THE PRODUCT SAFETY SOCIETY NEWSLETTER

July, 1988 Vol 1, No. 6

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CHAIRMAN'S MESSAGE

by RICHARD PESCATORE

As our targeted time to formally petition the IEEE for affiliation approaches, your officers are taking a close look at the ramifications. We have discussed in past Newsletters several of the benefits we hope to realize. One question now comes to mind: What will the IEEE expect of the Product Safety Society?

We are investigating specific expectations held by the IEEE, but we have a general answer to this question: Some folks will have to commit their personal time to carry out the expected functions of an IEEE Society. These functions include running Chapters, editing publications, organizing conferences, and participating in IEEE activities and administration. With our present relatively small membership base compared to other IEEE Societies (hundreds of people rather than thousands), to immediately participate in all these activities may prove difficult.

Our most important goal is to maintain our group focus on Product Safety. Maintaining this focus is absolutely essential! We have been exploring options for affiliation with the IEEE that can achieve this goal and may be more appropriate right now than full Society status. The most promising scenario seems to be to continue our quest fur sanction as an IEEE member Society, but to make it a long term project (2 to 3 years). We recommend, as an interim step, applying to the IEEE to form a Technical Council with existing IEEE Societies.

A Technical Council exists in the IEEE to provide “a continuing mechanism for two or more IEEE Societies to work together in a multidisciplinary technical area of mutual interest”. Both the EMC Society and the CHMT Society have expressed interest in working with our group, and other Societies may also be interested in Product Safety. As a Technical Council, we would operate at the national level as a separate technical entity focusing on Product Safety. Council members from the sponsoring Societies would provide liaison and guidance. At the local level, we would operate as independent Chapters of the Technical Council within the various geographical IEEE Sections. As our membership grows, we should be in a good position to make a smooth transition to a full-f1edged IEEE Society.

Another interim arrangement worth considering is to join the IEEE as a Technical Committee of just one Society. Setting up both national and local Technical Committees focusing on Product Safety can be done unilaterally within a Society, while starting a Technical Council requires more co-ordination between Societies and the aproval of the IEEE Technical Activities Board. We will be meeting with the EMC Society Board of Directors on August lst to discuss both these possibilities.

Chairman's Message, Continued

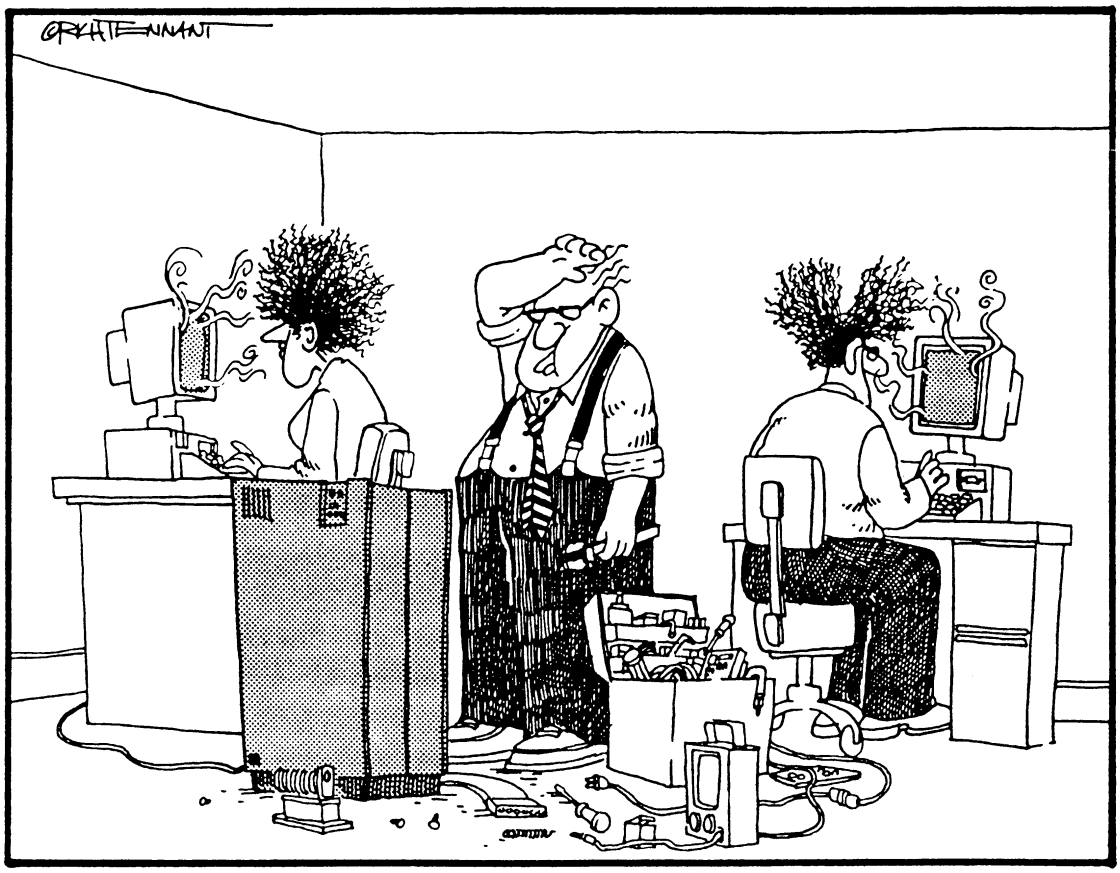
We present this recommendation to elicit your thoughts on the subject. Please send your comments to me by the end of July.

Richard Pescatore
Hewlett Packard (M/S 42LS)
19447 Pruneridge Avenue
Cupertino, CA 95014
(Fax: 408-257-5034)

And please continue to send in your signed petitions and membership questionaires.

Richard Pescatore
Chairman

The 5th Wave



IN A DISPLAY OF PERVERSE BRILLIANCE, CARL THE REPAIRMAN MISTAKES A ROOM HUMIDIFIER FOR A MID-RANGE COMPUTER BUT MANAGES TO TIE IT INTO THE NETWORK ANYWAY.

TECHNICALLY SPEAKING

by RICHARD NUTE

"Energy Hazard"

A History and Analysis

Hello from Vancouver, Washington, USA

Bob Lundin, through Al Brazauski, was able to find the origins of the so-called "energy" hazard in UL 478. Here is a review of the origins.

History

The material dates back to a manufacturer's (identity withheld) Corporate Standard for Product Safety, dated February, 1962. Within this standard is a section titled "Effects of Electrical Current on the Human Body". Within this section, the following appears:

> "Burn Hazards. Circuits with sufficient energy to cause arcing when short- circuited can be a potential burn hazard or a source of ignition. High energy discharges can cause an intense arc with erosion and splattering of the metal at the point of contact.
>
> "The amount of energy required to create a hazard of this type is a function of the type of metal. its shape. its heat sink mass and the way contact is made. Since so may factors are involved. it is not practical to establish a specific energy level that de-fines this level. However. any circuit capa-ble of supplying 240 volt-amperes without operating overcurrent devices should be considered a potential burn hazard:'

In the "Electrical Design" section of the standard, we find:

> "Customer access areas must not have exposed . . . potentials below 30 volts that can supply more than 240 volt-amperes."

Without addressing the documents dated 1962 until 1966, we finally find the following UL 478 meeting report dated October 14, 1966:

> "Burn Hazard -Where high current is available at potentials down to about 2 volts, enough energy is present to melt and splatter metal from neck chains, eye-glass frames, watchbands, bracelets, rings, and other personal metal objects unintentionally put across hot bus or between such a bus and ground by operators or servicemen, thereby giving rise to severe burn hazard. One of the industry representatives reported that his company reduces this haseared by limiting the apparent power available to 240 volt-amperes and the available energy to 10 joules:'

Elsewhere in the same document, we find:

> "Energy Hazard --An energy hazard is considered to exist at any exposed live part of a piece of equipment if, between the exposed live part and an adjacent exposed live or dead metal part of different polarity, there exists a potential of 2 volts or more and either an available continuous power level of 240 volt-amperes (or more), or a reactive energy level of 10 joules (or more):'

Questions:

There are several questions here:

Technically Speaking, *Continued*

1. Why was the title of the requirement changed from "burn" to "energy"?

2. What part does energy play in splattering of molten metal?

3. By what mechanism do limitations on volt-amperes and volts prevent the splattering of molten metal?

4. Energy is measured in joules; why is the parameter "apparent power", measured in volt-amperes, used?

5. Molten metal results from heat. Heat arises from the dissipation of watts. Why is the parameter volt-amperes used?

6. If the criterion is the product of volts and amperes, then why is there a minimum of 2 volts?

Hypotheses:

I thought that I would verify the theses on which the "energy hazard" is based: At potentials between 2 volts and 30 volts rms, volt-ampere levels greater than 240 can cause metals to splatter.

If this statement is true, I ought to be able to produce splattering of metal and consequent burns at something more than 240 volt-amperes at all potentials between 2 and 30 volts rms. In other words, I ought to be able to confirm the thesis that "high energy discharges can cause an intense arc with erosion and splattering of the metal at the point of contact".

In order to melt anything, we've gotta have heat. Electrically-caused heat comes from dissipation of power. A zero-impedance short-circuit cannot dissipate any power in the short. So, the only way of getting power dissipation is in the arc. In this case, power is defined as the product of volts and amps in the arc.

Experiments

So, I got out my trusty 200 watt, 10 Ampere power supply, connected a 7200 uP, 75 volt capacitor across the output (to get instantaneous volt-amperes greater than 240), connected a storage scope with DC-to-50 mHz current probe in series, and voltage probe across a couple of tinned copper wires. I wanted to measure the voltage and current during the time of arcing between the two copper wires as they were shorted together. With these two parameters, I can calculate power in watts.

Somewhere in the literature, I have read that air does not break down at less than about 300 volts peak. This hypothesis is supported by Table All of IEC Publication 664. I'm sure this is difficult to measure as the distances involved are in the neighborhood of 0.01 millimeter! That's 0.0002 inch!

So, I started with 2 volts. By golly, there was a very small arc. Pretty tiny, but it was there. And the current was a whopping 25 amps! (I tried the same experiment without the capacitor, and found the same arc, but the current was only about 12 to 15 amps.) So, we have two arcs at 2 volts, one at 12 to 15 amps, and the other at 25 amps. This does not square with either the breakdown voltage of air, nor with the current-carrying capacity of air. And, the arcing occured in the first 1 millisecond of bringing the conductors together. Very short time.

I checked at 5, 10, 15, 20, 25, 30, 35, and 40 volts. The arc was brighter with every increase in voltage. The current went up to a whopping 40 to 60 amps! The time for things to settle down to steady state increased from less than 1 millisecond to about 20 milliseconds. The erosion of metal also increased with increased voltage.

Technically Speaking, *Continued*

I repeated the tests without the capacitor. About the same results, except the arc was noticably less bright. The current was about 1/3 of that with the capacitor.

I put my finger and the back of my hand next to the arc. It was obvious that some material was being emitted from the shorting process. I could feel something blowing on my finger, but I could not feel anything on the back of my hand. There was no sensation of heat or burning --even with my finger in the flame of the arc.

I was holding the wire dcuring the arc -- about 1/4 inch from the end. Shortly after a 25 volt or greater are -say 1 to 5 seconds -- I could feel the wire get hot. And then it immediately cooled. But, if I left it shorted, it did not get hot.

The wires tended to stick together --indicating some degree of melting and "welding" of the wires. A close inspection of the wires readily proved melting of the metals.

I repeated the short using a gold chain necklace. About the same results insofar as the arc, except there were two arcs, one at each of the two places where the chain made contact with the wires. But, between the two points of contact, the chain became uncomfortably hot.

Analysis

Okay. Those are the facts from the experimentation. Now, let's develop some hypotheses -- explanations -- that fit the facts.

Some of the facts strongly suggest a virtual short circuit, where the current was limited only by the impedance and charge of the source.

If the voltage is virtually zero, then power, if E x I, must be virtually zero. But, this is not the case because the conductors tend to stick together after shorting. If they stick together then the metal must be melting (which is confirmed by the marks left on each wire). If the metal is melting, then it must be heated by the electrical energy. If the voltage is virtually zero, then power must be dissipated by the I x I x R version of the power of the equation rather than the E x I version. But, the brighter arc as a function of voltage indicates that the arc is indeed E x I.

The oscilloscope display is difficult to interpret. We see both short-circuit and variable E and I displays in a 1 to 10 millisecond window with duration increasing with voltage. Thereafter, we have a stable short-circuit.

About the only hypothesis that fits all the facts is that BOTH kinds of power dissipation are occuring, E x I and I x I x R. And, it is not air that is the conducting medium, but metal.

Consider the following hypothesis: At the instant of contact, we have a metal-to-metal contact of very small cross-sectional area. Because of the very small cross-sectional area, there is high contact resistance, and we have I x I x R power dissipation. This heating causes the metal in the region of the high current to melt. The electromotive force of the high current causes the small amount of molten material to move away from the point of contact. As the metal moves away, an arc occurs, characterized by E x I power dissipation. Because the electrodes are moving, both by external forces (my hand) and by electromotive forces, the process tends to repeat until a large contact area is achieved.

Such a hypothesis explains all the reported facts: The increase in brightness of the arc with both current and voltage; the heating of the wire in the vicinity of the arc; the sensation of emitted material, the arcing at less than 300 volts, the melting and erosion of the metal on the electrodes.

Technically Speaking, *Continued*

Without further investigation and experimentation, this hypothesis explains the reported facts, but does not confirm a hazard -- burns from splattered metal -- severe enough to warrant a 240 watt (not volt-ampere) limit. It is difficult to convert the electrical energy to sufficient thermal energy to actually cause burns with the very small amount of molten metal produced and with the very small distance the metal travels.

The 2 volt limit seems appropriate, as the E x I power at 2 volts barely results in an arc.

Interestingly, there is a more severe hazard which shows up in this experimentation, but is not controlled by this requirement or any other requirement: I x I x R heating in the necklace chain (and in a ring or watchband). This heating occurs quite quickly, and can cause burns at currents as low as 6 to 8 amperes. This is because of the square function of I in the power equation.

Energy

Energy can be defined as a watt-second, and is measured in joules. Energy, in mechanics, is defined as a newton-meter, and is also measured in joules.

With the first definition, how can "energy" be hazardous? That is, what is the harm or injury that arises from energy?

If we take I watt-second (which is a joule) and dissipate it over several seconds, then we have a small amount of heating. If we take that same watt-second and dissipate it in a millisecond, then we will have a small explosion (assuming we dissipate it at a single point in space).

Thus, whether or not electrical energy is hazardous depends on the time period during which the energy is expended. Note that this is true for mechanical energy.

The energy involved in my experiments can be calculated:

$$J = W \times t$$
$$J = E \times I \times t$$

For the worst-case arc, I had the following:

$$E = 40 \text{ V}$$
$$I = 60 \text{ A}$$
$$t = 20 \text{ mS}$$

$$J = 40 \times 60 \times 0.020 \text{ joules}$$
$$J = 48 \text{ joules}$$

If we store electrical energy in a capacitor, and if we assume that the energy will be dissipated in a short-circuit, and that the hazard is that of burns which will arise from the splattering of molten metal, then we can specify a maximum energy (in joules) AND VOLTAGE to produce an acceptable level of splattered molten metal. Remember that we must have a voltage exceeding 2 volts to produce any significant arc.

The energy stored in a capacitor is

$$J = 1/2 \times C \times V \times V$$

For the capacitor I used,

$$c = 7500 \text{ uF}$$
$$V=40$$

$$J = 1/2 \times 0.0075 \times 40 \times 40 \text{ joules}$$
$$J = 5.76 \text{ joules}$$

Conclusions

First, the term "energy hazard" is a misnomer. We are dealing with a burn hazard arising from molten material expelled from an arc. Contrast the inconsistent use of the term "energy hazard" with the use of the terms "shock hazard" and "fire hazard".

Technically Speaking, *Continued*

Second, volt-amperes is not a measure of either power or energy as stated and implied in the various standards. I deplore the fact that graduate and experienced engineers continue to promulgate this requirement with such obvious misstatements.

Third, while energy is involved in the splattering of molten metal, the principal parameter is that of power, namely joules per second. Consider that the energy stored in a capacitor can only be released as a function of time, the worst case being a short-circuit. The power dissipated in the arc causes the splattering of metal and any consequent burns. For a capacitor, it may be convenient to specify joules, but for continuously energized circuit, the proper parameter is power.

Fourth, the 240 watt limit appears very conservative.

Fifth, every safety requirement should be verifiable as to its effectiveness in controlling a situation to a non-hazardous level. I would challenge you to repeat this experiment and convince yourself as the viability of the so-called "energy hazard" requirement.

Your comments to this article are welcome. Please address your response to the Editor. Product Safety Society Newsletter. 2550 *Walsh Ave. Santa Clara. CA* 95051-1392

PRODUCT SAFETY NEWS

The following trade publications included arti*cles of interest to the Product Safety Society:*

IEEE GRID. June 1988:

New Society Expands

"The group that is working towards affiliation with the IEEE as a Society for Product Safety is closer to its goal. The required minimum of 100 IEEE member signatures on the affiliation petition has been surpassed, and more names are constantly being sent in. "Several people have told me they are just waiting to get their IEEE membership cards before signing and returning the petition;' says John McBain, PSS Secretary- Treasurer.

Interest in the PSS continues to grow nationwide with organizational meetings being planned for chapters in the Los Angeles and Boston areas. The Pacific Northwest Chapter has already scheduled quarterly technical meetings on June 29 at Fluke in Everett, Washington and on October 19 at Tektronix in Beaverton, Oregon

Compliance Engineering. Spring. 1988:

Product Safety Society Formed

Compliance Engineering reported on the formation of our Product Safety Society in its Spring, 1988 edition. The article described the intent of the society, its charter and a partial listing of the chapter contacts. The publication's large distribution to the engineering community provides continued great exposure for the society.

ASK DOCTOR Z

by DOCTOR Z

In the world of Product Safety and Certification, there are many pitfalls for the unwary. If you have problems that seem insoluable, then it's time to ask Doctor Z! *He has the answers, derived from his many years of training and experience in the Science of Product Safetiology. Pitfalls hold no terrors for Dr.* z, *since he is on a first name basis with most of them. Remember, any resemblence to persons, places, products, agencies, or good advice is purely coincidental, but don't let that stop you. Write to Dr.* Z *today!*

Dear Dr. Z:

Can I rely on three separate agencies to catch a simple substandard clearance problem that I am having with an GEM power supply?

Last week a power supply caused our product to fail the production line dielectric withstand test. Upon investigation we found the failure was due to common mode choke resting directly on a ground trace. A check with the vendor showed that this same construction was used since the design of the power supply.

A quick inspection of other samples of the same power supply that had passed the production dielectric test revealed that the choke in question was located up to 0.8 mm above the ground trace to resting on the ground trace, with the varnish of the choke coil in contact with the pc trace.

This same power supply has approvals from three different safety test houses! The standard with the least restrictive clearance shows a minimum of 2.54 mm clearance is reuired. What really gets me is that THREE different test agencies looked at three power supplies, all which had this same condition. I would have thought that at least one of the three houses should have caught a common mode choke with insufficient clearance to ground.

Can you tell me what is going on here???? Are the test agencies so busy that simple things are slipping through the cracks??? What should I do???

Sincerely, Frustrated in Manufacturing

Dear Frustrated,

Many safety certification engineers have experienced the same type of problem, including Dr. Z in his younger days. It is not unusual for a safety certification engineer to assume that purchasing a part with agency certification marks on it means the part was subject to an engineering evaluation for safety.

You made two fundamental mistakes: First, you assumed that the agency marks prove that a product is safe. Second, you assumed that the agency marks prove that a product complies with the standards.

A product certified by agencies such as CSA, TUV, UL, VDE, etc. does not necessarily comply with the standards.

A certified product is simply that: A certified product.

Ask Dr. Z, *Continued*

Frustrated in Manufacturing should recognize that certification agencies are VENDORS to clients. Clients pay them money for the right to use their mark on the product. Clients, being driven by economics, only do what is necessary to obtain the right to use the mark. Certification houses are vendors, who make money with repeat business, in the name of safety. Frustrated in Manufacturing has been brainwashed by the certification agency engineers into believing they make his and other clients products safe!

Contrary to what certification agencies would have Frustrated in Manufacturing believe, safety is designed into products by the R & D engineer. The process is that simple. If the R & D engineer does not understand safety, then the result is a common-mode choke resting on a ground trace. Safety is not provided by the certification house.

The value of agency certifications on a power supply simply pushes certification liability onto the power supply manufacturer. Such certifications make the end-product certification process easier. That's all. Nothing more! Full stop! End! The SAFETY of a power supply MUST be determined by the user, in this case, Frustrated in Manufacturing.

With all my love, but no tears for your predicament (which is of your own making),

Dr. Z

PS: Yes, modern-day wire coatings (not varnish) will withstand 1500 volts rms. The failure was probably due to rubbing between the wire and the ground trace which scoured the coating to a thin enough layer to fail the dielectric strength test.

PPS: 1 mm will barely break down at 1500 volts rms. See IEC 664, Table All. Any air gap less than 1 mm would break down at 1500 volts.

PPPS: You can be quite certain that the "boiler plate" agreements between the certification agencies and your power supply vendor are such that the condition you discovered should never have existed.

NEW AND FOR YOUR INFORMATION:

CERTIFICATION AGENCIES: PART I

The following is the first in a series of articles meant to aid you in your work with the various agencies. It is important to be able to contact the right person at the right Certification Agency (defined here as a company that supports its own certification mark, rather than obtains a mark on behalf of a client). We will be including different agencies in the coming months, as space and time permit. Please let us know if you find this article useful, what improvements could be made and which agencies you would like to see included.

TUV Rheinland of North America

TUV Rheinland of North America, Inc. is a North American subsidiary of TUV Rheinland in Cologne, West Germany. TUV Rheinland can test and issue the GS mark and the Bauart mark on equipment and components according to VDE, DIN, BG and IEC Standards.

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CHAPTER ACTIVITY REPORTS

SANTA CLARA VALLEY CHAPTER REPORT

The meeting started at 7:00 p.m. with announcements and committee reports. Rich Pescatore briefly described the latest discussions about IEEE affiliation for the PSS and asked for comments to be returned to him. (See the "Chairman's Message'. in this Newsletter.) A Publicity committee Chairman for the SCV Chapter was announced: Rick Buck will be reporting to the PSS Newsletter on SCV Chapter meetings and activities and improving our local publicity as well. The Pacific NorthWest Chapter is spearheading the effort to have a booth or table at the national EMC symposium in Seattle at the beginning of August. Any member who will be attending is asked to donate an hour of their time to help run the display. Call Walt Hart at 206-356-5177 for more information.

Committee Reports: The Constitution Committee (Mike Harris) is "on hold" right now, pending more details about the IEEE affiliation. The Membership Committee (Scott Barrows) has received over 100 of the "Membership Application and Questionnaire" forms that were printed in the last Newsletter. Please return your form today! The Chapter Communications Committee (Roger Volgstadt) has had one offer of help with the Newsletter production, but could use more. -Please call Roger at 408-748-2102. The Program Committee (Brian Claes) announced that the speaker next month will be from Underwriters Laboratories discussing the new UL478.

The guest speaker, Lewis Bass, presented "system Safety for Commercial Products Beyond certification", an overview of safety considerations that are not covered by acquiring an agency mark. Mr. Bass is both an attorney and a Professional Safety Engineer and serves as legal and safety consultant for many Fortune 500 companies as well as smaller organizations. He teaches university courses in safety engineering and has written numerous articles on the subject, including his recent book "Products Liability: Design and Manufacturing Defects".

The presentation, since it was an overview, is impossible to summarize. Some of the topics mentioned were definitions of "product" and "product defects", liability issues, risk factors to consider, system safety techniques, warning labels, and many more. For more information you might want to refer to the book mentioned above, which can be ordered from the publisher, Shepard's/MCGraw-Hill, at 800-525-2474.

Thirty-five people from eighteen companies attended this meeting. The next meeting will be held on July 26 at the same location: Apple Computer, 20525 Mariani Ave, Cupertino. This will be your chance to hear and ask about the new UL478, so pass the word and don't be late!

COLORADO CALLING!

Steve Tarket is continuing to act as the contact person for people interested in starting a chapter in the Denver area. Please let Steve know of your interest.

Contact: Steve Tarket (M/S 65)
Hewlett Packard
3404 E. Harmony Road
Ft. Collins, CO 80525
telephone 303- 229- 2481; Fax 303- 229- 2692

NEWS FROM SOUTHERN CALIFORNIA:

The next meeting of the Southern California Chapter of the Product Safety Society will be at MAl Basic Four, 14101 Myford Rd., Tustin, CA on August 1,1988 at 6:00 pm. Frank Campion of LH Research will discuss the CSA Power Supply Committee. There will also be an election of officers and committee heads. Any questions about the meeting can be addressed to Charlie Bayhi as noted below:

Contact: Charlie Bayhi, MAl Basic Four, Tustin CA
Telephone: 714-730-2556; Fax: 714-730-3185

REPORT FROM THE NORTHWEST

On June 29th, the NWC of the Product Safety Society conducted their second formative meeting at John Fluke Mfg. Co. in Everett, WA. The meeting began with a general introduction of all members and a discussion of IEEE affiliation. The pros and cons of affiliation with the EMC Society were discussed and the general concensus was that it would be a good idea until we learn all the rules and regulations of full individual IEEE membership. Money to help pay for the Newsletter could be obtained at both the national and chapter levels of the IEEE, based on attendance.

The next meeting will be held on October 19, 1988. Pete Perkins of Tektronix in Beaverton, OR is hosting an all afternoon PSS meeting which will conclude with dinner. The topic for discussion will be “International Power Line Configurations and Components”. Representatives from Japan, England, and the Netherlands will be there to discuss the differences and consequences in grounding, leakage current, 50 Hz vs 60 Hz, ring circuits vs branch circuits, attachment plug caps, and much more. An additional speaker from a US manufacturer or expert is this area is being sought for the meeting.

There will be a PSS booth at the EMC International Symposium held in Seattle on August 2-- 4th. This booth will be manned by volunteers from the NWC of the PSS for one day to recruit and help spread the news about our growing society.

Northwest, *Continued*

Hal Mickelson of HP gave a speech on domestic product liability. In a nutshell, Hal warned the audience that if a consumer is injured by a product, the manufacturer is going to pay. Your records could be subpoenaed as evidence and it is very important to state the facts in all correspondence. Be objective and do not editorialize. Write professionally and do not make someone look bad.

Ruth Redden (Dr. Ruth) of Fluke gave a speech on European product liability. The European Commission made up of 12 countries have harmonized the laws regarding product liability. The environment regarding product liability is very different than what is found in the US. The Europeans are much more tolerant and not as likely to sue for damages. The plantiff must prove there was a defect that there was damage, and that the damage was caused by the defect. Also, there are limits to the amount that can be claimed, especially in massive product liability cases.

Finally, there was a demonstration on surge testing given by Walt Hart and Heber Farnsworth of Fluke. Walt showed us how a product can be tested for its resistance to lightning strikes and load switching without $ 30,000 worth of equipment. Using about $ 50.00 worth of locally available components, Fluke has constructed a surge tester that will allow you to test per IEC specifications. The meeting was concluded with a dinner.

At Van Houdt
Product Safety Engineer

NEWS FROM NEW ENGLAND

The Northeast Chapter of the Product Safety Society held its second regular meeting on June 25, with 32 engineers attending. The initial enthusiasm and support continue to be very strong. The chapter membership has exceeded 100 and is still growing!

Two presentations were made at the June meeting: Bruce Langmuir from BOSE Corporation talked about a number of issues being considered by the EIA, CEG, R -I Product Safety Committee, including surface adhesives and harmonization of IEC 65 with IEC 950; Glen Dash of Dash, Straus & Goodhue, talked about the legal issues surronding EMI and Product Safety Regulations in the European Common Market.

The next chapter meeting will be held on July 27, at DS & G facilities. The topic of discussion will deal with teh recent changes implemented by the NFPA and NEC regarding safety regulations for wire. Any interested parties can contact Jim Norgaard at DS & G for more information about the chapter's activities.

Jim Norgaard
617- 263- 2662.

LETTERS FROM OUR READERS

The following letters were received from our readers since the last issue of the *Product Safety Society (PSS) Newsletter:*

Polarity a Problem?

"Technically Speaking" in your June newsletter contains some glaring omissions which should be addressed by readers of any technical journal but are quite appalling to find in a product safety society newsletter. Any electrical product or system, with a few exeptions to be discussed later, which can experience a polarity reversal and remain operable is inherently unsafe. It means the system is not grounded, a violation of the NEC, OSHA, and the IEEE Stds. The exceptions are toasters, small portable tools which are doubly insulated, and some unique equipment designs which are for laboratory use only. There are instances when it might be advisable to isolate the system from the building ground through a transformer. Here the secondary of the transformer becomes the "supply service" and its polarity must also remain fixed with respect to the product or system by grounding one point.

Sincerely,

Irwin Einsohn
Belmont, CA

The following response to the above was received from the "Technically Speaking" author; Richard Nute.

In my June column, I did not provide a clear definition for polarity reversal. Here is the definition I used for that column:

> *In a single-phase AC supply system, polarity reversal is the interchanging of the phase and neutral conductors with respect to their identification.*

For example, it is quite common for the ordinary 120 volt NEMA 5-15R to be miswired so that the black wire is connected to the wide terminal and the white wire connected to the narrow terminal. This is indeed contrary to the US National Electrical Code and the Canadian Electrical Code. But, it does occur. Indeed, in the electrical department of almost any hardware store, one can find receptacle testers which test whether or not the NEMA 5-15R receptacle is properly wired, including the condition of phase-neutral polarity reversal.

Note that such interchange does not mean that the system is not grounded. The system remains grounded in accordance with National Electrical Code and Canadian Electrical Code requireements, but the identification of the grounded conductor is incorrect at one or more points in the system

Fortunately, in most products, all of the primary circuits are treated as live" conductors and are suitably insulated such that there are equal insulating qualities for both the phase conductor and the neutral conductor; and any interchange will not adversely affect the safety of the product.

Virtually all 120 Volt, plug and socket connected equipment remain both safe and operable under polarity reversa conditions.

Indeed, ANSL UL, and CSA Standards require NEMA 5-l5P connected equipment to remain safe under polarity reversal conditions. Evidence of this is the leakage current test, which is done under both normal and reverse polarity conditions. (See ANSI and almost any UL or CSA standard.) In addition, the dielectric strength test is a common-mode test for both phase to ground and neutral to ground installations.

Contrary to the above, home laundry electric dryers and home electric ranges have no independent protective conductor, but have the neutral conductor connected directly to the frame and accessible metal parts. These appliances are connected to the supply via the NEMA 10- 30 or 10- 50 series plugs and receptacles. Here, polarity reversal would indeed result in an inherently unsafe product and in electric shock. This construction is permitted by the National Electrical Code, Articles, 250-60 and 250-61(b), Exception No. 1.

Sincerely,

Richard Nute
Author; "Technically Speaking"

Product Safety Newsletter
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Cupertino, CA 95014
Attn: Roger Volgstadt

The Calendar of the Product Safety Society

July 1988

Tuesday, July 26

Santa Clara Valley Chapter

Subject: UL478/IEC 950
Speaker: Mike DeMartini, UL
Time: 7:00 pm
Location: Apple Computer
20525 Mariani Ave.
Cupertino, CA

Wednesday, July 27

Northeastern Chapter Meeting

Subject: Recent Changes to Wire Rqmts in NEC & NFPA
Speaker: tbd
Time: 7:00 pm
Location: Dash, Straus & Goodhue
593 Masschusetts Ave.
Boxborough, MA

August 1988

Monday August 1

Southern California Chapter:

Subject: CSA Power Supply Comm.
Speaker: Frank Campion, LH Research
Time: 6:00 pm
Location MAI Basic Four
14101 Myford Road
Tustin, CA

October 19

Northwest Chapter

Subject: International Power Info
Speaker: Various
Time: tbd
Location: Tektronix, Beaverton. OR

July, 1988 VOL. 1, NO.6

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