2021 IEEE IAS Petroleum and Chemical Industry Technical Conference (PCIC 2021)

San Antonio, Texas, USA 13 – 16 September 2021



IEEE Catalog Number: ISBN: CFP21PCI-POD 978-1-6654-0677-2

Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number: ISBN (Print-On-Demand): ISBN (Online): ISSN: CFP21PCI-POD 978-1-6654-0677-2 978-1-6654-0676-5 0090-3507

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 E-mail: curran@proceedings.com Web: www.proceedings.com



TABLE OF CONTENTS

GENERAL TECHNICAL SESSION I Monday, September 13, 2021 – 8:00 a.m. to 11:15 a.m. Room: Salon E – 3rd Floor Presiding: Jim Bowen, PCIC Chair

		-	
PCIC-2021-01	HIGH IMPEDANCE GROUND FAULT DETECTION	ON FOR A SAFER PETROCHEMICAL INDUSTRY NEI Electric Power Engineering Inc	1
PCIC-2021-02	INCIPIENT ELECTRIC CIRCUIT FAILURE DETR PETROCHEMICAL FACILITIES USING ADVANCE B. Don Russell Carl Benner Jeffrey Wischkaemper Karthick Muthu-Manivannan		9
PCIC-2021-03	INTRODUCTION TO HORIZONTAL DIRECTION TRANSMISSION LINES AND OTHER DUCT BA Arthur J. Smith, III	IAL DRILL INSTALLATION OF HIGH VOLTAGE INKS Waldemar S. Nelson and Co., Inc.	17
	GENERAL TECHNIC Monday, September 13, 202 Room: Salon E – 3rd Floor Presidir	1 – 2:00 p.m. to 5:00 p.m.	
PCIC-2021-04	WHEN TO REPLACE AGING TRANSFORMERS	ΡΔΡΤ-2	29
1 010-2021-04	Fred L. Dixon	LyondellBasell	20
	Derrick Robey	LyondellBasell	
PCIC-2021-05	THIRD-PARTY CERTIFICATION - WHAT DOES BENEFIT THE USER?	IT ALL MEAN AND HOW DOES IT	39
	Michael W. Wactor	Powell Industries, Inc.	
	Daleep C. Mohla	DCM Electrical Consulting Services	
	Paul D. Barnhart	Underwriters Laboratories, LLC	
	Mike Lusk	Canadian Standards Association	
PCIC-2021-06	ADVANTAGES OF REAL-TIME CLOSED-LOOP	SIMULATION	47
	Scott Manson	Schweitzer Engineering Laboratories, Inc.	
	Abdel Rahman Khatib	Schweitzer Engineering Laboratories, Inc.	
	Niannian Cai	Schweitzer Engineering Laboratories, Inc.	
	Siddharth S. Rajan	Schweitzer Engineering Laboratories, Inc.	
	INTERNATIONAL TECH Monday, September 13, 202 Room: Salon L/M – 3rd Floor	1 – 2:00 p.m. to 5:00 p.m.	
PCIC-2021-07		OR MEDIUM VOLTAGE EQUIPMENT BY CONTINUOUS	57
	AND REMOTE MONITORING OF PARTIAL DIS Brian Oberer	Eaton Corporation	
	Jim Kozusko	Eaton Corporation	
	JJ Dai	Eaton Corporation	
	Raul Febres	Eaton Corporation	
PCIC-2021-08	EQUIPMENT ASSEMBLIES FOR EXPLOSIVE ATMOSPHERES Brian Keane Innio-Waukesha		67
	Tony DeSousa	CSA Group	
	William Simpson	North American Standards Assessment Corp.	
	Jay McVeigh	CSA Group	
PCIC-2021-09	CHANGE IS CONTINUOUS: A REFINERY REST Roger Goembel	ART E&I DESIGN CASE STUDY Worley	75
	Mike Sosbe	Roxtec, Inc.	

MARINE TECHNICAL SESSION I Monday, September 13, 2021 – 2:00 p.m. to 5:00 p.m. Room: Salon A/B – 3rd Floor Presiding: Chris Heron, Chair			
PCIC-2021-10	MONITORING DEVICES AND DESIGN CONS	IDERATIONS FOR ROTATING MACHINES IN	83
	Rajendra Mistry Scott Kreitzer	Siemens Industry Inc. Siemens Industry Inc.	
PCIC-2021-11	ELECTRICAL CIRCUIT PROTECTION AND S		95
	Stephen Cary Pierre Chouinard	Innovative Controlgear Solutions (ICSI) Hydro Quebec	
PCIC-2021-12	LED LIGHTING. MINIMIZING ECOLOGICAL Marty Cole Monica DeJohn Logan McClure Sean Rogers	IMPACT WITHOUT COMPROMISING HUMAN SAFETY Hubbell Canada ULC Hubbell Killark Hubbell Killark Hubbell Killark	107
SAFETY TECHNICAL SESSION I Monday, September 13, 2021 – 2:00 p.m. to 5:00 p.m. Room: Salon F – 3rd Floor Presiding: Clifton Oertli, Chair			
PCIC-2021-13	PRACTICAL APPROACH TO DEVELOPING A SYSTEMS ANALYSIS	MODEL FOR ARC FLASH AND POWER	115
	Tryton Bower Arunkumar Aravamudhan Anirudh Malik Marc Brunet	Mangan, Inc. Marathon Petroleum Mangan, Inc. Marathon Petroleum	
PCIC-2021-14	ADVANCES IN SOLID-STATE CIRCUIT BREAKERS		127
	Michael Harris Ryan Kennedy	Atom Power Atom Power	
PCIC-2021-15	LOW VOLTAGE MOTOR CONTROL CENTER LIFE EXTENTION/ SAFETY ENHANCEMENT PROJECTS – ANALYSIS AND JUSTIFICATION		135
	Jim Bowen Tom Malone	MMT Services, Inc. MMT Services, Inc.	
CHEMICAL TECHNICAL SESSION I Tuesday, September 14, 2021 – 8:15 a.m. to 11:15 a.m. Room: Salon E – 3rd Floor Presiding – Keith Lyles, Chair			
PCIC-2021-16	INTRODUCTION TO IEEE 841-2020 FOR SEVE MOTORS – UP TO AND INCLUDING 370 KW (500 HP)	145
	Donald G. Dunn Laura Reamer Dennis Bogh William Finley	WS Nelson Regal Beloit Consultant Siemens	
PCIC-2021-17	TOTALLY ENCLOSED WATER COOLED (IC 7 Robert F. McElveen Jr. Christopher A. Stockton	1W) MOTORS FOR API 541 ABB ABB	153
PCIC-2021-18	ELECTRICAL POWER RELIABILITY METRICS Gary D. Osborne Ryan Kruse Rick Mendle		163

		CHNOLOGIES TECHNICAL SESSION I 21 – 8:15 a.m. to 11:15 a.m. residing – Andrew Ackerman, Chair	
PCIC-2021-19	FIRE RATED ENCLOSURES – A CASE STUD	ΥY	173
	Ryan Wilson	ABTECH Inc.	
	Babak Fazel	WorleyParsons	
PCIC-2021-20	20 INTRODUCTION TO THE NEW STANDARDS — IEEE STD 844.3 [™] -2019 /CSA C22.2 No. 293.3-19 AND IEEE STD 844.4 [™] -2019/CSA C293.4-19 FOR IMPEDANCE HEATING OF PIPELINES AND EQUIPMENT Roy Barth Thermon		183
	Neal Fenster	Thermo Systems Technology	
	Franco Chakkalakal	nVent	
PCIC-2021-21	BATTERY STORAGE APPLICATIONS IN TH Clifton Oertli Don Bushby Joe Marquardt Carson Bates	E PETROCHEMICAL INDUSTRY NEI Electric Power Engineering, Inc. ExxonMobil Corporation ExxonMobil Corporation NEI Electric Power Engineering, Inc.	191
		INICAL SESSION I 21 – 8:15 a.m. to 11:15 a.m. residing – Shelly De Grate, Chair	
PCIC-2021-22	ELECTRICAL PROTECTION STANDARD HA Paul G. Cardinal	RMONIZATION CHALLENGES CITGO Terminals and Pipelines	199
PCIC-2021-23	CASE STUDY: MOTOR FAULT RESULTS IN OF GROUNDING RESISTOR RATING		209
	Matt Proctor	Root 3 Power, LLC	
	Becky Lobitz	Shell Pipeline Company LP	
	Philip Ducote	Shell Pipeline Company LP	
PCIC-2021-24	ECONOMICS OF PREFABRICATED ELECTRICAL AND INSTRUMENTATION BUILDINGS		219
	Luca Magenes	Powell Electrical Systems, Inc.	
	X. Steven Wu	Shell Global Solutions	
		ICAL SESSION I 21 – 8:15 a.m. to 11:15 a.m. residing – Clinton Roache, Chair	
		······································	227
PCIC-2021-25	LIGHTNING PROTECTION AT PETROCHEMICAL FACILITIES – PART 2 REQUIREMENTS OF STANDARDS		
	Dr. Robert A Durham	THEWAY Labs	
	Dr. Marcus. O. Durham	THEWAY Labs	
	Tommy W. Gillaspie	Donato, Brown, Pool, Molemonn	237
PCIC-2021-26	USING MULTIFUNCTION BUS DIFFERENTIA Troy Rains	L RELAYS FOR CT SATURATION ISSUES McDermott Inc.	201
	Rekha T. Jagaduri	HDR, Inc.	
	Prasanna Muralimanohar	SEL, Inc.	
	Marc Taylor	Freeport LNG	247
PCIC-2021-27	WHAT SHOULD YOU KNOW BEFORE ACQUIRING PARTIAL DISCHARGE ON HIGH VOLTAGE MOTORS AND GENERATORS		247
	Saeed UI Haq	GE Power Conversion	
	Madu Thirugnanasam	GE Power Conversion	
	Kevin Dickens	GE Power Conversion	
	Humayun Tariq	AEP Transmission	

TRANSPORTAION TECHNICAL SESSION I Tuesday, September 14, 2021 – 8:15 a.m. to 11:15 a.m. Room: Salon A/B – 3rd Floor Presiding – Brandon Cassimere, Chair			
PCIC-2021-28	INNOVATIVE COOLING OF MEDIUM VOLTAG Tony Merschman David Lichtenberg Anil Bhadkamkar (retired) Ravi Kureti	E DRIVES IN E-HOUSE Enbridge Enbridge Toshiba International Corporation Toshiba International Corporation	257
PCIC-2021-29	LNG COMPRESSOR DRIVER TRENDS GAS T Jimmy J. Guerrero Amber Wright Neeraj Bhatia	URBINES VS. ELECTRIC MOTORS Cheniere Energy, Inc Eaton Bechtel OG&C	263
PCIC-2021-30	OIL AND GAS INDUSTRY Rainer Kurz Jay Mistry Peter Davis Ge Juan Cole CHEMICAL TECHNIC WEDNESDAY, September 15, 2		273
PCIC-2021-31	DATA ANALYTICS – OPTIMIZATION OF PLAI MONITORING AND EXPERT LEVEL ANALYSIS Mark Hodowanec Bill Finley Frank DeWinter		283
PCIC-2021-32	WHAT MEDIUM AND HIGH VOLTAGE STATOR CAN – AND CAN NOT – TELL YOU Greg Stone Howard Sedding William Veerkamp	WINDING PARTIAL DISCHARGE TESTING Qualitrol-Iris Power Qualitrol-Iris Power Dow Chemical Company	293
PCIC-2021-33	MORE THAN JUST A BOX AND PARTS DESIGN BEHIND "db eb" CREATIONS Brad J. Zimmermann William G. Lawrence Wolfgang W. Berner ELECTROCHEMICAL & EMERGING TECH WEDNESDAY, September 15, 2 Room: Salon L/M – 3rd Floor Pre	R. STAHL, Inc. FM Approvals LLC R. STAHL, Schaltegeräte, GmbH INOLOGIES TECHNICAL SESSION II	303
PCIC-2021-34	REDUCING RISK (AND MAKING FRIENDS) WITH Steve Williams Jim Parks	I PROPER APPLICATION OF ELECTRIC HEAT TRACING Co-op Refinery Complex nVent Thermal Management	311
PCIC-2021-35	UNIQUE NEW COOLING TECHNOLOGY FOR R Chet Sandberg	EFINERY USE C L Sandberg & Associates	321
PCIC-2021-36	ELECTRICAL BEST PRACTICES AND LESSON Frieder Endrejat Patrick Hilliard Alfonso Ramirez Charles Huddleston	S LEARNED FROM A CHEMICAL MEGAPROJECT Sasol Fluor Technip FMC Sasol	327

PRODUCTION TECHNICAL SESSION II WEDNESDAY, September 15, 2021 – 8:15 a.m. to 11:15 a.m. Room: Salon J/K – 3rd Floor Presiding – Dane Martindale, Vice-Chair NEW MOTOR PROTECTION STANDARD IEEE 3004.8 - GETTING UP TO SPEED! PCIC-2021-37 337 Padden Engineering, LLC Lorraine K. Padden John A. Kav Rockwell Automation Canada Inc. PCIC-2021-38 MEDIUM VOLTAGE MOTOR VIBRATION - WHERE DO I START? A PRIMER FOR 347 EARLY CAREER PROFESSIONALS TMEIC Manish Verma Matt Norlander **Chevron Products Company** Brandon Kim TMEIC James Nanney TMEIC PCIC-2021-39 IEC 61850-BASED ADVANCED BUS TRANSFER SCHEME FOR INDUSTRIAL SUBSTATIONS 357 GE Renewable Energy Robert Muziol Christine Crites GE Renewable Energy Darrvl Pole Imperial Oil Palak Parikh **GE Renewable Energy REFINING TECHNICAL SESSION II** WEDNESDAY, September 15, 2021 – 8:15 a.m. to 11:15 a.m. Room: Salon F – 3rd Floor Presiding – Giovanni Parra, Vice-Chair PCIC-2021-40 POTENTIAL IGNITION SOURCES AND PROTECTIONS IN ELECTRIC ROTATING MACHINES 365 **OPERATING IN EXPLOSIVE GAS ATMOSPHERES** Bharat Mistry Mototech Consulting Rajendra Mistry Siemens Industry Inc. William G Lawrence FM Approvals LLC Amnit Dhindsa **Enbridge Operational Services** PCIC-2021-41 TESTING AND INSPECTION OPTIONS FOR SQUIRREL CAGE INDUCTION MOTORS 375 FROM CRADLE TO GRAVE Retired US Electrical Motors Austin H. Bonnett Helmuth M. Glatt Nidec Motor Corporation John R. Frese Nidec Motor Corporation PCIC-2021-42 APPLICATION CONSIDERATIONS IN VIEW OF NEW REVISIONS TO HIGH VOLTAGE 385 CIRCUIT BREAKER STANDARDS John Webb ABB, Inc. TRANSPORTATION TECHNICAL SESSION II WEDNESDAY, September 15, 2021 - 8:15 a.m. to 11:15 a.m. Room: Salon A/B – 3rd Floor Presiding – Jonathan Havey, Vice-Chair RUN-UP PROTECTION IN HIGH-INERTIA SYNCHRONOUS MOTOR APPLICATIONS PCIC-2021-43 395 Matthias Centner Siemens AG Thorsten Getschmann Siemens AG Mark Chisholm Elin Motoren S. Allen Smith Air Products Michael A. Melnick Air Products OPERATION OF LARGE TWO POLE SLEEVE BEARING INDUCTION MOTORS WITH PCIC-2021-44 405 WELL DAMPED RESONANT SPEEDS Gregory G. Zemaitis ABB Papa Diouf ABB Wayne Paschall ABB FAILSAFE MOTOR CONTROL DESIGN TO PREVENT RUNAWAY MOTORS PCIC-2021-45 415 Philip Ducote Shell Pipeline Company LP Becky Lobitz Shell Pipeline Company LP David Virost Colonial Pipeline Company Colonial Pipeline Company Michael "Andy" Martin

	INTERNATIONAL TECHNICA – Wednesday, September 15, 2021 – Room: Salon J/K – 3rd Floor Presiding	2:00 p.m. to 5:00 p.m.	
PCIC-2021-47	IEC vs. ANSI/UL MEDIUM VOLTAGE MOTOR CONTR USE AND DOES IT MATTER?	ROL: WHICH ONE SHOULD YOU	427
	Lee Woollen ABB		
	•	S.p.A.	
		S.p.A.	
	Harshavardhan Karandi ABB	Inc.	
PCIC-2021-48	FOR CRITICAL PROCESSES IN THE OIL AND GAS INDUSTRY		439
		i Aramco	
	· · · · ,	i Aramco	
		i Aramco	
	Ali Alameer Saud	i Aramco	
	MARINE TECHNICAL SE – Wednesday, September 15, 2021		
		Allen Kachurowski, Vice-Chair	
PCIC-2021-49	THE PRACTICAL IMPACT OF AREA CLASSIFICATION	ON ON TRACE HEATING COST	447
	Olivia Miloj Therm	ion Inc.	
	Prabhat Jain Becht	el, Inc.	
	Paul G. Cardinal CITGO	O Petroleum Corp.	
PCIC-2021-50	IEC/IEEE 80005.1:2019 UPDATES TO ADDRESS PRA	ACTICAL ISSUES WITH INSTALLATIONS	453
	Dev Paul AECC	DM	
	Kevin Peterson P2S I	nc.	
	P. (Ben) Chavdarian P2S I	nc.	
	Scott Baird Port o	f Los Angeles	
PCIC-2021-51	LONG CABLE APPLICATIONS WITH PM MOTORS A	ND MV DRIVES	461
	Mukul Rastogi Sieme	ens Industry, Inc.	
	David J. Liney Shell		
	Richard Broderick Shell		
	Richard H. Osman Sieme	ens Industry, Inc.	
	SAFETY TECHNICAL SE Wednesday, September 15, 2021 –	2:00 p.m. to 5:00 p.m.	
	Room: Salon E – 3rd Floor Presiding:	Thomas Papallo, Vice-Chair	
PCIC-2021-52	REMOVING THE ROADBLOCK: ENHANCED ARC FLA VACUUM FAULT INTERRUPTION AND SECONDARY Sam T. Reed Eaton	SENSING SYSTEMS ON TRANSFORMERS	469
		Corporation	
	Steven H. Buenier Eaton	Corporation	
PCIC-2021-53	COST-BENEFIT ANALYSIS OF ACTIVE ARC MITIGA MEDIUM-VOLTAGE SWITCHGEAR		481
	Terry Neighbours ABB		
	Harshavardhan Karandikar ABB	Inc.	
PCIC-2021-54	A PRACTICAL APPLICATION OF IEEE STD 1584-201	8	493
	Adam Reeves Eaton		
	Mark Freyenberger Eaton		
	Michael Hodder Eaton		