Director’s Message

By Xinsheng Lou

I fully believe that it is not an accident that you are reading this newsletter.

Did you know that ISA has 40,000 members and ISAs Power Industry Division (POWID) has over 1,800 registered members? Please be invited to connect with your industry peers on our LinkedIn site, https://www.linkedin.com/groups/2031360, for periodic announcements on division activities. Dan Lee, our membership coordinator, provides a list of new division members in each newsletter. A warm welcome to all our new members of POWID!

With such a large base of industry peers, consider the opportunities that are available to you through POWID. Firstly, contributions to newsletters like this are always welcome—check out one of the best technical papers from the POWID 2017 Symposium in this edition. If you have a technical article, interesting find, or book description, please contact the POWID newsletter editors (Dale Evely and Elizabeth Clarkin from Southern Company). Secondly, ISA67 Nuclear Power Plant Standards and ISA77 Fossil Power Plant Standards committees have several subcommittees that are drafting new standards and maintaining existing standards. Thirdly, the 2017 POWID Symposium was recently held from June 27–29, 2017 in Cleveland, Ohio; and we are starting to plan for the 2018 POWID Symposium with continued momentum.

At the 2017 POWID Symposium, the technical program covered fossil power, nuclear power, renewable power, power fleet, cybersecurity and emerging technologies. Three keynote speakers were invited from Emerson Automation Solutions, IBM Corporation, and Oak Ridge National Laboratory, respectively, each giving an impressive presentation on the market and technology trends, and the future of power and automation. At the POWID Honors and Awards Luncheon, Dr. Geoffrey Landis, a brilliant scientist and engineer from NASA Glenn Center impressed all of us with his very inspiring talk on power for spacecraft. POWID also hosted a Student Career Development Forum (SCDF) with two evening sessions for young students to meet with experienced professionals to discuss networking, resume development, interviews and career growth in the dynamic industrial environment. Congratulations to the 2017 POWID Symposium committee!

The POWID newsletter provides us all with an opportunity to extend our involvement in the Power Industry Division and make positive impacts to the power community throughout the remainder of 2017 by reflecting on some of the key activities that are taking place. Let’s explore together how our specific talents, experience and network could assist this power-oriented division and the ISA community at large. Please be encouraged to contact me or any other POWID EXCOM members by emails or phone calls. The POWID EXCOM as a team will respond with service opportunities from the Power Industry Division and ISA as an industrial society on automation and controls.

Xinsheng Lou
POWID Director 2017/18
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Phone 1-860-285-4982

Upcoming POWID and ISA Events

2017 ISA POWID Symposium
June 2018 (exact date and location to be announced)
Knoxville, Tennessee (tentative location)
For updates see: https://www.isa.org/powersymposium
You can find information on other ISA Events at: www.isa.org/events
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The ISA Power Industry Division (also known as POWID) is organized within the Industry and Sciences (I&S) Department of ISA to provide a means for information exchange among engineers, scientists, technicians, and management involved in the use of instrumentation and control in the production of electrical power by any means including but not limited to fossil and nuclear fuels. The POWID Executive Committee (Excom) administers the activities of the division. The Executive Committee normally meets face-to-face once a year at the POWID Annual Symposium in June and conducts conference calls/web meetings as needed throughout the year. For more information about the Excom you can contact the ISA POWID Director.
Newsletter Editor Update

By Dale Evely, P.E.
Southern Company
ISA POWID Newsletter Editor

Many thanks to all of you who contributed to this edition of the POWID Newsletter; I am sure our readers appreciate the extra effort you have made to go above and beyond your normal work by sharing some of your knowledge and experience. We would also appreciate the efforts of you members in recruiting others to join ISA and the Power Industry Division (POWID).

I have kept quite busy this summer with both personal and work activities. A very enjoyable work activity for me this past June was attending the ISA POWID Symposium at Case Western Reserve University in Cleveland, Ohio USA. It was a nice change having the conference at a university and it made me feel a bit nostalgic for my own college years. The joint session was thought-provoking, with three keynotes and a speaker from NASA. We learned from the NASA speaker, Dr. Geoffrey Landis, that for spacecraft, solar power not only has problems when you get farther away from the sun but also has heating issues that must be addressed as you get closer to the sun.

We learned many things as well from the three keynote speakers (Bob Yeager of Emerson, Dwight Clayton of Oak Ridge National Laboratory and Jeffrey Katz of IBM) including:

• China is the largest emitter in the world of CO2 but on a per capita basis they come in at 38th.
• Since most research today is multi-disciplinary in nature it is rarely one person working alone, but usually many people working together as a team that make the big discoveries.
• Cognitive computers like IBM’s Watson have significant potential to help companies address their aging workforce issues through assisting with knowledge capture and application of that knowledge.

Once the joint session was over, the difficulty at the conference came in deciding which of the three tracks to attend. Luckily, there were three of us there from my company, so we were able to split up and have representation in all three tracks. I am awaiting their notes and the conference proceedings to be published so that I can learn from the sessions that I was not able to attend personally. The presentations that I did attend provided a good assortment of ideas and the ones that were probably the most beneficial to me were the ones that discussed ways to improve the flexibility of our fossil generation fleet.

Don Labbe has done a great job in this newsletter describing the ISA POWID Honors and Awards that were bestowed during the conference. I would like to add to that by passing on that a new ISA Fellow from our Power Industry Division (POWID) was just announced and that is Brent Shumaker of Analysis & Measurement Services Corporation in Knoxville, Tennessee. He was elected to the distinguished grade of Fellow for development and implementation of online technologies to assess the health and remaining useful life of critical components in nuclear power plants. Brent will be formally recognized as an ISA Fellow at the 55th Annual ISA Honors & Awards Gala on October 29th at the Grand Hyatt Tampa Bay in Tampa, Florida. If you don’t get a chance to congratulate him there, perhaps he will be at our 2018 POWID Symposium, which coincidentally is expected to be held in Knoxville, where Brent resides.

I want to again thank Beth Clarkin for her willingness to serve as the Assistant Newsletter Editor, and with this edition, she has taken on a more active role in the editing process. Beth is an I&C Design Engineer at Southern Company, but is also an active volunteer in our local ISA Birmingham Section, as well as with the ISA Power Industry Division. We are greatly appreciative of her willingness to serve ISA as a volunteer as she continues to gain experience in the I&C profession. Being a volunteer leader with ISA is an excellent way to polish leadership and communication skills while making additional contacts with similar interests in industry.

For those of you who are not recent Newsletter contributors, let me once again ask your help in providing articles for our next newsletter. Technical content that is specific to the automation side of the power industry is what provides the best benefit to our membership. We are also interested in historical items and items of general technical interest. You can send your articles to dpevely@southernco.com (please limit any attachments to 5MB or my mail server may not let them through, and I will never know that you tried to send them). If you e-mail an article and do not get a thank you response from me, it may not have gone through. Please keep in mind that articles need to be non-commercial in nature, so don’t include a heavy sales pitch as a part of the technical content.

I hope your 2017 is going well for you and I look forward to sharing with you again in future newsletters.

Welcome New POWID Students

Danish Ahmed
Rohit Kumar Alok
Srilaishksh B S
Alvaro Javier Bazante Martinez
Mohan Devaraj
José Luiz Fernandes
Ronal Eduardo Florez Galindez
Colin D France
Aswanth Balaji Gunasekaran
Jonathan Hill
Shaishav Kumar
Prashanth Kumar
Sneha Kumari
Peter D. Lefere
Mahendra Mahato
Martin Eduardo Molina Florentino
Manuel Antonio Monobe Escobedo
Jacob B. Mozdzierz
Sindhu N S
Valery Nambke
Gustavo Francisco Navarro Henriquez
Madhuri P
Rosa Estefany Portillo Ramos
Abdul Qoyim
Akshara Ravishankar
Pranjal S
Yashaswini S
Shayan Hasan S
Tejas T S
Arghya Saha
Anubhav Shah
Swathi G Shanbhag
Ritesh Sharma
Anshul Rajesh Kumar Sharma
Shivdhan Singh
Kris Teague
Prabhanshu Pratap Tomar
Manvendra Singh Tomar
Pavan U A
Arshath V
By Seth Olson  
*Chevron*  
2017 POWID Conference General Chair

I was happy with how the symposium turned out this year. As usual, our committee was worried about having enough technical content, authors waiting until (after the) last minute, etc. There was a learning curve with locating the symposium at Case Western Reserve University, as well. The symposium committee all pulled together to make it happen. The committee came away excited and has started planning for next year.

The attendees I talked to enjoyed the university environment. Even though it took us a while to find a few of the breakout rooms and learn the audio/visual (A/V) equipment, things went well. I want to thank Richard Kolacinski and Ken Loparo for their support and appreciate their hospitality.

The keynote speakers (Emerson Power and Water, Oak Ridge National Laboratory, and IBM) in the opening session and the NASA speaker at the Honors and Awards luncheon were all excellent. We had 53 technical presentations, a DOE/EPRI/NASA Instruments and Controls Interest Group Meeting and an Alarm Management Workshop. (Let me know if you want to learn more on integrating alarm documentation and rationalization information into your control system and I’ll tell you what I’ve learned.)

The exhibit was smaller than previous years (possibly due to the uncertainty about the university location), but I was able to pick up some valuable information from a few of the exhibitors. I hope that if we have it at a university again that the exhibit will expand.

This was my first trip to Cleveland and I was impressed by the city. Dan Lee arranged a pre-symposium social downtown at an Irish pub. A few of the guys went to an Indians game afterwards. Aaron Hussey and I went to the Rock and Roll Hall of Fame on Wednesday night after the symposium and had a good time.

The symposium continues to be the premier event for control systems professional development. The time spent volunteering pays off and I really enjoy coming together with my friends in the Power Industry Division (and meeting new ones). We’re always looking for volunteers so reach out to anyone on the symposium or Executive committees if you’re interested or have feedback on the symposium.

Thanks for your attendance at the 60th POWID Symposium this year at Case Western Reserve University and I hope to see you next year!

ISA POWID Honors and Awards Luncheon 2017

By Don Labbe  
*Schneider Electric*  
ISA POWID Honors & Awards Chair

The ISA Power Industry Division Honors and Awards Event for 2017 was held as a part of the 60th ISA POWID Symposium at Case Western Reserve University in Cleveland, Ohio. The event was held during lunch on Tuesday, June 27th.

First, our Symposium plenary session speakers were presented with certificates. These certificates were presented to:

- **Jim Keaveney** – Former ISA President and Symposium welcome speaker  
- **Robert Yeager** – Keynote Speaker  
- **Dwight A. Clayton** – Keynote Speaker  
- **Jeffrey S. Katz** – Keynote Speaker  
- **Geoffrey A. Landis** - H&A Luncheon Speaker

The dedicated POWID volunteers who planned, organized and orchestrated the Symposium were then recognized:

- **General Chairperson**  
  Seth Olson  
- **Program Chairperson**  
  John Sorge  
- **Cybersecurity Track Chair**  
  Michael Firstenberg  
- **Emerging Tech Track Chair**  
  Benjamin Chorpening  
- **Renewable & DG Track Chair**  
  Rick Meeker  
- **Fossil Track Chair**  
  Steven Seachman  
- **Fleet-wide Track Chair**  
  Xinsheng Lou

- **Nuclear Track Chair**  
  Chad Kiger  
- **Program Paper Chairperson**  
  Robert (Bob) Queenan  
- **POWID Web Page Coordinator**  
  Cyrus Taft  
- **Symposium Assistant Coordinator**  
  Terri Graham  
- **Student Career Development**  
  Jacob Albright  
- **Conference Coordinator**  
  Kim Belinsky  
- **Host Coordinator**  
  Dan Lee

The 1st portion of this Honors & Awards program recognized our dedicated volunteers and keynote speakers that made this year’s 60th ISA POWID Symposium possible. The 2nd portion presented the POWID awards for outstanding contributions.
Beyond the standards support, Bob has presented multiple technical papers and developed multiple sessions at the POWID Symposia. Bob has been a strong advocate of the bond between ISA and the nuclear I&C world.

Mike Skoncey has been a very active member of POWID EXCOM for over 20 years promoting the automation needs of utilities. He has served the following roles:

- Honors & Awards Chair for over 10 years, setting a standard of excellence.
- He was the General Chair for the outstanding “50th” POWID in Pittsburgh, the site of the 1st POWID.
- He has been the organizer of the POWID Awards ceremony seeking out local keynote speakers such as mayors, city councilors and other local politicians and public service individuals including a real law enforcement type Texas Ranger.
- Mike has also been a much needed advocate for the value of POWID to the electric utility industry.

The ISA Power Industries Division was proud to bestow the 2017 Service Award to Bob Queenan and Mike Skoncey.

### The ISA POWID Facility Award

This year’s recipient of the ISA POWID Facility Award was the Yingcheng 35 MWth Oxy-Fuel Combustion Plant. The Facility Supports the US-China Clean Energy Research Center with sponsorship from US DOE and China’s Ministry of Science and Technology.

The Yingcheng 35MWth oxy-fuel combustion plant is a key milestone for demonstration of oxy-fuel combustion carbon capture technology at an industrial scale. It is composed of the most critical components of oxy-fuel technology, such as air separation unit, air and oxy-fuel fired boiler, flue gas cleaning devices, and flue gas recycling system. The CO2 concentration in its flue gas reached 82% in September 2015, as compared to 14% for a conventional plant, which proved the readiness of oxy-fuel combustion technology for future large scale demonstrations including retrofits.

The engineers applied dynamic modeling and 3-D flame imaging. The plant provided an advanced platform for oxy-fuel combustion and related I&C development and testing, supporting the preparation of operation and design guidelines.
Best POWID Technical Papers
Each year POWID has historically recognized the best papers from the previous year’s symposium. The three best papers were:

Best Paper
A Novel Rotor Stress Controller for Increased Operational Flexibility
by Nikolaus Schuermann

2nd Best Paper
Devitrification Kinetics and Optical Stability of Optical Fibers at High Temperatures
by Anastasia Yakusheva, Daniel Homa, Li Yu, Anbo Wang, Paul Ohodnicki, Benjamin Chorpening, Michael Buric, and Gary Pickrell

3rd Best Paper
Optimization of CHP and Fossil Fuels by Predictive Analytics
by Patrick Bangert

The ISA POWID Achievement Award
And, our final and most prestigious award; the ISA POWID Achievement Award. The recipient is entitled to award a $4,000 scholarship to a college student of one's choice. This year’s recipient of the POWID Achievement Award was Carl H. Neuschaefer.

Mr. Neuschaefer served the power and automation industries for over 45 years in his technical and management roles at Combustion Engineering/ABB/Alstom/GE, and in collaboration with many University, DOE, EPRI and Utility experts.

He has many significant achievements including:
• Advocated and promoted advanced sensing, on-line computations, model predictive controls and real-time optimization technologies and their applications to existing and future thermal power technologies and power plants.
• Demonstrated technical achievements in Nuclear Power Generation specializing in Reactor Safety and Control. Participated in Industry standards preparation committees, authored numerous safety and accident monitoring technical papers, lead development of post TMI Reactor Vessel level Instrumentation development, appeared before ACRS, Advisory Committee for Reactor Safety presenting this HJTC level sensing post TMI solution and subsequently supported development of numerous digital accident monitoring systems solutions post TMI.
• Demonstrated distinguished leadership in Research and Product Development on Sensing, Instrumentation and Diagnostic Monitoring for nuclear power, Fossil power and Renewable/solar thermal power generation systems, including advanced sensing and controls concepts and designs for Molten Salt Receiver based Solar Plants, for existing Fossil PC, & CFB plants, and future Oxy-fired Boiler steam and Chemical Looping plants
• Developed R&D Labs in his department at Alstom Power/GE Power:
  • Instrumentation and Electronics Lab
  • Manufacturing Automation Lab
  • Controls Software Lab
  • Process Dynamics and Controls Lab
• Mentored and developed a significant number of next generation professionals on the technical track of Power Plant Automation (including Sensing and Instrumentation, Advanced Controls, Software & Diagnostics and Operational Control and Optimization for power generation systems during his 45 years’ tenure in several of the power businesses of Combustion Engineering /ABB/Alstom/GE.

The ISA Power Industries Division was proud to bestow the 2017 Achievement Award to Carl H. Neuschaefer.

Lastly, our sincere thanks to Kim Belinsky of the ISA staff who poured in tremendous effort to make the POWID symposium successful.

ISA67 Nuclear Power Plant Standards Committee Update
By: ISA67 Committee Chair Bob Queenan, Scientech

The committee responsible for all ISA standards relating to nuclear power, ISA67, and its various subcommittees, met during POWID 2017. Excellent participation for remote members was provided through WebEx.

The ISA67.01 subcommittee is responsible for ISA-67.01.01-2002 (R2007) Transducer and Transmitter Installation for Nuclear Safety Applications. They are working to revise the standard next year.

The ISA67.02 subcommittee is responsible for ISA-67.02.01-2014 Nuclear Safety-Related Instrument Sensing Line Piping and Tubing Standard for Use in Nuclear Power Plants. They are also working to revise the standard, and intend to ballot it next year.

The ISA67.04 subcommittee is responsible for a standard and a recommended practice: ANSI/ISA-67.04.01-2006 (R2011) - Setpoints for Nuclear Safety-Related Instrumentation and ISA-RP67.04.02-2010 Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation. They are currently working on changes to the standard to better fit with recent changes to technical specifications.

Finally, the ISA67.06 subcommittee is responsible for ISA-67.06.01-2002 Performance Monitoring for Nuclear Safety-Related Instrument Channels in Nuclear Power Plants. They intend to ballot a revision to the standard this year.

The ISA67 committee is following the new work on small modular reactors to determine if the industry needs additional guidance on how to properly instrument these new power plants. It’s an exciting time for the nuclear industry. I encourage all who work in the field to get involved in standards work—it’s the best way to learn the techniques and to steer the industry by documenting the best technical solution to the challenges ahead.

More information about the ISA67 Committee and its activities can be found at the ISA67 committee website.
2017 POWID Symposium–A Spouse’s Point of View

By Paula Labbe

Cleveland Ohio was wonderful! There was no shortage of things to do and I tried to do them all. Of course, that was impossible, but I gave it a good try!

Our hotel was the Tudor Manor, a beautiful historic building with a grand ballroom the likes of which I have only seen in movies. I felt like royalty gazing at the chandeliers and décor. The hotel location was perfect, only ¼ mile from the conference center at Case Western Reserve University. It was also within a mile from several of Cleveland’s fine museums and the hotel provided shuttle service. The hotel was located less than 5 miles from downtown Cleveland and its many attractions.

My first adventure was the Rock & Roll Hall of Fame, a five story glass structure on the shore of Lake Erie. I spent the whole afternoon exploring music memorabilia, and listening to cherished music from the past along with about a thousand other happy visitors.

From there I walked through downtown. Cleveland surprised and impressed me, as not only was it immaculately clean, but its architecture was quite amazing with so many varieties of buildings. Pedestrians had great walkways and ample time to cross streets. I met up with the ISA POWID group for dinner at Flannigan’s Pub located in a pedestrian only section lined with flowers and eateries. It was a great meal and a nice opportunity to catch up on old times.

Day two was a visit to the Museum of Natural History. If you like dinosaurs, gemstones, moon rocks, planetariums (I saw a show on dark matter, which was plenty scientific) and live animal exhibits, then this is the place for you!

Day three, I took a break from touring and photographed the ISA POWID Symposium Honors & Awards Luncheon. I found the presentation by NASA’s Dr. Geoffrey A. Landis very interesting. Through the lens of my camera, I could see that the attendees also enjoyed his message that included solar power on Mars and Venus and even orbiting close to the sun. I met people from Australia, France, Germany, China, and Russia.

Day four was no less exciting, as I visited the Cleveland Museum of Art. I couldn’t believe it when they said admission was free! The original majestic marble building was constructed in 1916. Three other buildings were added to enclose a climate controlled court yard with a glass roof and trees. I saw art classes being conducted and the students were quite accomplished. I spent many hours walking through room after room, yet I saw less than half of the exhibits.

That evening, after the ISA meetings were over for the day, we were invited to tour the “Think Box” at Case Western Reserve University. The theme was “think beyond the possible”. It was filled with the latest tools along with more basic tools: 3-D printers, 3-D scanners, laser cutters, digital multi-meters, mixed signal oscilloscopes, vinyl cutters, large format printers, computerized sewing machines, DSLR cameras, wood shop equipment, metal shop tools and the list goes on and on. Seven floors full of equipment with able students there to show you how to use them. They even have a glass “think box” where you can close the door, sit on colorful pillows and let your imagination go. If you can think it, then maybe you can build it with the high tech equipment and a little help from the student workers. The best part of all is that this is available to the public, so you don’t have to be a teacher or student of the university. What a great service to the community!

Day five was my last day in Cleveland. I went to the Botanical Gardens; twenty different gardens, all unique, colorful and peaceful. The ”Glass House” was divided into two different temperature zones; one a tropical butterfly house, the other emulating Madagascar, complete with lizards, banana trees and waterfalls. Then it was back to the hotel for a ride to the airport to head home.

ISA never disappoints me. The symposiums are always held in interesting places and Cleveland was wonderful. I came home with many incredible memories and a few new friends.

Photo Collages from the 2017 ISA POWID Symposium

(Photos by Paula Labbe)

Above: Welcome Speakers – Jim Keaveney, ISA Past President (top left), Aaron Hussey, Outgoing ISA POWID Director (bottom left), Xinsheng Lou, incoming ISA POWID Director (bottom right). Note: Ken Loparo, Nord Professor and Chair EE & Computer Science department of Case Western Reserve University was not available for photos.

Above: Keynote speaker – Dwight A. Clayton, Research Operations Manager, Electrical and Electronics Systems Research, Oak Ridge National Laboratory.
Above: Keynote Speaker – Robert Yeager, President Emerson Power and Water Solutions.

Above: Keynote Speaker – Jeffrey S. Katz, Chief Technology Officer, Energy and Utilities Industry, IBM.

Above: Recognition of ISA POWID Symposium volunteers and Special Recognition (top left photo): POWID web page coordinator-Cyrus Taft, POWID Director-Xinsheng Lou, Program Paper Chairperson-Bob Queenan, and Host Coordinator-Dan Lee (assistant coordinator-Terri Graham was not available for photos); Special recognition to NASA, DOE and EPRI (top right photo) - a representative from EPRI was not available for photos; Session developers- Donald Parker, Josiah Long, Cyrus Taft, Joe Quinn, and Robert Okojie, Ph.D. (bottom photo) - Prokash Paul, Shizhong Yang and Paolo Pizzini, Ph.D. were not available for photos.

Above: Recognition of ISA POWID Symposium volunteers: Seth Olson-General Chair (center in top left photo), John Sorge-Program Chair (center in top right photo), Outgoing ISA POWID Director-Aaron Hussey (bottom right), Track Chairs- Chad Kiger, Benjamin Chorpening, Ph.D., Michael Firstenberg, and Dr. Xinsheng Lou (bottom left photo). Note: Rick Meeker and Steven Seachman were not available for photos.

Above: Technical presentations sample - Bill Poe of Schneider Electric (top left), Damien Faille of EDF (top right) and Jacob Albright, West Virginia University (bottom).

Above: Luncheon speaker – Dr. Geoffrey A. Landis, Acting Director, Photovoltaic and Power Technology Branch at NASA Glenn Research Center.
Above: Outstanding awards: ISA POWID Co-Service Award - Bob Queenan and Mike Skoncey (top left photo) - Mike was not available for photos; ISA POWID Facility Award to Yingcheng 35 MWth Oxy-Fuel Combustion Plant (top right photo); 2nd Best Paper award to Benjamin Chorpening and his DOE team (bottom right photo) - Best paper and 3rd Best paper award recipients were not available for photos; ISA POWID Achievement Award to Carl H. Neuschaefer accepted by his colleagues (bottom left photo) - Carl was not available for photos.

Above: Technical presentations sample - Bill Poe of Schneider Electric (top left), Damien Faille of EDF (top right) and Jacob Albright, West Virginia University (bottom).

Above: Awards Luncheon, Plentiful Buffet and Kim Belinsky of ISA directing traffic.

Above: Exhibit Area and sampling of the Reception Food.

Above: Discussions in the Exhibit Area.

Above: Scenesc from Case Western Reserve University.

Save the Date!
(Tentative)
ISA POWID Symposium
25–28 June 2018
University of Tennessee Conference Center
Knoxville, TN
ISA77 Fossil Power Plant Standards Committee Update

By: ISA77 Committee Chair Dan Lee, ABB, Inc.

Hello POWID Members! The ISA77 committee last held a physical/WebEx meeting on June 26, 2017 before the POWID Symposium. You can find the meeting minutes posted on the ISA77 committee website. The ISA77 sub-committees continue to make progress in the revision/drafting of multiple standards. The following sub-committee also held physical/WebEx meetings before the ISA77 committee meeting:

- ISA-77.00.01 Definitions and Basic Control Concepts (new document)
- ISA-77.22.01 Power Plant Automation (new document)
- ISA-77.42.01 Feedwater Control (in revision)
- ISA-77.44.01 Steam Temperature (started revision)

As a leader in instrumentation and controls to the power industry, we solicit your participation in the development of the important technical standards that apply to our work. The ISA77 committee members are volunteers who comply with the ISA antitrust policies with the overall objective to draft, comment, and ballot on minimum requirements of various topics for the power industry. Most of our work is accomplished via e-mail and WebEx meetings, with perhaps one physical meeting per year in conjunction with the annual Power Industry Symposium.

Involvement as a member of ISA77 will greatly expand your knowledge of industry codes, good engineering practices, and networking through dialog with other Power experts in drafting and maintaining these ISA documents. We invite your support and involvement in this important power industry standards development. If you have any questions about ISA77, please don’t hesitate to contact Daniel Lee (dan.lee@us.abb.com).

The next ISA77 committee WebEx meeting is scheduled for October 5th at 11:00 am EDT. The ISA77 committee meetings are open to members and guests.

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Book Review

By Dale Evely
Southern Company
ISA POWID Newsletter Editor

I read a book a couple of months ago as a result of a recommendation to many of us from our company executives; you may have similar recommendations come your way. The title of the book is “Thanks for the Feedback” and it was written by Douglas Stone and Sheila Heen. The book, at 317 pages, isn’t too challenging of a read and is quite affordable at around $10.00 per copy in paperback at www.amazon.com.

There was some repetition of ideas in the book, which contributed to the length, but in general the book was helpful and painted the whole idea of giving but mostly receiving feedback in a different light. My short summary of the key ideas the book brings out are as follows:

- There are three types of feedback: Appreciation (thanks), Coaching (here might be a better way of doing that) and Evaluation (here is where you stand). You need all three types but you need to learn how to identify and separate the three types.
- Appreciation must be specific to count and must be in a form the receiver values.
- We need to give the type of feedback that is needed for the occasion and it may be helpful to specifically identify the type of feedback that is being given.
- Receiving feedback is hard; but we need to learn from it and use it to grow.
- Feedback is more effective when the feedback receiver desires it and pulls to get value out of it.
- We need to recognize and manage our own resistance to feedback; even when the feedback seems wrong; there may be some truth in it that can help us to learn and grow.
- The key variable in our growth is not our teacher or mentor but us.

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Thank you to

for hosting this year’s POWID Symposium!
Preliminary Call for Papers

The 61st Annual ISA POWID Symposium is dedicated to automation, control systems, and instrumentation in the power generation industry. The Symposium Program Committee is soliciting abstracts for full papers and for presentations. All paper submissions will be peer-reviewed to ensure high quality and originality. Symposium proceedings will be published in the conference proceedings for distribution to attendees and also made available on the ISA website. Suggested topics for submissions are as follows:

**Fossil**
- Environmental Control
  - Scrubbers
  - SCR Controls
  - Regulatory Challenges
  - MATS Compliance

- Combustion Turbine and Combined Cycle Plants
  - Operational Flexibility
  - Start-up and Ramp Rates
  - Load Range Extension

- Existing and Future Fossil
  - Regulatory Challenges
  - Cycling
  - Operation Flexibility

**Cybersecurity**
- Case Studies in Cybersecurity Implementations & Audits
- Balancing compliance requirements with security needs
- Analysis, developments, applications and case studies on Cybersecurity
- Analysis on the efficacy of ICS/SCADA cybersecurity technologies or processes

**Fleetwide**
- Equipment Development
  - New Sensors
  - Wireless Sensors
  - Embedded Sensing

- Human Factors Engineering
  - Alarm Management
  - High Performance HMI
  - Control Center Design

- Fleet Management
  - Inspection & Maintenance
  - Condition Monitoring
  - Alarm Management
  - Monitoring, Diagnostics & Prognostics
  - Big Data & IIoT

**Nuclear**
- Operating Nuclear Plants
  - Digital Upgrades
  - I&C System Upgrades
  - Plant Life Extensions
  - EMC Qualification Testing
  - Wireless Sensors and Device Implementation

- New Nuclear Plants
  - Commercial Reactors
  - Small Modular Reactors
  - Regulatory Challenges

**Programmatic Issues**
- Setpoints, Uncertainties, and TSTF-493 Implementation
- Operability Determinations
- Suspect & Counterfeit Parts

**Renewable & Distributed**
- Renewable Optimization
- Thermal Cycle Augmentation
- Energy Storage
- Process Modeling and Predictive Controls
- Long Term Reliability and Maintenance Issues
- Renewable Power Forecast and Management

**Emerging Technologies**
- Simulation and Training
- Advanced Control
- Advanced Sensors
- Automation

For more information on the 61st ISA POWID Symposium and to submit an abstract, please go to [http://www.isa.org/powersymp](http://www.isa.org/powersymp) or contact:

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Bob Queenan
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To submit an abstract go to [https://www.xcdsystem.com/powid](https://www.xcdsystem.com/powid)

- Abstract Due: December 2017
- Draft Paper Due: February 2018
- Final Paper Due: April 2018
ISA POWID 2017 Goals Update

By Xinsheng Lou
POWID Director 2017/18

In 2014, ISA developed and implemented a new vision for aligning its vision and mission to strategic goals that, when implemented, will align the needs of key stakeholders with the membership as a whole (www.isa.org/strategicgoals). In 2016, the Power Industry Division adopted the framework (see figure below) that was established by the vision and completed 86% of the measurable goals. Areas that have been given a focus for 2017 are:

Student session at symposium—engaging students will be a focus, with a current student organizing a session at POWID 2017. And this goal has been more than achieved at POWID 2017 Symposium: Two sessions of Student Career Development Forum (SCDF) were hosted by a current WVU student and a current Case student at the POWID 2017 Symposium. Besides, young PhD students from West Virginia University, Southeast University (China), etc. were invited to present their papers in the technical sessions in the Fleet-Wide and Fossil tracks.

Delivery of content—as we transition into a mix of written, presented, and online content it is important for the division to improve delivery mechanisms.

This article highlights some of the key activities that are taking place within POWID during 2017 in order to deliver value to its membership while also meeting the goals that support ISA’s vision.
Content

POWID will develop timely, relevant content on important topics to meet the career enhancement and professional development needs of automation within the electric power industry.

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>ACTIONS</th>
<th>Status</th>
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<tbody>
<tr>
<td>Provide strong technical programming at annual controls &amp; instrumentation symposium</td>
<td>Add cycling/operational flexibility focus in technical tracks</td>
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<td></td>
<td>Add Industrial Internet of Things (IIoT)/Big Data focus in technical tracks</td>
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<tr>
<td></td>
<td>Continue session on Monitoring &amp; Diagnostics (M&amp;D)</td>
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<td>Continue student session and networking reception</td>
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<td>Continue session on Cyber Security</td>
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<tr>
<td>Develop standards in fossil (77) and nuclear (67) power</td>
<td>Identify collaborative opportunities in 67 &amp; 77 standards between ISA, EPRI, and other organizations</td>
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<td></td>
<td>Continue 77 standards in progress by continuing subcommittee meetings</td>
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<tr>
<td></td>
<td>Continue conducting face-to-face meetings at annual symposium</td>
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<tr>
<td>Address industry needs in training</td>
<td>Review training courses and identify new areas of focus</td>
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<td></td>
<td>Offer at least one highly relevant course during annual symposium</td>
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<tr>
<td>Present relevant content to the membership</td>
<td>Assemble and publish a newsletter three times a year with content relevant to our membership</td>
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<td>Update and maintain the POWID website to provide an always available portal to information about POWID and its activities</td>
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<td>Archive all POWID technical papers (1959 – Present) in ISA Technical Paper database</td>
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Data

POWID will use data to understand trends, make decisions, and develop products and services that align with market needs.

Coolest Delivery

POWID will deliver industry-leading content via multiple platforms in an engaging, easy-to-use, and interactive way.
Cybersecurity

POVID will utilize ISA's resources and expertise related to the cybersecurity of automation and control systems used across the electric power industry.

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>ACTIONS</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Provide a platform for presentation and discussion of the latest industry activities in Cyber Security</td>
<td>Continue track on Cyber Security at POWID 2017</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Communicate availability of ISA's cyber security standards and publications to target market for annual symposium and membership</td>
<td>Yellow</td>
</tr>
<tr>
<td>Collaborate with leading industry organizations to address cybersecurity concerns</td>
<td>Identify areas for collaboration on cyber security with EPRI, ISA, and other relevant organizations</td>
<td>Orange</td>
</tr>
</tbody>
</table>

Advocacy

POVID will increase understanding and awareness of automation across all age groups, resulting in enhanced proficiency of automation as a profession.

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>ACTIONS</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Engage college students and young professionals</td>
<td>Identify a candidate for the Robert N. Hubby scholarship prior to annual symposium</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Reward a candidate for the achievement award recipient scholarship</td>
<td>Yellow</td>
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<tr>
<td></td>
<td>Continue student track at annual symposium</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Identify marketing focus for young professionals and engage in annual symposium</td>
<td>Red</td>
</tr>
<tr>
<td>Participate in directing local Science, Technology, Engineering, and Mathematics (STEM) education curriculum and teacher training</td>
<td>Attend and contribute to JM Robinson High School Manufacturing and Automation STEM program in Concord, North Carolina to make faculty/students aware of ISA and the various divisions</td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td>Use this activity as a learning experience for engagement of additional POWID members with their local community STEM programs</td>
<td>Red</td>
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</tbody>
</table>
$5.15 million will be allocated to turbine research at universities. The funding will support a portfolio of gas turbine–focused university projects that address a wide variety of technical topics including combustion, aerodynamics/heat transfer, and advanced materials. The program’s cutting-edge research is relevant to the gas turbine industry and supports advanced technologies that can increase energy efficiency, reduce emissions, and provide additional performance benefits. The FE seeks proposals from universities that address advancing the performance and efficiency of combustion turbines. There are six different technologies topic that the FE is looking for:

1. Low-NOx (nitrogen oxide) Combustion Technology Development for “Air-Breathing” Advanced Turbines,
2. Advanced Cooling Technology Development for “Air-Breathing” Advanced Turbines,
3. Advanced Materials Technology Development for “Air-Breathing” Advanced Turbines,
4. Big Data Analytics,
5. Advanced Instrumentation, and
6. Pressure Gain Combustion.

$12.8 million will be allocated for funding of small scale modularization of gasification technology components for radically engineered modular systems. This funding opportunity will support the development of advanced technologies that will foster the commercial adoption of coal gasification technologies for power and other products that may open new markets for coal. Specifically, The FE seeks proposals for using small modular plant engineering approaches including development of modular, small-scale, air-separation technologies for use in these systems. There are three areas of interest:

1. Modularization of Emerging Gasification Technologies,
2. Modularization of Advanced Air Separation Technologies to Enable Oxygen-Blown Gasifier within a Radically Engineered Modular Systems (REMS) Context, and

$10 million will be allocated for existing plant improvements and transformational technologies for advanced combustion systems. To achieve near-term improvements in advanced combustion coal power plant technologies, the Advanced Combustion Systems program focuses on research, development, integration and testing of transformational technologies, such as chemical looping and pressurized oxy-combustion systems. The FE seeks proposals under two areas of interest:

1. Advanced Combustion Coal Power Plant Improvement Technologies, and

For more information on POWID’s goals for 2017, contact Xinsheng Lou at xinsheng.lou@ge.com.

DOE Investments in Advanced Fossil Fuel Energy System

By: Paul Hollingshead – Process & Controls Department, Babcock & Wilcox

According to the US Department of Energy Website, the DOE will be making approximately $28 million of funding available related to advanced combustion systems, advanced turbines and gasification as part of the Office of Fossil Fuel Advanced Energy System program, referred to as FE.

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1. Advanced Combustion Coal Power Plant Improvement Technologies, and
Welcome once again to Dr. Gooddata country. Last time we got together we developed the uncertainty propagation equations for systematic standard uncertainty. The time before that, we discussed propagation for random standard uncertainties. We now need to evaluate the impact of the elemental uncertainties in pressure and temperature on the calculated example result, compressor efficiency. Therefore (I love that term) we need some typical elemental uncertainties to go with our typical levels.

You will remember that the equation to calculate efficiency was:

\[
\eta_c = \left[ \frac{P_2}{P_1} \right]^{\frac{\gamma-1}{\gamma}} \left( \frac{T_2}{T_1} \right)^{\gamma-1} - 1
\]

(1)

In Equation (1) above, we assumed that the ratio of specific heats, \( \gamma \), was a constant.

We also defined the specific levels of interest at which we desire to calculate the uncertainty. These were:

\[
\begin{align*}
P_1 &= 14.70 \text{ psi} \\
P_2 &= 96.0 \text{ psi} \\
T_1 &= 520.0 \text{ R} \\
T_2 &= 970.0 \text{ R} \\
\gamma &= 1.40
\end{align*}
\]

Now we need some typical elemental uncertainties. They are in the Table below:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>( P_1 )</td>
<td>0.010 psi</td>
<td>0.03 psi</td>
</tr>
<tr>
<td>( P_2 )</td>
<td>0.085 psi</td>
<td>0.17 psi</td>
</tr>
<tr>
<td>( T_1 )</td>
<td>0.41 R</td>
<td>0.57 R</td>
</tr>
<tr>
<td>( T_2 )</td>
<td>0.82 R</td>
<td>0.67 R</td>
</tr>
</tbody>
</table>

For the random standard uncertainty of compressor efficiency, we need to use the equation developed two Dr. Gooddata articles ago. It was:

\[
s_\eta = \left[ \left( \frac{\partial \eta_c}{\partial P_1} \right)^2 s_{P_1}^2 + \left( \frac{\partial \eta_c}{\partial P_2} \right)^2 s_{P_2}^2 \right]^{1/2}
\]

\[
+ \left[ \left( \frac{\partial \eta_c}{\partial T_1} \right)^2 s_{T_1}^2 + \left( \frac{\partial \eta_c}{\partial T_2} \right)^2 s_{T_2}^2 \right]^{1/2}
\]

(2)

Once we have that equation, we can then fill in the values for the influence coefficients and the elemental random standard uncertainties to calculate the random standard uncertainty of the compressor efficiency.

The values for the influence coefficients are determined from the levels of the parameters used to calculate the result, the compressor efficiency. The determination of the partial derivatives is left as an exercise for the reader except for one example shown below for inlet pressure, \( P_1 \).

\[
\frac{\partial \eta_c}{\partial P_1} = -\left( \frac{\gamma-1}{\gamma} \right) \left( \frac{P_2}{P_1} \right)^{\gamma-1} \left( \frac{T_2}{T_1} \right)^{\gamma-1} - 1
\]

(3)

Equation 3 above is the partial differentiation of the efficiency equation with respect to inlet pressure, \( P_1 \). You will remember that the efficiency equation was:

\[
\eta_c = \left[ \frac{P_2}{P_1} \right]^{\frac{\gamma-1}{\gamma}} \left( \frac{T_2}{T_1} \right)^{\gamma-1}
\]

(4)

Filling in the levels of \( P_1, P_2, T_1 \), and \( T_2 \) we obtain numerical values for the partial differentials. These are:

\[
\begin{align*}
\frac{\partial \eta_c}{\partial P_1} &= -0.0384 \\
\frac{\partial \eta_c}{\partial P_2} &= +0.00588 \\
\frac{\partial \eta_c}{\partial T_1} &= +0.00340 \\
\frac{\partial \eta_c}{\partial T_2} &= -0.00182
\end{align*}
\]

(5-8)

Now we need to substitute the above partial differential values into Equation (2) above to obtain the random standard uncertainty of the compressor efficiency. When that is done, we obtain Equation (9) below:

\[
s_\eta = \left[ \left(-0.0384\right)^2 + \left(0.00588\right)^2 + \left(0.00340\right)^2 \right]^{1/2}
\]

\[
+ \left[ \left(0.00340\right)^2 + \left(-0.00182\right)^2 \right]^{1/2}
\]

(9)

\[
= \sqrt{0.013264 + 0.000992 + 0.010623} = 0.0027
\]

Thus \( s_\eta \) in efficiency units.

Now what? What happens next? We must apply our parameter levels and standard uncertainties to obtain the systematic standard uncertainty of the calculated efficiency. When we do that, what unique effect will be present? We will reveal the answer to that question next time.

Until then, remember, use numbers not adjectives. 'Bye!
Optimization of CHP and Fossil Fuels by Predictive Analytics

Patrick Bangert
algorithmica technologies Inc., 10870 N Stelling Rd, Suite 39B, Cupertino, CA 95014
p.bangert@algorithmica-technologies.com

ABSTRACT

As physical systems that are well instrumented, power plants can be modeled using automated methods of machine learning. A digital twin, or computational replica of the plant, can be used to compute the necessary actions to bring the plant to its optimal performance in real-time. The actions are changes to the set-points of the plant accessible in the control system. These highly complex, non-linear and time-dependent models are tested in two CHP plants and found to improve the overall fuel efficiency by 1.1% in one plant and the financial profitability of the other plant by 6.9%.

1. INTRODUCTION

Operating a CHP plant is a complex task for the operators who have to make many detailed decisions every few minutes on how to modify the set-points of the plant in order to respond to a number of external factors. The plant must always deliver the power and heat that is demanded by the market and this demand fluctuates frequently without warning. The plant must respond to changes in the weather and the quality of its fuel.

Plants are operated in shifts. A frequent observation during a shift change is that the new shift believes that it knows better than the previous shift. Therefore, a number of set-points are modified. The plant, due to its size, may require a substantial period of time to reach equilibrium after this happens. Some eight hours later, at the next shift change, the scene is repeated. As a result, the plant is rarely at the optimal point.

Not only is this true because of the divergent beliefs of the various shifts. It is also due to information overload as a plant may have ten thousand sensors that cannot possibly be looked at by human operators. So each operator must, by training and experience, decide which few sensors to use for their decision making. Those few sensors provide a lot of information but not all of it.

Automation and control systems are usually local and designed from the bottom up. They do well on encapsulated systems such as the turbine, furnace, boiler and such. An overarching methodology is very difficult for these systems and seldom considered. It is there, considering the interplay of all the components of a plant, that the potential lies untapped.

So let us consider the entire plant as a single complex system. It is a physical device and thus obeys the laws of nature. Therefore, the plant can be described by a set of differential equations. These are clearly very complex but they exist. This set of equations that fully describes the plant is called a model of the plant. As the model represents the physical plant in every important way, this model is often called a digital twin of the plant.

There are two basic ways to obtain a model. We might develop it piece-by-piece by putting together simpler models of pumps, compressors and such items and adding these into a larger model. This approach is called the first-principles approach. It takes a long time and consumes significant effort by expert engineers both to construct it initially and also to keep it up-to-date over the lifetime of the plant.

The second way to get a model is to start with the data contained in the process control system and to empirically develop the model from this data. This method can be done automatically by a computer without involving much human expertise. It is thus quick to develop initially and is capable of keeping itself up-to-date. This approach is called machine learning.
2. MODELING

The purpose of machine learning is to develop a mathematical representation of the plant given the measurement data contained in the process control system. This representation necessarily needs to take into account the all important factor of time as the plant has complex cause-and-effect relationships that must be represented in any model. These take place over multiple time scales. That is to say that the time from cause to effect is sometimes seconds, sometimes hours and sometimes days. Modeling effects at multiple scales is a complicating feature of the data.

The model should have the form that we can compute the state of the plant at a future time based on the state of the plant in the past and present. This sort of model can then be run cyclically so that we can compute the future state at any time in the future.

The state of the plant is the full collection of all measurements that are important to the running of the plant. Typically there are several thousand measurements in and around a plant that are important. These measurements fall into three categories. First, we have the boundary conditions. These are measurements over which the operators have no control. Examples include the weather or the quality of the fuel. Second, we have the set-points. These are measurements that be directly set by the operators in the control system and represent the ability to run the plant. Third, we have the monitors. These are all the other measurements that can be affected by operators (as they are not boundary conditions) but not directly (as they are not set-points) and so adjust themselves by virtue of the interconnected system that is the plant as the boundary conditions or set-points change over time. A typical example is any vibration measurement.

If we represent the full state of the plant at time t by the vector quantity $X_t$, the model we seek then looks like $X_{t+1} = f(X_t, X_{t-1}, \ldots, X_{t-m})$. This begs the questions what form $f(\ldots)$ should take and how much history we need at any one step, i.e. what is m?

It can be mathematically proven [1, 2] that a recurrent neural network can represent an arbitrary complex dataset with high accuracy as long as the network is large enough, sufficient data is available and the data is internally consistent. Internal consistency simply means that whatever laws underlie the data are constant over time. In our case, these are the laws of physics and thus the assumption is warranted. Enough data is typically available from any plant as the control system usually collects much more data than is needed for modeling.

A recurrent neural network is nothing more than a complex mathematical equation with parameters that are tuned to the data. We keep changing the values of the parameters until the model correctly and accurately represents that data. There is a process that does this systematically with a guaranteed good outcome. This method is called a training algorithm.

As more data becomes available, the model might need to change to take into account whatever information is in this new data. There is another process that can make changes to an existing model to incorporate this new data without going through a full training. The method is called an update algorithm.

The three elements of having a prototypical system that can accommodate the complexity of reality, being able to do an initial training, and keeping the trained system up-to-date is quite similar to the education and experience of a human being. That is the background of calling this approach machine learning.

Describing the mathematical and computation methods behind this is beyond the scope of this paper. We refer to [1] for full details.

3. OPTIMIZATION

Having gotten the model, we now want to use it to optimize the plant’s performance. Here we need to agree on a precise definition of performance. It could be any numerical concept. Sometimes it is a physical quantity such as pollution (e.g. NOX, SOX) released, or an engineering quantity like overall efficiency of the whole plant, or a business quantity like profitability. We can compute this performance measure from the state of the plant at any point in time.

So now we have a well-defined optimization task: Find the values for the set-points such that the performance measure is a maximum taking into account that the boundary conditions are what they are. In addition to the natural boundary conditions (e.g. we cannot change weather) there could be other boundary conditions arising from safety protocols or other process limitations.

This is a complex, highly non-linear, multi-dimensional and constrained optimization problem that we solve via a method called simulated annealing [1]. The nature of the task requires a so called heuristic optimization method as it is
too complex for an exact solution. Simulated annealing has some unique features. It converges to the global optimum and can provide a sensible answer even if the time is limited.

The procedure in real-life practice is that we measure the state of the plant every so often (e.g. once per minute) by pulling the point from the control system and then update the model, find the optimal point, and report the actions to be performed on the set-points. This can be reported open-loop to the operators who then implement the action manually or closed-loop directly to the control system. As soon as something changes, e.g. the weather, the necessary corrective action is computed and reported. In this way, the plant is operated at the optimal point at all times.

4. RESULTS

We focus on two power plants as examples where this approach was taken. Both offer some unique features and benefited significantly from the optimization.

The Vattenfall CHP plant in Berlin, Germany supplies both electricity and district heating to the country’s capital. The business is highly seasonal as summers are hot and winters very cold. The aspect of the weather is thus a crucial boundary condition. The demand for electricity is also highly variable and based on time-of-day (daylight vs. night time) as well as the day of the week (industrial use during the week). In addition the quality of the coal as the primary fuel source is a crucial element. Depending on the supplier, the calorific value and the response to milling differs significantly.

The overall fuel efficiency of the entire plant was taken as the performance measure but only the district heating portion of the plant was offered to the optimizer as set-points to control. The running of the power generation portion was defined as a boundary condition even though it could be controlled by the operators. This was an organizational decision and not based on engineering reasons.

The gain in overall efficiency was found to be 1.1% absolute over the full year. Most of the benefit was felt during the winter months as district heating is not important for the rest of the year. Averaged over the full year, the optimizer still performed at this significant rate.

The InfraServ power plant in Wiesbaden, Germany is a complex plant that runs partly on coal, oil and mostly on wood. It produces electricity, steam, heating and cooling for the local chemical facilities as well as the city. The business is highly volatile as it depends heavily on the running of the chemical plants that provide most of the demand. The quality of the wood is the most complex boundary condition as this depends on several parameters.

The financial profitability of the plant was chosen as the performance measure and the entire plant was offered up to the model with all the set-points that the operators have access to. This is a complex performance measure as the different fuel sources are treated differently from a taxation and accounting point of view.

It was found that the profitability could be improved by 6.9% over the period of one year by controlling the set-points in real-time.

5. SUMMARY

The availability of process data from power plants over a long historical period allows automated mathematical methods from machine learning to develop a digital twin of the plant. This computerized representation of the plant can be used to compute the necessary changes to the set-points of the plant in real-time so that the plant always runs at the optimal performance possible. This approach requires very little human effort to initiate and maintain and has been proven in real cases. It was observed to provide a 1.1% improvement in technical efficiency or a 6.9% increase in profitability in two practical case studies presented here.

6. BIBLIOGRAPHY


The Power Industry Division (POWID) would like to welcome all of our new POWID members and our new student POWID 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's a great way to get to know other industry professionals, to gain professional recognition, and to keep informed!

### Welcome New POWID Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Company</th>
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<tbody>
<tr>
<td>Pedro Barretto</td>
<td>Automation Engineer, Novonordisk</td>
</tr>
<tr>
<td>Ahmed Elfetiany</td>
<td></td>
</tr>
<tr>
<td>Scott Eschak</td>
<td></td>
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<tr>
<td>Jon Garrity</td>
<td>CEO, Tagup, Inc.</td>
</tr>
<tr>
<td>Omar Gonzalez Martinez</td>
<td>Gerente de Ingeniería</td>
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<td>Marc Gradwohl</td>
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<td>Bertin Habets</td>
<td>Tchibv</td>
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<td>Qasim Hasan</td>
<td>Global Energy Technologies</td>
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<td>Efrain Holguin</td>
<td>Public Service Company of New Mexico</td>
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<tr>
<td>Eric Key</td>
<td>Pflow Industries</td>
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<tr>
<td>Pankaj Kumar</td>
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<tr>
<td>Sinning Kwong</td>
<td>Senior Lead Engineer, Emerson Automation Solutions</td>
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<td>Mr. Aaron T Lynch</td>
<td>Cold Mill Electrician, Nucor Steel Arkansas</td>
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<td>Electrical Engineer, Jacobs</td>
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<td>Lead I&amp;C Engineer, Duke Energy</td>
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<td>Ingeniero Industrial</td>
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<td>Engineering Group Manager, ABB Global Industries and Services Pvt Ltd</td>
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<td>Directora Division Electrica Aplein Ingenieros. S. A.</td>
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<td>Southern California Edison (SCE)</td>
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<td>Stefan Schoenen-Steinberg</td>
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<td>Darkmatter</td>
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<td>Principle Security Architect, BHP</td>
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<td>Adhe Tatang Mulyana</td>
<td>Advanced Control Instrument Engineer, PT Indonesia Power</td>
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<td>Sam Walker</td>
<td>Control Systems and Calibration Specialist, Vrcprotx, LLC.</td>
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<td>Instrument, Controls &amp; Electrical Technician, Diamond Generation Corp.</td>
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<td>Ronny H York</td>
<td>Maintenance Technician</td>
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<td>Yi (Joey) Zhou</td>
<td>Technical Engineering Specialist, Canadian Nuclear Laboratories Limited</td>
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<td>Andrew Zwart</td>
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