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2009

Motor Diagnostics and Motor Health News

A Reliability, Maintenance, Energy and Environment eMag

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Editorial: Welcome to the MDMH News eMag

From the President: The Motor Repair Industry and IEEE

Guest Editorial: Ultrasound World V Annual Conference Report

Article: Energy Efficiency Through The Repair Process Pt 1

Motor Management: HECO

Feature Company: About Areva EMPATH Signature Analysis

About AMP: Association of Maintenance Professionals

Advice: Getting Your ATPOL Software to Work on Vista!

Monthly Feature: Motor Diagnostics Tech Tips

Monthly Motor Standards Feature: IEEE Std 1068 Motor Repair

IEEE Dielectrics and Electrical Insulation Society Web Launch



Motor Repair Edition

A **SUCCESS by DESIGN**® Publication

2/3/2009

Motor Diagnostics and Motor Health News eMag

Editorial

Welcome to the brand new Motor Diagnostics and Motor Health News eMag.

In the past, our focus has been on SUCCESS by DESIGN® and our related projects and information that would impact the reliability, maintenance, energy and environment industry. Based upon reader interest in 2008, we have made the decision to expand our focus and, instead of a SUCCESS by DESIGN® only newsletter, MDMH News is now a full free eMag with a focus on the Reliability, Maintenance, Energy and Environment (RMEE) industry. Our intent is to draw in industry articles and information beyond just the information we have provided in the past.

Our focus is to provide something a little different – something to set us apart – in the tradition of the previous newsletter. This means that we are going to cover some topics that have been avoided through other magazines and a little controversy that will result. In this we will be asking for your opinion, articles, stories, successes, press releases, etc. Articles selected as a feature in our monthly eMag will receive \$50 per non-commercial, first run article to be split between the authors. Go to <http://www.motordoc.com/writers.htm> for more detail. You do not have to be a professional writer or journalist as we are looking for real experience and technical articles. We are also searching for volunteer associate editors for reporting on news in the industry. If interested, contact us through email at info@motordoc.com.

The eMag is also free to readers and may be re-distributed, in its entirety, without having to request permission first. Permission is required for the use of specific articles by just emailing info@motordoc.com.

It also came to our attention that some of the readers of the newsletter were under the impression that Resume Lady was somehow associated with SUCCESS by DESIGN® or an employee. The Resume Lady is an independent resource who specializes in High Quality Resumes which may require extensive technical writing. She may be reached for more information at: info@myresumelady.com.

We are soliciting advertising for the eMag in order to support it and our contributors. All profits are rolled back into the eMag and its objectives, including industry research. For more information contact us at info@motordoc.com.

Along with the announcement for this eMag, you will have received one for AllAmericanHybrid.com, our new eMag with a focus on the North American hybrid, electric and alternate vehicle industry. If you are interested in this eMag and technology, please sign up on <http://www.allamericanhybrid.com/addnews.htm>.

Howard W Penrose, Ph.D., CMRP
President, SUCCESS by DESIGN®

Table of Contents

From the President: The Motor Repair Industry and IEEE	2
Guest Editorial: Ultrasound World V Annual Conference	3
Feedback: Comments from Our Subscribers	4
Maintaining Energy Efficiency of Electric Motors through the Repair Process: Part 1	5
Getting Your ATPOL Software to Work On Microsoft Vista	6
HECO Uses Equipment Management Technology to Grow	7
Association for Maintenance Professionals (AMP)	8
EMPATH Motor Diagnostics System	10
Motor Diagnostics Tech Tips (General ESA and Motor)	11
IEEE DEIS Web Launch February 6, 2009, 6pm EST	11
IEEE P1068: Draft Standard for the Repair and Rewinding of AC Electric Motors in the Petroleum, Chemical and Process Industries	12
SUCCESS by DESIGN Calendar of Events	12
Back Matter (Announcements, etc.)	13

Notices:

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From the President: The Motor Repair Industry and IEEE

By and large, most industries and professionals are honest, hard working folk. Unfortunately, there are those few that are not and they cause problems for the rest of us. Such is true in virtually every industry including the motor repair industry.

The real question is: how do you identify the organizations that are the best for you at the best price? Especially when it comes to pricing, the motor repair industry is pretty much all over the map. Hourly rates will range from \$35+ to well over \$100 but somehow the initial end cost comes out to be the same. In other cases, you may go out for three bids and get three wildly different repair descriptions/scope and quoted prices.

Over the past year SUCCESS by DESIGN has been qualifying repair shops for our clients. We use our experience to go on site and evaluate the programs and processes looking for the little tricks and shortcuts that reduce your long-term reliability. What we have found is that most places do not have the motor repair experience to perform such surveys. The result is that a company will get a tour of a facility, or just send out a checklist, and accept them at face value.

With electric motor assets being one of the most significant MRO costs associated with manufacturing, why is it that so little effort is spent on managing that asset? Worse, why do many companies just rely upon the repair shop rather than having controls in place? Of course, on the repair shop side, why do companies constantly go after the lowest bid rather than the best cost, best reliability?

The impact of proper motor repair practices and asset management can be staggering. In one instance related to a program we were involved in, the cost impact of motor repair, had an issue been allowed to occur, was close to a \$million in plant downtime and repair costs for a 200hp motor! If we had not issued a motor repair specification, the poor quality would have been accepted and the company would have suffered. However, with the standard in place, and attention/questioning some of the results, the repair shop was required to re-do the associated work at their cost. As is often the case with companies of this type, they attempted to offer an

'extended warranty' in lieu of rework, which has the exact value of '\$0.'

We went through this several more times, even with shops capable of passing review and even ISO 9000 certified. In one case, we discovered a motor repair facility was surge testing dirty 460 volt stators at over 3500 volts! When confronted, they stated that the test instrument company had provided that instruction, which was, of course, untrue. Sometimes people confuse my PhD with my being an academic instead of having also been a Navy trained motor repair journeyman and field experienced analyst, diagnostician and troubleshooter. The PhD is nice, the experience is better, and being able to identify the BS from the repair facility, and knowing who to contact at the test instrument company retained their reputation and protected my client. We do not compromise, so the repair shop was required to rewind what should have been a clean dip and bake, prior to the damage, at their own cost.

Just because a motor repair shop is associated with EASA (Electrical Apparatus Service Association, Inc.) does not guarantee quality repair. EASA is a trade association which means that it serves its constituents, not the motor owner. This does mean that there is organized training on technical programs, recommendations, engineering support, and education provided to the motor repair shops and motor owners making EASA membership a very important part of the motor repair process to small repair facilities that cannot maintain engineering level resources. It also means that the buyer must still beware the motor repair vendor and be able to provide and support a motor repair specification. When possible, verify or certify that the repair shop can meet that specification.

Standards are being developed within the Institute of Electrical and Electronics Engineers, Inc. (IEEE) that provide greater guidance for motor repair than ever before. The developers include a number of EASA engineers and professionals throughout the industry. In this case, IEEE Std 1068 is being completely revised and even includes a scorecard to evaluate your repair vendor. We will be discussing this standard in detail in this edition of the MDMH News eMag and will be offering a FREE 2-hour webcast of the motor repair industry and

qualifying your repair vendor on February 27, 2009, through <http://www.motordoc.com/training1.htm>. There are a limited number of seats, but the webcast will be recorded for later viewing. Full day training courses will be announced in our February, 2009, eNewsletters.

An area that generates confusion in motor repair, as well as any electrical testing, is knowing pass/fail and understanding standards such as the IEEE standards for insulation to ground testing and so on. The IEEE DEIS Web (IEEE Dielectrics and Electrical Insulation Society) is officially launched on Friday, February 6, 2009, at 6pm EST and includes the ability for members and non-members to participate in a forum and blogs in which you can ask questions, be involved in discussions, and hear from the very people who develop the standards that you use. Let your voice be heard! <http://ewh.ieee.org/soc/deis>.

For more information on how we can assist you in evaluating your repair facility based upon your or other industry standards and specifications, please email us at info@motordoc.com. For information on the IEEE DEIS Web, please contact me directly, as the Web Editor-in-Chief, at hpenrose@ieee.org.

Sincerely,
Howard W Penrose, Ph.D., CMRP
President, SUCCESS by DESIGN®
WEiC, DEIS Web

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FREE Motor Repair Webinar

In the FREE February 27, 2009, 9am EST webinar, SUCCESS by DESIGN President, Howard W Penrose, Ph.D., CMRP, will discuss the ins and outs of the motor repair industry and how to develop specifications to ensure high quality repair and reliability. There are a very limited number of seats, so the webinar will be recorded through the WebEx system.

For more information, go to <http://www.motordoc.com/training1.htm> and sign up today!

Guest Editorial Report

Ultrasound World V Annual Conference

Associate Editor Amy Campbell

The Ultrasound World V annual conference convened January 19-21st week with over 75 registrants and 7 sponsor companies exhibiting. The conference was an intimate gathering of professionals from as far away as Venezuela, Holland, New Zealand and Russia converging on Clearwater Beach, Florida for 3 days of workshops and interactive tutorials on the use of Ultrasound (structure-borne and airborne) and this year a number of interesting case studies along with a few cost/benefit analysis of energy savings were on the conference proceedings.

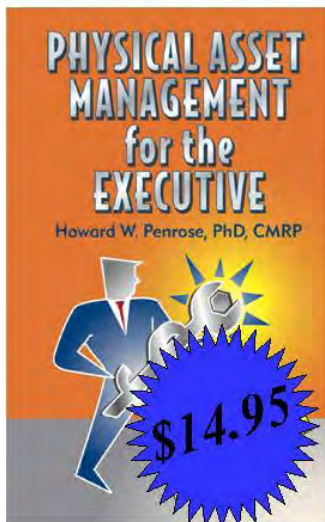
The keynote "Show Me The Money" was conducted by Ricky Smith of Allied Reliability and started with Ricky requesting that a volunteer from the audience smash Doug Waetjin's watch with a hammer. The volunteer did so but with some trepidation as Doug's face showed that he was pretty concerned about the outcome of this little exercise! Doug surrendered the watch and as expected the watch was no match for the hammer and 3 good strikes and it was flying in pieces around the room! Doug appeared shocked but then laughed as Ricky confessed that the watch was indeed a \$2 watch from the drugstore and not the actual watch belonging to Doug. Funnily enough, Ricky asked "isn't it odd that we get nervous about hitting a \$2 watch with a hammer but have no issue at all with striking a very expensive critical piece of equipment with a hammer?" Everyone laughed and the presentation continued with a clip from the '80's blockbuster film "Jerry McGuire" where Jerry (Tom Hanks) and his client (Cuba Gooding, Jr) have a phone call that culminates in Jerry screaming "Show ME the Money!" In the end the overall presentation covered things you can do TODAY to get the returns in your reliability program that will carry your company through the economic crisis at hand and steps that could even allow you to capture market share through reduced per unit costs through greater asset and process reliability. It was a great kickoff to a very good conference!

Papers presented included: Energy Efficiency; Performing Compressed Air Surveys and Managing Data; Diagnosing Electric Motor Bearings Using Ultrasound Technology; Fighting the Maintenance Crisis; SMRP's CMRP Certification and How it Gives You a Competitive Edge; UT is Complimentary; Generating Savings from an

Ultrasound Inspection Program; Building the Ultimate Reliable Plant; Implementation of a PdM Program in the Port Sector and It's Huge Profits; Standards for Electrical Safety and the need for Safer Work Environments; "Something for Nothing" Hits Pay Dirt!; Locating Tracing in a High Voltage Substation Using Ultrasound; Inspecting Aircraft Pneumatic Leakage; Examining Route Based Leak Inspections of Air Operated RKL Valves and a post-conference 1-day Software Training Class was conducted.

The Expo area was also where the breaks and lunches were served and this provided ample time to have conversations crop up amongst attendees with their various experiences as well as to allow for time with sponsor companies in attendance like: Ludeca; Allied Reliability; Commtest; PdMA; SMRP and Flir. The Annual Beach-side BBQ was made possible due to pleasant weather, good food and the free flowing bar. The laughter and engaging conversations overheard amongst the attendees was proof that everyone enjoyed themselves a great deal and at the conclusion of the evening, prizes were drawn and distributed by Doug Waetjin to a dozen lucky ticket holders. One guest even won a complimentary registration to next year's conference so he couldn't have been happier! Having attended now my 3rd UE World Conference, I think it is fair to say that this event was valuable to the participants and the sponsor companies though the registrant number was small it was a quality group of individuals who really came to get information about how to make their UT program better and find new applications they may not have been employing at their site.

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Feedback: Comments from Our Readers

Howard:

I have followed with great interest your editorials on the current economic landslide. I am app-ending below an insightful article by the Editor-in-Chief of *Maclean's* magazine, Canada's version of *Time* and Germany's *Spiegel*. I think you will be interested in his views and the background he has in the article. The "Canadian angle" will, I hope, interest you in connection with your family ties to our country and to your sense of fairness.

By the way, I do not at all think that you have "sold out" as one of your readers suggested. I think you are doing a most commendable -- and necessary -- job and I have always admired your fearless way of calling a spade a spade. Love your stuff. Keep it coming. And enjoy the article below, forwarded to me by my son who lives in Calgary.

Best wishes,
Steve Gahbauer / Contributing Editor to Plant Magazine.

Dear Mr. Penrose,

Here is a fan from you in Europe - Belgium.

You know Belgium is such a small country most of your USA colleagues do not know where it is situated (and very understandable of course).

Before I started in Purchasing (now approx. 9 years ago), I worked in the Chemical Industry in Engineering (Instrumentation) and being an Expert in Physical Measurements (read sensors and transducers).

May I congratulate you and wish you a lot of success as I think you are doing a great Job and would like to have had a professor in Electrical Motors in my student time as an Engineer in electricity and electronics. Because of the many applications you wrote about Elect. Motors might give young people a big and quick understanding how these things function.

So I would suggest please continue and do not forget that all over this planet there are people thinking the same way like you and who like to read your papers via e-mail .

Best regards,

Daniel Haegdorens
Purchasing Department
Atlas Copco Airpower NV

To the Readers:

The above emails are from readers of the MDMH News and represent a small sample of the responses we receive every day from our growing number of readers. This is why we do what we do. While we do not have the opportunity to respond to all of your comments, we do appreciate them, do read them, and wish everyone success.

Howard W Penrose, Ph.D., CMRP
And the Volunteer Editors

Maintaining Energy Efficiency of Electric Motors Through the Repair Process Part 1

Dreisilker Electric Motors, Inc.

<http://www.dreisilker.com>

In the mid 1960s, Henry Dreisilker noticed that many rewound motors did not last as long as new motors. His commitment to quality electric motor repair resulted in the identification of excessive heat during the burnout of the old winding as the root cause of such premature failures. There remains in industry an expectation that repaired motors have a "half life" following rewind.

The core of an electric motor is sliced into thin laminations for the purpose of reducing eddy currents (core loss). They are insulated from each other using either organic or inorganic materials. Damage to the dielectric strength of the inter-laminar insulating material results in an increase of eddy currents and can be measured using a core loss tester. The industry "standard" calls for before and after stripping tests to determine whether or not core loss has increased more than 20%. This should be unacceptable to any user seeking to maintain the energy efficiency of their electric motors.

The most obvious damage caused by excessive heat is the physical deformation of the core laminations. As a result, they become loose and rusty. Another physical damage issue, not related to the high burn out temperatures is splayed end laminations. This can occur if caution is not exercised during the coil removal process after a stator has been burned out below 680 F. **[Note: stray load is the result of uneven airgap and splayed laminations, eddy currents from inter-laminar damage, fusion of laminations, and hysteresis losses from metallurgical changes in the lamination steel]**

Figure 1: Degraded Lamination Segment



See Fig. 1, a lamination segment from the rotor of a 206 kW wound rotor crane motor. The image shows degradation of insulation at the slot teeth and round air vents. You can see signs of rust in the middle, and the graininess of some areas in the middle. This core tested at 25.8 Watts/lb loss. The total loss for this core was 16,911 Watts. The standard for maximum core loss is 10 Watts/lb. The rotor had been rewound previously using the burnout method.

Figure 2: New Lamination Segment

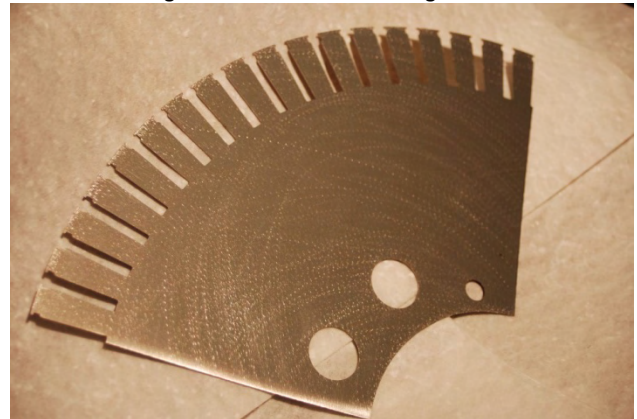


Fig 2 is a new lamination segment used to restack the rotor core from Fig 1. Core loss testing after the restack of the core was 2.25 Watts/lb for a total of 1,475 Watts.

NOTE: The motor core losses were 8.2% prior to replacing the core and 0.7% after the repair was completed. This is a percentage of the motors full load not a percentage of the losses! Assuming the motor runs 8 hours per day, 5 days per week at \$0.07 per kW-hr results in an annual expense of \$2,161.04 to heat the rotor.

Many methods are used for coil removal. They include:

- Direct Flame- A flame from a torch, bonfire, flame thrower (gas or propane).
- Burnout- The core is processed in an oven usually at 650 to 750 F. If detected, high temperatures can be controlled with water spray.

- Pyrolysis Oven. Controlled temperature burnout oven that also controls oxygen content to prevent spontaneous combustion of organic materials in the motor.
- Chemical Stripping. Stator is lowered in a chemical bath to soften and dissolve varnish. Mechanical cutoff and pulling of coils are also needed as part of this process.
- High Pressure Water Blasting. Very high pressure water jets are used to blast coils usually for stripping medium and high voltage motor stators.
- Motor Safe Stripping. A mechanical stripping method performed at or below the winding insulations rated temperature to soften varnish for ease of removal.

The results of improper stripping methods on motor cores are many. Core hot spots and overall increased heat cause rapid degradation of the new winding insulation causing shortened life expectancy. The resulting uneven heating will cause unbalanced amperage draw. Uneven air gap causes rotor and electrical imbalances. Motor efficiency is decreased due to the increased core loss.

Nearly four decades after Henry Dreisilker first raised the issue of the hazards associated with high temperature for coil removal from electric motors, many end users are still unaware of the damaging effects of the burnout method. Burnout continues to be a "standard" repair practice to this day. However, there is a tremendous difference between acceptance of "standard" repair practices and an expectation of quality repair methods due to your needs for energy efficient electric motors. In order to assure that your motor repairs do not reduce their efficiency (increase losses), make sure you are specific about what methods are acceptable.

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Getting Your ATPOL Software to Work on Microsoft® Vista®

Selwyn Old, New Zealand

You probably already know but ATPOL 4.41 won't load onto a Vista computer. ALL-TEST Pro, LLC, advises me that they don't intend to upgrade to Vista and sometime they might write a Vista compatible program. Well I have a new Vista computer with a SATA drive so cannot load XP without a lot of hassle.

My solution after hunting the internet:

1. Get a 2 Gig flash drive.
2. Format it (apparently flash drives over 2 gig will not always format correctly)?
3. Load the Power Systems Manger on to the flash drive (it will load on Vista)
4. Load the ATPOL onto the flash drive.
5. I then loaded all my data files onto the flash drive.
6. Plug into a Vista computer.
7. Use Windows explorer to find the flash drive and open the program by clicking on the green symbol in the flash drive.

Not all the data bases are available although the motor one is. It is a bit "messy" to get started. But all the important bits seem to work and I find the actual display to be a lot sharper.

Most importantly I can get it to work without XP. This may be of help to others who find themselves in the same hole.

Further Notes During Discussion (problems with following above instructions:

Since my initial tip, I have set up a "readyboost vista" flash drive. I had a 4 gig drive and it wouldn't work. I had to format it down to a 2 gig partition because vista doesn't like the flash drive to be bigger than the computer ram (for the ready boost). My ram is 2 gig. In case this is a conflict, because you are loading a program, I would amend my instruction to "use a 2 gig drive". (It was only by chance that I used the 2 gig drive, it was what I had to hand).

I loaded the program onto the flash drive using my old XP computer I loaded the data files from my XP computer into the flash drive

I then plugged the flash drive into the vista machine. Used Windows explorer to find the attached screen Then I click on the EMPW green symbol. This opens to the main screen which is then called EMPATH 2000, 4.41 instead of (normally ATPOL something). From there I can then select the data I want to look at.

*Note: Very interesting because I sometimes have to lug around two computers in order to use the software. The above can be a challenge, but I managed to get it working with a 1 Gig flash drive myself
- Howard W Penrose*

HECO Uses Equipment Management Technology to Grow

Tom Baney

<http://www.hecoinc.com>



By the time you finish reading this article HECO Industrial Services Group's TracRat software system will probably have saved a variety of Fortune 500 and local customers tens of thousands of dollars. Ever vigilant, TracRat is HECO's homegrown software system that works around the clock, tracking equipment and locating replacement spares for TracRat users.

Developed through over 25 years of serving the electric motor sales and service industry, the current version of TracRat not only can track equipment, but is also a tool for maintaining a continuous operational and service history of virtually any repairable asset.

With business plummeting across all manufacturing sectors, HECO's vision of a web-based software system to minimize down time, constantly monitor repair trends and maintain money saving reports such as "cause of failure" analyses has paid off. The combination of being both an EASA repair facility and a major electric motor distributor narrowed the field of competition in a tough economy. But adding the ability to deliver contemporary Information Technology solutions has placed HECO in the forefront of Maintenance Repair and Operations problem solvers.

According to Mark Hatfield, president of HECO, "We have seen sales double in the last four years and the forecast for the future matches that pace. The traditional sales method of touting equipment upgrades and capabilities can't capture the attention of potential new customers. And low repair prices seem to lead the customers to question quality and therefore reliability."

Founded 50 years ago this year, HECO is now in the hands of a second generation trio of sons. With over 75,000 square feet of service and distribution warehousing HECO was always a significant player in the motor repair and replacement field. It was, however, necessary to devote significant time and money to software development for HECO to position itself as unique to the existing and potential customer base.

In its earliest form, "Equipment Management" was driven by Rolodex's, land lines and fax machines for HECO and customers. Hatfield, with a small stable of programmers, began to formulate a more contemporary approach using IBM technology of the late 1980s and early 90s. As the information tech sector accelerated through PCs and now today's World Wide Web, HECO saw an opportunity to bring its EASA shop and distribution capabilities to the customer with all the benefits of evolving information technology.



In its simplest form, TracRat is constant overseer of database information for any repairable piece of equipment. Whereas, in the past, customizing screens and software applications required constant trips to the software development and programming crowd, TracRat has been designed to "morph" on the screen for any set of equipment attributes a customer may need. Once input and utilized, TracRat also, as a byproduct of day to usage compiles and formats reports on cause of failure, warranty tracking and other valuable maintenance data.

SO EXACTLY HOW DOES TRACTRAT WORK? *(To be continued in the next issue of MDMH News)*



Association for Maintenance Professionals (AMP)

Terrance O'Hanlon, CMRP, Amy Campbell, Tammi Pickett

<http://www.maintenance.org>



The Association for Maintenance Professionals

Facilitate • Connect • Share

I was on the phone with my mother the other day and I was discussing my hectic schedule and all the directions I'm going at a breakneck speed and I told her I had joined the Association for Maintenance Professionals. My mom laughed and asked if it was a support group for people who couldn't stop joining organizations! I had a good laugh at that and wondered secretly to myself if I might have to drop some of my other affiliations? Listen, I'm a pretty passionate member, if I can't be highly involved and contribute or I'm not committed to the "cause" then I don't join up! And to my mother's point, it is a support group of sorts...Let's be honest, my reasons for joining are not totally altruistic. I'm a people person and as such, I want to meet lots of people, plus it is FREE! I like FREE! There are many other reasons to join – I'll get to them in a minute; but following are a few folks – some YOU may know, who have shared their reasons for becoming involved with the Association for Maintenance Professionals (AMP). www.maintenance.org

Shelley Whitener, P.E., CMRP

I joined the AMP Advisory Council because I saw it as an excellent opportunity to collaborate with highly respected and enthusiastic professionals to stimulate learning and knowledge sharing among the maintenance community.

Larry Hoing, CMRP

I joined AMP to explore the opportunities of sharing and learning from not only industry experts, but others like myself that are in the trenches on a daily basis, and have learned from experience how to make things work in their situations.

Alberto Landeaux

For me its a honor to be part of such a visionary group of professionals, I joined because it's a tribute to contribute to and for the maintenance practice worldwide and it's a one time in life opportunity to work with such a prestigious group of professionals, authors and practitioners of maintenance.

Jeff Smith CMRP

I am involved in AMP because I feel this organization has no boundaries, spreading reliability knowledge will produce more efficient companies which will affect the health, safety, environmental impact, energy utilization, sustainability and profitability of all organizations. I feel this is for the greater good of people and the environment.

Jack R. Nicholas, Jr., P.E. (California - Quality Branch), CMRP

Purpose in joining AMP Advisory Council is to lend expertise gained in other professional organizations and maximize its usefulness.

Nezar A. Al Shammasi, Saudi Arabia

I joined the AMP Advisory Council to be able to globally assist in promoting the maintenance profession.

Ok, so I mentioned it was FREE and that probably got your attention already, but how about that list I promised of reasons someone interested in the Maintenance Profession might want to join AMP?

The Association for Maintenance Professionals (AMP) exists to: **Connect international maintenance professionals to share and facilitate change through an open forum.**

Connect Δ Share Δ Facilitate

Δ Create an international network that encourages a free and open exchange of information

Δ Personal development of maintenance knowledge and abilities

Δ Foster maintenance and reliability knowledge to corporate leadership

Δ Promote proactive maintenance practices

Δ Reference and utilize proven/established resources

Δ Share knowledge of proven best practices

Δ Promote innovation in all elements of the maintenance process

Δ Promote precision maintenance

Motor Diagnostics and Motor Health News eMag

Δ Provide benchmarking and normalizing maintenance and cost data

Δ Educate on cost effective decision making

Δ Provide value to the global community

Δ Allow the maintenance community to collaborate with local or like industry

The Benefits of FREE membership in the Association for Maintenance Professionals

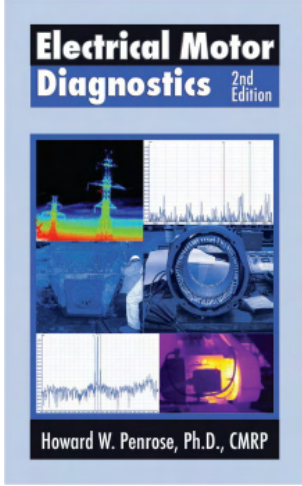
The Association for Maintenance Professionals is a not-for-profit organization dedicated to connecting and empowering maintenance and reliability professionals and groups from around the world. Maintenance.org offers private member access to a vibrant online community of peers, subject matter experts and solution providers. You can create a personal profile - with full control of your choice for privacy settings (just like other networking sites). AMP allows you to use Screen names – to avoid compromising your privacy as well as allowing you to represent yourself – not your company. You can create a monthly, weekly or daily web log (blog) or journal and build an audience that wants to share your experience and learn. It's designed to allow you to connect with peers – you can use profile information and an internal messaging system to invite others to add you to their network of contacts or to form a group (based on shared subject interest, local geography or based on people attending an upcoming event for example).

You will find that groups can be private or public, open or by invitation. Groups can have their own blogs, event calendars, forums, video and photo uploads and more. Have a group that needs a web site? New groups are created by request through the site administrator to ensure they are adding value to the site's members. The site allows multimedia – you can post audio or video files (uploaded and automatically converted to flash) or from hosted sites (like YouTube or Google Video). There's the ability to share documents – you can also post/share Word Documents, spreadsheets, PDF, Slide Presentations and more! The event calendar comes in handy – public or private with RSVP feature to track attendees. There's lots of open sharing on the threaded discussion forums – you can post a question or share advice there. One thing I like most is the privacy – you have control who can contact you and who has access to your profile and other content, no personal or company information is ever displayed or revealed. There are live training events - members enjoy free access to a variety of training events held around the world.

Who doesn't want to network for business opportunities and learn from thought leaders in industry? I definitely have made acquaintances with Reliability Professionals from around the world who actually give a rat's anatomy about something bigger than themselves! I don't want to cheapen AMP by telling you it's the "Linked-in" or the "Facebook" of the

reliability world, its way better than that! It's sort of the hub for all things Maintenance and you can get whatever you need out of it because it can be whatever you want it to be. AMP is the common conduit for free-flowing exchange of ideas relating to maintenance and it's FREE to join! Does that fit your budget? www.maintenance.org

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Editor's Note on the AMP Article:

Did the Authors note that membership in AMP is FREE?

EMPATH® Motor Diagnostics System

Don Ferree
Areva NP, Inc.

The EMPATH® motor diagnostics system tests AC induction, synchronous, wire wound rotor and DC motors as well as generators and transformers using a set of algorithms to advise the user of problems in the motor, power supply and driven load. The current and voltage waveforms are acquired directly into a laptop computer where the analysis program analyzes the data looking for flaws and weaknesses. The EMPATH 2000 system includes a “Blue Box” electronic package, laptop computer with PCMCIA A/D card and EMPATH software, current probes, voltage probes and manuals.



Technician is attaching current probes to de-energized power cables feeding a 75 horsepower motor

Extensive use of spectral analysis permits both time and frequency data to be analyzed. The embedded algorithms are based on engineering standards like IEEE, published technical papers and proprietary empirical data. The algorithms are specific to the tested equipment. A large portion of the testing is done on AC induction motors powered by three-phase power. The most common data acquisition is therefore three phases of current via current transformers and three phases of voltage. EMPATH can acquire data with as little as one current and can work with any combination of one to three phases of current and voltage but at least one input must be current.

In many cases, the voltage supplied to the electrical equipment is greater than 600 volts RMS which is the maximum that can be directly input to the EMPATH 2000 system. In these cases, the current and voltage probes are attached to the secondary side of current and potential transformers already installed at

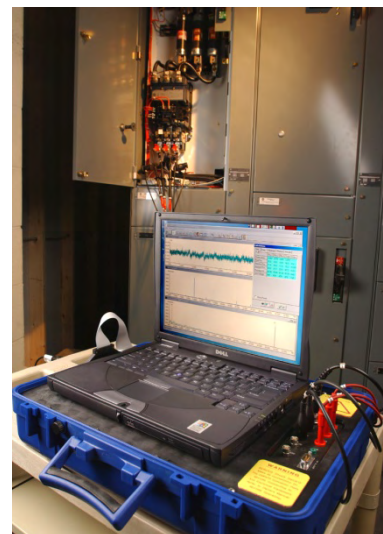
the site. Thus, there is no practical limitation for the ability of EMPATH to acquire data since the secondary side output of these installed transformers produces currents and voltages acceptable to be input into EMPATH.

The typical data acquisition is 50 seconds but user-chosen test periods and frequencies can be set for specific data acquisitions. In addition, true triggered data acquisition is possible with the dual-buffered data acquisition system.

For DC motors, a single phase of armature current using a Hall Effect probe and a single phase of voltage is acquired. Unique DC motor and drive algorithms are used to analyze the data and advise the user of problems in the motor, drive and driven load.

For variable frequency drives, the algorithms for AC induction motors have been modified to adjust for the improved torque feedback typical of VFD's. For higher frequency applications, like 400 Hz, EMPATH automatically resets the data acquisition sampling rates to provide ideal data acquisition parameters.

For more information, please contact Don Ferree at Don.Ferree@areva.com or via phone at 256-851-8651. EMPATH is a product of AREVA NP, Inc., an AREVA and Siemens Company.



EMPATH 2000 'Blue Box' electronics and laptop computer prepped to acquire data on a 75 horsepower pump motor

Motor Diagnostics Tech Tips (General ESA and Motor)

Tip 1

When starting a motor diagnostics program, it is important to note that an average of 1 in 4 to 1 in 6 motors will have some type of electrical or mechanical defect. Careful consideration of the severity of the conditions detected, and the ability to estimate time to failure, are essential to the success of a program.

Some problems, such as early carbon contamination in DC motors, loose connections, misalignment and similar minor issues can usually be readily corrected. More severe issues such as bearing failure, power quality issues and developing winding shorts, must be addressed quickly in critical applications.

Tip 2

Technologies that rely upon insulation to ground measurements evaluate only the insulation barrier between conductors and ground. This monitors only 17% of motor electrical faults, which make up 37% of electric motor faults, which make up less than 10% of motor system faults (incoming power to driven load). This translates into a success rate of less than 0.8% for insulation system-only monitoring programs.

A solid motor diagnostics program incorporating multiple technologies, including motor circuit analysis and electrical signature analysis, will assist the maintenance and reliability professional in detecting close to 100% of potential faults.

Tip 3

Motor Circuit Analysis (MCA) and Electrical Signature Analysis (ESA) technologies can successfully evaluate the condition of DC motors for both troubleshooting and condition-based monitoring. For example: Carbon contamination shows in MCA as non-repeatable readings of impedance, phase angle and current/frequency response, regardless of insulation to ground values. This is, normally, a correctable condition requiring only low pressure, dry air. Arcing and sparking at the commutator can be seen as a raised noise floor around SCR frequencies (# of SCR's times line frequency) in current FFT analysis while DC drive problems are seen as line frequency and SCR frequency harmonics of voltage FFT's.

Tip 4

In the past, winding contamination was detected using methods such as Polarization Index (PI) testing. This required the applied insulation test voltage for a period of 10 minutes. The PI would evaluate only the area between the conductors and ground (ground-wall insulation). Modern motor circuit

analysis techniques use low voltage AC measurements of impedance and inductance.

Winding contamination causes changes to the circuit capacitance (normally increases) which causes the phase relationship of impedance and inductance. For example: In a good insulation system, with the rotor stationary, a motor might have a low, medium and high value of inductance (it can be any combination), the impedances would follow the same pattern (low, medium and high values). If winding contamination exists, that has begun to affect the insulation system, the impedance value in the effected phase(s) will decrease, changing the pattern.

IEEE DEIS Web Launch

February 6, 2009, 6pm EST

Preview the coming launch of the IEEE DEIS Website, a true Institute of Electrical and Electronics Engineers, Inc. Dielectrics and Electrical Insulation Society (IEEE-DEIS) website that is fully interactive and designed to support our members while also providing resources to potential DEIS members and non-members alike.

Dr. Penrose is contracted as the Web Editor-in-Chief (WEiC) for the fully interactive site and has been working with the IEEE-DEIS editorial and web committees, contractors, and associate editors in the development of the online tool. You will be able to access abstracts, ask questions about testing standards, participate in forums and comment on IEEE-DEIS member blog postings. IEEE-DEIS members will have access to a broad range of resources that will continue to be added to the site as well as collaborate with non-members.

IEEE-DEIS members are made up of academia, students, researchers, manufacturers and industry who maintain a broad level of interest in everything from dielectric chemistry to electrical insulation systems.

To preview the upcoming website, please visit: <http://ewh.ieee.org/soc/deis/> today!

IEEE-DEIS members may be IEEE or affiliate members. You do not have to be an Electrical Engineer to be a member of IEEE-DEIS and may be eligible for Associate Membership. Go to the IEEE-DEIS website and click 'Join' for more information.

IEEE P1068: (Draft) Standard for the Repair and Rewinding of AC Electric Motors in the Petroleum, Chemical and Process Industries

14 January 2008

IEEE P1068™ Draft B1

Draft Standard for the Repair and Rewinding of AC Electric Motors in the Petroleum, Chemical and Process Industries

Sponsored by the
Motors Working Group of the Petroleum and Chemical Industry Committee
of the
IEEE Industrial Applications Society

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This upgrade from the original, but still active, IEEE 1068-1996, which was rather general, has expanded the original scope and content to provide a full evaluation of motor repair, as a specification and a scorecard for evaluating your motor repair facility. The draft standard covers general recommendations for the repair of electric motors and includes guidelines for both the user and repair facility. It is not intended to replace specific instructions contained in the manufacturer's instruction book or in any contractual agreement between a manufacturer and a purchaser of a given machine. It covers reconditioning, repair and rewind of horizontal and vertical induction motors and synchronous machines. It applies to all voltages under 15kV and all ratings above 0.75kW (1 horsepower). The draft applies only to the repair of motors and in those cases involving modifications to the basic design, care must be taken so as not to negatively affect the safety and reliability of the machine. Excluded from the scope are the following:

- Specific requirements, certification, and inspection required for explosion proof, dust ignition proof, flameproof and like machines having a listing issued by a Nationally Recognized Testing Laboratory (NRTL). For example: Underwriters Laboratories (UL), Factory Mutual (FM), Canadian Standards Association (CSA), etc.;
- Any specific or additional requirements for hermetic motors, hydrogen cooled machines, submersible motors, or Class 1E nuclear service motors; and,
- DC machines

This draft is intended to be a basic or primary document that can be utilized and referenced by owners of motors that need repair as well as by owners and operators of establishments that offer motor repair services. It has been developed primarily for the needs of the Petroleum and Chemical Industry but can be adapted to other applications. The use of this standard by users and repair facilities is expected to result in higher-quality, more cost-effective, and timely repairs. It also provides a means of evaluating repairs and facilities.

Calendar of Events

Date	Event
Feb 6, 2009	Launch of IEEE-DEIS Website at 6pm EST. http://ewh.ieee.org/soc/deis/
Feb 27, 2009	Free Motor Repair Webinar by Dr. Penrose. http://www.motordoc.com/training1.htm
Mar 17-20, 2009	SUCCESS by DESIGN Electrical Motor Diagnostics Level 1. Glen Ellyn, IL. http://www.motordoc.com/training1.htm
Aug 11-14, 2009	SUCCESS by DESIGN Electrical Motor Diagnostics Level 1. Kalamazoo, MI. http://www.motordoc.com/training1.htm
Oct 27-30, 2009	SUCCESS by DESIGN Electrical Motor Diagnostics Level 1. Glen Ellyn, IL. http://www.motordoc.com/training1.htm

Additional dates and times for training and events will be included in upcoming editions and on the <http://www.motordoc.com> website.

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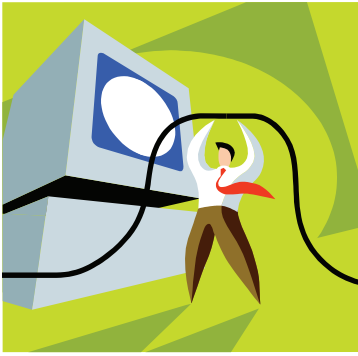
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Our program is designed to bring the ability to attend either a live on-line session or to be able to view each session, which will be recorded. The training is based upon the Electrical Motor Diagnostics: 2nd Edition book, which will be required, and provided additional materials. The course is open to users, potential users, and managers responsible for electrical motor diagnostics systems and electric motor system predictive maintenance and analysis.

The live sessions will be performed each Sunday evening at 7pm EST for two hours over 6 weeks using WebEx with the recorded sessions being available online before midnight EST the same day. Homework and tests will be submitted via email.

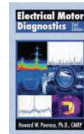
SCHEDULE

EMD Level 1: Begins - February 22, 2009
Ends - March 29, 2009

Attendees may start at any point following February 22, 2009

COST

\$695 which includes Electrical Motor Diagnostics: 2nd Edition



\$545 if you already have your copy of Electrical Motor Diagnostics: 2nd Edition

REQUIREMENTS

Broadband speed internet connection, or better; the ability to use WebEx; a valid email address; Internet Explorer 6, or above; and, the ability to call a long-distance number in the USA, if required.

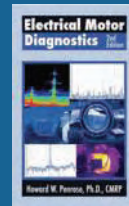
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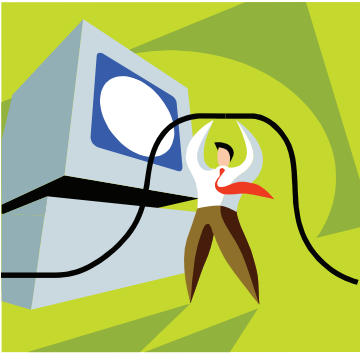
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