

# **57th ISA Power Industry Division (POWID) Symposium 2014**

## **Power Generation: Instrumentation & Control Solutions for Today's Industry Challenges**

**ISA Volume 499**

**Scottsdale, Arizona, USA  
1 – 6 June 2014**

**ISBN: 978-1-5108-0199-8**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2014) by International Society of Automation - ISA  
All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact International Society of Automation - ISA  
at the address below.

International Society of Automation - ISA  
67 Alexander Drive  
Research Triangle Park, NC 27709 USA

Phone: (919) 549-8411  
Fax: (919) 549-8288

[info@isa.org](mailto:info@isa.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

<b>Biologically-inspired Distributed Power Plant Control using Annealed Disorder</b> .....	1
<i>R. Kolacinski, K. Loparo</i>	
<b>Distributed Sensor Network Control with Evolutionary Algorithms</b> .....	9
<i>M. Colby, K. Tumer</i>	
<b>Optimization Of Wind Farm Capacity In Constrained ELCC</b> .....	12
<i>C. Shih, S. Han, C. Cao</i>	
<b>Flex Mitigation Strategies For Nuclear Power Plants</b> .....	15
<i>G. Singh</i>	
<b>Modeling the Interfacial Stresses in Thermal Barrier Coatings</b> .....	27
<i>S. Gullapalli, J. Chessa, C. Ramana</i>	
<b>“Stop and Go” Process to Fabricate Smart Parts using Electron Beam Melting</b> .....	31
<i>M. Hossain, J. Gonzalez, S. Gaytan, Y. Lin, A. Choudhuri, R. Wicker</i>	
<b>Wireless Temperature Sensor Measurements through Various Materials Using a Lithium Niobate Pyroelectric Ceramic</b> .....	34
<i>M. Sarker, S. Sandoval, N. Love, Y. Lin</i>	
<b>Digital Bus Application Experience - Power Generation</b> .....	39
<i>N. Pennington, G. Chatterji, M. Moutamani</i>	
<b>Emissions Sensing At High Temperatures Using Plasmonic Arrays: Probing Sensitivity And Selectivity Using Patterned Nanostructures</b> .....	46
<i>N. Joy, N. Karker, M. Carpenter</i>	
<b>Morphological Control Of YSZ Encapsulated Gold Nanoparticles For Emissions Sensing: Discrimination Between Reducing Gases Facilitated By Material Control</b> .....	48
<i>G. Dharmalingam, M. Carpenter</i>	
<b>Dynamic Model of a Solar Double Pipe Direct Steam Generator</b> .....	51
<i>R. Xu, T. Wiesner</i>	
<b>Expert Alarm System – Get Real Time Diagnosis without the Presence of Experts</b> .....	67
<i>P. Kumar, S. Shekhar, T. Sai</i>	
<b>Identifying Issues with Nuclear Instrumentation Cables and Detectors Using Electrical Testing Technologies</b> .....	73
<i>C. Kiger, C. Lowe, J. Dowdy</i>	
<b>Integrating Electromagnetic Compatibility (EMC) into the Design Modification Process: Example Application for Spent Fuel Pool Instrumentation</b> .....	85
<i>C. Kiger, B. Headrick, Z. Crane</i>	
<b>Automated Control System Health Monitoring – An Enabler to Achieve ZFO</b> .....	97
<i>P. Kumar, C. Babu, T. Rajagopalan</i>	
<b>Field Testing at CPS J. K. Spruce Boiler Unit to Evaluate Performance Optimization using Model Predictive Control</b> .....	102
<i>S. Yang, X. Lou, C. Neuschaefer, J. Harris</i>	
<b>The Trend Away from the DCS Centric Information Hub</b> .....	115
<i>C. Taft, J. Sorge</i>	
<b>Pulverizer Diagnostics for Improved Plant Dynamic Performance and Reliability</b> .....	124
<i>C. Kleineke, M. Little, L. Williamson, J. Sorge</i>	
<b>Purge Required: Fundamentals of Furnace Purging</b> .....	143
<i>A. Zadiraka</i>	
<b>Sensor Placement Algorithm Based on Continuous Estimator for Maximizing Process Efficiency</b> .....	155
<i>P. Paul, D. Bhattacharya, R. Turton, S. Zitney</i>	
<b>Benefits of Digital Computer-Based Annunciator Systems</b> .....	157
<i>J. McCord</i>	
<b>The Improvement of Magnetic Level Indicator for Drum Level Measurement</b> .....	168
<i>V. Yu, Y. Hou, G. Zhang</i>	
<b>On the Use of Magnitude Ratio in Sensor Placement Algorithms for Fault Detection and Diagnosis in Complex Energy Processes</b> .....	179
<i>P. Mobed, J. Maddala, D. Bhattacharyya, R. Rengaswamy</i>	
<b>A Proposed Schema for Establishing Sensor Groupings in Support of Decentralized Control Algorithms</b> .....	181
<i>Z. Reinhart, K. Bryden</i>	

<b>A Proposed Method for Stigmergic Control</b> .....	193
<i>P. Finzell, K. Bryden</i>	
<b>Transient Analysis of a Solar Receiver Steam Generator (SRSG) in a Solar Power Plant</b> .....	208
<i>C. Wang, A. Joshi, R. Terdalkar, X. Lou, J. Quinn, C. Neuschaefer</i>	
<b>Startup Flexibility Enhancements by means of Siemens PLMC and Advanced Automation Control Strategies</b> .....	222
<i>A. Karr, B. Fuetterer</i>	
<b>Improved Measurement and Control Utilizing Advanced Calibration Strategies</b> .....	235
<i>N. Espy</i>	
<b>Investigation of PV Inverter based Voltage Regulation schemes on a Florida Utility Feeder</b> .....	243
<i>H. Ravindra, M. Faruque, K. Schoder, M. Steurer, P. McLaren, R. Meeker</i>	
<b>Wind Turbine Load Reduction with Multi-agent Adaptive Individual Pitch Control</b> .....	250
<i>S. Han, C. Shih, J. Shen, L. Pan, C. Cao</i>	
<b>Simulation Tools for Advanced Control Design and Hardware-In-The-Loop Verification</b> .....	260
<i>D. Faille, M. Fouquet, M. Neyret, S. Liu</i>	
<b>Robustness/Performance Enhancement Of Power Plant PID Controller Part I: Model Identification And Robust Controller Design</b> .....	274
<i>I. Chang, C. Taft, J. Sorge, M. Little, J. Bentsman</i>	
<b>Performance Monitoring in Steam Turbine System Based on Mutual Information Entropy</b> .....	294
<i>H. Gu, X. Lv, F. Si, Z. Xu</i>	
<b>Merit based Real-time Operator Performance Analysis</b> .....	303
<i>J. Zhou, Z. Jiang, Y. Lu, F. Si, Z. Xu</i>	
<b>Multi-Scale Sample Entropy Analysis Of Furnace Process In Pulverized Coal Boiler</b> .....	313
<i>S. Ren, C. Wang, J. Zhou, F. Si, Z. Xu</i>	
<b>Novel Open Source Modelling Architecture for the Design Verification against System Requirements using Simulation</b> .....	323
<i>D. Bouskela, T. Nguyen, A. Jardin</i>	
<b>Operational Flexibility and Heat Rate Improvements at La Cygne Unit 1</b> .....	337
<i>N. Parikh, J. Stewart, K. Luebbert</i>	
<b>NERC CIP Version 5 – What’s New</b> .....	349
<i>J. Chance</i>	
<b>Model Predictive Control And Real-Time Optimization For Chemical Looping Process</b> .....	356
<i>X. Lou, C. Neuschaefer, A. Joshi, H. Andrus, I. Abdulally</i>	
<b>Applied an Approach of Diagnosis on Insulating Oil of Transformer</b> .....	369
<i>M. Lin</i>	
<b>Author Index</b>	