

# **PEERS Conference 2015**

Sustainable Solutions for our Future

Atlanta, Georgia, USA  
25-28 October 2015

Volume 1 of 2

ISBN: 978-1-5108-1758-6

**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© (2015) by the TAPPI Press  
All rights reserved.

Printed by Curran Associates, Inc. (2016)  
For permission requests, please contact the TAPPI Press



at the address below.

TAPPI Press  
15 Technology Parkway South  
Peachtree Corners, Georgia 30092

Phone: (800) 332-8686  
Fax: (770) 446-6947

[memberconnection@tappi.org](mailto:memberconnection@tappi.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: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## **SESSION 2: STATE OF THE INDUSTRY (SPONSORED BY PIMA)**

<b>PULPING/BLEACHING CHEMICAL RECOVERY DEVELOPMENT NEEDS .....</b>	<b>1</b>
<i>David Turpin</i>	

## **SESSION 3: BLEACH PLANT OPTIMIZATION**

<b>BLEACHING OPTIMIZATION AT WESTROCK, COVINGTON, VIRGINIA .....</b>	<b>14</b>
<i>Ricardo B. Santos, Peter W. Hart, Douglas C. Pryke, John Vanderheide</i>	
<b>ON THE IMPACT OF DISSOLVED LIGNIN IN OXYGEN DELIGNIFICATION AND CHLORINE DIOXIDE STAGES .....</b>	<b>24</b>
<i>Niclas Andersson, Caroline Wilke, Rick Van Fleet, Akhlesh Mathur, Ulf Germgård</i>	
<b>DEVELOPMENT AND USE OF AN IMPROVED STEADY-STATE MODEL FOR CHLORINE DIOXIDE BRIGHTENING THAT CONSIDERS EXTRACTION WASHER CARRYOVER .....</b>	<b>34</b>
<i>Brian N. Brogdon</i>	
<b>BLEACHING PRACTICES FOR OXYGEN-DELIGNIFIED SOFTWOOD KRAFT PULP: ANALYSIS OF THE 2013 PAPTAC BLEACHING COMMITTEE MILL SURVEY .....</b>	<b>55</b>
<i>Paul F. Earl, Doug Reid, Dan Davies, Murray Walters, Brian La Brash, Honey Nampak</i>	

## **SESSION 4: NEW TECHNOLOGY SHOWCASE**

<b>PRECIPITATOR DUST PURIFICATION (PDP-K) - CHLORIDE AND POTASSIUM REMOVAL SYSTEM .....</b>	<b>67</b>
<i>N/A</i>	
<b>HIGHLY EFFICIENT GAS DISSOLUTION TECHNOLOGY: CUT OGM COSTS BY REDUCING RESOUCE CONSUMPTION .....</b>	<b>74</b>
<i>Tanya LeBlanc</i>	
<b>SURE SAFE® - SAFER MILL CLEANING CHEMISTRY .....</b>	<b>110</b>
<i>N/A</i>	
<b>THE NEW REBURNEDLIME ANALYZER FOR RESIDUAL CARBONATE TESTING .....</b>	<b>122</b>
<i>Steve Hosein</i>	
<b>NEW LOW THERMAL CONDUCTIVITY BASIC BRICK REFRACTORY FOR LIME RECOVERY KILNS .....</b>	<b>129</b>
<i>Chris Macey</i>	
<b>MAXIMIZE COGENERATION PROFITABILITY AND ROBUSTNESS .....</b>	<b>138</b>
<i>Ben Janvier</i>	
<b>FITNIR KAPPA: MEASURING THE KAPPA NUMBER OF KRAFT PULP USING NIR SPECTROSCOPY .....</b>	<b>144</b>
<i>Cheryl Sewell</i>	

## **SESSION 5: STICKIES**

<b>HOW TO MINIMIZE ENERGY AND INCREASE CLEANLINESS FOR TISSUE PLANTS .....</b>	<b>149</b>
<i>Marco Pescantin</i>	
<b>A SIMPLE INDICATOR PAPER APPROACH TO RECYCLE MILL STICKIE CONTROL .....</b>	<b>161</b>
<i>Ved Naithani, Lucian A. Lucia, Sujit Banerjee</i>	

## **SESSION 6: SUSTAINABILITY TOPICS**

<b>UNDERSTANDING THE BIOMASS ENERGY CONTROVERSY .....</b>	<b>170</b>
<i>Reid Miner, Caroline Gaudreault, Ben Wigley</i>	

## **SESSION 7: BROWN STOCK WASHING**

<b>A NEW SENSOR BASED APPROACH TO BROWN STOCK WASHER OPTIMIZATION</b> .....	181
<i>Richard Van Fleet, Sandra Beder-Miller</i>	
<b>IMPACT ON FIBERLINE WHEN ADDING NEW BROWN STOCK WASHERS</b> .....	187
<i>Mona Henderson, Anders Hjort</i>	
<b>COMMISSIONING BROWN STOCK WASHING CONTROLS FOR AN EVAPORATOR LIMITED MILL</b> .....	204
<i>Ricardo B. Santos, Peter W. Hart</i>	

## **SESSION 8: SUSTAINABLE PRACTICES IN PAPERMAKING: UNDERSTANDING THE MARKET DEMAND AND ITS IMPACT ON SUPPLY CHAIN OPERATIONS PANEL**

<b>AF&amp;PA SUSTAINABILITY INITIATIVES</b> .....	218
<i>Jerry Schwartz</i>	
<b>ASIA PULP &amp; PAPER FOREST CONSERVATION POLICY SUSTAINABILITY UPDATE</b> .....	237
<i>Sandra Yacura</i>	
<b>GROWING OUR FUTURE - MARKET ENGAGEMENT IN THE SUPPLY CHAIN THROUGH SFI</b> .....	242
<i>Barry Graden</i>	

## **SESSION 9: KRAFT PULPING & BROWN STOCK WASHING I**

<b>IMPROVED RUNABILITY AND IMPREGNATION BY ENHANCED STEAMING</b> .....	253
<i>David Elfman, Jonas Lindqvist</i>	
<b>ANDRITZ' NEW TECHNOLOGIES APPLIED TO YIELD INCREASE – A-YIELD PROCESSES</b> .....	268
<i>Hannu Ramark, Jussi Piira, Kirsi Hirvonen, Outi Poukka</i>	
<b>PULP WASHING AID BASED ON ADVANCED SILOXANE TECHNOLOGY</b> .....	278
<i>Glenn Mudaly, Rob White</i>	
<b>NOVEL EVALUATION OF DEFOAMER PERFORMANCE IN BROWN STOCK WASHING</b> .....	288
<i>Carter Kirwan</i>	

## **SESSION 10: DEINKING OPERATIONS**

<b>ELECTRIC TREATMENT ASSISTED INKJET INK FLOTATION DEINKING</b> .....	298
<i>Tony Du, Jeffery S. Hsieh</i>	

## **SESSION 11: BLEACH PLANT AND PAPER MACHINE MATERIALS PERFORMANCE**

<b>PROVEN SOLUTIONS FOR PULP AND PAPER – A HISTORY OF MANAGING CORROSION WITH FRP EQUIPMENT</b> .....	305
<i>Kevin Lambrych, Alex Thibodeau</i>	
<b>PITTING CORROSION OF LEAN DUPLEX STAINLESS STEEL 2101 IN THIOSULFATE CONTAINING PAPER MACHINE WHITE WATER</b> .....	315
<i>Yushu Wang, Preet M. Singh</i>	

## **SESSION 12: YOUNG PROFESSIONAL PANEL (SPONSORED BY GEORGIA TECH'S MASTERS IN MANUFACTURING LEADERSHIP PROGRAM)**

<b>CAREER ADVANCEMENT: EDUCATION, TRAINING, AND MENTORSHIPS</b> .....	326
<i>Sabrina Burkhardt, Chris Luettgen, Jesse Shade, Mary Beth Cornell, Rasha Farag, Matias Gonzalez</i>	

### **SESSION 13: OCC IN BOARD**

<b>ENZYME BASED STRENGTH IMPROVEMENTS IN 100% RECYCLED BOARD</b> .....	348
<i>David R. Jones</i>	
<b>REFINING CASE STUDY, PART II: USING IMPROVED REFINER CONTROL TO INCREASE MACHINE MADE LINERBOARD STIFFNESS</b> .....	354
<i>Chris Demler, Josh Boatwright</i>	

### **SESSION 14: WATER TREATMENT**

<b>MICRO CARBON TECHNOLOGY®: A POWERFUL AND PROVEN TECHNOLOGY TO IMPROVE WASTEWATER TREATMENT EFFICIENCY</b> .....	361
<i>Shawn Whitmer, Heather Jennings</i>	
<b>INNOVATIVE WASTEWATER PRETREATMENT SYSTEM FOR A RECYCLE PAPER MILL</b> .....	367
<i>Jeff VanVoorhis</i>	
<b>ULTIMATE EFFLUENT TREATMENT ALLOWS FOR EVER LARGER PULP MILL CAPACITIES</b> .....	377
<i>Alexis Métais, Brendan Van Wyk, Jean-Christophe Hostachy</i>	

### **SESSION 15: EUCALYPTUS PULPING**

<b>POTENTIAL OF C. CITRIODORA FOR KRAFT PULP PRODUCTION</b> .....	384
<i>F. G. Silva, T. E. S. Segura</i>	
<b>DEVELOPMENT OF A EUCALYPTUS PLANTATION PROGRAM IN THE SOUTHEASTERN UNITED STATES AND HIGHER ELEVATIONS OF SOUTHERN BRAZIL – A STATUS UPDATE</b> .....	392
<i>Peter W. Hart, John Johnson, Ricardo Paim</i>	
<b>INVESTIGATION OF THE RESISTANCE TO WIND ACTION IN EUCALYPTS CLONES</b> .....	404
<i>F. N. Oliveira, J. L. Colodette, F. J. B. Gomes</i>	

### **SESSION 16: PROJECT MANAGEMENT PANEL (CAREER DEVELOPMENT)**

<b>MAKING DATA WORK FOR YOU</b> .....	411
<i>Saket Kumar</i>	
<b>ADVANCED WORK PACKAGING (AWP)</b> .....	418
<i>Kevin Gierc</i>	
<b>THE CONTINGENCY CONUNDRUM - HOW MUCH IS ENOUGH?</b> .....	423
<i>Jerry Forester</i>	
<b>TAPPI PEERS: PROJECT MANAGEMENT AND ENGINEERING IMPROVED PROJECT ENGINEERING THROUGH SIMULATION</b> .....	430
<i>Brett Schug</i>	

### **SESSION 17: ENERGY EFFICIENCY I**

<b>STEAM NETWORK CONTROL AND OPTIMIZATION</b> .....	435
<i>David Eapen</i>	
<b>WHAT KEEPS ENERGY MANAGERS UP AT NIGHT</b> .....	444
<i>Art Samberg</i>	

### **SESSION 18: OCC FIBER PROCESSING**

<b>ASEPTIC CARTON PACKAGES: RECYCLING REVIEW</b> .....	459
<i>F. L. Neves, E. M. Merendino, Marcelo Piva, Ricardo Honorato</i>	
<b>ENZYME BASED STRENGTH IMPROVEMENTS IN 100% RECYCLED BOARD</b> .....	474
<i>David R. Jones</i>	

<b>KADANT HELIDRUM SYSTEM</b> .....	480
<i>Neale Fetterly</i>	

**SESSION 19: WATER ISSUES (CAREER DEVELOPMENT)**

<b>WATER REUSE DURING MILL SHUTDOWN PROVIDES COST SAVINGS WHILE CONSERVING ENERGY</b> .....	491
<i>Randy Serwan</i>	
<b>ACCELERATED SLUDGE DIGESTION AT A KRAFT MILL USING A BIOSTIMULANT</b> .....	495
<i>R. Pote, C. Carlson</i>	

**SESSION 20: PULPING & BLEACHING R&D I**

<b>ESTIMATION OF THE S/G RATIO OF THE LIGNIN IN THREE WIDELY USED NORTH AMERICAN HARDWOODS</b> .....	505
<i>D. J. Nicholson, C. R. Guilford, A. B. Abiola, S. K. Bose, R. C. Francis</i>	
<b>EVALUATING THE EFFECTIVENESS OF A CHIP PENETRATION AID FOR KRAFT DIGESTERS IN THE LAB AND IN THE FIELD</b> .....	519
<i>Jack Williamson, Adebola Adedire, Scott Schnelle, Terry Bliss</i>	
<b>EVALUATION OF DEFOAMER CHEMISTRIES FOR BROWN STOCK WASHING</b> .....	535
<i>Rebecca Hamm</i>	

**SESSION 21: FUEL MANAGEMENT OPPORTUNITIES**

<b>TAKING ADVANTAGE OF OPPORTUNITY FUELS</b> .....	545
<i>Timo Bungert, Seppo K. Hulkkonen, Sebastian Kaiser</i>	
<b>EFFECTS OF ADDED MATERIALS ON BLACK LIQUORS COMBUSTION</b> .....	562
<i>Liming Zhao, Danielly Cortes, Honghi Tran</i>	

**SESSION 22: ENERGY EFFICIENCY II**

<b>EVALUATING PIPING SYSTEM USING ISO /ASME 14414 PUMP SYSTEM ENERGY ASSESSMENT STANDARD</b> .....	571
<i>Ray T. Hardee</i>	
<b>VARIABLE SPEED VACUUM PUMP DEWATERING</b> .....	578
<i>Charles H. Wunner</i>	
<b>HIGH POWER GENERATION FROM RECOVERY BOILERS, WHAT ARE THE LIMITS?</b> .....	587
<i>Jarmo Mansikkasalo, Pekka Siiskonen, Raymond Burelle, Jukka Kiuru, Don Simola</i>	

**SESSION 23: PULPING & BLEACHING R&D II**

<b>THE POTENTIAL IMPACT OF UNOXIDIZED AND THIOSULPHATE OXIDIZED WHITE LIQUOR USE ON OXYGEN DELIGNIFICATION PERFORMANCE</b> .....	599
<i>Tom Mullen</i>	
<b>THE 2014 IPBC: A BRIEF REVIEW</b> .....	610
<i>Tom McDonough</i>	

**SESSION 24: NONWOODS PROCESSING**

<b>PAPER PULP FROM STRAW BY BIO MECHANICAL PROCESS ON MINI MILL</b> .....	622
<i>Shahriar Nafici, Florence Miremadi</i>	
<b>HEMICELLULOSE BASED MATERIAL FOR COATINGS AND ADHESIVES APPLICATIONS IN THE PAPER INDUSTRY</b> .....	633
<i>Ashley Quick, Richard A. Venditti, Ali Ayoub</i>	

<b>UTILIZATION OF SOY HULLS IN THE PREPARATION OF HIGH VALUE CELLULOSIC FORMS</b> .....	639
<i>Thomas Theyson</i>	

**SESSION 25: DUPLEX STAINLESS STEELS (CAREER DEVELOPMENT)**

<b>DUPLEX APPLICATIONS IN PULP &amp; PAPER INDUSTRY</b> .....	646
<i>Lena Wegrelius</i>	
<b>MATERIAL SELECTION OPPORTUNITIES IN PULP MILLS AND BLEACH PLANTS</b> .....	659
<i>Sandra Le Manchet, J. Grocki</i>	
<b>DUPLEX STAINLESS STEEL FOR THE PULP &amp; PAPER INDUSTRY</b> .....	676
<i>Tommy Sand, Andreas Nirs</i>	

**SESSION 26: ENERGY EFFICIENCY III (JOINT SESSION WITH SUSTAINABILITY)**

<b>HOW NORTH AMERICAN PULP AND PAPER MILLS CAN RECOVER MILLIONS OF DOLLARS THROUGH ENERGY AUDITS AND MANAGEMENT</b> .....	682
<i>Tatiana Rafione, Enrique Mateos-Espejel, Douglas Singbeil, Tom Browne</i>	
<b>EVAPORATORS, THE PLACE TO LOOK FOR ENERGY AND WATER USAGE REDUCTIONS</b> .....	693
<i>Raymond Burelle, Helena Fock, Fredrik Anangen</i>	
<b>OPTIMIZING THE OTHER HALF OF THE LOG (USING ON LINE MEASUREMENT TO UNDERSTAND THE PROPERTIES OF BLACK LIQUOR)</b> .....	704
<i>Jack Porter</i>	

**SESSION 27: RECOVERY BOILER OPTIMIZATION I (CAREER DEVELOPMENT)**

<b>IMPROVING HEAT TRANSFER TO RECOVERY BOILER SUPERHEATERS USING OPTIMIZATION AND COMPUTATIONAL FLUID DYNAMICS</b> .....	717
<i>Viljami Maakala, Mika Järvinen, Ville Vuorinen</i>	
<b>A REVIEW OF UNIVERSITY OF TORONTO RESEARCH ON DEPOSIT REMOVAL IN RECOVERY BOILERS</b> .....	731
<i>Danny S. Tandra, Markus Bussmann, Andrei Kaliazine, Honghi Tran</i>	
<b>SAFETY ASPECTS AND PRACTICAL CONSTRAINTS IN THE COMBUSTION OF ODOROUS GASES IN BLACK LIQUOR RECOVERY BOILERS</b> .....	746
<i>Keijo Salmenoja, Petri Pynnönen, Pasi Miikkulainen</i>	

**SESSION 29: NEW DEVELOPMENTS IN PAPER RECYCLING**

<b>NEW DEVELOPMENTS IN PAPER RECYCLING: KAOLIN-BASED DEINKING AIDS</b> .....	754
<i>Cesar Basilio</i>	
<b>NEW DEVELOPMENTS IN PAPER RECYCLING: DEINKING CHEMISTRY</b> .....	761
<i>David R. Jones</i>	
<b>PERSPECTIVE OF A SYSTEMS AND EQUIPMENT SUPPLIER</b> .....	767
<i>Chris Demler</i>	

**SESSION 30: RECOVERY BOILER SMART PROCESS CONTROLS**

<b>SUPERIOR RECOVERY BOILER WATER CHEMISTRY CONTROL AND LEAK INDICATION ACHIEVED WITH NEW MONITORING AND CONTROL SYSTEM</b> .....	774
<i>Robert D. Baxter, Virginia Durham</i>	
<b>ACOUSTIC ANALYSIS OF RECOVERY BOILER DISSOLVING TANK OPERATION AND SMELT SHATTERING EFFICIENCY</b> .....	791
<i>Hugo Lepage, Willy Wong, Markus Bussmann, Honghi Tran</i>	
<b>MODERNIZE WITH SMART BURNER MANAGEMENT SYSTEMS</b> .....	802
<i>Michael Simpson</i>	

### **SESSION 31: PULP YIELDS PANEL DISCUSSION (CAREER DEVELOPMENT)**

<b>SOME FACTORS THAT IMPACT PULP YIELDS DURING KRAFT PULPING &amp; BLEACHING</b> .....	814
<i>Brian N. Brogdon</i>	
<b>TAILORING KAPPA NUMBER COMPOSITION FOR MAXIMUM EUCALYPT KRAFT PULP YIELD</b> .....	820
<i>J. L. Colodette, F. J. B. Gomes</i>	
<b>AIMING FOR HIGHER YIELD</b> .....	827
<i>Anders Hjort</i>	

### **SESSION 32: NONWOODS**

<b>TECHNICAL / ECONOMIC ANALYSIS OF BAMBOO FIBER IN PULP AND PAPER MANUFACTURE - PART I: ECONOMICS OF GROWING BAMBOO IN A PLANTATION FOR BIOMASS PRODUCTION</b> .....	835
<i>Richard B. Phillips, H. M. Chang, Hasan Jameel</i>	
<b>TECHNICAL / ECONOMIC ANALYSIS OF BAMBOO FIBER IN PULP AND PAPER MANUFACTURE - PART 2: ECONOMIC POTENTIAL FOR BAMBOO UTILIZATION IN AN UNCOATED FREESHEET MILL</b> .....	850
<i>Richard B. Phillips, Ved Naithani, H. M. Chang, Hasan Jameel</i>	
<b>BENCH SCALE PULPING &amp; BLEACHING OF MALAYSIAN OIL PALM EMPTY FRUIT BUNCH</b> .....	865
<i>Robert W. Hurter, Medwick V. Byrd</i>	

### **SESSION 33: MILL ASSET MANAGEMENT**

<b>COMPRESSED AIR SYSTEMS INVISIBLE MONEY</b> .....	880
<i>Peter K. Stern</i>	
<b>PRECISION ALIGNMENT OF WINDERS</b> .....	893
<i>Myron Smith, Roger Cross</i>	

### **SESSION 34: RECOVERY ASSET MANAGEMENT**

<b>CHEMICAL RECOVERY AND PULP MILL OPTIMIZATION AND CONTROL</b> .....	898
<i>T. Trung, B. Allison</i>	
<b>SÖDRA CELL VÄRÖ MILL EXPANSION, MAKING OF A STATE-OF-THE-ART PULP MILL</b> .....	911
<i>Raymond Burelle, Mona Henderson, Håkan Dahllöf, Jonas Eriksson</i>	

### **SESSION 35: ENVIRONMENTAL ADD HOC**

<b>THE LATEST ON EPA'S CCR RULE AND THE CHALLENGES OF COAL ASH</b> .....	924
<i>Piet DePree</i>	
<b>RECENT DAM REMOVAL EXPERIENCE - GLATFELTER PAPER COMPANY SPRING GROVE, PA</b> .....	939
<i>Matthew W. Muzzy, Bradley D. Martin</i>	

### **SESSION 37: EXTRACTING VALUE FROM BIO-PRODUCTS**

<b>IMPORTANT LESSONS LEARNED DURING THE COMMERCIALIZATION OF THE LIGNOBOOST™ PROCESS</b> .....	963
<i>Maria Björk, Jarmo Rinne, Kari Nikunen, Ari Kotilainen, Ville Korhonen, Gene Christiansen, Henrik Wallmo, Hanna Karlsson</i>	
<b>A LIGNIN RECOVERY SYSTEM AT WEST FRASER HINTON PULP</b> .....	971
<i>Jon Foan</i>	



TREATING KRAFT MILL EXTRACT USING BI-POLAR MEMBRANE ELECTRODIALYSIS.....	986
<i>R. Patil, J. Genco, H. Pendse, A. Van Heiningen</i>	

**SESSION 38: RECOVERY BOILER INSPECTION AND REPAIR**

TIP-0416-26, BEST PRACTICE FOR RECOVERY BOILER INSPECTION (OPTIMIZING THE INSPECTION SCOPE).....	1004
<i>David C. Bennett, Christopher E. Jackson</i>	
EVALUATION OF NEAR-DRUM THINNING DATA IN RECOVERY BOILER GENERATING BANK TUBES .....	1006
<i>W. B. A. Sharp, W. A. Jones</i>	
SWEDISH AND NORWEGIAN RECOVERY BOILER COMMITTEE GUIDELINES FOR WELD REPAIR OF COMPOSITE BOILER TUBES.....	1017
<i>Tommy Sand</i>	

**SESSION 39: LIME KILN OPERATION**

THE USE OF NON-DETONATING CARBON DIOXIDE SYSTEMS AS A MEANS TO CONTROL LIME KILN RINGS.....	1024
<i>J. P. Gorog , W. R. Leary</i>	
60% ALUMINA BRICK REFRACTORIES FOR LIME RECOVERY KILNS.....	1036
<i>Christopher L. Macey</i>	
LIGNIN FIRING IN LIME RECOVERY KILNS .....	1046
<i>M. Beddows, R. Manning, C. Rennie, M. Björk, A. Kotilainen, V. Korhonen, J. Moilanen, K. Nikunen</i>	

**SESSION 40: STEAM & POWER OPTIMIZATION**

KEY CONSIDERATIONS FOR SUCCESSFUL INTEGRATION OF COGENERATION SYSTEMS INTO EXISTING PULP MILLS .....	1060
<i>William Cheung</i>	
ACHIEVING MAXIMUM VALUE FROM STEAM AT A PULP & PAPER MILL BY IMPLEMENTING ADVANCED CONTROL .....	1070
<i>Sava Kovac, Ben Rodin, Kevin Yeh</i>	

**SESSION 41: AIR – BOILER MACT COMPLIANCE ISSUES**

CLEARSTACK 3-STAGE COMBUSTION TECHNOLOGY - MULTI-POLLUTANT CONTROL .....	1079
<i>Mark Becker</i>	
BOILER MACT REGULATORY UPDATE.....	1086
<i>Amy M. Marshall</i>	
BOILER MACT IMPLEMENTATION DATA MANAGEMENT AND RECORDKEEPING .....	1097
<i>Karin Greenacre</i>	

**SESSION 42: CONSISTENCY CONTROL/SENSOR TUTORIAL (CAREER DEVELOPMENT**

AN UPDATE ON CONSISTENCY TRANSMITTER MEASUREMENT TECHNOLOGY & PROCESS CONSIDERATIONS.....	1109
<i>Mike Hendricks</i>	

**SESSION 43: BLACK LIQUOR AND BIOFUEL CORROSION**

CORROSION MONITORING AND ROOT CAUSE IDENTIFICATION IN HIGH SOLIDS CONCENTRATORS.....	1119
<i>Pasi Niemeläinen, Martti Pulliainen, Jarmo Kahala, Sampo Luukkainen</i>	

<b>FLOW INDUCED ACCELERATED CORROSION IN PULPING LIQUORS</b> .....	1134
<i>P. M. Singh, B. A. Baykal</i>	
<b>MATERIALS COMPATIBILITY ISSUES WITH BIOMASS-DERIVED OILS</b> .....	1147
<i>James R. Keiser, Michael P. Brady, Michael D. Kass, Samuel A. Lewis, Raynella M. Connatser, Donovan N. Leonard</i>	

**SESSION 44: HEALTH AND SAFETY TRAINING OPTIONS**

<b>INJURY PREVENTION THROUGH ERGONOMIC TRAINING THAT WORKS</b> .....	1157
<i>Paul A. Fontana</i>	
<b>TAPPISAFE - ALBANY INTERNATIONAL'S INVOLVEMENT</b> .....	1217
<i>Ken Walker</i>	

**SESSION 45: RECOVERY BOILER CLEANABILITY**

<b>IMPROVING RECOVERY BOILER AVAILABILITY THROUGH UNDERSTANDING FUME BEHAVIOR</b> .....	1226
<i>Aino Leppänen, Erkki Välimäki</i>	
<b>CHEMICAL ADDITIVES TO OPTIMIZE BLACK LIQUOR RECOVERY THROUGHPUT AND INCREASE CAMPAIGN LIFE</b> .....	1237
<i>Ian Saratovsky, Christopher Smyrniotis, Heng Wang, Scott Bohlen</i>	
<b>FORMATION OF BLUE DEPOSITS IN KRAFT RECOVERY BOILERS</b> .....	1255
<i>Xiaosong Mao, Honghi Tran</i>	
<b>Author Index</b>	