



1824 kVAr Elspec Equalizer system and 1100 kVAr Indoor Fixed Capacitor Bank

Background

South East Fibre Exports (SEFE) operate a wood chipping mill at Jews Head near Eden on the NSW south coast. With a workforce of over 80, SEFE sources its timber from sustainably managed forests in NSW and Victoria.

In 2006, they achieved a record export of one million tonnes. The majority of SEFE's woodchips are exported to Japan where they are turned into high quality paper for the Japanese market and some other exports.

Wood waste from SEFE's chip mill also provides renewable energy for other local businesses. For example, Bega cheese uses wood residues from SEFE's mill operations to power its cheese manufacturing facilities. This eliminates the need to rely on power from electricity generated by coal-fired power plants, which are major contributors to Australia's greenhouse gas emissions.

Tender

Siemens (previously Emsby) was awarded the contract for the design, manufacture, testing, installation and commissioning of a voltage stabiliser at the 3.3 kV Motor Control Centre 1, which feeds the mill's chipper motor.

Scope of Works

SEFE needed to upgrade its power system quality to overcome supply problems that were effecting nearby industry and residents.

The mill is fed from a relatively weak 66/11kV overhead line running from the nearby coastal town of Pambula.

When the mill was first established in 1969, the plant's load requirements were different to the present load profile. A saturated reactor style static VAR compensator (SVC) was installed at that time to handle the voltage variations caused by the plant. Over the years changes to electricity supply system and the operating requirements of the plant, combined with the use of regrowth logs reduced the effectiveness of the original SVC. As a result, the mill retired the equipment as it was no longer able to correct the voltage variations.

The mill's major load is a wood chipping machine powered by a 1.5MW 3.3kV wound rotor motor and accelerated using secondary resistor grids. When this motor was started it caused voltage drops on the 11kV distribution line, thus affecting nearby residents and other industry.

Voltage Stabiliser Upgrade Application note

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Siemens Application note

Implementation

To achieve the voltage stability required in the power system, Siemens engineered a combined fixed/variable 3MVar compensation system operating at 3.3kV. **The system comprises an 1824kVAr 690V Thyristor Switched Controlled (TSC) Elspec Equalizer system feeding a 690V/3.3kV 2000kVA dry type transformer and a separate 1100kVAr 3.3kV indoor capacitor bank.**



When the wood chipper motor is first started, both the fixed and variable Power Factor Correction (PFC) is switched into service to supply maximum VARs. As the motor accelerates and the motor VAR demand is reduced, the *Equalizer* gradually switches out the amount of compensation delivered by the variable system. The fixed PFC remains connected to the 3.3kV bus to provide normal system compensation.

An inbuilt control monitoring unit was provided under the contract to manage the switching of the VAR control system on a 16 hour ON/OFF basis. The system ensures the motor can only operate within the 16 hour time frame in any 24 hour period that the mill is in operation.

The commissioning of the unit was finalised in July 2007 and the mill's power factor was increased from .66 to a constant .98 lag at peak load. This increase in power factor will reduce significantly SEFE's costs of operation (reduced costs for reactive power consumption) leading to a high return on investment. This project complies with the Siemens philosophy of making 'the investments of our customers better'.

Summary

This combination of fixed and variable power factor control systems is cost-effective method of providing MV SVC using standard LV and MV equipment. **The very fast speed of response of the *Equalizer* and its ability to switch capacitors in and out of service within less than 1 cycle makes this type of system ideal for voltage support of large motors starting on weak power systems.**

The Features

The *Equalizer* provides ultra fast, real time response and transient free switching of capacitors with:

- Response time < two thirds of one cycle (1/4 – 1 cycle max.)
- SCAN mode of operation – rotates the capacitors connected continuously thus extending capacitor life
- Integral three phase network analyser
- Windows based software
- Reduces voltage drop and flickering
- Provides cost effective reactive support for local distribution networks.



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