

Electrical, Automation and Digitization Knowledge Sharing Event

FINAL PROGRAM

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**Conference site:**

The Tower Hotel
St Katharine's Way
London E1W 1LD
United Kingdom

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PCIC Europe Mission

To provide an international forum in the heart of the major source of petroleum products for the exchange of electrical and instrumentation applications technology relating to the petroleum and chemical industry, to sponsor appropriate standards activity for that industry, and to provide opportunity for professional development.

PCIC Europe Strategies

1. The PCIC Europe Annual Conference will be held in locations of industry strength, and its location will be rotated annually in an effort to attract national and international participation.
2. PCIC Europe will proactively promote participation by a broad base of PCIC Europe representatives, with an emphasis on both younger and senior engineers.
3. Attendees will be encouraged to participate in technical activities including authorship of papers and participation in IEC standards development including IECEx.
4. The quality of PCIC Europe papers is essential for the PCIC Europe mission and is given highest priority. Application oriented papers are given priority.
5. The technical content of the PCIC Europe Annual Conference will be continuously evaluated and updated to reflect the evolving needs of the industry.
6. Participation of users, manufacturers, consultants and contractors will be encouraged in the activities of PCIC Europe to strengthen the conference technical base.
7. PCIC Europe will offer tutorials directed towards enhancing the technical, communication, and interpersonal skills of petroleum and chemical industry engineers.



PCIC Europe 2022 Conference would like to thank its sponsors

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Hospitality Suites (12th floor)

Monday 6th June

Exertherm – Mayflower Room
WEG – Great Eastern Room

Tuesday 7th June

ABB – Great Harry Room
ETAP – Discovery Room
WEG – Great Eastern Room

Wednesday 8th June

GE – Britannia Room
WEG – Great Eastern Room

Welcome to the 2022 Conference!



We've seen enormous changes in the past two years to our society from the disruption of COVID-19 impacting us all individually and our ability to meet collectively, this has impacted PCIC Europe tremendously leading to the cancelation of our last face-to-face event in Copenhagen, Denmark in 2020 and rescheduling to the delivery of our ViRTUA1 event in 2021. This however demonstrated to us an enduring appetite for industry professionals to continue to meet and collaborate on knowledge sharing events, our <<raison d'être>>.

London is a special location for PCIC Europe, we came here last in 2015, our biggest and most successful event. London is a historic world city, a global financial and project development hub, synonymous with major investments and developments in the energy sector. London 2022 promises to be even better, returning to the Gouman Tower hotel adjacent to the iconic London Tower Bridge, historic Tower of London and Saint Catherines Dock. It is a fitting location for both knowledge sharing and collaborative networking with industry peers outside the constraints of our normal work environment.

Our technical content echoes the changing perspectives in society and focus on reduction in carbon intensity of industry, reflecting a progressive and accelerating move to electrification and digitization, as per the recent UN COP26 conference in Glasgow. Our industry keynote speakers have been chosen on the basis of their expertise in this context. As industry professionals in the energy sector we have always adapted to challenges and as our industry evolves so will PCIC Europe.

Watch this space and looking forward to engaging with you at London 2022 and on our social media channels

Justin Mason
Executive Committee Chair

The 2022 PCIC Europe London technical programme



Dear attendees,

Welcome to PCIC Europe in London. In 2021 we ran the conference virtually and the quality of papers, presentations and interaction was excellent.

COP26 in Glasgow, following on from the Paris COP, again emphasised the challenges and changes needed in the near future to meet the Climate Change goals. As far back as 2019, which seems a long time ago, we put energy transition at the heart of the conference. We have seen many changes since then: European and national energy transition targets, major companies divesting or diversifying and re-focusing for the future.

Energy transition requires industries to carefully examine how to reduce energy consumption, with energy-efficient designs and projects requiring sharing and use of data collaboratively across purely contractual boundaries, optimising equipment size and weight all helping to reduce GHG footprint.

Variable speed drive systems and the move from mechanical drivers is a key enabler; designs meet the requirements of the process at levels of reliability and availability that proves cost-effective for both CAPEx and OPEx. A number of papers address these topics.

Energy storage will also play a key role in the net zero future as the balance between power generation from renewables and demand in the grid becomes harder to manage. We have papers examining flexible storage of heat energy and the challenges for EV charging.

As industry invests in energy transition, it is also dealing with an ageing asset base; we have papers and tutorials looking at the challenges for safe, cost-efficient operation including proactive technical monitoring and network operation in industrial power networks which become increasingly important to asset availability and reliability.

On conference day one we have our tutorials, where there is a more time for interactions with the presenters. The papers and presentations reflect ever closer integration and optimisation of the automation/electrical power systems. Plenary sessions have a wide range of technical content, aimed at a broad cross-section of the attendees, to inform and provoke discussion. Parallel sessions are arranged so that papers with common themes are presented as far as possible in one room for the convenience of presenters and attendees.

As we mentioned before, competence development comes not just from watching and reading, but from questioning and discussing; finding that connection to take the next step.

Please take opportunity to meet and engage with the presenters, authors, exhibitors and conference organising committee; often that external engagement can lead to an opportunity in the future.

We invite you to contribute to the future conference events and welcome your ideas regarding new subjects or areas of interest. This might lead to future conference papers or tutorial - we would be delighted to work with future authors.

We look forward to the success of PCIC Europe and the engaged discussion with you.

Paul Donnellan
Technical Chair Electrical

Diedrich Thaden
Technical Chair Automation & Digitalization

Welcome from the Local Committee

Welcome to London, which is one of the most visited cities and has something for everyone: from history and culture to fine food and exceedingly good times.

London is famous for more than its magnificent ancient buildings, the Palace of Westminster, Trafalgar Square, Tower of London, London Eye, Art Galleries, and Big Ben. In addition, the hotel is situated next to the iconic Tower Bridge.



Speaking of history, London is famous for its variety of top notch museums home to some of the most prized possessions in the world. From Tate Modern to the Museum of Natural History, it's no wonder the city is a treasure trove for museum lovers. But those hardly scratch the surface. London is home to more than 200 museums – one of which is the mighty British Museum with more than 8 million pieces in its arsenal and around 80,000 on display at any given time.

London's status as one of the world's most culturally rich cities should come as no surprise given its large functions as a business, arts and economics centre for the world. And when we say London is diverse, we mean it. On any given day there are more than 300 languages spoken throughout the city and each year puts on more than 197 festivals.

The United Kingdom is world-famous for its tea culture surrounding an obsession with afternoon teatimes fit for the movies. London is no exception, and you'd be hard pressed to find any cafe in the city that doesn't have a stellar line up of tea to make for the perfect British cuppa. If you want something special, head to Fortnum and Masons for afternoon tea!

In 2022, Her Majesty The Queen will become the first British Monarch to celebrate a Platinum Jubilee, seventy years of service, having acceded to the throne on 6th February 1952 when Her Majesty was 25 years old. There will be many events happening as part of the celebrations in London from the 2nd to 5th June.

On behalf of the local committee, I wish you a very interesting and profitable PCIC Europe conference and we will do our best to make your visit to London enjoyable.

Have a wonderful stay in London.

Chris Thomason – Chair | Jeremy Andrews | Caroline Bishop | Thibaut Jouvét

Schedule at a Glance

Monday June 6th, 2022

Time	
18:00 - 21:00	Registration at welcome desk

Tuesday June 7th, 2022

Time	Tower 2	Tower 3
08:30 - 9:00	Registration, Welcome Coffee	
09:00 - 10:30	Tutorial 1 – Digitalization EUR22_34 - Enabling Edge and Cloud Computing in the O&G Industry	
10:30 - 11:00	Coffee Break / Sponsors tables	
11:00 - 12:30	Tutorial 2 – Electrical EUR22_35 - How Medium Voltage Cables Fail – Fundamentals to Ensure Long Cable Life	
12:30 – 13:30	Lunch	
13:30 – 14:15	Paper – Automation / Digitalization EUR22_25 - Digital Supply integration a key to low & unmanned installations	Paper – Electrical EUR22_17 - Contents of instructions regarding Ex equipment: potential enhancement
14:15 – 15:00	Paper – Electrical EUR22_36 – Min. Terminal Voltage on Running Synchronous Motors during Large Motors Starting	Paper – Electrical EUR22_07 - Lessons Learned Through Commissioning, Liveness, and Operating Switchgear
15:00 – 15:30	Coffee Break / Sponsors tables	
15:30 – 16:15	Plenary session: Prof. Jon Love Partnership in Automation and Control Training	
16:15 – 18:00	Hospitality suites are open	
18:00 – 19:00	Welcome and notices – PCIC Europe Chair Keynote Speaker	
19:00 - 20:00	Networking Event in Tower Hotel	
20:00	Hospitality suites are open	

Wednesday June 8th, 2022

Time	Tower 2	Tower 3
08:30 - 9:15	Paper – Automation EUR22_24 - How to digitalize an equipment for operational excellence and eco-conception	Paper – Electrical EUR22_15 - Electric Discharges in Ball Bearings of Wind Turbine Double Fed Generator
09:15 - 10:00	Paper – Electrical EUR22_22 - Commissioning Tests to Assure MV Power Cable Systems meet IEC/IEEE standards	Paper – Electrical EUR22_10 – Digital Design Process for Trace Heating Systems
10:00 - 10:30	Coffee / Sponsor tables	
10:30 - 11:15	Paper – Automation/Digitalization EUR22_21 - Digitally Enabled Predictive, Maintenance Solution for Electric Motors	Paper – Electrical EUR22_20 - Life Extension of Power Transformers Through Proper Moisture Management
11:15 - 12:00	Paper – Electrical EUR22_06 - Electric Heating Systems for Electric Thermal Energy Storage (eTES)	Paper – Electrical EUR22_02 - Flashover Caused by Electrostatic Discharge During Transformer Routine Switching
12:00 - 13:00	Lunch	
13:00 - 13:45	Paper – Electrical/Automation EUR22_12 - New non-metallic cable support systems for harsh environments	Paper – Electrical EUR22_33 - Excitation of natural frequency in large motors by double frequency test
13:45 - 14:30	Paper – Electrical EUR22_16 - TRV Considerations when Switching a Large Captive Load with a MV Circuit Breaker	Paper – Electrical EUR22_18 - Improving VSD System Availability by using Fully Redundant Power Converters
14:30 - 15:00	Coffee / Sponsor tables	
15:00 - 15:45	Paper – Electrical/Automation EUR22_08 - Smart Sensor for Advanced Electric Motors Condition Monitoring	Paper – Electrical EUR22_13 - Replacement of Steam and Gas Turbines by Electrical High Speed systems for CO2 Reduction
15:45 - 16:30	Paper – Electrical/Automation EUR22_04 - Risk management of electric vehicle charging on fuel forecourts and basements	Paper – Electrical EUR22_05 - Sympathetic Inrush Study Case
16:00 – 0:00	Hospitality suites are open	

Thursday June 9th, 2022

Time	Tower 2	Tower 3
08:30 - 09:15	Paper – Automation/Digitalization EUR22_31 - Creating an Algorithm to Identify Patterns from Power Generation Asset & IOT Solutions	Paper – Electrical EUR22_11 - Selection and Return of Experience of Integrated Moto-Compressors
09:15 - 10:00	Paper – Electrical EUR22_19 - Theoretical and Experimental Investigations on Flameproof Enclosures for Ex Area	Paper – Electrical EUR22_14 - Design good practices to reduce LV switchgear footprint, cost and CO2 footprint
10:00 - 10:30	Coffee / Sponsor tables	
10:30 - 12:00	Paper – Electrical EUR22_09 - Supporting Decarbonisation - an Introduction to Electro-Mechanical ASD	
12:00 - 12:30	Closing	

The following papers will be presented at the 18th PCIC Europe 2022.

Ref.	Title	Authors
EUR22_02	<p>Flashover Caused by Electrostatic Discharge during Transformer Routine Switching</p> <p>When switching on a power transformer, the coupling of the applied step voltage function to the stray capacitance and inductance of the secondary winding is generating an oscillatory transient voltage. The existence of a resonant point close to that oscillation frequency can amplify the surge severity above the insulation withstand and lead to insulation breakdown or flashovers. In addition, factors affecting the transformer capacitance, like the oil degradation, might shift the resonance point and impact the surge severity.</p>	<p>Georgios Fotiou <i>Aramco Oil Company</i></p> <p>Omar Arfaj <i>Aramco</i></p> <p>Hussain Suwaidan <i>Aramco</i></p>
EUR22_04	<p>Risk Management of Electric Vehicle Charging on Fuel Forecourts and Basements</p> <p>Recent experience in EV charging installations have highlighted risks initially unanticipated by the business. The paper will introduce the risks of charging EV's on forecourts and in building basement by means of a bowtie and barrier model.</p> <p>Each significant barrier will be detailed with emphasis on initial site selection, electrical and general engineering design considerations, construction safety concerns and operational implications. Special attention will be offered to the charging of EV's in building basements and the risk of a building fire from an EV battery fire. Risk ownership will be addressed as an example case.</p> <p>Whilst the topics are not significantly technical, compiling the separate parts can be challenging to the industry. Recommendations on how to safely select, engineer, construct and operate EV charging sites will be offered. References to local and international standards will be made.</p>	<p>Jeff McQueen <i>BP</i></p>
EUR22_05	<p>Sympathetic Inrush Study Case</p> <p>Sympathetic Inrush is the transient current which is drawn by an already energized transformer while another transformer is being energized and connected in parallel. Depending on the severity of this phenomenon, these currents may have many adverse effects, like false triggering of protection elements, electrical and mechanical stressing to equipment and generally demotion to the network power quality.</p> <p>The magnitude and the duration of this currents are mainly related to the involved transformers electromagnetic and mechanical characteristics (residual flux, core air reactance, transformer geometry, etc), the network source impedance, the load conditions, the breaker point of wave switching, the breaker pole closing synchronization (important for single pole breaker operation) and finally the network configuration.</p> <p>This paper summarizes the analysis using PSCAD/EMTDC software platform to have:</p> <p>The effects of specific network condition on the sympathetic inrush.</p> <p>The voltage sag on the 13.8kV Electrical Submersible Pumps (ESPs) associated with this sympathetic inrush.</p> <p>Validation of the simulation with actual recording from the field.</p>	<p>Hussain Alawami <i>Saudi Aramco</i></p> <p>George Fotiou <i>Saudi Aramco</i></p>

Ref.	Title	Authors
EUR22_06	<p>Electric Heating Systems for Electric Thermal Energy Storage (eTES)</p> <p>A number of thermal energy storage technologies are competing for shares in the energy storage market. The thermal energy input into the systems will frequently come from electric heating systems. These systems typically have process temperature needs of 560 to 900+C. Also, the systems normally use megawatts of power from renewable energy sources. The electrical heating systems are often designed at or near the peak available power to maximize the amount of energy stored. As such the electrical heating systems require control system solutions not normally needed in electrical process heaters operating well below the available power. The paper will show the design of very large megawatt heating systems for electric thermal energy storage, including both the heaters and the control system. Special emphasis will be placed on the needs of the control systems to assure reliable operation in situations that are consuming all or nearly all of the available power, with consideration of the needed durability and reliability.</p>	<p>Dennis Long <i>Watlow</i></p> <p>Eric Ludwig <i>Watlow</i></p>
EUR22_07	<p>Lessons Learned Through Commissioning, Livening, and Operating Switchgear</p> <p>During commissioning, verifying the functionality of protective relays and wiring prior to livening is standard practice in the oil and gas industry. For protective relays, verification is complex due to their increased capabilities and the sophisticated control schemes that use them. This paper presents lessons learned from an industrial project of approximately 12,000 protective relays covering a 110, 35, 10, 6, and 0.38 kV power generation, transmission, and distribution system.</p> <p>The paper discusses power-system-related events from commissioning to after handover. Some events involve a single relay; others include complex schemes involving multiple electronic devices, communication protocols, and their impact on overall power system performance. Each event includes a detailed analysis using the protective relays waveform capture, sequential event report, logic diagrams, instruction manuals, and functional design specifications to determine the root cause and corrective action.</p>	<p>Matthew Watkins <i>Schweitzer Engineering Laboratories, Inc.</i></p> <p>Nilushan K. Mudugamuwa <i>Tengizchevroil</i></p> <p>Michael T. Mendiola <i>Tengizchevroil</i></p> <p>Kamran Heshami <i>Schweitzer Engineering Laboratories, Inc.</i></p>
EUR22_08	<p>Smart Sensor for Advanced Electric Motors Condition Monitoring</p> <p>This paper exposes the recent advances of the author's research group related to the development of intelligent sensors that combine the analysis of different electrical quantities. More specifically, the sensor relies on the analysis of currents and stray fluxes, which can be measured in a non-invasive way and with simple sub-sensors. The smart sensor combines the application of traditional tools based on stationary analysis (e.g. MCSA) with modern powerful methods relying on the analysis of transient currents and fluxes, which have proven to provide a high reliability for the diagnosis. Moreover, the sensor enables not only to analyse such quantities but also to provide a direct conclusion of the motor health thanks to the artificial intelligence tools that enable an automatic diagnosis. The paper explains the results obtained when diagnosing different faults in real machines, proving the powerfulness of the developed methodologies.</p>	<p>Jose Alfonso Antonino-Daviu <i>Universitat Politecnica de Valencia</i></p> <p>Israel Zamudio-Ramirez <i>Universitat Politecnica de Valencia</i></p> <p>Roque Osornio-Rios <i>Universidad Autónoma de Queretaro</i></p> <p>Larisa Dunai Dunai <i>Universitat Politecnica de Valencia</i></p>

Ref.	Title	Authors
EUR22_09	<p>Supporting Decarbonisation - an Introduction to Electro-Mechanical ASD</p> <p>Electrification of energy plants is an evolving trend as operators look to decarbonise facilities. This paper focuses on electro-mechanical ASD which can be an effective solution to turbine driver replacement or new plant versus large power electronic ASD, for speed regulation of driven equipment up to 20MW.</p> <p>Electro-mechanical ASD utilize the power split principle which can result in efficiency gains of up to 2.5% versus a full-scale power electronic ASD. The drive consists of a fixed speed motor, two smaller servomotors connected to a regenerative ASD providing control power and the main planetary gearbox which connects to the driven equipment.</p> <p>The paper evaluates the underlying theory behind the technology, benefits in comparison to full-scale ASD, starting performance, reliability and availability. Assessment of TOTEX including lifecycle energy consumption and carbon dioxide emissions savings of the hybrid electro-mechanical ASD in comparison to the alternative traditional full-scale ASD are included. Finally, a case study is presented detailing a 5MW pump drive train upgrade.</p>	<p>Simon Turnbull <i>Voith</i></p> <p>Wissam Moubarak <i>Voith</i></p> <p>Justin Mason <i>Trydanol Energy Solutions Cyf</i></p> <p>Mike Rimmer <i>Costain Ltd</i></p>
EUR22_10	<p>Digital Design Process for Trace Heating Systems</p> <p>Large capital projects are now designed using fully digital 3D modeling systems. Leveraging the digital plant model and digital data to engage the supply chain in the most efficient and accurate manner can yield cost savings to the operator and EPC. A case study is presented showing the efficiency of exchanging digital model data for piping and trace heater design information as opposed to relying entirely on drawings. Techniques and best practices are discussed for exchanging piping and trace heating data in both directions between the EPC and heat trace supplier. The benefits of a fully digital workflow for the project design teams are described.</p>	<p>Ben Johnson <i>Thermon Industries</i></p> <p>Lamont Lewis <i>Thermon Industries</i></p> <p>Daniel Ridsdale <i>Thermon Holding Corporation</i></p>
EUR22_11	<p>Selection and Return of Experience of Integrated Moto-Compressors</p> <p>With the development of high speed motors and active magnetic bearings, integrated moto-compressors (seal less, oil free, centrifugal compressor driven by variable speed drive system) using process gas to cool the motor have been developed as an alternative solution to conventional compression trains using either turbines or low speed motor associated with gearbox. The first part of the paper presents and describes the integrated moto-compressors and variable speed drive technologies used on two Oil & Gas sites in Europe and South America. The second part of the paper explains and gives the reasons of the selection of integrated moto-compressors for these two Oil & Gas sites. Finally, the last part of the paper provides the site operator and manufacturer return of experience of these integrated moto-compressors.</p>	<p>Edouard Thibaut <i>TotalEnergies</i></p> <p>Lionel Durantay <i>GE Power Conversion</i></p> <p>Alexandre Bouteille <i>TotalEnergies</i></p> <p>Sebastien Bouyssou <i>TotalEnergies</i></p> <p>Laurent Garaudee <i>TotalEnergies</i></p> <p>Olivier Pellerin <i>Baker Hughes</i></p>

Ref.	Title	Authors
EUR22_12	<p>New Non-Metallic Cable Support Systems for Harsh Environments</p> <p>One of the trends for future developments, including those offshore and harsh environments, is for modular construction minimising site assembly. Size, weight and availability of complete range of fittings are key factors for modulator construction, and all elements are considered including cable support systems.</p> <p>This paper will explore the use of non-metallic cable support systems, particularly for harsh environmental conditions.</p> <p>Work done to determine the acceptability, according to IEC 60079-32-1, for use of new non-metallic cable support systems in hazardous areas will be presented and compared with the use of traditional metallic and non-metallic cable support systems.</p> <p>Practical measures for mitigation of issues of electromagnetic compatibility will be addressed.</p>	<p>Jose Antonio Mostazo <i>UNEX</i></p> <p>Marc Serra <i>UNEX</i></p>
EUR22_13	<p>Replacement of Steam and Gas Turbines with Electrical High-Speed Drive Systems</p> <p>Abstract - Regulations on Co2 emission reductions, as well as potential taxation on Co2 production are coming in place worldwide. There are many possible ways to reduce Co2 emissions in Chemical and Petrochemical plants. One is to replace Steam Turbine (ST) or Gas Turbine (GT) equipment drives with electrical drivers. This can be done for new plants, as well as for existing plants, however, the requirements can be very different.</p>	<p>Hartmut Walter <i>Siemens AG</i></p> <p>Gijs van Maanen <i>Siemens AG</i></p> <p>Bart Sauer <i>Siemens Industry Inc.</i></p>
EUR22_14	<p>Design Good Practices to Reduce LV Switchgear Footprint, Cost and CO2 Footprint</p> <p>Optimization for electrical equipment has been a constant interest for O&G operators, as well as to EPCs. A special attention shall be paid to LV switchgear as end users and designers can select many alternatives, which may significantly impact the outcome. This paper will discuss some key design choices and present good practices to reduce footprint and costs as well as reduce CO2 footprint. It will focus on circuit breaker/fuses choice impacts at switchboard level, complementing the paper presented at PCIC Europe 2013, nominal voltage selection and some other design proposals enabling above optimizations.</p> <p>Circuit breaker/fuses choice: fuses are often perceived as a cheaper alternative to circuit breakers. That could be challenged from a Totex perspective, but the experience gained in supporting end-user projects clearly shows the smaller MCC footprint, leading to up to 10% cost reduction, not to mention lower electrical rooms costs and reduced GHG emissions.</p> <p>Nominal voltage selection: combined with appropriate product selection, shifting from 400V to 690V nominal voltage can bring significant optimizations, as demonstrated by relevant case studies.</p>	<p>Laurent Bloch <i>Scheider Electric</i></p> <p>Matthieu Guillot <i>Schneider Electric</i></p> <p>Jean-Philippe Herpin <i>Schneider Electric</i></p> <p>Philippe Angays <i>Technip Energies</i></p> <p>Victor Ascher <i>Technip Energies</i></p> <p>Benoît Stefanski <i>Schneider Electric</i></p>

Ref.	Title	Authors
EUR22_15	<p>Electric Discharges in Ball Bearings of Wind Turbine Double Fed Generator</p> <p>The Double Fed Induction Generator (DFIG) with a rotor fed by PWM converter through a slip ring is the most common architecture used for onshore windmills. Compared to motors fed by power electronic through the stator, this configuration is more severe for the electrical stresses in the ball bearings. The first part of this paper describes a 3.95MW DFIG system architecture powered by a 2-level voltage source inverter. The second part overviews the common mode voltage mechanisms from the drive inducing high frequencies currents in the bearings. A new indicator of bearing electric discharges is presented and completed by two others existing indicators for bearings electric lifetime. The last part focuses on recommendations of rotor grounding based on experimental measurements and lifetime prediction using the three indicators.</p>	<p>Lionel Durantay <i>General Electric</i></p> <p>Christophe Grosselin <i>General Electric</i></p> <p>Kum-Kang Huh <i>General Electric</i></p> <p>Gaetan Miclo <i>General Electric</i></p>
EUR22_16	<p>TRV Considerations when Switching a Large Captive Load with a MV Circuit Breaker</p> <p>Circuit breakers can undergo significant stress and fail to interrupt high currents when the power system has transient recovery voltage (TRV) characteristics that exceed the rating of the circuit breaker. This paper presents a practical case of flashover incident and failure of an indoor 34.5 kV switchgear at an industrial plant substation</p>	<p>Hamad Alsharhan <i>The Arabian Oil Company Saudi Aramco</i></p> <p>Basel Ishwait <i>The Arabian Oil Company Saudi Aramco</i></p>
EUR22_17	<p>Contents of Instructions Regarding Ex Equipment: Potential Enhancement Proposals</p> <p>Recent surveys have shown that a lack of consistency for the contents of instructions regarding Ex equipment. As a major contribution for safety regarding prevention and protection against explosion, the manufacturer shall provide to the user written instructions that include the necessary information for safe use, repair, maintenance and/or overhaul of the equipment concerned in accordance with the relevant standards or statutory and regulatory requirements, including any Specific Conditions of Use.</p> <p>In addition, regarding the intended use, considerations are suggested to enhance contents through</p> <ul style="list-style-type: none"> equipment category and/or EPL defined by the manufacturer (normal use and misuse); role of certification agencies regarding assessment of instructions; instructions as inputs regarding explosion risk assessment consideration, like hazardous area assessment (fuel dispersion, volume, hazard probability) due to the design of the considered equipment. <p>Suggestions are given to define contents of the instruction's manual considering the specific design and the intended use.</p>	<p>Xavier Lefebvre <i>exprevention</i></p> <p>Michal Gorny <i>exkontakt</i></p>

Ref.	Title	Authors
EUR22_18	<p>Improving VSD System Availability by using Fully Redundant Power Converters</p> <p>VSD Systems are thoroughly evaluated for their availability and reliability, when used in critical applications for Chemical, Oil and Gas plant. Critical and demanding process applications have traditionally been driven by steam and/or gas turbines, due to their well-known reputation in the market. Efficiency, environmental and life cycle cost considerations are motivational factors that encourage operators to replace these machines with fully electrically driven powertrains. The focus to avoid any unplanned process interruption has increased. Despite a power converters ability to automatically re-start following an interruption within a short time frame; associated critical processes may require more time to recover. Therefore, recently established specifications include requirements to use redundant elements. Having a second VSD converter used in a “hot stand-by configuration” reduces the risk of process disruption and allows maintenance activities, without process interruption. In this paper different VSD (LCI and VSI) and different system configurations will be compared. The performance will be described based on HiL simulation results....</p>	<p>Stephane Mouty ABB</p> <p>Axel Rauber ABB</p>
EUR22_19	<p>Theoretical and Experimental Investigations on Flameproof Enclosures for Ex Area</p> <p>More and more often, electrical equipment needs to be monitored and supervised by operators. So often the electrical equipment is inside enclosure that can be opened when necessary. Nowadays, most of equipment used in industries, such as Oil&Gas, chemical and pharmaceuticals plant, are electrical devices that can be exposed to flammable GAS or DUST. In this kind of ambient, any ignition source like a spark could ignite the substance and leads to a fire or explosion, therefore, the opening of the enclosure is not allowed. Flameproof enclosure (Ex d) with large window is becoming very important for hosting electrical devices in Ex area. These new products need to be designed and validate to support so, high mechanical strength (to avoid any possible deformation, failure of enclosure and flame transmission) and normally this validation is obtained by realizing real enclosure and doing experimental tests. To reduce the number of experimental tests, cost, and time of products design to validate a Flameproof enclosure in this paper the use of Finite Element Method (FEM) for stress analysis of an enclosure EJB stainless steel and Aluminum with large window has been described.</p>	<p>Kim Fumagalli Technor Italsmea</p> <p>Roberto Sebastiano Faranda Politecnico di Milano</p>

Ref.	Title	Authors
EUR22_20	<p>Life Extension of Power Transformers Through Proper Moisture Management</p> <p>Excessive moisture within the oil and insulating materials of a transformer has a significant effect on the life cycle of these critical and expensive assets. Moisture is one of the most influential elements that can accelerate ageing in oil, paper, and pressboard insulation, possibly resulting in severe damage and premature failure. In this session we will discuss how moisture accumulates, how it effects the aging process, and how significant damage or failure from excessive moisture can occur. We will look at ways to determine the amount of moisture that is present, and what drying options can be applied to eliminate moisture, potentially extending the life of the transformer. We will discuss the challenges associated with using traditional dissolved gas analysis, (DGA), or oils screens for moisture determination. and explore more modern techniques such a dynamic frequency response, (DFR). Included are specific case studies that will support the findings and recommendations.</p>	<p>Drew Welton <i>Intellirent</i></p> <p>Charles Sweetser <i>Omicron electronics Corp, USA</i></p>
EUR22_21	<p>Digitally Enabled Predictive Maintenance Solution for Electric Motors</p> <p>Advances in connectivity solutions, low-cost wireless sensors and cloud storage have made wider predictive maintenance for low voltage motor driven systems viable. Monitoring device with multi-parameter sensing functionality help monitor and trend wear of rotating machine components, and identify factors that contribute to such degradation. When compared to just monitoring overall vibration and temperature, capturing leakage flux and acoustic signals, and using advanced analytical methods add more to the detectability of likely faults. However present-day technology and solutions are not without challenges. This paper brings out the deployment of a wireless smart sensor-based solution as an integrated predictive maintenance system with remote monitoring for electrical motors at a Chemical plant. Application of maintenance support tools that use information from monitored assets to address maintenance needs in the short to medium term are also discussed. Successes of this approach have resulted to a 100% reduction in motor downtime and also helped with identification of process related issues, resulting in increased reliability and OEE.</p>	<p>Ankush Gulati <i>ABB</i></p> <p>Veronica Chew <i>ABB</i></p> <p>Cajetan Pinto <i>ABB</i></p> <p>Hock Cheong Ng <i>Denka Singapore Pte Ltd</i></p>
EUR22_22	<p>Commissioning Tests to Assure MV Power Cable Systems meet IEC/IEEE Standards</p> <p>Abstract: Many common solid dielectric medium cable system commissioning tests are not comparable with factory tests and provide little or no certainty of future performance. One of the most effective dielectric tests performed in the factory and the field on solid-dielectric cable system components is the off-line 50/60Hz partial discharge (PD) test. Data collected over the last two decades supported by test experience on over 200,000 cable system tests will demonstrate the significant improvement in cable system reliability performance that can be achieved using this approach in the field. Later in the paper: The off-line 50/60 Hz partial discharge diagnostic test offers a major advantage over traditional withstand tests, because it enables the cable owner to non-destructively detect partial discharge and pinpoint the defect location, providing the details necessary to take precise repair action without destroying the cable. Note: This paper will include 5 to 7 case studies, 2 to 3 case studies will be from petrochemical facilities.</p>	<p>Rene Hummel <i>IMCORP</i></p> <p>Ben Lanz <i>IMCORP</i></p> <p>Michael Joseph <i>IMCORP</i></p>

Ref.	Title	Authors
EUR22_24	<p>How to Digitalize an Equipment For Operational Excellence and Eco-Conception</p> <p>There are two possible approaches to the digitalization: one top-down, the other bottom-up. While the top-down approach seems reserved to operators because requiring a global overview of the digitalization, the Original Equipment Manufacturers (OEMs) and Manufacturers can bring part of the digitalization solution with a bottom-up approach. By digitalizing their equipment, OEMs and Manufacturers can not only reach higher operational excellence but also reduce the carbon footprint of projects and operations. The purpose of this article is to present a method and an example on how to digitalize your equipment. The first part will explain the logic and the pitfalls of the digitalization. The second part will be dedicated to detail the process for a successful digitalization. The last part will high light the theory with a practical case : the connected agitator, benefits and specifications.</p>	<p>Jean Guilhem <i>2B1st Consulting</i></p> <p>Philippe Eyraud <i>Mixel</i></p>
EUR22_25	<p>Digital Supply integration a key to low & unmanned installations.</p> <p>May 2021 Abb and Equinor launched a pilot project called Digital Supplier Integration, ABB collaborates with Equinor on digital integration to improve operations at offshore assets : https://www.youtube.com/watch?v=SBKo14I0rJ0 The focus in the abstract will be further value by onboarding other assets, development of new tools/ use cases/ use of AI/ML to earlier detect faults and predict several years upfront when maintenance is needed. Will also elaborate combination of other tools like different simulators to be able to predict the consequence if these component/system is failing. Since this is a collaboration with Equinor I will ask them to join in presenting the abstract. br Svein Edvin Håvåg</p>	<p>svein Edvin Håvåg <i>ABB</i></p> <p>Tor-Ole Bang-Steinsvik <i>ABB</i></p>
EUR22_31	<p>Creating an Algorithm to Identify Patterns from Power Generation ASSET & IIOT SO</p> <p>Understanding the real operational status of a fleet's assets is challenging and highly desirable, it can maximize the time between unexpected shutdowns and improve the fleet performance. Digitalized signals from industrial electrical and mechanical equipment are becoming more and more available at the automation level. Currently, most high value-added assets, such as compressors, pumps and generators, they are equipped with monitoring devices which can remove the asset from service in case of severe problems, as high temperature and excessive vibration. In general, these devices are unable to identify an incipient operational deviation, which in the medium to long term may cause a sudden shutdown or unavailability period. In this paper, a workflow is proposed to guide the algorithm creation process, focusing on the operational pattern detection, based on data from SCADA (supervisory control and data acquisition) or dedicated acquisition system. Additionally, the areas of competence and the interface between them are discussed observing the proposed workflow. To evaluate the proposed workflow, a classification model and a regression model are built.....</p>	<p>Mateus Nicoladelli de Oliveira <i>WEG</i></p> <p>Ademir Nied <i>UDESC</i></p>

Ref.	Title	Authors
EUR22_33	<p>Excitation of Natural Frequency in Large Motors by Double Frequency Test</p> <p>The double frequency test is a method widely used due to several factors that make it more attractive compared to others. The advantages of the test method for large engines will be evaluated and also presenting two cases of resonance.</p> <p>The first is a case of an induction motor with a shaft center height of 630 mm, six poles that have arrived for shaft recovery. In the initial condition, the vibration was approved. During the double frequency test, the rotor increased vibration over time. Near temperature stabilization, the vibration reached levels of 10 mm/s RMS.</p> <p>In the second case, an induction motor with a shaft center height of 710 mm, eight poles, in which high vibration above 50 mm / s RMS was detected in the heat exchanger during the double frequency test.</p> <p>The positive points reinforce the advantage of the test method and both examples demonstrate the necessary care with excitation of natural frequencies in rotating and static parts of motors.</p>	<p>Lucas Selonke Klaas WEG</p>
EUR22_36	<p>Min. Terminal Voltage on Running Synchronous Motors During Large Motors Starting</p> <p>This paper presents the influence of power system voltage drop caused by starting large motors on the performance of Direct Online (DOL) running three-phase brushless synchronous motors that are connected on the same bus. The principal contribution of this paper is to propose a method to calculate tolerable terminal voltage on the synchronous motors, both salient-pole and cylindrical rotor designs, under the condition of large motors starting. This paper suggests that the motor pull-out torque at rated voltage and frequency is the main criteria to be used for calculating tolerable voltage drop that will secure the motor from out-of-step condition. Based on that, the paper proposes minimum terminal voltage for synchronous motors that are calculated using International Standards pull-out torque values. A dynamic simulation, utilizing power system software, for the performance of running Medium Voltage brushless synchronous motor under large motor starting endorsed the calculated minimum voltage values.</p>	<p>Ali Alameer Saudi Aramco/Consulting Services Department</p> <p>Rami Dabbousi Saudi Aramco/Consulting Services Department</p> <p>Hussain AlMarzoug Saudi Aramco/Consulting Services Department</p> <p>Zeyad Balkhyour Saudi Aramco/Consulting Services Department</p>

The following tutorials will be presented at the 18th PCIC Europe 2022.

Ref.	Title	Authors
EUR22_34	Enabling Edge and Cloud Computing in the O&G Industry <p>Every business, including the Oil and Gas industry, relies on compute power to run and manage their operations. Most every organization today is utilizing private clouds, IoT applications, analytics, Edge computing, high performance computing and so on. These new technologies are driving the way we run our businesses today making the operations faster, more efficient and much more effective, but they also present challenges. The challenges, especially in the Oil and Gas industry, is how to quickly and effectively implement these technologies and do so in remote and sometimes hazardous areas. The answer is to implement a prefabricated data center, one designed and built to meet your needs and capable of being installed and operated in remote areas and able to withstand harsh environments. Learn how you can overcome these challenges with a prefabricated data center, a data center built to meet your requirements in a quality controlled factory and shipped complete to your installation location. Most are completely self contained and can be shipped and operated almost anywhere. Come learn more about this innovative, flexible data center solution.</p>	Brian Canney <i>Schneider Electric</i>
EUR22_35	How Medium Voltage Cables Fail - Fundamentals to Ensure Long Cable Life <p>Solid dielectric cable system failure mechanisms are often presumed unknown due to collateral damage at the failure site. On the basis tens of thousands of meter by meter cable profiles, thousands of defect locations, and hundreds of dissection, this paper will provided evidence to debunk three common myths namely, "cables last 40 years", "Water trees fail cable", and "electrical trees have very short lives." A utility case study involving thousands of kilometers of cable systems will be presented showing how effective cable system partial discharge (PD) assessments can be used to direct precise rehabilitation actions and extend the life of cable systems at a significantly lower cost.</p>	Rene Hummel <i>IMCORP</i> Michael Wallace <i>Duke Energy</i> Ben Lanz <i>IMCORP USA</i>

PCIC Europe Code of Conduct

1. PCIC Europe missions

The scope of the association is to hold an annual technical conference in Europe in the field of electrical, non-electrical and safety related items in connection with production, treatment and transport of crude oil and related raw materials and products, chemicals and chemical products and products of the Pharmaceutical Industry. The purpose is to share good practices and improve competencies of engineers working in the field of process industries.

2. Purpose of the Code of Conduct

European Petroleum and Chemical Industry Committee (PCIC Europe) is a not-for-profit association managed and operated by representatives of the process industry on a voluntary basis. Therefore it can only work from the dedication and commitment of the volunteers in charge. PCIC Europe Conferences involve different categories of people: Organizing Committees, Authors, Delegates and Sponsors. Each one of these categories has rights and duties to contribute to the success of the conferences. These rights and duties are described in different documents available when someone is joining one of these categories. In any case these documents may be subject to interpretation and cannot claim to be exhaustive. In order to avoid misunderstandings and misleading expectations, this Code of Conduct intends to draw the guidelines to contribute positively to the development of PCIC Europe and eliminate inappropriate behaviour that could compromise PCIC Europe missions.

3. Member / Organizing Committees

The members of the different Organizing Committees are volunteers. Generally their respective time allocation and costs are supported by their respective companies. Therefore the different Organizing Committees members:

- Shall register at the conference according to the conference terms and conditions
- Shall not benefit of any advantage regarding the conferences

- Shall not use their position in the Organizing Committee to “invite” people or give any advantage to other conference Delegate, Author, Sponsor.

- Shall not disclose unofficial information from internal documents or discussions to third parties without prior agreement from the organizing committee

- Shall adhere to anti competition rules as described in paragraph 7

4. Authors

The Authors contribute to the success of the conferences by the quality of their papers and presentations. In compensation they contribute to promote the expertise of their respective company. The PCIC Europe copyright is intended to give permission to PCIC Europe to publish the paper and to use it to promote its Technical Conferences. The copyright also states that the contents of the paper are the sole responsibility of the author(s). Authors retain all rights to the technical contents. Therefore the Authors:

- Shall register at the conference (as a minimum the presenting author) according to the conference terms and conditions

- Shall not benefit of any advantage regarding the conferences

- Shall not use their position to “invite” people or give any advantage to other conference Delegate, Author, Sponsor.

- Shall adhere to competition law code PCIC Europe as described in paragraph 7

5. Sponsors

The Sponsors are essential to the financing of the conferences and PCIC Europe is committed to maximize Sponsors visibility in respect with the sponsorship terms and conditions. PCIC Europe is also welcoming Sponsors initiatives that may contribute to the conference attractiveness within the PCIC Europe commercialism rules and sponsorship terms and conditions. In purchasing a sponsorship, the Sponsors:

- Shall register their representatives at the conference according to the conference terms and conditions

- Shall not benefit of any advantage beyond the sponsorship terms and conditions regarding the conferences.

- Shall not use their position to “invite” people or give any advantage to other conference Delegate, Author, Sponsor.
- Shall adhere to competition law code PCIC Europe as described in paragraph 7

6. Delegates / Conference attendees

The venue of the Delegates is the fundamental goal of PCIC Europe and in that respect all efforts are mobilized to satisfy them. As part of these efforts PCIC Europe is calculating the registration fees fairly in order to maximize the conference attendance. In addition PCIC Europe is welcoming all remarks and suggestions from the Delegates for improving the conferences year to year. In registering at the conference, the Delegates:

- Shall register at the conference according to the registration terms and conditions
- Shall not benefit of any advantage beyond the registrations terms and conditions regarding the conferences.
- Shall not transfer his/her registration to another person
- Shall not use their position to “invite” people or give any advantage to other conference Delegate, Author, Sponsor.
- Shall adhere to competition law code PCIC Europe as described in paragraph 7

7. Competition Law Code PCIC Europe

All members of and participants to meetings and events of PCIC Europe (collectively “Participants”) are held to comply with the prevailing antitrust and competition law rules. For that purpose, each Participant shall:

- avoid to discuss or share any commercial and/or strategic company information, including information about prices, profit margins or costs, bids, offerings, market share, distribution practices, terms of sales, specific customers or vendors
- avoid to engage in any agreements - formal or otherwise - to fix or set prices or allocate products, markets, territories or customers; Participants will ensure that meetings and conferences are preceded by an agenda listing legitimate topics and are followed by minutes in compliance with antitrust and competition law rules. Participants agree not to exchange any commercially sensitive or company strategic information during any formal and

informal PCIC Europe gathering. Non-compliance with this Competition Law Code may, at the discretion of the PCIC-Europe Executive Committee, result into the withdrawal of PCIC Europe membership and exclusion from PCIC Europe’s activities.

8. Freedom from Commercialism

The technical papers, tutorials and poster and related presentations will be free from commercialism by all authors whether affiliated with manufacturers, users, or contractors. It is acceptable to present valid technical data. It is not acceptable to show company logos, use company names, use trade names, use trademarks, use facility names, or use facility locations. This applies to written paper, the presentation file, and to the contents of the oral presentation. Company names may only be used together with the authors’ names and email addresses at the start of the paper and the first slide of the presentation file. They may not be included anywhere else in the presentation file, including the information band in the bottom of the slides. During question and answer sessions, participants shall refrain from asking any commercial questions. The PCIC Europe appointed session chair shall stop any discussions that contain commercial content. Sponsors shall confine commercialism at the conference within the limits agreed with PCIC Europe.

9. Closing remark

This code of conduct is required to be accepted by:

- authors and presenters, during the paper submission process,
- conference attendees, when registering
- sponsors, when accepting PCIC Europe sponsor quotation
- committee members, before the General Assembly accepts their nomination