to be from the same manufacturer?

No they do not! It is always good practice to try and keep all the CTs from the same manufacturer but in some circumstances, this is not possible. What is critical is that they all have the same ratio, a 5amp secondary, and are Class One or less (1% maximum error at full load).

sales@power-electronics.co.nz
www.power-electronics.co.nz

Christchurch Head Office
(Southern Region)
14B Opawa Road
P.O. Box 1269
Christchurch
New Zealand

Phone: 03 379 9826

Napier
(Central Region)
Unit 1, 105 Ford Rd
Ford Road Business Park
Onekawa
Napier

Phone: 06 845 9067

Auckland
(Northern Region)
16 Aranui Rd
Mt Wellington
Auckland

Phone: 09 527 8523