What’s Watt
Power Industry Division

Summer Newsletter 2019

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Upcoming Events
Oct 25-28 Annual Leadership Conference
San Diego, California, USA

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Welcome to the summer newsletter for ISA POWID. I am proud to provide my first message as your new Director of the POWID division. First and foremost, I would like to thank Xinsheng Lou for his great leadership over the past several years. He and Aaron Hussey, past POWID director, have done a lot to help prepare me for the coming years. I look forward to continuing to work with them to provide value for your POWID membership. Please know that you can contact me at any time with questions or comments on how ISA can serve you and the POWID community. I would also like to congratulate Xinsheng on being voted as the Vice President-Elect for Industries & Sciences. He will assume this role on January 1, 2020.

Hopefully, several of you were able to attend this year’s first annual ISA Energy & Water Automation Conference (EWAC) held in Orlando, Florida from August 7-8th. Special thanks to Josiah Long for serving as one of the Conference Chairs and John Sorge for once again serving as the Program Chair. They helped put together a great line-up of speakers and presenters to continue making the POWID event a great success. Please make plans to attend next year’s event. If you have any feedback, or suggestions for events topics, then please let us know.

As we look forward to the next year, I ask for your help in volunteering to take on a role within the POWID division to: make contributions to the newsletter, participate in our industry symposium, serve as a division leader, or just make suggestions for how we can better serve your needs. We continuously try to improve our programming and outreach to better support the industry. Please do not sit back idle. Jump in and help volunteer, whether at a local section event or in helping organize the program for the next conference. Without your help, we cannot make a difference.

Finally, I would like to announce an exciting line-up of webinars planned for the POWID community. Our first speaker will be Aaron Hussey discussing Fleet Monitoring and Diagnostics planned for September 2019. You should be receiving an email with additional details soon. We have several other planned webinars including Dan Lee, Josiah Long, and myself. We hope that you can find time to view these webinars and engage the speakers in productive dialogue to make use of their expertise for the implementation of the concepts and ideas that are presented. Again, if you have suggestions for future topics or would be interested in presenting then please let us know.

At the time you read this, the first Energy and Water Automation Conference should have just ended. Included in this newsletter is a short synopsis of the event for those of us who could not attend. We appreciate the hard work of those who made this event possible and hope it provided you with many opportunities for growth and exposure. If you would like further exposure and an opportunity to help others grow, please consider contributing to this newsletter. We are primarily looking for technical content related to the automation side of the power industry. However, historical and general technical items are also welcome. Please keep your articles non-commercial. We will not print heavy sales pitches. Please send these articles to epclark@southernco.com. I am unable to receive attachments over 5MB. If you send and article and do not get a thank you response, I probably did not receive it. To keep up with the POWID in between newsletters, check us out on LinkedIn.

Our goals for the upcoming year center around increased participation from the POWID community. The reason for combining the POWID symposium with the Water/Wastewater Automation Conference was to promote collaboration across multiple industries to leverage knowledge and expertise. We look forward to continuing to work with ISA staff to identify additional methods of reaching a wider audience. In addition, we are beginning a series of webinars meant to address emerging technologies in the POWER industry. There is currently an ISA effort, and we would also like to make this a POWID effort, to engage young professionals in the POWER industry. They will be the leaders of tomorrow that will have to help shepherd POWID forward into the future. Without their help, we will not be able to flourish as a division and community. Therefore, this is a call to all young (and old) professionals to step up and take an active role. We would like to help get you engaged in the division activities. As we begin to make plans for next year’s conference, please make it a point to engage your management to allow you to attend the event, make a presentation, walk the exhibitor floor, and learn the latest trends within the industry. If you have any suggestions for additional ways to reach existing and
potentially new members of the division, then please let us know. We look forward to growing with your help.

Executive Committee Membership

Dear colleagues,

Are you an active ISA member and a member of the power industry division (you get to pick two as part of your annual dues)? Are you in an industry role as an end user, academia, solution or service provider, or other and want to bring leadership to the division?

If so, please contact me to discuss open executive committee membership opportunities, power division activities, and leadership development opportunities. Some specific needs we have coming up include:

- Marketing coordinator – traditional and digital marketing strategy formation and execution
- Historian – organizing and storing/access to conference materials from past years

Additionally, all volunteers on the executive committee are grateful for assistance, including drafting newsletter articles, updating website content, conference track planning, and standards preparation. Please see the organizational chart below. Commitment is scalable from 2 hours/month to as much time as you want to dedicate.

We strive to maintain a balance of end users, vendors, and academia as well as international representation. The process is simple – 1) I’ll arrange a web meeting with the nominating committee and yourself; 2) you submit your resume; 3) the nominating committee decides whether to nominate; 4) the director collects executive committee votes; 5) you begin to participate.

Aaron Hussey
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ISA’s 1st Annual Energy & Water Automation Conference (EWAC)

The ISA Energy & Water Automation Conference was held 7-8 August 2019 at the Omni Championsgate Resort in Orlando, Florida. The event featured interactive sessions led by ISA’s power generation, alternative energy, municipal water and industrial water experts. Multiple industries collaborated in this new event to explore best practices and new technologies to address: leveraging data analytics to drive results, navigating IIoT with safety and cybersecurity in mind, applying the insights of Smart Cities Initiatives to improve operations and leveraging solutions in multiple industries, including oil and gas, refining power generation, wind and solar energy and water handling.
Keynote speakers of this event included leaders with many years of industry experience. To kick off the conference, Tom DeLaura, President/CEO of DeLaura Consulting, addressed “Asset Management – An Approach to Achieving Sustainability” while Dean Ford, Managing Principal Engineer and Executive VP of Westin Technology Solutions lectured on “Automation Maturity – Where does the System Live?” On the last day of the event, Mark Delfunt, Director of Knowledge Management at InSource Solutions spoke on “Why You Need a Digitalization Strategy”.

One day training courses were held in conjunction with the conference for an opportunity to expand professional development and gain CEU or PDH credits. The valuable short courses filled up quickly as classes were held on: Introduction to SCADA Systems Integrations, Introduction to the Management of Alarm Systems, Project Management for Technical Professionals and CyberSensors: Advancements in Automation CyberPhysical Security.

The conference as a success with over 100 attendees, plus several exhibitors, media partners and supporting organizations. Please stay tuned for more on 2020 EWAC location and dates. We hope to see you there!

2019 ISA EWAC Supporters

ISA Power Industry Division Honors and Awards for the 1st ISA EWAC Conference – Orlando, Florida

The POWID Honors & Awards recognizes our dedicated POWID volunteers that made this year’s 1st ISA EWAC Conference possible and presents our POWID awards for outstanding contributions.

The POWID volunteers who planned, organized and orchestrated the conference within the new format of EWAC were:
General Chairperson – Josiah Long, Bechtel, Chair
Program Chairperson – John Sorge, Southern Company (Retired)
POWID Web Page Coordinator – Cyrus Taft
POWID Director – Chad Kiger, AMC
Past POWID Director – Xinsheng Lou, GE Energy
Conference Coordinator – Kim Belinsky, ISA Staff

And these are the folks who coordinated the Water & Wastewater side of the conference:
Conference Chair – Manoj Yegnaraman, PE, CP, CE, Carollo Engineers
Program Co-Chair – Joe Provenzano, KPRO Engineering Services
Program Co-Chair – Hassan Ajami, PCI

Our thanks for their efforts on this challenging task.

The POWID awards for outstanding contributors were presented during the EWAC conference.

Each year, the ISA Power Industry Division presents its most esteemed awards to outstanding individuals and facilities nominated by ISA members.

The Service Award is for outstanding service in the field of instrumentation. The service of the individual must be noteworthy, exemplary, and exceed the normal duties of the office held. The service is of a nature that advances the stature of the Power Division and/or ISA.

The Facility Award was created to honor facilities that demonstrate innovative application of control systems or instrumentation technology within the power industry.

The Robert N. Hubby Academic Scholarship is POWID’s most esteemed scholarship and is awarded to a deserving student meeting the rigid technical requirements.

The Achievement Award recognizes individuals whose efforts have advanced the generation of electrical power. These efforts are exemplified through the individual’s outstanding achievements, original design application, or special contributions toward the development of engineering concepts in the field of instrumentation and controls within the power industry.

The ISA POWID Service Award

This year the recipient of the POWID Service Award is Seth Olson. Mr. Seth Olson is a Process Control Engineer at Chevron Global Power Company. Seth has been highly instrumental in the success of three consecutive POWID symposia where he served as Program Chair or General Chair. Seth has served on the POWID Executive Committee for many years and provided end user guidance on the role of ISA POWID to the industry. He is an enthusiastic volunteer leader that has supported many service roles at POWID.

The ISA POWID Facility Award
This year’s recipients of the ISA POWID Co-Facility Award are AMS Testing and R&D Facility, Knoxville, Tennessee and West County Energy Center, Loxahatchee, FL.

AMS Testing and R&D Facility

In June 2018, AMS completed the construction of a third building that represents a major expansion to its main technology campus. This new USD 5 million testing and research and development (R&D) facility added 15,000 square feet of new office and laboratory space to AMS’ existing headquarters, including a USD 1 million electromagnetic compatibility (EMC) chamber. The new chamber contains nearly 10,000 cubic feet for MIL-STD and IEC testing and is designed to accommodate equipment with weights up to 5000 lbs. The new chamber also features a 1000 cubic foot control room that allows for remote access of support equipment. The AMS campus now spans over 100,000 square feet of office, laboratory, and expansion space staffed by highly qualified specialists and consultants with degrees in electrical, mechanical, nuclear, chemical, computer, and materials engineering. The AMS campus includes an EMC qualification laboratory, a cable forensics laboratory, a test flow loop, and a temperature sensor response time testing laboratory.

Benefits to the industry: The new facility provides the power industry and other industries with access to a 24/7 EMC qualification testing laboratory with the capability to not only qualify new digital and analog equipment for EMC but also with the technical expertise to provide
troubleshooting of the failures to bring it into compliance. The new capabilities also provide for further R&D within the power generation industry in the areas of life extension through equipment condition monitoring, wireless technology, software reliability, and others. This will improve upon the reliability and availability of the current and next generation of power reactors.

Benefits to ISA: The R&D as well as operating experience case studies gathered because of the new facility will continue to be published through the ISA POWID symposium and other ISA venues. This will allow for the POWID community to build upon and enhance these outcomes.

West County Energy Center

Innovative ideas: Automation of the operator tasks from prestart checks to encompassing the standard operator procedures (SOPs) to ensure reliable power block starts and increase flexibility through the automation of the HRSG trains for transitions from 1x1 to 2x1 to 3x1 for each of the three power blocks at the site. Unique turbine bypass control techniques, coupled with the sequential function chart views of the SOPs that would “assist” the operator in timely, and fuel saving, starting and loading advice and automation of the power block helped raise the operator to managing the process vs being tasked to complete many repetitive steps. The plant faced increasing demands to cycle due to renewable generation intermittency. In 2018 the plant had 648 cycles and it was predicted to be 1,000 in 2019.

Benefits to the facility:
1. Starting fuel savings of greater than 50% from baseline
2. Consistent block starts with 18% reduction in hot cycle fuel use
3. Reduced annual total emissions
4. Lowered O&M costs of SCR operation
5. Increased ramp rate
6. Lowered operator stress
7. Improved steam turbine inlet conditions on blending trains
8. Enhanced HRSG tube life from improved SH and RH temperature control
9. Human performance factors improved
10. Heat rate variability was reduced

The ROBERT N. HUBBY Academic Scholarship Award

The recipient of the ROBERT N. HUBBY Academic Scholarship Award is Peter Shaw of Virginia Tech, Blacksburg, Virginia, USA. Peter’s qualifications were outstanding with a solid GPA, several strong letters of recommendation, a compelling essay, internship in power equipment manufacturing, and president and co-founder of a student ISA section at Virginia Tech. Peter will be awarded a USD 4000 scholarship from ISA.
The ISA POWID Achievement Award

The ISA POWID Achievement Award is the most prestigious POWID award. The recipient is entitled to award a USD 4000 scholarship to a college student of one’s choice.

The ISA Power Industries Division is proud to bestow the 2019 Achievement Award to Susan Maley of EPRI. Susan holds BS degree in Chemical Engineering from West Virginia University, and MS degree from University of Kentucky.

Susan has been driving the advancement of novel sensing and control technologies and their unique applications to fossil power plants when she was working as Project Manager and then Technology Manager at US DOE’s National Energy Technology Laboratories. She encouraged and facilitated the NETL teams and university teams to work with the industrial teams to develop and commercialize sensing and controls technologies at industrial labs and actual power plants. These technologies include:

- Fiber optic sensing of temperature, pressure and strain, etc. of coal-fired boilers and steam plant systems
- Advanced controls including linear and nonlinear model predictive controls with applications to chemical looping process, gasification process and IGCC plant systems, etc.
- Wireless sensing and controls with applications to fossil power plants
- Application of Artificial Intelligence (AI) to fossil power plant controls and diagnostic monitoring

Currently, as Principal Technical Leader on Generation at EPRI, she has been driving the advancement of fleet wide optimization and diagnostic monitoring for power generation systems. From EPRI, she continues to promote collaborations between universities, utility companies and OEMs.

Susan’s contributions to the technical field of power automation are unique and significant in terms of the impact level of her accumulated efforts/deliverables at DOE/NETL and EPRI.

Congratulations to all 2019 POWID awardees.

Dissertation Abstract: Regulation and Control of AC Microgrid Systems with Renewable Generation and Battery Energy Storage System

Author: Dr. Huiying Zhao
Advisor: Dr. Mingguo Hong
Department: Electrical Engineering and Computer Science
University: Case Western Reserve University

Abstract:

Microgrids can provide significant operational benefits to the connected grid when operating in the grid-connected mode, and energy security to the end users when operating in islanded mode. This research has first developed microgrid dynamic models which consist of multiple facility-scale microgrids with different types of distributed energy resources and are interconnected through the medium-voltage distribution system network. The dynamic models are represented by a set of ordinary differential equations to support analytical studies. The models also consider both conventional and renewable generation resources such as synchronous generators and photovoltaics, as well as battery energy storage systems. For converter interfaced systems, both grid-feeding type and grid-forming type converters are modeled to support the microgrid islanded mode of operation.

The stability of the microgrid systems in islanded mode is studied through small signal stability and sensitivity analysis. The participation factor study shows that the stability issues are associated with the system impedance loads parameters. Then this thesis presents a novel primary control strategy based on both the linear and nonlinear output regulation theory for voltage and frequency regulations in microgrid systems with fast-response converters. The proposed control strategy can accurately track voltage and frequency set points while mitigating system transients in the presence of disturbance events. Therefore, it overcomes the main shortcomings of the common droop-based control methods such as large steady-state voltage and frequency deviations and poor transient performance. Different control schemes are designed while considering trade-offs between communication requirement and system dynamic performance. Their effectiveness is validated through Matlab SIMULINK simulation studies involving a medium-voltage microgrid with both synchronous generation resources and converters. Although the proposed control schemes are centralized, practical implementation is possible with available communication links in microgrids and embedded hardware technology.
Emerging Sensor Technology

Subject: Distributed fiber sensing systems for 3D combustion temperature field monitoring in coal-fired boilers using optically generated acoustic waves
Sponsor: USDOE - National Energy Technology Laboratory (NETL)
Project Manager: Barbara Carney and Jessica Mullen
Award Number: DOE DE-FE0023031

Principal Investigator (PI): Prof. Xingwei Wang, University of Massachusetts – Lowell (UML)
Co-PI: Prof. Chengyu Cao, University of Connecticut (UCONN)
Co-PI: Dr. Xinsheng Lou, General Electric (GE)

The overall objective of this project is to develop a novel distributed optical fiber sensing system for real-time monitoring and optimization of spatial and temporal distributions of high temperature profiles in a boiler furnace in fossil power plants. This is the first active non-contact all optical fiber distributed sensing system to use optically generated acoustic signals to operate in the super harsh environment of coal-fired power generation systems. This work has great significance because of the ability of the distributed fiber sensors to survive in high temperatures and the ability of the optically generated acoustic signals to measure even higher temperature distributions where the fibers do not reach. The temperature profile will provide critical input for the control mechanisms to optimize the combustion process. This will address the critical problem in fossil power plants of achieving higher efficiency and fewer pollutant emissions. Extensive sensor tests were done in the university lab at UML and industrial scale facility tests were done at GE’s Clean Energy Center located at 44 Tobey Road, Bloomfield, Connecticut. A 2D/3D temperature reconstruction algorithm was developed and simulated at UCONN.

Figure 1 Fiber Optic Sensor and Potential Applications

This is a collective work between the UML team, the UCONN team and the GE team. The UML team includes Jingcheng Zhou, Xu Guo, Cong Du and Rachana Guruprasad Kashyap. UCONN Team includes Tong Ma and Yuqian Liu. And the GE Team includes Carl Edberg (Lab Manager) and his test team - Steve Unker, Matthew Varhue, Richard Malchow, etc. This DOE funded project started on September 1, 2014, and it was concluded on March 31, 2019. A final report was delivered to DOE NETL on April 5, 2019.
CAD in Retirement
By: Dale Evely, P.E.
ISA Life Fellow - Southern Company (retired)

I began using Computer Aided Drafting (CAD) tools in the early 1980’s, beginning with a mainframe based Auto-trol CAD system and then moving into PC-based AutoCAD®. For the most part my use of CAD was limited to schematic type logic and piping and instrument diagrams but for personal home projects on the side I used it for scaled drawings as well.

When I retired at the end of January, I began looking for CAD software that I could purchase that would be affordable and provide me with the light drafting features that I needed for various home projects. I quickly learned that AutoCAD was not an affordable option, the stripped down 2D AutoCAD LT costs $50/month ($390/year) to lease; there is not a direct purchase option. The full AutoCAD package that I was used to at work is an even pricier $210/month ($1,680/year). I should note that registered students can download free AutoCAD software, but I have no plans to go back to school so that would be an even pricier solution.

I knew that anything besides AutoCAD would require a steep learning curve for me unless it utilized the same AutoCAD commands. I was also concerned about the potential security aspects of using freeware. I did consider it important, however, to find a package that could load and save AutoCAD native format drawing files in case I ever did gain access again to AutoCAD. I did not perform an exhaustive search because even though I am retired I am still somewhat busy (and maybe even lazy).

I finally decided on a program called TurboCAD® Deluxe and purchased the 2018 edition of that software through Amazon.com for a total of $138.54 including tax. I loaded the 64-bit edition on my Windows 7 based Dell laptop and did not have any problems with the graphic card. I also connected by 21-inch monitor from my old desktop machine so that I did not have to use the 15-inch laptop display for drafting; this also made the command icons easier to distinguish from one another.

I need to note that the Deluxe version of this software is the second up in the hierarchy of program versions of this software. This hierarchy runs from Design, to Deluxe, to Expert and then to Pro Platinum. The Deluxe edition provided the features that I thought I needed for my light 2D drafting work and is also the entry point for the inclusion of a 3D drafting option, should I ever decide to use it. The two versions above Deluxe would have also provided a command line entry option, which is the way I primarily did CAD in the past, but I decided against that to keep the cost down.

The software came with an “Introduction to TurboCAD” tutorial program that I loaded and attempted to use to help learn the software. This became a very frustrating effort and after spending a few days doing that I decided I needed something more. A further search on Amazon yielded the availability of a book entitled “Using TurboCAD in technical professions for draftsmen, technicians, and engineers”. The book was written by a power-user of the software named Matthias Bosse and cost me an additional $56.91 but that ended up being well worth the investment.

Figure 2 Testing of Fiber Optic Sensor Systems on GE Facility in Connecticut
Mr. Bosse did an excellent job with his book, but I should note that the book is written for the 2017 edition of the Pro Platinum version, but it sufficed for my needs. I should also note, that the book is written assuming the metric system of units (millimeters) but the program as loaded by me defaulted to the inch system, which is my preference and what I have been using. The book covers both 2D and 3D drafting, but so far, I have only read and used the 2D applicable portions of the book and software.

**ISA67 Nuclear Power Plant Standards Committee Update**

By: Daniel Steik  
ISA67 Committee Chair  
Cognizant System Engineer  
Advanced Test Reactor  
Idaho National Laboratory  
(208) 533-4247 or Daniel.Steik@inl.gov

ISA67 is organized to be the focal point in ISA for documenting through standards publications: criteria, standards, practices, and procedures related to instrumentation and controls in nuclear power generating stations and associated industries. The ISA67 committee is responsible for all ISA nuclear plant instrumentation and control standards. Currently we address transmitter installation, sensing lines, leak detection instrumentation, setpoints and uncertainty calculations, and performance monitoring.

The committee is next meeting this September 9-10, 2019 at the Idaho National Laboratory in Idaho Falls, ID. The meeting will consist of the various working group meetings and a tour of various nuclear facilities. Please send RSVP to Daniel.Steik@inl.gov if you are planning on attending.

We are always open to new ideas and input from those with a stake in Nuclear Power Plant Standards. Please consider getting involved today! More information about the ISA67 Committee and its activities can be found at the ISA67 committee website.

**ISA77 Committee Update**

Hello, POWID Industry members! The ISA 77 committee last held a Skype meeting on July 3, 2019. You can find the ISA 77 meeting minutes posted on the ISA 77 committee website. The main purpose of the meeting was to review the status of new/revision documents which are summarized here:

- **ISA77.00.01 Definitions and Basic Control Concepts** (Completed - waiting for ISA publication)
- **ISA77.13 Turbine Steam Bypass Systems** (in revision and still in progress)
- **ISA77.14.01 Steam Turbine Controls** (Completed – waiting for ISA publication)
- **ISA77.22.01 Power Plant Automation** (new document and still in progress)
- **ISA77.42.01 Feedwater Control** (Completed – new document is available)
- **ISA77.44.01 Steam Temperature** (balloting completed – new to resolve editorial comments)
- **ISA77.82.01 SCR Instrument and Controls** (Completed – waiting for ISA publication)

ISA 77 committee has approved two new voting members; Mark Faurot (Southern Company) and Roger Lesaca (Mitsubishi Hitachi). The committee members appreciate Mark and Roger volunteering to support this committee. If you have an interest in joining ISA 77 committee or any of its working groups or any questions about ISA 77, then please don't hesitate to contact Daniel Lee (dan.lee@us.abb.com).

The ISA77.20.01 Fossil Power Plant Simulator working group chair Bill Talbot would like to revise this standard and is looking for working group members. If you would like to participate as a working group member, please contact Bill Talbot (wtalbot@TalbotSimulationAssociates.com).

Regards,  
Daniel Lee  
ISA77 Chair

**POWID Membership Recognition**

The Power Industry Division (POWID) would like to welcome all our new members and new student members. We hope you will take advantage of everything POWID has to offer for your work and your career including the opportunity to network with power industry professional colleagues across the globe. Our primary goal is to provide a means for information exchange among engineers, scientists, technicians, and managers involved in instrumentation, control, and automation related to the production of power. POWID is active in developing industry safety and performance standards, working closely with two ISA standards committees—ISA67, Nuclear Power Plant Standards, and ISA77, Fossil Power Plant Standards. The Division also conducts technical training and sponsors awards for power plants and individuals advancing instrumentation and control within the power industry.

POWID welcomes your involvement in our division activities. Opportunities are available to provide information for our newsletter and web site, to develop papers for presentation at our annual conference, and to participate in our division’s management structure. It is a great way to get to know other industry professionals, to gain professional recognition, and to stay informed!