The
Product Safety Engineering Newsletter

Vol. 6, No. 4 December 2010

IEEE PSES
Product Safety Engineering Society

What's Inside

President's Message

Greetings, PSES Members! I hope everyone is having a great holiday season, and that we can look forward to a prosperous, healthy New Year. For our society, we have had a good 2010 and plan for a busy 2011.

In 2010, we made real progress. Our membership approaches 950, we have numerous chapters, had a successful China workshop and Boston conference, and have improved our structure. Our plan and approach has been supported by the IEEE leadership, so we are on the right track. We have a lot of activities planned for 2011. Your Board of Directors' goal is to provide real value for your IEEE PSES membership.

The April, 2010 Beijing Workshop showed the tremendous interest in product safety engineering and compliance in China. The structure is being established to support a dynamic professional society in China. I am excited about both the opportunities for engineers, managers, and administrators in China, as well as the potential for them to share their ideas and culture with our global organization. I think that one of the unique features of the PSES is its global membership. Given the requirements of global trade and peaceful advancement for all regions and countries, it's really essential for us as compliance professionals to understand the amazingly diverse global environment. We have to deal with multidimensional technical issues on a global scale. PSES is a unique forum for disseminating information. Global warming and other environmental issues will certainly provide new complexity and career opportunities for product safety engineering professionals far into the future.

Our seventh annual symposium was in the Boston, Massachusetts area. The Keynote Speaker, Dean Woodard of the U.S. Consumer Product Safety Commission (CPSC), brought a whole new perspective for me. He talked about how defective products get into the U.S. marketplace. In the discussions that followed, I think we all learned something about how our efforts affect the public. Also, we learned something about how the U.S. is different than most other countries. Raising such issues is, in my opinion, important to our profession, and helpful in our careers.

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The
Product Safety Engineering Newsletter

Newsletter Committee

IEEE PSES Officers

IEEE PSES Web Sites

http://www.ieee-pses.org/
http://psessymposium.org/
http://product-compliance.oc.ieee.org/
http://www.ieee-pses.org/emc-pstc.html
http://www.ieee-pses.org/newsletters.html
http://www.ieee-pses.org/pses.html

The keynote was one of a number of informative presentations at our annual symposium. As at past symposia, an electric (non-hazardous) atmosphere was shared by the attendees. A number of people from one of our oldest chapters, the Northeast Product Safety Society (NPSS) attended and enjoyed the camaraderie. We had 26 exhibitors who showed their offerings and met with the attendees. Steve Brody and his committee did a great job setting up a conference that ran smoothly. Even the food was great.

I'm excited about next year's Symposium! It will be in San Diego, California. See www.psessymposium.org. The committee is already planning another great event. I encourage everyone to submit papers. The biggest challenge for many participants is picking which presentation tracks to attend. There are too many topics of interest! We try to have something for everyone—product safety engineering/compliance basics, new requirements/technical developments in various product areas, and fringe/future trends/slightly offbeat topics. I'm sure that our members who attend year after year will tell you that the most stimulating way to attend our annual conference is to keep coming back. The symposium also provides context for the topics and people involved in the various discussion groups throughout the year.

Each year at our symposium, we spotlight a timely product safety area that has gotten public attention. It's often forgotten that the talent and commitment of our community usually avoids publicity. Marketing safe products may be profitable and good for our organizations and the public, but it doesn't make headlines. There are notable exceptions that rise to public interest. In past years, it has been lithium batteries. This year, it was automotive safety reliability. Who knows what it will be next year? We've been fortunate to have experts closely involved with the issues to give us non-proprietary background.

Besides our San Diego conference, we have a number of activities planned for 2011. First and foremost, we want all of our chapters up and running with regular meetings, featuring interesting, informed speakers. Please attend your local meetings! Let the leadership know what topics are of interest to you. Our society will build topic/speaker resources. Please don't be shy about getting involved in the chapter leadership. Our society—any professional society—depends on a growing, dynamic leadership. Your growth in leadership skills is vital to the society, but also crucial for your career and your company's success in the future. Those active in chapter leadership can move on to committee involvement and serving on out board of directors. IEEE is a huge organization (now approaching 400,000 members), and our society offers exposure and opportunities in wide-ranging topics and disciplines. Check out the IEEE website to get a sense of some of the neat stuff IEEE is doing.

Thomas Ha is our VP, Membership; Doug Kealey oversees chapter activities. (Their e-mail addresses are on the board of directors' page of our website.) Don't hesitate to let Doug know your ideas and suggestions for improving chapter effectiveness. Ideally, the chapters will act as a team to provide meetings and other activities that are worthwhile for all our members.

We are starting to plan some new workshops/conferences for 2011. Some will be our own; some will be jointly sponsored. If you would like to have a workshop for a specific topic or in your area, please let Doug Nix, our VP of Conferences, know your thoughts. In most cases, workshops and colloquia require a steering committee to get started and to coordinate the various functions of a conference. Unless you have a team and plans already in place, it's probably best to plan in 2011 for an event in 2012. We are building experience and resources to help you be successful, but it does take some time and considerable organization to carry out such an event.

We are starting some preliminary discussions with other societies and other organizations about building joint relationships. For now, I would encourage everyone to pass along our Call for Papers for posting with other organizations. We will post information about other safety-related conferences/workshops. Dan Roman, our VP for Communications, is the one to contact about posting CFPs on our website as well as other outreach (we might exchange ads, for example.)

In August, 2011 the IEEE Sections Congress will be in San Francisco. I hope to actively network with the Sections (IEEE Geographical Locations) and Societies/Councils (IEEE Technical Entities). This will be a major forum for PSES to reach out within IEEE.

For the future, we plan to have our annual symposium in Portland, Oregon in 2012, in Austin, Texas in 2013, and in Santa Clara, California in 2014. We invite you to make a proposal to host our conference in 2015 and beyond.

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Chapter Safety Probes

To see current chapter information please go to the chapter page at: http://www.ieee-pses.org/Chapters/index.html

Congratulation to the Madras India PSES Chapter for becoming our newest PSES Chapter

People Looking To Start Chapters

China

Paul Wang
paulwang@gmcompliance.com.cn

Dallas Texas

Jonathan Jordan (jonathan@goodsonengineering.com).

Denver Colorodo

Richard Georgerian
voice: (303) 833-2327
e-mail: richardg@ieee.org

Japan

Hiroshi Sasaki
hiroshi_sasaki@jema-net.or.jp

North Carolina

Warren Fields

ncps@bellsouth.net

Ohio

Jim Bacher

j.bacher@ieee.org

Southern California

Charles Bayhi
bayhi@cpsm-corp.com

Chapter Chairs - make sure you send your updates to Dan Roman.

Rochester (joint chapter with EMCS and EMBS)
The Rochester chapter's November meeting featured a presentation by Michael Brousseau of Intertek, and the topic was major changes to IEC 60601-1 Medical Electrical Equipment, 3rd Edition: (why 90 percent of medical devices fail). The new requirements go into effect in the EU in June 2012. The FDA follows in 2013.

Mr. Brousseau is the engineering team leader for the medical team in the Intertek Boxborough lab. He has 15 years of experience in safety compliance and 13 of them have been exclusively medical. He has helped thousands of clients make their way through the pitfalls of meeting the requirements of the standards, from the largest medical manufacturers to startup companies.

Santa Clara
Santa Clara's October meeting started with some socializing among colleagues at El Torito Mexican Restaurant in Santa Clara. The speaker was Kevin Ravo, and the topic was an Overview and Updates on IEC 62368-1, the new standard for audio/video, information technology and communications technology equipment. Mr. Ravo has been with UL over 30 years in various roles of engineering and management and is currently responsible for the coordination of technology and regulation issues related to the Global High Technology Business Group, which is responsible for services to the information technology equipment, consumer electronics, telecommunications, battery, and printed circuit board industries.

Mr. Ravo is focused on evaluating new business opportunities, implementing new programs, and developing and nurturing relationships with other organizations. He has also been involved in various domestic and international standards development related activities and currently is the Chair of the Technical Harmonization Committee for North America that is developing a proposed harmonized standard to IEC 62368-1.

Madras

For its second meeting of the year, the Madras Chapter participated in a technical seminar arranged by Tamil Nadu Electrical Installation Engineer's Grade A on Diesel Generators, maintenance and installation safety precautions at Hotel Deccan Plaza, Chennai on 18.12.2010.

Dr.G.V.Rao, PSES Chapter Chair explained in detail about the IEEE activities and also Product Safety Engineering and invited attendees to join the IEEE.

M/s A.K.Venkatasamy, President TNEIEA, Er.S.Appavoo, Chief Electrical Inspector to Government of Tamil Nadu, Mrs.K.Selvam, Electrical Inspector (Technical), S.Shankar, Regional Manager, Cummins India Ltd., and V.Lakshmanan, HHP, Cummins India Ltd., also spoke.

About 90 Members from various segments such as electrical contractors, consultants and power plant engineers participated in the technical lecture program, and a lunch was arranged at the end of the meeting. (See picture below)

Technically Speaking

by Richard Nute
Product Safety Consultant
San Diego

Questions and Answers

Introduction

Recently, a number of questions have been asked of me. Here is a compilation of those questions with answers. The subjects are quite varied, and all of these questions and answers refer to IEC 60950-1.

Electric burn versus electric shock

Question:
Why are electrically-caused burn requirements relatively independent of frequency while electric shock (perception and let-go) requirements are dependent on frequency?

Answer:
1. Electric burn.

Electrically-caused burn is due to POWER dissipated in the body resistance. Power is independent of frequency. Likewise, body resistance is independent of frequency. Electric burn is due to I^2R power dissipation in the body.

Electrocautery (which is a form of electric burn) is performed with high frequency to avoid electric shock effects of the current in the body. Here is some information from the web that describes electrocautery and effects of frequency on the body:

> Electrocautery is a surgical technique which involves introducing high frequency current to a specific area of the body in order to remove unwanted tissue, seal off blood vessels, or to create a surgical incision.
>
> The instrument used to perform electrocautery is also known as an electrocautery. An electrocautery uses a very high frequency, usually upwards of 100 kHz, to ensure that the patient's nerves and muscles are not stimulated. Lower frequencies could cause twitching and cramps, which would be a serious problem. Depending on the voltage used, the electrocautery can have varying effects on the patient's body.

2. Electric shock.

The physiological response of the body to CURRENT is frequency-dependent. For the same value of current, the higher the frequency, the lower the physiological response. Electric shock is due to I in the body; the effect of I varies as a function of the frequency of I.

Thickness of solid insulation

Question:
According to IEC 60950-1, for solid insulation material, there is no thickness requirement for basic insulation. Many factories manufacture Class I power supplies using a thin solid insulation between the PCB and the metal enclosure. There are many sharp component pins left on the solder side of the PCB. If there is no thickness requirement for the solid insulation material, it is possible to puncture the solid insulation. On the other hand, IEC 60065 has thickness requirement for basic insulation.

Answer:
In the described construction, the insulation is BASIC INSULATION. This means the construction must include a SUPPLEMENTARY SAFEGUARD, which is either SUPPLEMENTARY INSULATION (which has a minimum thickness of 0.4 mm) or an EARTHED METAL BARRIER (metal enclosure of Class I equipment).

The supplementary safeguard provides protection in the event of a failure of the basic safeguard (basic insulation). So, if the sharp component pins should puncture the basic insulation, the supplementary insulation or the earthed metal enclosure will provide protection against electric shock.

In addition, the mechanical tests should show whether or not the PCB pins will touch the basic insulation or not. Most sheet insulation has high tensile strength, so it is not likely to be punctured by the sharp PCB pins. If the sheet insulation is floating (not fastened to the earthed metal enclosure), then the sharp points will first push the insulation against the chassis and then cause an indentation in the sheet insulation which may lead to a puncture.

To safeguard against a component pin from puncturing a sheet basic insulation, then the sheet would need to be thicker than the pin height dimension. Or, the sheet insulation must be physically held in place the distance of the pin height plus the distance the PCB bends when pushed. In other words, the pins must not touch the sheet insulation. Both of these solutions would put severe (and undue) constraints on the design of products.

15 VA and fire

Question:
Why is 15 VA thought as the value not possible to cause fire hazard?

Answer:
The parameter volt-ampere is wrong. The parameter for electrically-caused heating (which causes fire) is the watt. Consider a 15-watt light bulb. You can easily touch a 15-watt light bulb without getting burned. So, the temperature of a 15-watt light bulb is less than 100 C, probably closer to 50 C. The reason that a 15-watt light bulb does not get very hot is that the local environment provides a good heat sink, which limits the temperature.

The self-ignition temperature of most plastic materials exceeds 350 C. So, 15 watts (or 15 VA) is highly unlikely to raise the temperature of the plastic sufficient to cause the plastic material to ignite.

A candle flame is about 50 watts. Furthermore, the maximum temperature within the candle flame can be as high as 1400 C. A candle flame will ignite plastic materials.

Limited Current Circuit (LCC) and Touch Current

Question:
What is the difference indeed between LCC and TOUCH CURRENT?

Answer:
As defined in IEC 60950-1:

LIMITED CURRENT CIRCUIT is “a circuit that is so designed and protected that, under both normal operating conditions and single fault conditions, the current that can be drawn is not hazardous.”

TOUCH CURRENT is “the electric current through a human body when it touches one or more accessible parts.”

Strictly speaking, an LCC only exists when either a capacitor or resistor “bridges” double or reinforced insulation. In practice, a circuit that comprises a current source is often taken as an LCC. LCC is measured either through a 2K resistor or with the Annex D scheme.

Touch current is from accessible parts and from the open PE conductor. Touch current is measured with the Annex D scheme.

Electric shock is due to BOTH voltage AND current. For an electric shock, ELV/SELV and Touch Current must both exceed the specified limit values. The standard presumes that any voltage exceeding ELV/SELV limits is a voltage source, which is not necessarily true. A high voltage measurement may be a low current source.

Likewise, the standard presumes that any current exceeding LCC limits is a current source, which is not true for low voltage sources. A high current measurement may be from a low voltage source.

As an experiment, open the earth wire on an equipment, and measure the open-circuit voltage. It will be about 1/2 the mains voltage (and exceeds the ELV/SELV limits). But, the current does not exceed either the touch current limits or the LCC limits. It is a current source. Likewise, if you measure ELV/SELV with for touch current, you will find that it exceeds the limits for both touch current and LCC.

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Power cord sheath

Question:
Inside a metal enclosure class II equipment, where the sheath of power cord has been cut off after the anchorage, is it permitted for the conductor insulator to contact the metal enclosure? The thickness of the conductor insulator is greater than 0.4 mm.

Answer:
In Class II construction, the insulation between the mains and the metal enclosure must be double insulation or reinforced insulation. Sub-clause 2.10.5.2 specifies that reinforced insulation must be 0.4 mm thick or greater. The power cord wire without the sheath meets this requirement and could be considered reinforced insulation.

Sub-clause 3.1.4 specifies that the power cord sheath is considered supplementary insulation. This implies that the power cord wire would be considered basic insulation, regardless of thickness. In a Class II metal-enclosed equipment, basic insulation must not touch the metal enclosure.

The standard appears to be contradictory. Since the standard is contradictory, I recommend that the construction:
– include the power cord sheath; or
– include an independent sheath over the wires; or
– the wires be restrained so that they do not touch the metal enclosure (meet the clearance requirements for supplementary insulation).

The 5000-ohm voltmeter

Question:
In sub-clause 1.4.9 and sub-clause 2.3, why is a 5000-ohm resistor used rather than the 2000-ohm resistor?

Sub-clause 1.4.9: When measuring a voltage between earth and a conductor in a circuit that will not be earthed in the intended application of the equipment, a non-inductive resistor of 5 000 Ω ± 10 % shall be connected across the voltage measuring instrument.

Answer:
I don't know why the 5000-ohm resistor is connected across the voltmeter. One guess is that, before the advent of electronic voltmeters, the passive voltmeters were typically 5000 ohms/volt input resistance. Perhaps this requirement was to standardize the voltage measurement to a worst-case voltmeter input resistance.

External circuits

Question:
What is the difference between "telecommunication networks" and "cable distribution systems?"

Answer:
Historically, telephone networks use twisted pairs of wires. One wire may be connected to –48 V dc through a high impedance. Telecommunication networks are subject to transient voltages. On the other hand, cable television distribution systems use coaxial cables. The outside conductor (braid) is connected to earth. Cable distribution systems are less subject to transient voltages because the shield (braid) is grounded and continuously surrounds the center conductor.

Resistance to abnormal heat

Question:
Sub-clause 4.5.5: *However, a thermoplastic part supporting part in a PRIMARY CIRCUIT is tested at a minimum of 125 °C.*

Why, for a PRIMARY CIRCUIT, there is a minimum temperature requirement, while for a secondary circuit, there is no such requirement?

Answer:
All thermoplastic parts on which parts at hazardous voltage are mounted shall be tested. The term "hazardous voltage" includes secondary circuits and primary circuits.

Thermoplastic parts for secondary hazardous voltage are tested at 15 C above the manufacturer's maximum rated temperature. Thermoplastic parts for primary circuits are tested at 125 C or 15 C above the manufacturer's maximum rated temperature, whichever is higher.

The reason for the higher temperature for the primary circuit is the energy in the primary circuit is very much higher than in secondary circuits. This energy, if converted to thermal energy due to a fault, can cause thermoplastic material to

soften. This lack of physical support of a conductor can cause other faults with consequent safety incidents.

Grounding resistance test

Question:
Why must the dc or ac source be less than 12V when we measure the grounding resistance?

Answer:
1) So that the open-circuit voltage is not a shock hazard to the person performing the test.

2) The voltage does not need to be any higher than 12 volts to do the measurement.

E = I x R
E = 25 amperes x 0.1 ohm
E = 2.5 volts

E = 25 amperes x 0.5 ohm
E = 12.5 volts

The earliest mention of 0.1 ohm, 12 volts, and 25 amperes is in IEC 950, 1986. Some years before 1986, the maximum grounding resistance was 0.5 ohm at 25 amperes. This would be 12.5 volts. Very many years ago (1971), the maximum grounding resistance was 1 ohm (but no test current was specified).

Comments or questions

If you have comments or questions about this article, please send them to Richard Nute, richn@ieee.org.

If you have a question about safety, and would like to see the answer published here, or if you would like to see a topic discussed here, please send the question or topic to Richard Nute, richn@ieee.org.

Richard Nute is a product safety consultant in San Diego, California.

Tip: ***Best way to get your boss to approve your trip to the 2011Symposium on Compliance Engineering is to submit a paper that gets accepted for the symposium! Or volunteer and tell him you have to be there!***

News and Notes

AHAM Fills New Certification Position
The U.S.-based Association of Home Appliance Manufacturers has appointed Ralph Hudnall as its Director of Product Certification and Verification. Mr. Hudnall will oversee AHAM's ongoing and new appliance rating certification and verification programs. These programs presently cover room air cleaners, room air conditioners, dehumidifiers, refrigerators, and freezers. AHAM is also developing verification programs for clothes washers and dish washers, and is expected to receive approval from ENERGY STAR as a recognized verification administrator for all of the product programs.

NEMA Opposes RILA Audit Standard
The U.S.-based National Electrical Manufacturers Association is vigorously opposing a new factory audit standard being developed by the Retail Industry Leaders Association of Arlington, VA. NEMA says "The standard prescribes an enormously broad and complex audit program that retailers will impose on their suppliers at great expense 'to help manufacturing or contract-packing sites to reliably produce safe, legal products to the quality levels specified by their customers or demanded by consumers.' "

According to NEMA, "After broad industry review, it appears that as much as 80 percent of 400+ requirements detailed in the standard are not directly applicable to the safe and effective manufacture of electrical products." And, "Program designers also envision thousands of trainers and inspectors traveling around the globe to visit and evaluate tens of thousands of facilities."

NEMA seems particularly irritated that the proposed factory audit program entirely ignores the existing factory audit programs of test houses, because the existing audits already check for compliance with consensus-based product safety standards.

Brownouts Coming?
ANSI standard C84.1, *Voltage Ratings for Electric Power Systems and Equipment*, is in the process of revision. Among the items on the committee's agenda is a proposal that "Conservation Voltage Reduction" be added to the standard. Apparently the idea has a significant base of support, as the U.S. Department of Energy has already contracted with Battelle to study the matter, with a report having been delivered in July 2010. The report is available at www.pnl.gov/publications (Type "CVR" into keyword search.)

New CPSC Database Will Require Close Attention
Manufacturers should be aware that the U.S. Consumer Product Safety Commission (CPSC) will soon (March 2011) implement a much-expanded searchable complaint database that will be readily accessible to anyone. Consumer reports (complaints) will be sent to manufacturers within five days of filing with the CPSC, and then the reports will be put into the CPSC database within 10 days after that.

Ten days is an extremely short period for a manufacturer to respond to a complaint that has been filed by a consumer. The CPSC sends the complaints to manufacturers, but if a complaint doesn't quickly get to the right person in the manufacturing organization, the 10-day window could easily expire. Manufacturers should make sure that the CPSC has correct contact information for complaints. Just one example of why manufacturers should be concerned—suppose a complaint is posted against one of your products, and upon review you find that the product is actually someone else's. Wouldn't you want to be able to post a response that it's not your company's product?

OSHA Decides Against SDoC System
The U.S. Department of labor's Occupational Safety and Health Administration announced on December 17, 2010 that it will not abandon its system for ensuring that electrical products used in the workplace are safe. The European Union had requested that OSHA explore the possibility of adopting its system, known as Supplier's Declaration of Conformity (SDOC). Under the EU system, manufacturers declare that their product meet safety requirements before placing these products on the market, thus requiring EU governments to operate a post-market surveillance system to verify whether products are compliant after they

have been placed on the market. OSHA's present system requires employers to use electrical devices tested and certified by independent testing laboratories recognized by OSHA.

In response to the EU's 2008 request that OSHA consider adopting an SDoC system, OSHA published a "request for information," essentially a public request for comments. During the time since 2008, OSHA reviewed the many comments and documents it received. OSHA determined that its requirement that "substantial evidence" show that the SDoC system would provide a higher level of employee safety was not met.

Warnings and Instructions Course to be Offered

The University of Wisconsin at Madison, WI will offer its highly regarded course, "Using Warnings and Instructions to Increase Safety and Reduce Liability" March 22–24, 2011. Four experts in their respective fields will present material on

- Factors useful in evaluating effective warnings and instructions
- The current legal duty to warn and instruct
- Court interpretations of this duty
- Testing and revising warnings and instructions
- ANSI standards that apply to product warnings
- ANSI Z535.6 regarding manuals
- Product safety issues in the global marketplace
- International standards for warnings
- Resources and techniques available to help write clearer instructions and warnings

TAC News

Telecom Safety Technical Committee

Developing a proposal to modify IEC/CSA/UL 60950-22 to address field problems associated with explosive atmospheres in lead-acid battery compartments of cell-site base station equipment. Ultimately will be proposed to IEC TC 108 MT2 through the Canadian National Subcommittee and the US TAG.

- Continue to monitor IEEE Smart Grid activities.
- Reviewing new Article 840 from 2011 edition of NFPA 70 (Premises-Powered Broadband Communications Systems).
- Membership includes engineers from the UK, Canada and US

Of note

- Telcordia GR-950-CORE just completed technical updates and is in the final stages of editorial changes.

ITE Safety Technical Committee

The ITE/Computers TAC is still in a start up mode. Though small so far, our group has engaged in some very interesting discussions regarding the safety considerations applicable to inductive and wireless chargers. Our TAC meets for one hour a month on every third Wednesday afternoon. Those seeking to join should contact Gary_Schrempp@dell.com.

Medical Devices Safety Technical Committee:

We need to be able to communicate to the whole PSES that the world of high-tech medical devices, medical device standards, and national regulations is exploding. The founders of the Medical TAC have built a base to communicate about the medical device industry and regulatory bodies what is happening in the world of medical devices in relation to safety.

Now is the time for you to join the Technical Advisory Committee to help us get to the next level. You can be the group that gets us to the next level and make our TAC an even better success. Please contact Sandy Weininger at Sandy.Weininger@fda.hhs.gov to find out more about the Medical TAC and to provide your name to submit as a potential TAC member. We are looking for those that have been in the medical device field in industry, regulatory bodies, consultants, etc. that have dealt with some aspect of safety for medical devices.

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Past President's Message / Election Results

The 2010 PSES elections are over and the details are pretty amazing. We had a 45 percent increase in members voting compared to last year. This is of special note as we had a significant increase in society membership this year. According to the November count, the society grew 29 percent over a year ago. Therefore having a 45 percent increase in those voting is truly amazing. I would like to see a large increase in voting next year as well.

Also notable is that we have been getting a lot more people volunteering to run for the BoD of the society. In years past it was tough to come up with four candidates. This year we had seven, and we already have people wanting to run next year. Our society now has representation from all regions outside of the U.S (regions 1-6).

We've reached a stage where we have been in existence long enough that some office holders are hitting term limits, so those people will have to sit out one year before they are permitted to run again. Beginning in January, nominees will be accepted for next year's election.

Every nominee in 2010 received a significant number of votes. The election results are as follows (note in any order):

2011-2013 BoD:
Silvia Diaz Monnier
Stefan Mozar
Doug Nix
Thomas P. Shefchick

The following Executive Committee members were voted in by the PSES BoD:
Vice President, Communications: Dan Roman
2011–2012 Vice President, Member Services: Thomas Ha
2011–2012 Vice President, Technical Activities: Ivan VanDeWege
2011–2012 Vice President, Conferences: Doug Nix
2011 President Elect: Elya Joffe

I would like to thank Dan Arnold, Ken Thomas, and Jim Knighten for serving on the Election Committee.

Jim Bacher
Past President, IEEE PSES

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In addition to oversight of this Newsletter, which has a 25-year heritage, VP of Communications Dan Roman oversees our website and other outreach. You should be aware that our list server and LinkedIn network are leading-edge in IEEE. Our society provides members access to crucial and continually evolving technical and regulatory issues. We are looking into having some articles in Chinese, Portuguese and Spanish with English translations. We hope that this will ease the cultural transition to a global marketplace. There is a lot going on! We can use help, especially with editorial and marketing needs.

Overriding our events and organizational issues is technical activities. We have a number of technical committees and areas of interest. A remarkable structure continues to be developed. Ivan Vandewege is picking up the technical activities lead from Jack Burns. See http://ewh.ieee.org/soc/pses/technical.html for our current technical committees. What do technical committees do? Well, we would like them to provide a number of technical functions, from state-of-the art research into technical issues and developing requirements to generating and reviewing papers to providing regular chapter presentations. Please don't hesitate about getting involved with any committee or considering a new one that you think would be worthwhile. We are still at the formative stage, so there are many opportunities. I am encouraging the TCs to provide topics and speakers for our chapter meetings, and we are building an editorial board for reviewing technical papers.

I could say that "the sky is the limit" so far as what our TCs might accomplish, but the limitation is with the number of people involved and their time. The more people who participate, the more that can be attempted; the more reasonable the burden on the volunteers. (That's us!) And the increased benefits to our members. As a "professional" society I think every member should be active in some manner. That might be in the local chapter, a conference/workshop committee, or a technical committee. Or your might make presentations and write papers. Or you might lead a science fair judging team. (As I mentioned in previous articles.) Or you might host a tour/meeting at your company. I've done every one of these things myself over the years, so I know the career growth and satisfaction that comes with active participation.

As the PSES president, I have been fortunate to participate with IEEE leadership/management. Many of you have been involved in other IEEE societies, so you have an idea of the breadth of IEEE activities. I can tell you that there are many more opportunities with which I would like us to be more involved, but we just don't have the time. IEEE Smart Grid is just one example where there are numerous product safety engineering and regulatory implications. We could participate in conferences, technical discussions, and planning. There are administrative and managerial opportunities in IEEE. Just meeting some of the legendary leaders in numerous engineering and scientific fields, and the leaders from all regions of the world is a stimulating experience.

I have tried to give you an overview of where we are, and where we will be going in 2011. I see 2011, my last year as PSES president, as a year of building our society for the future. Our next president will be Elya Joffe, who has considerable experience leading the much larger and established EMC Society. I hope all our members can be a part of our growing, dynamic society that is dedicated to serving product safety engineers, design engineers, and regulatory administrators and managers. We can be part of a unique global, multi-cultural community. Please don't hesitate to contact me with your ideas (murlinm@ieee.org).

Murlin Marks
President IEEE PSES

Source Impedance As An Ignition Risk Factor

by Gary Tornquist

Introduction

The other evening I was digging under the sofa cushions searching for a lost remote control. I thought there must be uncountable similar low voltage consumer electronic products in the world and wondered if they represent a significant risk of starting a fire. One of the first questions safety engineers may ask in assessing the potential risk factors for electrically caused ignition is, "How much power is available to be dissipated in a fault?" The higher the power the greater the risk of ignition. Recalling that W = V*A, I wondered which matters more at a given power level, the volts or the amps, or are they equal risk factors?

If volts and amps were interchangeable risk factors, the lines of equal risk would be hyperbolas as shown in Figure 1, and the risk would increase as the VA product increased towards the upper right of the graph.

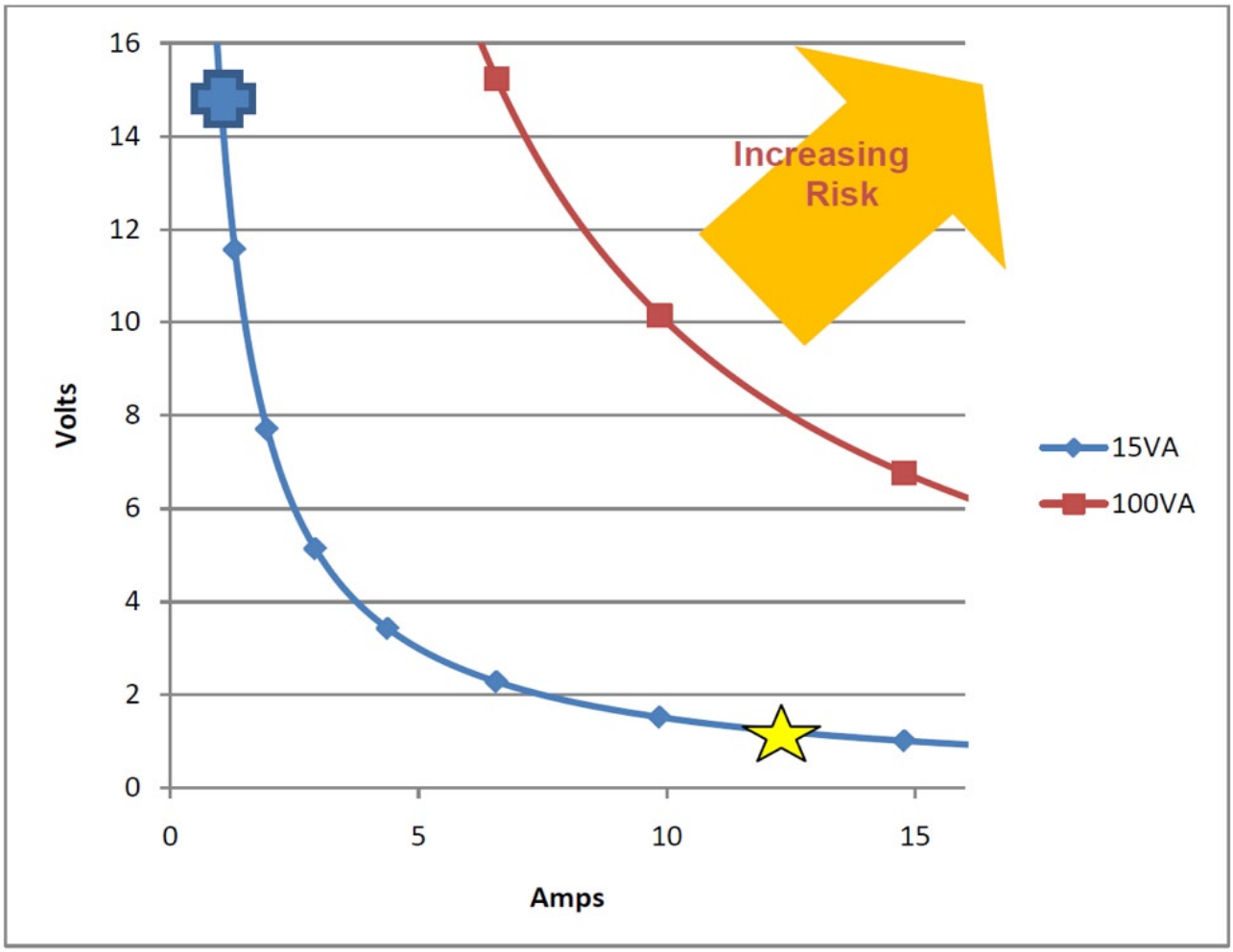

Figure 1

To make the problem specific, what would have more likelihood of an ignition, a 15V circuit with 1A available or a 1V circuit with 15A available? On Figure 1 the 15V circuit is marked with a cross, and the 15A circuit is marked with a star.

Next we can figure out how to model these circuits as simply as possible. We know that the power to a load is limited by the source impedance, and in this case we need only to consider resistive elements. Furthermore, the power transfer is maximized when the load impedance matches the source impedance as shown in Figure 2.

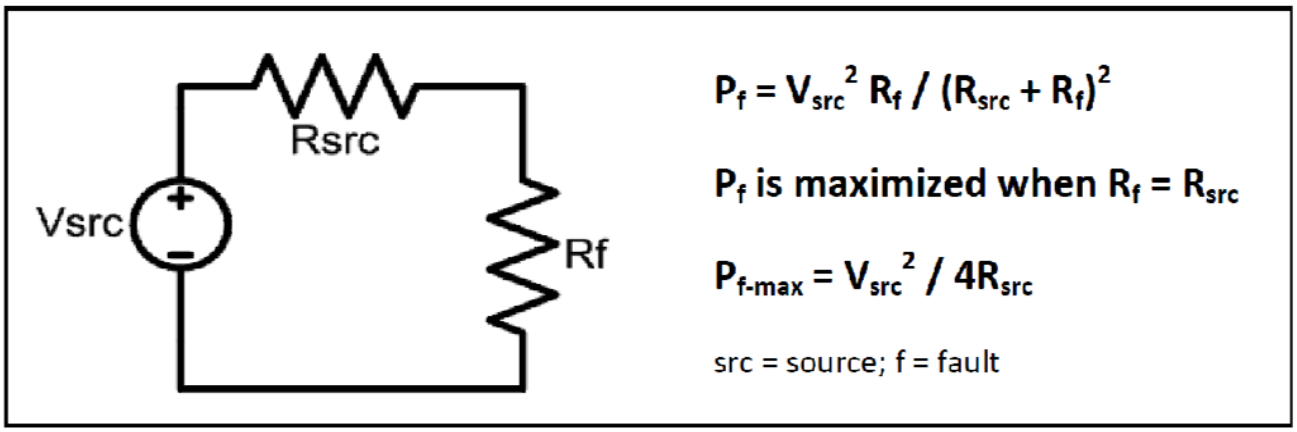

Figure 2

Then we can solve for the circuit values that will deliver a maximum power to a fault, $P_{f\text{-}max}$ equal to 15W at either 15V and 1A, or 1V and 15A, and we end up with the high impedance and low impedance circuits shown in Fig. 3.

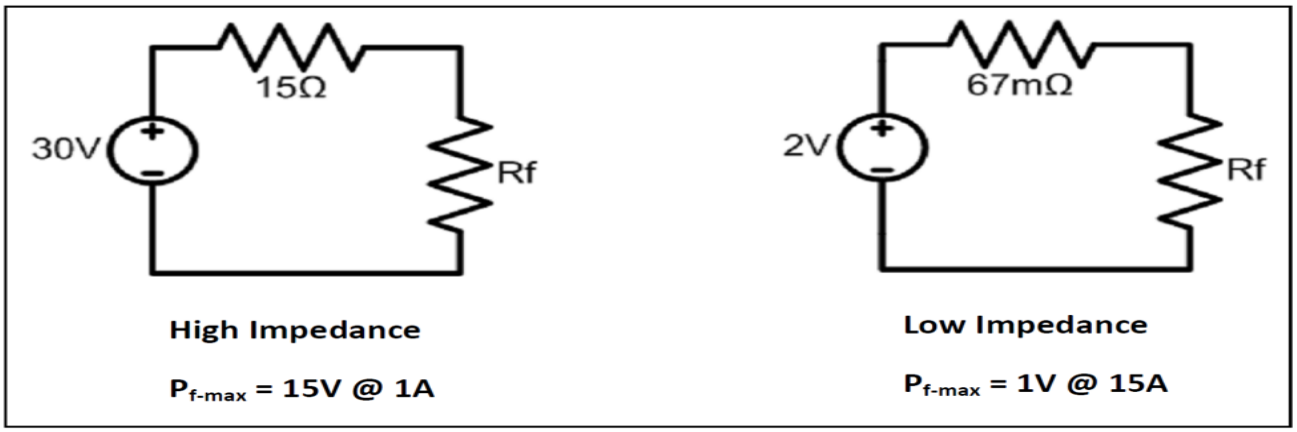

Figure 3

So both circuits can deliver just the required 15W, but only if the fault resistance happens to exactly equal the source impedance. These impedances are separated by more than two orders of magnitude as shown in Figure 4, which I believe has an impact to the potential ignition risk.

Continued on Page 16

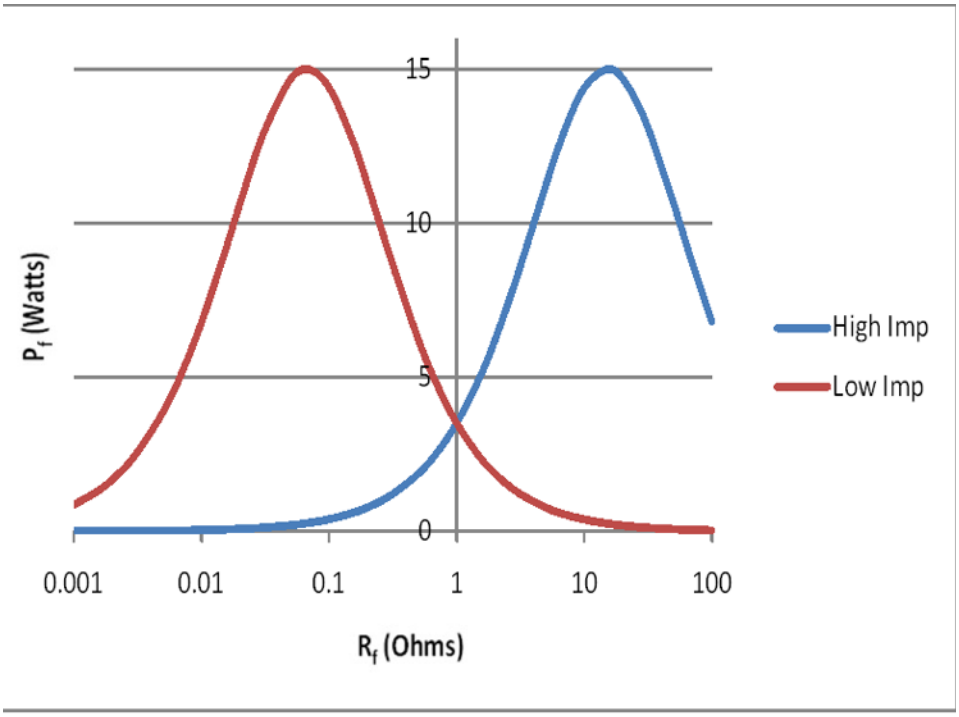

Figure 4

So the question comes down to this, in consumer electronics, which is more likely to occur, a fault resistance of a tens of ohms or tens of milliohms? Both can happen, but in my experience it is harder to create a few milliohms by accident than a few ohms. Metal-to-metal contact or heavy duty power semiconductors (which are rare, especially in 15W circuits) are two ways to create a fault of a few milliohms. On the other hand, many components (ICs, capacitors, general purpose transistors, etc.) may fail to resistances of a few ohms.

Conclusion

Are you convinced? There are many more things to consider in the voltage vs. current (or to phrase it more precisely, high source impedance vs. low source impedance) debate than can be covered in this article, including specific failure modes such as arcing and 'last strand' partings. Constructions beyond the PCB and silicon semiconductors of consumer electronics might behave differently. And valid conclusions inside the V-A region of figure 1 might not hold outside it.

That said, the result that voltage is more important than current feels right to me for two reasons, one practical and one theoretical. The theoretical reason is that voltage and current are not physically symmetric quantities (look up Maxell's equations if you doubt) and expecting a perfectly symmetric hyperbola to be the line of equal risk is counter-intuitive.

The practical reason is that circuit voltages in consumer electronics have been decreasing over the years leading to lower impedance circuits than were common when the 15W standard was established. Think about a vacuum tube radio which used 90 volts and a 10's of milliamps vs. a notebook computer—with a motherboard that might run at 3.3V at 20A. This trend toward lower voltages and higher currents hasn't been accompanied by an increase in the incident rate of electrically caused ignition, though surely many other relevant changes may have occurred over the years and the low numbers make analyzing the data difficult.

This article is intended to make an interesting argument rather than scientifically prove a hypothesis. The simpler single predictive factor of risk, available watts, is preferable in most cases. Other factors such as nearby fuel loads and available oxygen may dominate the overall risk. Still, I won't worry too much that there may be a

device with couple of AA batteries capable of delivering 10A at 1.5V = 15W under my couch cushions.

Gary Tornquist is Director of Product Safety for Microsoft Corp. Opinions are those of the author and not Microsoft Corp.

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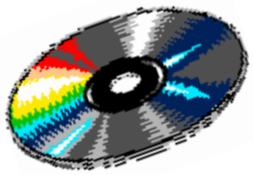

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