

Major Trend Energy Efficiency

PCIM Europe 2008, from 27 to 29 May 2008, attracted 252 exhibitors and 56 represented companies from 26 countries in an exhibition area of 10,600 sqm. Once again the participation of numerous companies from overseas (57%) underlines the high international standing. The large number of companies from the USA, France, United Kingdom and Italy is particularly noteworthy. The number of new exhibitors is also worth mentioning: 31 additional exhibitors were at PCIM for the first time. Also the number of visitors (6,500) and conference delegates (592) marked a new high. PCIM Europe 2009 will take place in Nuremberg, Germany, 12 – 14 May 2009.

Power Electronics and its applications in Motion and Power Quality have a large influence on the development of technology and are applied in all stages of energy flow - from Power Generation to Power Distribution and to Power Use. Power Electronics is playing a key role in the energy saving and energy efficiency fields. Consequently, the sector is seeing a significant rise in the use of power semiconductor technologies in fields of application such as the automotive, telecommunications and domestic appliances industries. It is, therefore, not surprising that energy efficiency was an important subject

throughout the conference and exhibition.

Conference awards

The three best papers submitted by young professionals aged under 35 years received a Young Engineer Award (prize money of €1,000). The winners were Luc Lowinsky, LAPLACE Research Laboratory, France with the subject '3 MVAR Single Phase STATCOM based on AC Chopper Topology'; Matthias Neumeister, Siemens AG, Germany with 'Investigation of Surge Current Capability of SiC MPS Diodes', and Marco Bock, Siemens AG, Germany with 'Methods for Path

Decomposition of Redundant CNC-Axes'.

Luc Lowinsky proposed a 3 MVAR single phase STATCOM (STATCOM) based on an AC Chopper topology. In France, 25kV single phase AC railway lines have to be equipped with reactive power compensators to reduce the penalties for reactive power consumption. For the dimensioning, 3.3kV IGBTs devices were considered and experimental results for a 100kVAR prototype were presented. Matthias Neumeister investigated the surge current capability of Silicon Carbide (SiC) Merged-Pin-Schottky (MPS). The

diodes were impinged with trapezoidal respectively sinus shaped surge current pulses at different pulse times and temperatures. Thereby the diode structures provide a different responsiveness depending on the diode design. The destruction mechanism for these diodes is temperature limitation of the material, in this case the anode metallisation. Another sort of diode shows destruction at lower current density by occurring hot spots, while surge current, the first type of diode reaches astonishingly high temperatures on the anode face. This sort of diode was simulated with a simplified temperature model.

Roughly 600 people attended the oral and poster sessions at PCIM 2008





PCIM 2008 awardees (left to right) Matthias Neumeister (Siemens), Sponsor Oleg Khaykin (CEO IR), Luc Lowinsky (LAPLACE Research Lab), Marco Bock (Siemens), Sponsor Thomas Harder (GM ECPE), Sponsor Achim Scharf (Editor PEE), Stéphane Lefebvre (SATIE), Prof. Alfred Rufer (PCIM General Chairman), Leo Lorenz (PCIM Chair PE), and Udo Weller (GM PCIM)

Marco Bock described two algorithms that decompose the path in the geometric domain by applying spline approximation methods, since machine tools with redundant axes require special methods to control their motion along given paths. The machining time of a redundant two-dimensional machine tool has been simulated with this motion control methods and has been compared with that of non-redundant machines. The productivity of redundant machines is considerably higher than

that of non-redundant machines with the same working range.

The Best Paper Award for 'Power Electronics in Industrial or Automotive Applications', sponsored by Power Electronics Europe, was presented at the opening session of the conference. The paper 'Investigations on ageing of IGBT transistors under repetitive short circuit operation' given by Stéphane Lefebvre, SATIE Laboratoire Ecole Normale Supérieure de Cachan, France won an invitation to PCIM China 2009

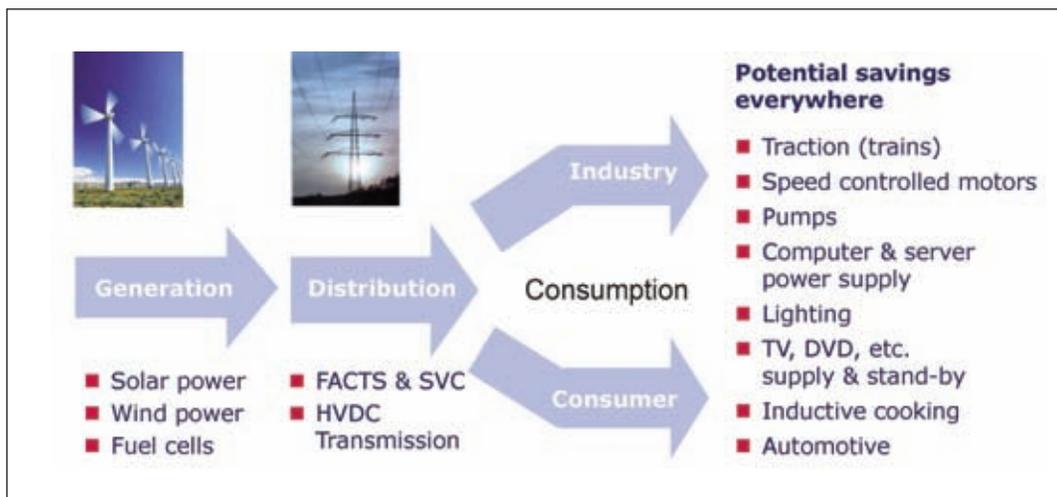
Conference in Shanghai (including flights and accommodation). The major content of this paper can be found in our first feature.

Energy efficiency and power electronics

The rising demand for energy in all forms and the recent series of dramatic increases in energy prices have made it evident that energy must be used more efficiently. According to the European Commission, about 180 million tons

of CO₂, the equivalent output of around 50 power stations, could be saved by 2010 with new and energy-efficient products and appliances alone in Europe. To reach these goals, new highly efficient power electronic technologies are needed as an enabling factor to reduce today's massive waste of energy, while keeping the conveniences of technical progress – this was one of the focal points of this year's PCIM in Nuremberg.

Pumps are the single largest



Energy-efficiency chain and potential savings Source: Infineon

Energy saving potentials in various application fields Source: Infineon



consumer of electricity with 160 TWh per annum in the EU, accounting for 79 million tonnes of CO₂ emissions. With variable speed control through inverterised drives, the duty point of the pump follows an unchanged system curve. Changing the speed moves the pump curves in accordance with the affinity laws, meaning that the pumping capacity is exactly matched to the process requirements. Though the initial cost for an inverterised drive is higher, a payback through energy savings and better process control can be expected in a two-year period. In Germany alone, the use of motors with electronic speed control may lead to 20% of energy savings

avoiding 17 million tons of CO₂. It is estimated that lighting amounts to approximately 15% of the world total electricity consumption. Electronic ballast for fluorescent lighting saves up to 25% of the energy compared to magnetic lamp ballast. Further reductions are feasible by using daylight linked dimming systems. Light emitting diodes (LED) are the most dynamic light sources with the potential to catch up with high intensity discharge lamps (HIDs) by 2010. LEDs offer benefits such as small size, long life, low heat output and durability. LED converters are based on a current-controlled buck with outputs of 300, 500 and 1050mA supplied to a chain

of LEDs. No ignition circuit, filament-heating or observation conditions like end-of-life is necessary. And there are no special requirements regarding the stability of the regulation and dimming is relatively easy – another opportunity for power electronics. Various surveys confirm that, by using state of the art energy efficient technologies, 20% of the current energy consumption in the European Union could be saved, translating into 60 billion Euros per year. Approximately a quarter of current CO₂ emissions is known to come from the transport sector. And traffic fatality is still increasing worldwide. In order to create a society that will continue to enjoy the convenience

that automobiles bring, in other words, to achieve sustainable mobility, automobile makers must work to reduce automotive CO₂ emissions and to enhance technologies for vehicle safety even further. A hybrid car has an inverter that provides tens of kilowatts of power to drive the motor by converting DC voltage to AC voltage. The power semiconductors that are used to control the current are therefore critical key devices for hybrid technology, and this is the topic of PCIM's session 'Automotive Power' organised by Power Electronics Europe. www.pcim.de

Energy savings through inverterised drives Source: ZVEI/Infineon

