

## Case Study PCS100 Active Voltage Conditioner

### High technology industries protected with AVC



Multiple PCS100 AVCs in the FAB switchrooms



PCS100 AVCs and associated bypass cubicles

New electronic technologies are being applied to save the huge semiconductor industries in Asia from production shutdowns. Over 100MW's of ABB Active Voltage Conditioners now protect the critical plant in the new Hynix-ST Semiconductor Fabrication (FAB) plant in Wuxi, near Shanghai, China.

The US\$3 billion chip plant at Wuxi was announced in November 2004 as the single biggest foreign high-tech investment in China to allow the chipmaker to tap the country's US\$30 billion semiconductor industry. Ongoing investments have been made beyond this with the latest 300mm memory chips now being produced in volume.

Most of the world's semiconductors are assembled into products in Asian manufacturing facilities and in particular China. Computers, phones, MP3 players and many other electronics devices rely on memory chips for their functionality. This plant manufactures both DRAM and NAND Flash memory chips which are in huge demand in China so having a plant in country makes sense from a logistical perspective.

To achieve maximum profitability, the semiconductor wafers have to be "the highest yield for the lowest cost". This is where "economy of scale" comes in. From the electrical switchroom to the clean room floor, everything is on a large scale to drive the cost per chip down. The process is exacting and demands extremely clean air, water and electrical supplies.

In the ultra competitive FAB industry the problem faced was with the high tech silicon wafer fabrication process. Production shutdowns are common due to the sophisticated process equipment being extremely sensitive to power fluctuations and under-protected plants suffer from events occurring several times each year.

The cost of getting the plant operating again and the damaged product that has to be scrapped can quickly run into the millions. With a wafer taking in the order of 40 days to process any disturbance that results in a total loss is very expensive. A major event can cost millions of dollars with the facility typically taking days to recover.

The biggest contributor to poor power quality is weather, particularly electrical storms but this is compounded by the increasing use of sensitive electronic loads in FAB's. Vernon Pryde, ABB Power Quality International Sales Manager explains, "These plants typically have very good electrical supply connections and seldom suffer outages. However power fluctuations in the utility supply network still occur regularly and can cause sensitive control equipment to switch off and shut down the plant."

The obvious solution for Hynix was to commission ABB Active Voltage Conditioners (PCS100 AVC's) to provide fast, accurate voltage sag and surge correction as well as continuous voltage regulation and load voltage compensation. There are multiple switch rooms within the facility and ABB now take pride of place in two of them. For example one switch room measuring over 210 metres long has installed:

22 x	1250kVA	transformers
20 x	1500kVA	transformers
8 x	2500kVA	transformers

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The summary of the last two years is that Hynix have had numerous voltage sags, especially during winter snowstorms, but have not seen one complete outage or even a micro-cut at their operation. No protected equipment faulted during all the events, whilst unprotected lines actually shut down, hence the installation has justified itself in the eyes of the customer.

Hynix is now breaking all sorts of records and is in the top echelon of production facilities. Recently they exceeded 100,000 x 300mm wafers from one of their plants which is also protected extensively with ABB AVC technology. Scale in facilities, scale in production, scale in Power Quality systems all so they can chase the number one spot in the world for production of semiconductor IC's.

These ABB AVC units, some as large as 3MVA have now been successfully applied in plants operated by some of the industry leaders such as Samsung, LG-Philips, Honeywell, BP Solar, TI and Hynix. A large number of PCS100 AVC's have now been operating for over five years with excellent reliability and have become a standard solution because of their proven performance in overcoming voltage sag problems.

Mr Pryde comments, "In many respects the power quality in China is quite good, but the Chinese are dedicated to achieving the best performance possible from their facilities and this is driving AVC sales. Every possible advantage is explored to improve productivity and maximise plant 'up' time. New technology from ABB has helped to solve these problems. ABB Power Quality products use advanced microprocessor control combined with high power electronics to quickly correct these fluctuations before the plant sees them and can save them millions of dollars for a single event."

Technical Specifications	
Date of Installation	2006, 2007, 2008
Power Rating	>108MVA
Voltage	208V, 480V
Frequency	50Hz
Maximum sag voltage correction	3 phase 30% & 1 phase 50%
Response to sag event	2 – 4msecs
Load	Semiconductor Fabrication (FAB) plant
Product	DRAM and NAND Flash memory chips
Reason for installation	A better solution than UPS's
Availability since installation	100%

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