IEEE Power Electronics Society NEWSLETTER

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President's Message

Both PELS and the IEEE as a whole have both recently completed fairly extensive surveys of its members. These surveys are meant to be used to improve services in the most desired areas. I do not have space here to report all the statistics associated with these surveys. I would, however, like to share some thoughts with you on the more interesting results.

Regarding society membership and institute membership, an important fact not commonly known is that only 3 in 5 IEEE members belong to one or more societies. For many of us as PELS members, the Society is the major reason for IEEE membership; but this is not true in general. So what are the reasons for membership? Respondents overwhelming rate remaining technically current (69%) and access to technical information (66%) as important reasons for joining IEEE. It is the societies that are responsible for generating the technical content, even though many members do not belong to them. Respondents to the PELS survey also overwhelming indicate that technical publications are the most valuable features of membership.

In looking at who makes up our membership, I was surprised to see that roughly two thirds of IEEE members have advanced (MS or PhD) degrees. The percentage is even higher for PELS members. This reflects not only that IEEE is the main source of research results and new technology, but also that many practicing EE's now have at least Master's degrees. About 60% of IEEE members work in private industry, and 14% in academia. For PELS, the percentage in academia is somewhat higher (29% of the respondents). I would suspect this same trend holds for many or most of the other societies. Another interesting fact is that around 55% of IEEE members work for organizations with more than 1000 employees.

IEEE survey respondents were given a list of products/services and asked to their importance to them and their satisfaction with IEEE in delivering them. By far, the 3

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More New IEEE Fellows

After the January Newsletter went to print, two additional new IEEE Fellows were identified as members of the Power Electronics Society:

- Barry C. Brusso, S&C Electric Co, Chicago, "For leadership in industrial applications of environmental, health, and life-safety systems"
- Gerald-Andre Pierre Capolino, University of Picardie, Amiens, France, "For contributions to modeling, simulation, and control techniques applied to power electronics and electrical drives."

We congratulate Barry and Gerald for their notable achievements.

Society Awards to be Presented at PESC®

Awards ceremonies this year will take place at the Awards Luncheon on Thursday, June 27, 2002 in Cairns, Australia at PESC 2002. Our Society's most prestigious award, the William E. Newell Power Electronics Award, will be presented for the twenty-sixth year. The PELS Distinguished Service Award and the Richard M. Bass Outstanding Young Power Electronics Engineer Award will be presented for the sixth year. The Society will also present the PELS Transactions Prize Paper Awards to the authors of the three papers judged by the Associate Editors to be the best papers published in the PELS Transactions in 2001.

The ceremonies will also recognize members of PELS who were elected to Fellow Grade effective 1 January 2002.

The PELS Best Chapter Award will be presented for the third year.

A ticket for the Awards Luncheon is included in the fulltime registration fee for IEEE members and non-Members. Persons registering at student rates and partner rates may purchase tickets for the luncheon. Online registration is available at <*http://www.pesc2002.com/*> or via a link from the PELS web site <*http://www.pels.org*>.

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Invitation to PESC® '02 in Cairns, Australia

On behalf of my committee I have much pleasure in inviting you to attend the 33rd IEEE Power Electronics Specialist Conference, PESC '02, to be held June 23 – 27, 2002 in Cairns, Far North Queensland, Australia. Cairns — surrounded by the Great Barrier Reef, a string of enchanting beaches, and spectacular rainforest scenery — is one of Australia's top vacation destinations.

Although PESC has clearly been international for some time, this is the first PESC to be held in the southern hemisphere. The program is also quite international, as can be seen at the PESC website, www.pesc02.com .

It is also the biggest PESC so far. We had 643 digests from 43 countries, accepting 342 or 53% of these digests. We are running six parallel sessions, and for the second time, following the introduction by Bill Dunford at PESC '01, we have a large poster session.

We in Australia are very excited about having PESC come here and have been working away at it for what seems like an inordinately long time. PESC in Australia

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In This Issue

Division II Director Report

I am serving this year on the IEEE Board of Directors as the Division II Director. Division II consists of four Technical Societies, one of which is PELS. I would like to address two important topics in this column.

IEEE Budget Issues

As some of you may already know, IEEE suffered from a large financial deficit in 2001 due to investment losses caused by the extremely poor world financial markets. As a result, several steps were taken to drive the IEEE 2002 budget to a net positive condition. These steps included:

1. IEEE staff authorizations have been cut by more than 33.5 positions, reversing a trend towards increasing staff during recent years to meet the needs for electronic publication, Society services, etc. The number of budgeted full-time equivalent (FTE) positions for 2002 is 910.5.

2. IEEE dues have been increased for the first time in several years by $15 from $86 to $101. The dues increase is expected to contribute an additional $4.5M to the operating budget.

3. A series of additional cuts in the operating budget yielded approximately $10M of additional savings compared to 2001. These cuts are being carefully targeted to minimize the negative impact on member services.

4. The Technical Societies have been mandated to turn in approximately $3.5M of additional net income compared to 2001. IEEE is moving towards a "pay-by-the-drink" model so that each Society will pay for the elements of IEEE infrastructure expenses that it uses, although this model is not yet fully in place. Although numbers are difficult to nail down precisely, the total infrastructure expenses that will be paid by the Societies in 2002 are expected to be in the vicinity of $20M.

5. A 15% across-the-board reduction in travel budgets has been mandated for all IEEE staff and volunteers. Each Society has been being asked to make the necessary adjustments. Business-class travel is being suspended for all IEEE staff and volunteers (except for the President and two Vice-Presidents) unless special circumstances (e.g., health-related) require it.

The 2002 budget was not approved at the last IEEE Board meeting of 2001 because Board members collectively demanded that the operating budget (separate from all initiatives, dividends, interest, and capital appreciation) be balanced or net positive. At that time (November 2001) there was still a budgeted deficit of approximately $800K in the operating budget that had to be eliminated in order to meet the Board's wishes. The IEEE Finance Committee identified more than $900K of additional cuts, resulting in a budgeted surplus in the IEEE operating budget of $146K (<0.1% of the planned total IEEE revenue/expenditures of >$220M).

According to this budget plan, the total reserves of all the Societies and Councils taken together are expect to increase by $283K. Again, this is the budgeted net without any impact of initiatives, dividends, interest, or capital appreciation. Furthermore, the results for any individual Society such as PELS depends on its particular situation and the way that TAB chooses to allocate the infrastructure charges among all of the Societies.

The big challenge that remains is to identify ways to significantly reduce the total infrastructure charges that are now being allocated to all of the Societies. IEEE President Ray Findlay is proceeding with plans to hire an outside consulting firm to study IEEE operations to provide clear recommendations on how to accomplish this difficult task. A Request for Proposals will be released during the 2nd quarter, and the objective is to get the study launched before the end of the year.

In all, I feel that the Board has made major strides in correcting the structural fiscal imbalances that caused the large deficit suffered in 2001. However, there is still much that remains to be done, so stay tuned!

Approval of IEEE Member Digital Library

An important out-of-cycle initiative was approved by the IEEE Board to develop an IEEE Member Digital Library that will make individual Transactions and conference articles available electronically to all IEEE members according to a progressive pricing structure. It is expected that this new member service (which will draw from the same IEEE Xplore database as the IEL institutional products) will be particularly attractive to IEEE members who do not have convenient access to the full Xplore database because they work for small companies or are self-employed. This new series of IEEE products will be rolled out during 2003.

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Quicker News Delivery

The *Power Electronics Society Newsletter* is available on the internet in PDF format approximately three weeks sooner than hardcopies can be printed, labeled, and delivered by postal mail. To receive email notification when the newsletter is posted on the PELS server, go to *http://www.pels.org/Mailing/MailForm.html* and add your name to the notification service list. Additionally, the email notification sometimes includes timely announcements that are not in the printed newsletter.

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News items should be sent to: Gene Wester, Editor, *PELS Newsletter*, Jet Propulsion Laboratory, M/S 303-300, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, USA; TEL: +1 818 354 3489; FAX: +1 818 393 4272; EMAIL: *gwester@jpl.nasa.gov*. Deadlines for copy are March 15, June 15, September 15 and December 15. Submission of items by email in plain-text format is preferred. Plain-text (straight ASCII) submissions on 3.5" diskettes are welcome, and should be accompanied by a backup printout. Fax submissions are acceptable, but are least desirable. Full-page calls for papers and announcements of PELS-sponsored conferences are welcome and should be sent as both high-quality hard copy and RTF format file.

The editor gratefully acknowledges the Jet Propulsion Laboratory for significant support of his editorial activities.

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Call for PESC 2007 and 2008 Proposals

The location of PESC 2007 will be decided at PESC 2002 in Cairns, Australia. In keeping with tradition, the 2007 conference would be held normally in North America/ South America (Regions 1-7 or 9) and the 2008 conference in Europe (Region 8).

A proposal outline for 2007 should be submitted to the PESC steering Committee Chair via Bob Myers, PELS Administrator, by May 31, 2002. The proposal should include: local conference facilities, name of proposed General Chair, and outline of budget. Each proposer for 2007 should plan to attend the PESC Steering Committee in Cairns and make a short presentation.

We are also interested in preliminary proposals for 2008. Further information may be obtained from the undersigned.

Prof. W.G. Hurley
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Call for Educational Workshop Proposals

The IEEE/PELS Educational Committee is accepting proposals to support educational workshops. The workshops can be held in any region, but the objective of this initiative is to grant up to $3,000 per request to support participation of international (outside USA) PELS members. The workshop must be held between August 1, 2002 and July 31, 2003.

The proponent must be the general chairman or the technical chairman of any educational seminar, conference, or event. The proposal must clearly indicate the importance of the topics discussed in the meeting, the relevance of diverse international participation, and how the results will be disseminated to the power electronics community. It must address the impact of the workshop in promoting the power-electronics educational mission. The narrative should also address how the contribution of PELS will be cost-shared by the event towards educational goals. The proposal must be no longer than two pages.

Proposals are due July 1, 2002. Send your proposal in PDF format to:

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IEEE Launches Virtual Museum

Piscataway, NJ — Thomas Edison didn't invent the light bulb, so why does everyone think he did? What was the first computer? How did the patterns in a Utah cornfield lead to the development of TV? What is the "X" in an X-ray? Why are Alvin and the Chipmunks part of a museum about technology?

The answers to these questions and more are found in the new IEEE Virtual Museum launched at http://www.ieee.org/museum. Designed for educators, pre-college students, and the general public, the virtual museum debuted with two exhibits containing audio and video clips, and interactive features: *Socket to Me! How Electricity Came to Be*; and *The Beat Goes On: How Sounds are Recorded and Played*.

Three more exhibits are in production and are scheduled for release by third quarter 2002. These will explore the different applications of microwaves, the works of Thomas Edison, and contributions women have made to electrical and information technologies.

The IEEE Virtual Museum explores the global social impact of electrical and information sciences and technologies and demonstrates the relevance of engineering and engineers to society. It is supported by the IEEE Foundation, the IEEE Life Members, and the Trustees of the IEEE History Center.

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http://www.ieee.org/history_center

Become an IEEE Senior Member

The Power Electronics Society is conducting a drive to nominate new IEEE Senior Members from our Society. The requirements for Senior Membership are (a) ten years of professional practice and (b) five years of significant performance, such as substantial job responsibilities. If nominated by PELS, you need only two additional references (senior members who sponsor you), and we can help you find them.

For further information, please contact Enrico Santi, PELS Membership Chair, at <esanti@engr.sc.edu>.

INTELEC® 2002

Reliable Energy: The Driving Force Behind Dependable Communications

Today's communications systems are our lifeline for business, family, and leisure, and we expect them to be "always on" through the proverbial "rain, or snow, or sleet, or hail", as well as through brown-outs, natural disasters, acts of war, and other disruptive events. Every new feature and capability added to the services available from our wireline, wireless, internet, and broadcast service providers increases our dependence on our communications link and our expectations for its reliability.

As network operator power engineers, power conversion and energy storage system designers, power system and battery suppliers, we face the challenge of addressing the powering needs of the infrastructures that deliver these services. For 24 years, the International Telecommunications Energy Conference (INTELEC) has provided a forum where we may learn of the latest technologies and practices to assist us in this task. INTELEC 2002 invites you to meet your fellows this year, from September 29 through October 3, in Montreal, to attend accredited professional development tutorials, hear high-quality technical paper sessions, participate in application workshops and see energy-system equipment displays.

This year the Management Committee has focused on reinforcing the value of the conference to all delegates. The Program Committee has taken steps to assure the quality and relevance of technical papers for both equipment-design and system-application practitioners. The tutorial program has been expanded; for the first time it extends over the four days of the conference and offers a selection of twelve valuable half-day courses, at basic and advanced levels, all of which earn participants professional development credits. The available equipment exhibition area has been expanded to better accommodate all products of interest to the communications power community.

Our host city, Montreal, is an unforgettable cosmopolitan experience. The world's second largest French-speaking city, it is renowned for its mixture of old European charm and 21st century modernity. Our so-

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CONFERENCE ANNOUNCEMENT

for the 33rd Annual

Power Electronics Specialists Conference

June 23 – 27, 2002

Cairns Convention Centre

Cairns, Queensland, AUSTRALIA

http://www.pesc02.com/ **Email:** ***info@pesc02.com***

PESC® is an international forum for discussion of the latest advances and forward-looking topics in power electronics.

- Technical program consists of 343 papers (289 oral and 54 poster presentations)
- Four Professional Education Tutorials
- Poster session with 54 poster presentations
- Three Problem-Wisdom-Matching (PWM) sessions
- Presentations of the William E. Newell, Richard M. Bass, and Distinguished Service Awards
- Active social program for participants and guests, featuring regional tours, music, art, and food

Venue

Cairns is one of the world's most diverse and exciting destinations. While in Cairns, delegates can visit the world-famous Great Barrier Reef, the World Heritage listed Daintree Rainforest, and experience Aboriginal art and culture, to name but a few attractions. June weather is idyllic with temperatures ranging from 17 to 26 °C (62 – 78 °F).

The PESC website has extensive information regarding the conference, travel, lodging, dining, and sightseeing. PESC has negotiated discounts for selected regional actrivities and accommodations when prepaid with registration. Discount airfares are also available — see website for additional information.

Registration Discount Deadline **23 May 2002**

PESC 2002 Conference Secretariat
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Fax: + 617 3848 5510
Email: *info@pesc02.com*

PESC '02 is sponsored exclusively by the IEEE Power Electronics Society

Tricks of the Trade: Combining Analog and Digital Scopes for Delayed Sweep©

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Many of today's popular digital oscilloscopes do not have the delayed-sweep feature that we need for multi-frequency waveforms in power supplies. Even some that have that feature are cumbersome to operate, compared to analog delayed-sweep scopes of the past. The good news is that you can combine the delayed sweep function of an old analog scope with the superior display and data-recording features of modern digital ones if the analog scope has a "Delayed-Gate Output" (most of them do). The trick is to let the analog scope perform the delayed-sweep function, using its delayed-gate output to trigger the digital scope.

An extremely useful application is the analysis of waveforms in power-factor-correction (PFC) circuits of switch-mode power supplies. In these circuits—typically boost converters placed after an input rectifier bridge—the switching circuit runs at a much higher frequency than the input mains. To keep the output voltage constant as the input voltage varies requires a variable boost ratio; thus, the switch duty ratio must vary with input voltage. The duty ratio is high when the input voltage is low (when maximum boost is required) and is low at the peaks of the input where little boost is required. It is very desirable to view each pulse of the boost converter in detail, as it changes during each half-cycle of the power line. This is especially important in the project design phase, as stresses on the FET switch and boost diode vary greatly with input voltage and output load. The boost converter is usually not synchronized to the mains. However, by properly synchronizing the digital scope's trigger circuits, these critical waveforms can be examined, one at a time, then stored in digital format for later analysis and publication.

Figure 1 shows a typical boost PFC input circuit, with an isolation transformer added at the input, between the mains and the circuit under test. It is extremely important to use an isolation transformer to provide a safety insulation barrier between the mains and the oscilloscope grounds. Autotransformers do not provide this isolation. The PFC circuit has an input full-wave rectifier followed by the boost inductor, switching FET, boost diode and output capacitor. Locations of key waveforms are labeled A, B, and C.

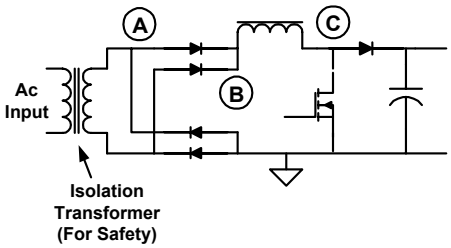

Fig. 1. PFC circuit with isolated input

Figure 2 shows the typical waveforms of the boost PFC circuit. Waveform A is the applied sinusoidal input, typically at 50 or 60 Hz. Waveform B appears at the output of the rectifier, and waveform C appears at the drain of the boost FET. Note that the amplitude is constant and equal to the output voltage (neglecting the diode drop), typically 400 Vdc. Because the amplitude of the waveform is constant and the pulses are asynchronous to the input mains, this waveform is nearly impossible to display and observe by simply triggering the oscilloscope on the waveform itself or even on the mains waveform.

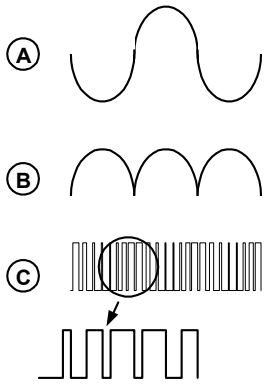

Fig. 2. PFC circuit waveforms

This task is a perfect candidate for the delayed-sweep feature found in analog oscilloscopes for many years. By triggering the *delay**ing*** sweep on the input line (by selecting "internal trigger" when observing waveform A or B) and triggering the *delay**ed*** sweep on waveform C after the delay interval elapses, one can see a perfectly stable picture of each pulse. By varying the delay interval, one can observe the pulses at each location across the half-cycle of the input line voltage. The process requires that the delayed sweep be set to *trigger after delay*, not to *run (start) after delay*; this allows the delayed sweep to synchronize itself to the next pulse that occurs after the delay interval has elapsed. This approach has been used for years on analog scopes with the delayed-sweep feature. The icing on the cake is the use of a digital scope to observe the individual pulses with the bright, high-resolution, digitally-refreshed displays of today. Once the delayed-sweep analog scope is triggered properly, the delayed-gate output (usually a logic-level rectangular pulse equal in duration to the delayed sweep) can trigger the digital scope and produce a solid, bright high-resolution display.

Figure 3 shows the arrangement of the two oscilloscopes. Waveform B is applied to channel 1 of the analog scope, and is displayed on the screen. The delaying sweep (usually called the "main" sweep) is triggered on the input waveform ("internal, channel 1") or from "line." Its sweep speed is usually set at 1 ms/div, so that one cycle of the line-frequency waveform fills the screen. Waveform C is applied to channel 2. It need not be displayed, as this will be done with the digital scope. The speed of the delayed sweep should be set faster than the delaying sweep (perhaps 100 us/div), so it produces a convenient highlight on the screen. The horizontal display of the analog scope can be set to the "delayed sweep intensified" mode, so that the time interval of the delayed sweep will be intensified as shown on the waveform. The intensified length of the trace will be approximately 10 times the time/div setting of the delayed sweep. The delayed sweep trigger circuit is set to trigger on channel 2, after the delay time elapses. The trigger controls (coupling, level and slope) must be adjusted to trigger on waveform C.

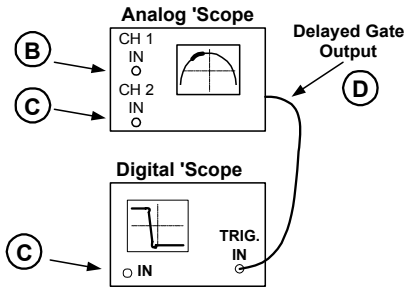

Fig. 3. Oscilloscope setup

When the delayed sweep triggers, its gate signal commences, and lasts for the duration of the sweep. It coincides with the intensified length of the displayed waveform. The gate signal is applied to the external trigger input of the digital scope, and

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Tricks of the Trade from page 5

the digital scope is adjusted to trigger on it. The digital scope can then be set for the desired sweep speed (perhaps 100 ns/div) to display the waveform C in detail. As the delay control on the analog scope is adjusted, the digital scope shows the pulses as they vary throughout the half cycle of the input mains.

Figure 4 shows the timing waveforms. At the top is the rectifier output. The next three waveforms are internal to the analog scope. The first and second are deflection voltage and gate voltage of the main (delaying) sweep. The ramp voltage controls the position of the electron beam, moving it from left to right over the display interval. The gate waveform coincides with it. The third internal waveform is the delay signal; it rises at the end of the delay interval set by the delay control. Waveform D is the delayed sweep gate, which coincides with the duration of the delayed sweep. The waveform below it is the same, except expanded for illustration, and the final waveform is C, as displayed on the digital scope.

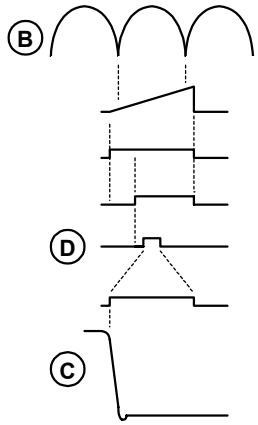

Fig. 4. Oscilloscope waveforms

Chuck Mullett is well known for his contributions to the power-supply industry over the past 30 years, particularly in magnetic amplifier circuits. He was the Founding Chair of the Los Angeles chapter of the IEEE Power Electronics Society and served as Program Chair and General Chair of APEC '95 and '96, respectively. He is presently a member of both the APEC Conference and Steering Committees, and is Chair of the Power Sources Manufacturers Association (PSMA).

Editor's note: You are invited to send your own favorite Trick of the Trade for publication in the PELS Newsletter. Just send it in any convenient medium, spelling out symbols such as Greek letters. Also, send along a recent photo, color or b/w of any size, for insertion along with your favorite Trick.

Simulation Tools for Power Electronics

Part II

The previous article (PELS Newsletter, October 2001) on modeling and simulation of power electronics and electrical drives brought several inquiries and contributions. Although I am not very old (at least in my opinion!), I remember simulating systems and circuits using programs running in mainframes. That seems like the Paleocene Age compared to the ease in use of modern simulators. Although most simulation environments provide some sort of programming interface and commands, the trend is clearly towards visual, drag-and-drop interfaces.

PSCAD (Power Systems Computer Aided Design) is a commercial package for simulating interactions between power-electronic equipment (converters, SVCs, machine drives) and the power system. It is capable of modeling interactions between many converters, with analog and digital controls, multiple time steps, event driven tasks, and non-linear effects. There is a free version of PSCAD that lets users model systems with up to 15 nodes, which is enough to model 12-pulse HVDC systems and some simple power-electronic systems and unlimited amount of controls. It has a graphical user interface, and it can interface with MATLAB. See http://www.pscad.com/

The VTB (Virtual Test Bed) is a product of a multi-university, international endeavor, funded primarily by the US Office of Naval Research. One aim of this effort is to integrate models of multidisciplinary dynamic systems, created in a variety of languages, into one simulation environment. Models can be created by experts using familiar languages. VTB is free and open for contributions. A web-based model library is maintained for users. Because it is a multidisciplinary project, there are models integrating distributed energy generation and storage, fuel cells, gas turbines, batteries and supercapacitors. See http://vtb.engr.sc.edu/

PLECS (Piece-wise Linear Electrical Circuit Simulation) is an add-on for Simulink, a Matlab based simulation package for dynamic systems. It has been developed at ETH Zurich, and can currently be used for free. Power electronics circuits are entered as netlists and may consist of passive components, sources, meters, and ideal instantaneous on/off switches. PLECS converts a circuit into a Simulink subsystem with signals for controlled sources and switches as inputs. Measurements taken by voltmeters and ammeters are provided as the subsystem's outputs. Controls can be built around the circuit using Simulink blocks. This facilitates the simulation of complex controlled power-electronics systems. See http://www.eeh.ee.ethz.ch/plecs/

PSIM (PowerSIM) is a commercial simulator specifically designed for power electronics and motor control. It has two add-ons: Motor Drive Module and Digital Control Module, providing various electric machine models and digital control simulation capability. The evaluation version allows up to 34 circuit elements. It comes with sample circuits such as motor control, active filter, power factor correction, space vector PWM, and switch-mode power supplies. See http://www.powersimtech.com/

The above summary is intended to inform readers about what is suitable and available for simulation of power electronics from an educational perspective. There are several other alternatives. Of course, your input is always welcome!

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President's Message from page 1

most important products/services were, (1) internet access to publications and technical information, (2) access to standards information, and (3) printed periodicals. As you might expect, however, the gap between importance and satisfaction was greatest for items (1) and (2). Internet access to technical information must remain at the highest priority level for IEEE. Much of the capital investment that IEEE has made over the last few years has been in this arena. PELS, too, must remain dedicated to improving our electronic delivering of technical information of all kinds. This means not only papers and articles, but also continuing education, PELS website info, newsletters, etc.

If you have questions or would like more details of the surveys (number of respondents, etc.), you may contact me at the email address below.

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present APEC 2003

CALL FOR PAPERS AND SEMINARS

EIGHTEENTH ANNUAL

Applied Power Electronics Conference and Exhibition

FEBRUARY 9–13, 2003 • THE FONTAINEBLEAU HOTEL • MIAMI BEACH, FLORIDA

The Eighteenth Annual Applied Power Electronics Conference and Exposition (APEC 2003) will address the application of new components and circuits, design-oriented analysis techniques, and current trends in the design and manufacture of power electronic products and systems.

CONFERENCE HIGHLIGHTS

- Full technical program of presented papers
- Professional Education Seminars on important topics for power electronics professionals including anyone involved in marketing, quality and manufacturing
- Exposition featuring component, equipment and service leaders in the power electronics industry

Participation is solicited in all areas of power electronics, including those listed below. Suggestions for other related topics are welcomed and encouraged.

- DC-DC Converters
- AC-DC Power Supplies
- Inverters & Cycloconverters
- Soft Switching Techniques
- Lamp Ballasts
- Adjustable Speed Drives
- Power Factor Correction
- Design For High Efficiency
- Modeling & Analysis
- High Frequency Design
- Control of Converters & Systems
- Simulation Tools & Techniques
- CAD/CAE Tools & Techniques
- Power Semiconductors
- 42 volt automotive electrical systems
- Aerospace/Defense Systems
- ICs for Power Electronics
- Design & Analysis of Magnetic Devices
- New Developments in Capacitors
- High Density Packaging
- Thermal Management
- Distributed Power Systems
- Uninterruptible Power Systems
- Battery Systems
- Electric Traction Systems
- Automotive Applications
- Protection of Converters & Systems
- Preventing & Controlling EMI
- EMI and EMC Issues
- Product Marketing & Distribution
- Power Supply Testing
- Market Analysis & Strategies
- Product & Technology Roadmaps
- The Voice of the Customer
- Identifying New & Emerging Markets
- Benchmarking Results
- Quality Programs & Data
- JIT & Material Management
- Vendor Qualification
- Manufacturing Processes
- Design for Manufacturability
- Technology Transfer
- Standardizing Specifications
- Regulatory Requirements
- Effective WEB Marketing

DEADLINE FOR SUBMISSION OF ABSTRACT AND DIGEST IS JULY 8, 2002

Notification that a paper was accepted or declined will be **mailed no later than September 6, 2002.** Manuscripts in final camera-ready form will be due at the publishers **no later than November 8, 2002.** Prospective authors are asked to submit a 50-word Abstract and a three-to-five page Digest of their planned presentation. Both the Abstract and Digest should be typed, double-spaced on $8_{1/2}$"x11" paper. The heading of the Abstract must include:Title of the presentation, Corresponding Author(s), Affiliation(s), Mailing address, and Daytime telephone, Fax number and e-mail address. The heading of the Digest should include **the title only**. **Digests for APEC must be submitted in Electronic Format.** Please visit www.apec-conf.org for details.

APEC 2003

2025 M Street, 8th Floor,Washington, DC 20036 • (202) 973-8664 • FAX: (202) 331-0111
For more information on exhibiting at the Exposition, call: (202) 973-8664 or FAX (202) 331-0111
or E-mail: apec@courtesyassoc.com • Web site: www.apec-conf.org

APEC is sponsored by the IEEE Power Electronics and Industry Applications Societies and the Power Sources Manufacturers Association

APEC 02 Recap

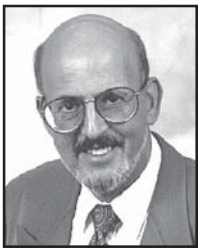
APEC 2002 was held March 10-14 at the Adams Mark Hotel in Dallas, Texas. A depressed economy reduced the total number of conference registrants from the records set last year. Nevertheless, attendees came from over 24 foreign nations representing every continent of the globe, which attests to the continued value of the APEC program.

Our challenge is to make sure that the annual program, be it Professional Education Seminars or the Technical Papers, truly addresses "applied" power electronics. During the conference I interviewed several attendees and exhibitors — both first-time and old-time — to get the "voice of the customer," and APEC 2002 received favorable reviews from both attendees and exhibitors. According to a survey reported at the PELS AdCom meeting, the top reason for joining the IEEE (69% of responses) is "to remain technically current." This desire is consistent with feedback from conference attendees, who had little difficulty in getting management approval to attend APEC.

Further evidence of the satisfaction of our exhibitors is that we increased the number of vendor exhibition booths to 155 this year setting yet another APEC record. Most of the 160 booths for APEC 2003 in Miami, FL were reserved at the exhibitor breakfast.

The APEC conference is an annual "family gathering" where academic and industry leaders demonstrate the true benefits of partnering. Having nine of the past ten General Chairs of APEC in attendance this year illustrates the good will and camaraderie of these volunteers, each of whom represents one of the three sponsoring organizations during the past decade. Many of these past chairs have remained very active in support of APEC through their service on the Steering Committee.

Occasionally we are challenged by events beyond our control. This year a trucking accident destroyed 3 of the 5 skids of printed conference proceedings during transit from the publishing house. Although every technical session attendee has a CD of the proceedings, many of us prefer to use printed proceedings at the conference. Courtesy Associates management quickly contacted the IEEE book broker, who had ordered extra copies of our proceedings. Their shipment was redirected to Dallas so that every technical session attendee could have a printed copy of the proceedings.



Attendees at this year's conference had the opportunity to attend 15 professional education seminars, 26 multi-speaker technical sessions, 12 exhibitor application seminars, three RAP sessions, the Exhibit Hall, the 16th annual Micromouse competition, and our Wednesday evening banquet held at the Dallas World Aquarium inside the Orinoco Rainforest.

Although there was no theme for APEC 2002, it was apparent that many engineers are interested in EMI issues. Both the seminar and technical session on this topic drew some of the largest crowds.

With an open mind to "customer satisfaction," several surveys are conducted each year. Attendees who complete surveys are eligible for prizes drawn in the exhibit hall

Continued on page 9

Automotive Rap Session Discusses 42-Volt Vehicles

The Rap Session "Does 42 V Really Have What it Takes for Future Automotive Electrical Systems?" at APEC'02 drew around 100 people interested in discussing the next generation of power for vehicles. The Session was organized and chaired by Tom Jahns of the University of Wisconsin, Madison. Panel members consisting of automotive industry experts John Miller from Ford Motor Company, Jim Takashima from General Motors, Ralph Taylor from Delphi Corporation, and Randy Frank from International Rectifier discussed the need for higher voltage, the rationale for choosing 42 volts, and associated specification and implementation concerns.

Increases in automotive loads are averaging 4 to 5% per year and several future vehicle loads will exceed 1000 watts. A 42 V PowerNet specification for the charging voltage and associated voltage limits has received widespread support to enable power generation beyond the 3 to 4 kW limit of today's belt-driven alternators. As panel members pointed out, there are numerous challenges associated with increasing the bus voltage to 42 V in vehicles. However, with Toyota's recent introduction of the Crown THS-M (mild hybrid system) based on a dual voltage 42V/14V system, 42V systems have come of age in the twenty-first century. Other manufacturers and their suppliers are developing or evaluating similar systems that provide idle stop, electrically-assisted acceleration and regenerative charging of the battery during braking. All these add up to 15% greater fuel economy depending on the vehicle and driving schedule. The power systems will not be limited to 42 V for those vehicles where manufacturers want electrical traction to play a greater role and a mild hybrid becomes a true hybrid. In these instances 192 V and 288 V are among the voltages that are discussed for traction motors that exceed 15 kW. These voltages will probably not be used to distribute voltage for other vehicle loads.

For those interested in more information, the Workshop on Power Electronics in Transportation (WPET) 2002 — to be held in Dearborn, Michigan in October — will also address 42 V systems and other power issues on future vehicles. For more information visit the PELS website at <http://www.pels.org/>.

Randy Frank
WPET 2002 General Chair
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INTELEC '02

from pg 3

cial program will provide ample opportunity for participants and their guests to take advantage of their visit to Montreal. Two exceptional post-conference tours will provide opportunities to further explore French Canada with a visit to the historical walled city of Quebec and the surrounding region, or to discover the Northern landscapes of James Bay and the extraordinary La Grande hydroelectric complex of Hydro-Quebec.

All conference sessions and exhibitions will be held in the newly expanded convention center, le Palais des Congrès de Montréal. Our conference hotels — the Hotel Inter-Continental Montréal, the Delta Centre-Ville Montréal, and the Holiday Inn Select Centre-Ville Montréal — are all adjacent to the convention center and are connected to it by Montreal's unique underground pedestrian corridor network.

Without doubt, INTELEC 2002 will be a valuable opportunity for technical education, for exposure to the latest technology developments and for networking with operators, designers and manufacturers, all focused on meeting the challenge of providing *Reliable Energy: The Driving Force Behind Dependable Communications*.

I look forward to seeing you in Montreal!

Michael Davis
General Chair, IEEE INTELEC 2002

APEC 2002 Recap

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on Tuesday evening. This year's five winners took home their choice of a portable DVD player, a digital camcorder, a digital still camera, a pocket computer, and a digital music recorder. The attendee selection for the best-designed booth went to IR. Votes for the booth with the best free giveaway and happiest sales staff went to Fairchild Semiconductor.

Following the drawing, interactive RAP sessions gave attendees an opportunity to challenge the panelists. Several intense debates concluded that the selection of voltage for future automotive electrical systems is unresolved. In the (two-hour) session on the cost and benefit of contract manufacturing versus in-house manufacturing, moderator Craig Johnson closed by stating that there is "no right answer." Unfortunately I could not be in three places simultaneously, so I cannot report on the RAP session that addressed acquiring an ASIC.

The Micromouse competition, an annual APEC highlight, had a virtual photo finish for fastest time to the center of the maze. This event was by far the most competitive of the ten annual APEC micromouse contests I have attended. Over 150 people witnessed the contest in which nine mice (and their handlers) representing India, Korea, Singapore, and the United States were all eager to capture the "big cheese." The fastest mouse (11.21 s) and overall winner was Min 3, designed by Ng Beng Kiat of Ngee Ann Polytechnic in Singapore.

Looking ahead, APEC 2003 will be held February 9 – 13, 2003 at The Fountainbleau Hotel in Miami Beach, Florida. Anyone interested in submitting a seminar or technical session proposal of practical importance in any area of power electronics should submit a 50-word abstract and a 3–5 page digest (including figures, tables and references) of the proposed presentation. In addition, authors should obtain company or governmental clearances prior to submittal. Abstracts and Digests marked as "Confidential" or "Proprietary" will not be accepted. Digests for APEC 2003 must be submitted in electronic format no later than July 8, 2002. Please see the APEC '03 Call for Papers in this *Newsletter* and visit *www.apec-conf.org* for additional instructions.

Larry Gilbert
APEC Publicity Chair

Photos from APEC® 2002, Dallas, Texas



Sponsors' Awards: PELS President Tom Habetler to Conference Chair Joseph Thottuvelil; Program Chair Bruce Miller; IAS President Mark Nelms to Micromouse Chair Dave Otten.

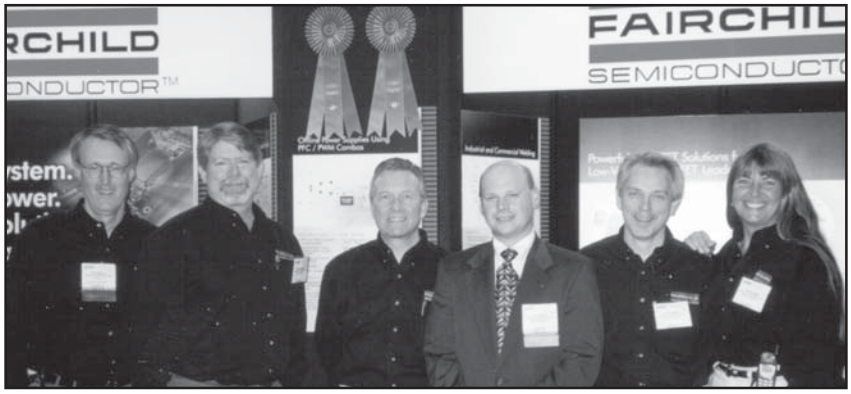

Exhibit Awards: Fairchild Semiconductor captured both "Best Give-away" and "Happiest Sales Force;" International Rectifier was voted "Best Booth Display" for the second consecutive year. Exhibit photos are courtesy of Larry Gilbert.


Micromouse Contest: Master of Ceremonies David Torrey explains the rules; victorious mouse handlers.

ANNOUNCEMENT

for the 8th

Workshop on Computers in Power Electronics

COMPEL® 2002

June 2 – 4, 2002

University of Puerto Rico at Mayagüez
Mayagüez, Puerto Rico

The Eighth IEEE Power Electronics Society Workshop on **Computers in Power Electronics (COMPEL® 2002)** will focus on computational science and engineering applications to the design, analysis, simulation, control, and operation of power electronic circuits and systems. An additional interest of COMPEL 2002 is the use of information technology to enhance and deliver power electronics courses and curricula. Computation is now regarded as an equal and indispensable partner, along with theory and experiment, in the development of future generations of power electronic systems where cost and reliability constraints will impose higher demands on the capability of power electronic systems simulation, design, and development tools to accurately predict system behavior before implementation. The goal of this workshop is to provide a lively venue for the discussion of these issues.

Simulation Tutorial

COMPEL starts Sunday afternoon, June 2, with a tutorial on Simulation of Electric Motors and Drives, presented by Dr. Steven Leeb, Associate Professor, MIT Laboratory for Electromagnetic and Electronic Systems.

Workshop Overview: 28 Presentations in 7 Sessions

Component models	Control design	Power converter design
Education	Motors/drives	Software tools (I and II)

Registration#

	IEEE Member	Non-IEEE Member
By May 24	$200	$250
After May 24	$300	$350
Student	$25	$50

#Includes the tutorial, two lunches, one evening reception, breaks, and one copy of the proceedings

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For Additional Information, see the COMPEL website *http://ece.uprm.edu/~compel*

COMPEL is sponsored by the IEEE Power Electronics Society

Power Electronics Packaging Committee

The Power Electronics Packaging Committee met on March 12 during the IEEE Applied Power Electronics Conference (APEC) and discussed future initiatives. The committee presently supports solicitation of papers for the major society conferences and initiates a workshop every other year. The meeting focused on initiating the next International Workshop on Integrated Packaging in 2003. Both the Power Electronics Society (PELS) and the Components, Packaging and Manufacturing Technology Society (CPMT) were financial sponsors of the previous two workshops and have expressed support for the third.

A second discussion focused on committee direction and meeting the future needs of those involved in packaging. Power electronics packaging has evolved as a commonly-recognized concurrent part of power-electronics design, and both the electrical and packaging designers have equal interest. The committee will split its strategies and have distinct foci on technology and applications. This is envisioned as closer affiliation between PELS and CPMT to meet the needs of the packaging engineers, and between PELS and PSMA (Power Sources Manufacturers Association) to meet the needs of electrical design engineers.

The committee is greatly interested in new members. Due to shifts within companies, committee membership has varied substantially. If you are interested in being an active committee contributor or even an observer (an "activist in waiting"), please contact the committee chair.

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PELS AdCom Meeting Highlights

The Power Electronics Society Administrative Committee (AdCom) held its spring meeting March 10 in connection with the Applied Power Electronics Conference (APEC'02) in Dallas. The meeting was expanded at the end of the regular session to include the Executive Board of the Industry Applications Society for a joint presentation by Matt Loeb, an IEEE Staff Director, on the state of IEEE operations and infrastructure.

Major actions taken by the AdCom dealt with publications, conferences, and educational programs. The Society also authorized renewal of a sister-society agreement with the Sociedade Brasileira de Eletronica de Potencia in Brazil.

AdCom decisions included:

- Expansion of the PELS Newsletter to accommodate technical articles and papers and to accept paid advertising.
- Purchase of a computer-powered projector for use by the AdCom and Society committees.
- Authorized the establishment of "Power Electronics Letters" for fast-response, peer-reviewed publication in an all-electronic format, with the first publication date in 2003.

The publication is expected to be part of the IEEE All-Society Periodicals Package and IEEE Xplore and it is anticipated that costs associated with a required print version of the letters will be born for the time being by ASPP, offset against income for the new publication. The AdCom set a member subscription rate of $10 and allocated $15,000 in the 2003 budget and subscription monies for startup of the new product. Publications Chair Ron Harley and Junior Past President Phil Krein will help the TAB staff organize and implement the program.

- Approved advance financial support for the 2002 Computers in Power Electronics Workshop, 2002 Power Electronics in Transportation Workshop, 2003 International Electric Machines and Drives Conference, and 2003 Power Electronics Specialists Conference.
- Approved technical participation in the 2002 Nordic Power and Industrial Electronics Conference in Stockholm and the 2003 4th International Conference of Power Electronics and Motion Control in China in the summer of 2003.
- Authorized funding for a CD-ROM tutorial project on an introduction to power electronics to be co-sponsored by PELS and the Industry Applications Society.
- Established a policy covering technical support and as appropriate some financial support for educational workshops.

President Tom Habetler reported on changes in meetings, conferences, and services procedures with three new requirements:

1. Society presidents must forward preliminary conference attendance and exhibits financial numbers to IEEE Conference Services within a week of the conference end
2. Full text PDF files will be required for all conference proceedings to accommodate the Xplore program beginning in 2003
3. A new copyright and export control form is in effect and must be used for all conference paper and abstract submissions.

Habetler said membership in PELS as of February 2002 stood at 6,554, an increase of 0.7 percent over the 6,506 reported a year earlier. The IEEE as a whole listed total membership in all categories in February of 401,275 as against 403,090 for the earlier year, a decline of 0.5 percent. The figures reflect a drop in the number of affiliate members and without that category, membership climbed from 374,599 in February 2001 to 374,998 in 2002, an increase of 0.1 percent.

Bob Myers
PELS Administrator

PESC '02 Invitation

from page 1

was first mooted in 1991, and 2002 was the first time slot available for an Asian venue in the usual sequence of locations!

Power electronics in Australia is practiced and taught by a small but dedicated band spread very thinly over our continent. Our committee is made up of the majority of those people, so that we can claim to represent our nation rather than being closely related to one institution. In fact, because we have members in both New Zealand and Singapore, we could fairly claim to represent our quarter of the globe!

PESC is usually located close to the home or supporting institution, so in our case we had to think rather differently. Unconstrained by "local" issues, we choose what we believe is the best possible venue in all of Australia — Cairns in far North Queensland, on the great barrier reef. Being tropical it has an ideal climate in the southern winter, the usual time for PESC, and there is a lot more; check the web site!

Not only are we excited about welcoming you to our region, but we greatly appreciate the support that you show by visiting us, reminding our small but dedicated band that we really are part of a large body of international researchers.

One final enticement — we have just been notified that Australia's Chief Scientist, Dr. Robin Batterham has agreed to open our conference.

Dean Patterson
General Chair, PESC 2002

Meetings of Interest to PELS Members

PES'02, the 6th International Conference on Power and Energy Systems, will be held in Marina del Rey, CA, USA on May 13 – 15, 2002. PES 02 is comprised of 4 symposia, and the IEEE Power Electronics Society is a technical co-sponsor. For complete information, see *http://www.iasted.com/conferences/2002/marina/pes.htm* .

COMPEL 2002, the 8th IEEE Power Electronics Society Workshop on Computers in Power Electronics, will be held June 3 – 6, 2002 at the University of Puerto Rico in Mayagüez, Puerto Rico. See the flyer in this *Newsletter* or visit *http://ece.uprm.edu/~compel* for details.

SPEEDAM 2002, a Symposium on Power Electronics, Electrical Drives, Automation & Motion, will be held June 11–14 in Ravello, Italy. The IEEE Power Electronics Society is a technical co-sponsor. See *http://www.speedam.unina.it/* for details.

PESC® 2002, the 33nd Annual IEEE Power Electronics Specialists Conference, will be held June 23 – 27, 2002 in Cairns, Australia. PESC is sponsored exclusively by the IEEE Power Electronics Society. For additional information see the article and flyer in this *Newsletter* or visit *http://www/pesc2002.com/* .

EPE-PEMC 2002, the 10th International Power Electronics and Motion Control Conference, will be held September 9 – 11, 2002 in Cavtat and Dubrovnik, CROATIA. For additional information visit *http://www.fer.hr/epe-pemc2002*.

INTELEC® 2002, the 24th International Telecommunications Energy Conference, will be September 29 – October 3, 2002 in Montréal, Canada. The IEEE Power Electronics Society is the sole sponsor in even years, and is a technical co-sponsor in odd years. See the article in this *Newsletter* or visit *http://www.intelec.org* for additional information.

CIEP 2002, the 8th IEEE International Power Electronics Congress, will be held October 20 – 24 in Guadalajara, Mexico. The IEEE Power Electronics Society is a technical co-sponsor. Visit *http://ciep2002.iteso.mx* for details.

WPET 2002, the 7th Biennial Workshop on Power Electronics in Transportation, takes place October 24 – 25 in Detroit, Michigan, USA. WPET is co-sponsored by the IEEE Power Electronics Society and the IEEE Southeast Michigan Section. Abstracts are due May 15, 2002. For more information visit *http://www.engin.umd.umich.edu/ECE/~WPET* .

IECON'02, the 28th Annual Conference of the IEEE Industrial Electronics Society, is planned for November 5 – 8, 2002 in Sevilla, Spain. PEDS '01 is held in technical cooperation with the IEEE Power Electronics Society and numerous other organizations. For further information see *http://iecon02.us.es* .

APEC® 2003, the 18th Annual IEEE Applied Power Electronics Conference, sponsored by the IEEE Power Electronics Society, the IEEE Industry Applications Society, and the Power Sources Manufacturers Association, will be held February 9 – 12, 2003 at the Fontainebleau Hotel, Miami Beach, Florida. USA. See the Call for Papers in this *Newsletter* and visit *http://www.apec-conf.org* for current information. Digests and seminar proposals are due July 8, 2002.

IEMDC 2003, the IEEE International Electric Machines and Drives Conference , is scheduled for June 1 – 4, 2003 in Madison, Wisconsin. The IEEE Industrial Applications, Industrial Electronics, Power Electronics, and Power Engineering Societies are technical co-sponsors. The deadline for digests is October 21, 2002. For additional information visit *http://www.iemdc03.org* .

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