

Case Study PCS100 Active Voltage Conditioner

Solar cell manufacturer benefits from AVC



The company advertises its products on the roof on its Maryland facility

The semiconductor industry has extremely high value production processes which are very intolerant to electricity network power fluctuations and it can cost hundreds of thousands of dollars for a single momentary event. When electronic and electrical equipment in a factory shuts down because of a brief “power cut”, it’s rarely a total blackout of the supply system but the results can be equally as devastating.

ABB has a range of powerful voltage conditioning devices to keep a whole factory full of sensitive equipment operating when the voltage drops. An ABB Active Voltage Conditioner (AVC) has been put to the test in one of the toughest environments – a solar cell manufacturing plant in North America.

During the production of a (photovoltaic) solar cell, silicon ingots (or bricks) are cast in an electric furnace. Two expensive bricks are mounted on a saw carriage and presented to an abrasive wire saw. An extremely long, endless loop of superfine wire cuts the bricks into a stack of 6” wafers over a 4 hour period. The problem for a manufacturing facility in Maryland, USA was their 15 wafer saws on site were extremely susceptible to any sag in voltage which would halt the machinery and potentially break the wire. As a result of the saw wire breakage,, it would damage the 2 bricks which were currently being sliced. To replace the wire would take 6 hours of downtime, lost product, lost production down stream, as well as ongoing maintenance costs taking the total cost per event to between \$4,000 - \$40,000.

ABB Research Manager Dr Simon Walton says, “A total power black-out is an extremely rare event, but every day the complex web of

an electricity network is subject to assaults, ranging from birdstrike to transformer faults. The resulting drop in voltage might be imperceptibly brief, but still have enough impact to cause sensitive electronic equipment to shut down, halting production processes.

To put this into perspective, just imagine a complex jig of cutting wires is half way through slicing a stack of photovoltaic cell wafers from a silicon crystal that’s taken weeks to grow. Suddenly there’s a spike in the electrical supply voltage and the cutting wire breaks, causing thousands of dollars of wastage of product and manufacturing time.”

The obvious solution for the facility was to install a 1600kVA ABB AVC. Commissioned in August 2002 the solar cell manufacturer says, “the results were dramatic and instant. Productivity losses on protected saws were eliminated.” Dr Walton adds, “Often the network company gets the blame for events beyond its control – such as a large motor being switched on at a factory and affecting the network’s voltage. They could get bigger wires and double the size of the transformers, but the cost of power would become very expensive, which would be unfair for most users.”

He continues, “In most cases, utility power is the cheapest form of energy (compared to generating it from alternative sources), and the AVC is an ideal way of improving the standard of quality the network can deliver to that required by sensitive electronic controls for a reasonable price. It’s an alternative to pushing a UPS into areas beyond their capability or economics, or using tap changing transformers or servo transformers, which have a slower response time.”

The AVC was commissioned on time and to specification and has performed faultlessly since. As a result the unit paid for itself in the first few power disruptions and the satisfied facility reported that full pay back was under one year. During thunderstorms the facility still had shutdowns in parts of the unprotected plant. They said, "Production managers asked why only half the plant was protected, so after 3 years a decision was made to purchase a second unit to protect the remaining plant." So what better endorsement could you get for a significant Power Quality investment by a plant than a facility that uses a unit for three years and then purchases another unit the same!

Further applications at all other company facilities are under consideration.



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Technical Specifications

Date of Installation	August 2002
Power Rating	1600kVA
Voltage	460V
Frequency	60Hz
Maximum sag voltage correction	3 phase 30%, 1 phase 50%
Response to sag event	Less than 1/4 cycle
Load	Solar Cell Manufacturing Facility
Product	Photovoltaic Solar Cell Silicon Wafers
Reason for installation	Material wastage and lost productivity costs
Availability since installation	100%