Pittsburgh Section

IEEE Bulletin

June 2004/ Volume 53, No. 9 www.ewh.ieee.org/r2/pittsburgh

Model Predictive Control of an EVD Reactor for the Manufacture of Fuel Cells

Karl F. Muller, Ph.D., P.E.
Design Assurance Group, LLC

Predictive Control or Model-based Predictive Control (MPC) is the only advanced control technique to have had a significant and widespread impact on industrial process control over the last 20 years or so. MPC is not just a specific control strategy but rather a wide range of control methods which make explicit use of a model of the process to obtain control signals by minimizing an objective function that clearly stipulates the control objectives. The main reasons for the penetration of MPC into industrial practice is that

1. The basic formulation extends to multivariable plants with almost no modification.
2. It is the only generic control technology, which can deal routinely with safety, actuator and equipment constraints, and limitations.
3. It is more powerful than conventional control of 'difficult' loops, such as those, which are highly nonlinear and have long response times.

MPC has, so far, been applied mainly in the petrochemical industry with commercial predictive control software products being available such as Aspentech's *DMCPlus*, Honeywell's *RMPCT* and ABB's *3DMPC*. However, the commercial products remain mostly high-level, usually implemented on top of a conventional control layer, aimed at increasing profitability of the operation. They can be an over-kill for smaller processes, such as the one of this talk but, nevertheless, the advantages of MPC may still be desired or needed as they were in this instance.

Described in this talk is the application of predictive temperature control to an Electro-Vapor Deposition (EVD) reactor furnace built for Westinghouse and used in the manufacture of fuel cells. The nonlinear, 4-input, 4-output EVD thermal process had long variable response times and MPC was applied because of difficulties experienced when PID control was considered.

Place:	Westinghouse Energy Center, Monroeville
Date:	June 3rd
Social:	6:30 PM
Program:	7:00 PM

This meeting will be of particular interest to the members who belong to the PES and IAS societies. For more information or to register, contact Charles Urso at (412) 338-4871 or curso@llitechnologies.com.

Directions: From downtown Pittsburgh, take the Parkway East Outbound to Exit 14A (Monroeville). Cross the traffic light (Business 22) and proceed on Rt. 48 South for two traffic lights. Turn left onto Northern Pike. Proceed East ~ 0.2 miles and turn right at the first traffic light onto Westinghouse Drive. Travel 0.7 mile to the three flags where the main entrance is located. Parking in the evening will be plentiful in the large area in front of the building. Enter the main entrance. Check with the security inside. You will be directed to the proper auditorium for the presentation.

From PA Turnpike, take Exit 57 (Monroeville). After the toll plaza, get in the left lane (Business-22). At the first light, turn left on to Rt. 48 South and follow the directions shown above.

Section News

Please be sure to keep your membership information up to date. That is the only way for the IEEE to get information to you. The only person able to modify information in the membership database is the member. This is for the protection of the member. Officers in the IEEE Pittsburgh Section are not able to update the database for you. IEEE Headquarters has suggested the following methods to update membership contact information.

1. Use the toll-free Member Service's phone number (800) 678-IEEE, that is (800) 678-4333.
2. Send an email to address-change@ieee.org.
3. Via the web-site www.ieee.org/coa.

When using any of these methods, please include your full name, membership number, and the information that you would like to update.

The Issues and Benefits of Applying FACTS Controllers to Power Systems

John Paserba, Fellow, IEEE

With the ongoing expansion and growth of the electric utility industry, including deregulation in many countries, numerous changes are continuously being introduced to a once predictable business. Although electricity is a highly engineered product, it is increasingly being considered and handled as a commodity. Thus, transmission systems are being pushed closer to their stability and thermal limits while the focus on the quality of power delivered is greater than ever.

In the evolving utility environment, financial and market forces are, and will continue to, demand a more optimal and profitable operation of the power system with respect to generation, transmission, and distribution. Now, more than ever, advanced technologies are paramount for the reliable and secure operation of power systems. To achieve both operational reliability and financial profitability, it has become clear that more efficient utilization and control of the existing transmission system infrastructure is required.

Improved utilization of the existing power system is provided through the application of advanced control technologies. Power electronics based equipment, or Flexible AC Transmission Systems (FACTS), provide proven technical solutions to address these new operating challenges being presented today. FACTS technologies allow for improved transmission system operation with minimal infrastructure investment, environmental impact, and implementation time compared to the construction of new transmission lines.

Place:	Westinghouse Energy Center, Monroeville
Date:	June 24th
Social:	6:30 PM
Program:	7:00 PM

For more information or to register contact Jace Cochrane, P.E. at (412) 390-0718 or jacejc@pghmail.com by June 17th.

Directions: For directions, please refer to the article on the 1st page of The Bulletin.

2004 Pittsburgh Section IEEE Program Calendar

Group/Society	January	February	March	April	May	June
ExecCom Harry Hagerty (412) 487-8235	15 Point Park	19 Point Park	18 Point Park	15 Point Park	20 Point Park	
Section Mtngs Harry Hagerty (412) 487-8235		22-28 Eng Wk 21 IndEEE Robot Car Race	23 Power Protection & Cond.	17 Leadership Skills for Engineers		
Upper Mon Matt Valenti mvalenti@wvu.edu		16 Computer Forensics 23 Propulsion				
Industry Application Kal Sen (724) 696-1611	8 Intellec. Prop. 22 Trans. K-Factor	5 Power Fact/ Harmonics 18 Career Dev.	4 Load Flow 23 Power Protection	1 EMC 22 Tour – Alleg. Energy	6 Power Qual. 12 & 19 Var. Freq. Drives	3 MPC 24 FACTS Contriller
Computer John Twigg (724) 387-2772			10 Outsourcing Summit			15 STAR Strategies
Communication Prashant Krishnamurthy (412) 624-5144						
Power Eng. Kal Sen (724) 696-1611	8 Intellec. Prop. 22 Trans. K-Factor	5 Power Fact/ Harmonics 18 Career Dev.	4 Load Flow 23 Power Protection	1 EMC 22 Tour – Alleg. Energy	6 Power Qual. 12 & 19 Var. Freq. Drives	3 MPC 24 FACTS Contriller
Robotics Guy Nicolleti (724) 836-9922				8 Artificial Heart/ Internet Security		
PACE Joe Kalasky (724) 838-6492						
Signal Processing Mike McCloud						
EMBS John Kalafut (412) 767-2400 Ext. 3249						

Becoming a STAR at work: High -Productivity Strategies

David Binder
Principal Consultant, Avid Learner, Inc.

In these days of rampant outsourcing, managing your professional career is more challenging than ever. This session based on the groundbreaking research of Dr. Robert E. Kelley, Carnegie Mellon University professor and author of the best-seller **"HOW TO BE A STAR AT WORK: Nine Breakthrough Strategies You Need to Succeed."**

Over a seven-year period, Dr. Kelley and his colleagues led nearly 1,000 **knowledge workers** at AT&T's Bell Labs through a unique development process—with outstanding results. Program participants noted such dramatic improvements in the personal productivity that the program was featured in a Harvard Business Review article, "How Bell Labs Creates Star Performers." The research story has also been reported in IEEE's *Spectrum*, and *Fast Company*.

In this session, we will describe how the research was conducted, share the most significant findings, present a high-level overview of the key work strategies proven to accelerate personal productivity, and discuss implications of this research on the selection of knowledge workers. This engaging and thought-provoking presentation will include real and current workplace examples –gathered through consulting with organizations like PPG, Hewlett-Packard, and many others-- that illustrate the critical differences in mental models between the stars and their more average performing colleagues.

The objectives of the session are to:

1. Present and discuss the groundbreaking research on star performers
2. Share examples and insights into how star performers define and execute the work strategies
3. Offer ideas, strategies and suggestions–based on real-life examples gathered during consulting engagements--on how to improve personal productivity

David Binder is a Principal Consultant for Avid Learner Inc., based in Pittsburgh PA. He is a co-designer of the productivity improvement process that will be highlighted. His responsibilities include consulting with clients on issues related to the selection, performance, development, management and retention of knowledge workers.

David has worked with organizations in industries including manufacturing, high technology, banking, service, health care and government. He has extensive experience in delivering training on leadership, organizational change, team building, problem solving, productivity, performance management and selection skills to employees and all management levels.

He has worked with Hewlett Packard, Heinz USA, PPG Industries, Los Alamos National Laboratory, Sharp Laboratories of America, Analog Devices, FORE Systems, Southwestern Bell Corporation, Carnegie Mellon University, and other clients on projects aimed at improving the productivity of knowledge workers through the use of the nine strategies described in **How to be a Star at Work**, by Dr. Robert Kelley.

Place:	Engineering Society of Western PA 337 Fourth Ave, Pittsburgh PA
Date:	June 15th
Lunch:	12:00 PM ($22 per person)
Program:	1:00 PM (no charge for program only)

Lunch will include a choice of Chicken Parmigiana, California Salad (with artichoke hearts, peppers, feta, and pineapple), or Virginia Spots. All suggested Luncheon Entrees are served with your choice of Tossed Salad or Soup du Jour, Fresh Rolls, Butter, Ice Cream, Coffee, Tea, Decaf and Iced Tea. Chef's choice of Starch & Vegetable where applicable

This meeting will be of interest to any member of Pittsburgh Section IEEE and is hosted by the Computer Society.
Reservations must be received by Friday, June 11th. Please send your meal choice and check for $22 payable to "Pittsburgh Section IEEE" to John Twigg, Ascent Systems, 785 Pine Valley Drive, Pittsburgh, PA 15239. For more information, contact John Twigg at (724) 387-2772 or jtwigg@ascent-systems.com.

Directions: The Engineering Society of Western PA is located on 4th Ave in Downtown Pittsburgh. If you need detailed directions, please contact John Twigg.