PCIC EUROPE
PETROLEUM & CHEMICAL INDUSTRY COMMITTEE

17th PCIC Europe Annual Electrical and Automation Knowledge Sharing Event

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Electrical, Automation and Digitization Knowledge Sharing Event

PRELIMINARY PROGRAM

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PCIC MIDDLE EAST PETROLEUM & CHEMICAL INDUSTRY CONFERENCE

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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.

Conference Site
Radisson Blu Scandinavia Hotel
Amager Blvd. 70, 2300 København, Denmark
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Dear Guests,

Welcome to Copenhagen. It is Denmark's capital, sits on the coastal islands of Zealand and Amager and is linked to Malmo in southern Sweden by the Öresund Bridge. It is a city known for Danish fashion and design and a certain famous brewery.

Copenhagen's largest shopping area is centred around Strøget and is one of Europe's longest pedestrian streets with a wealth of shops, from budget-friendly chains to some of the world's most expensive brands. The stretch is 1.1 kilometre long and runs from City Hall Square (Rådhuspladsen) to Kongens Nytorv.

Another must visit area is Nyhavn (New Harbor), which is flanked by a street of the same name. Nyhavn was once a disreputable quarter of the city, but now, with its brightly painted gabled houses, containing restaurants and cafés.

At Langelinje Pier you will find one of Copenhagen's most famous tourist attractions. The Little Mermaid was a gift from Danish brewer Carl Jacobsen to the City of Copenhagen. On the 23rd August 2013 she turned 100 years old.

Tivoli Gardens amusement park in Copenhagen is a must for all visitors to the city, young and old. The Gardens were founded in 1843 and has become a national treasure and an international attraction. Fairy tale writer Hans Christian Andersen visited many times, as did Walt Disney who even found the inspiration to his own Disney World here.

Kronborg Castle, known worldwide as Hamlet's and Shakespeare's castle, is one of Northern Europe's finest Renaissance castles and moreover a UNESCO world heritage site. Every summer Shakespeare's drama is brought alive and presented to the castle's guests.

Being in the home of modern design, a must visit is to the Danish Museum of Art & Design. It features works of famous Danish designers like Arne Jacobsen, Jacob Jensen and Kaare Klint.

Your hotel – the Radisson Blu Scandinavia – is set on the picturesque Stadsgraven Canal. Close by is a Metro station that can take you to the airport or into the city centre.

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

Have a wonderful stay in Copenhagen.

Chris Thomason – Chair | Alexandra Soares | Marianne Holstein | Caroline Bishop | Lars Abild | Thibaut Jouvet

The following papers will be presented at the 17th PCIC Europe 2020.

Ref.	Title	Authors
EUR20_01	**FIRST O&G APPLICATION OF HYBRID POWER PLANT: SOLAR PV - BESS – CONVENTIONAL GTG** - A hybrid Power Plant solution integrating Solar PV, Energy Storage and conventional Power generation (i.e. Gas Turbine Generators) is applied for the first time to an Oil&Gas facility. An existing Oil&Gas Plant fed solely by conventional power generation is being upgraded with the installation of Solar Power Generation and Battery Energy Storage. The integration of these new systems has allowed the Operator to obtain gas savings and reduction in CO2 emissions. This paper provides insights into the project presenting the technical challenges and selection process that have been followed during project development and a technical overview of the configuration selected.	**Stefano Fasoli** *eniProgetti* **Paolo Cormio** *EniProgetti* **Raffaele Lauricella** *EniProgetti* **Matteo Marchesini** *EniProgetti*
EUR20_02	**Innovative Strategies for Internal Arc Flash Mitigation in L.V. Switchgears** Internal Arc Classification (IAC) of Low voltage switchgear according to IEC and IEEE standards is one of the most important requirements to guarantee personal safety in case of internal arc faults. One of the challenge is to find innovative solutions to reduce the arc at its trigging utilizing more specific insulating materials inside the switchgear. As known, there are three mains philosophies of Arc Fault Management: Active protection, based on monitoring of electrical devices; Passive protection, obtained using structural reinforcements and insulations, Avoidance philosophy, where the assembly guarantees a reduced risk of fault (e.g. the arc fault free zones). What this research is going to explore is the passive philosophy with the introduction of new design solutions. Various designs exist, but this paper present these innovative examples in order to improve the IAC solution.	**Luca Franzosi** *Skema S.p.A.* **Luigi Bellofatto** *Skema S.p.A* **Roberto Sebastiano Faranda** *Politecnico di Milano* **Kim Fumagalli** *Excen*
EUR20_03	**NEW IEEE STANDARD ON INDUSTRIAL AND COMMERCIAL POWER SYSTEM HARMONIC STUDIE** This paper reviews the latest IEEE Std. 3002.8 “Recommended Practice for Conducting Harmonic Analysis Studies of Industrial and Commercial Power Systems”. The standard replaces the existing IEEE Std. 399 (Brown Book) Chapter 10 with many new enhancements and additions. The new standard systematically addresses requirements and recommendations for performing power system harmonic studies, including developing system models, modeling various harmonic sources and electrical equipment and devices, preparing required data for modeling and studies, validating model and data, selecting study cases, and analyzing results and outputs from the studies. The latest IEEE Std. 519-2014 is referenced in the standard. Illustration examples are provided to help engineers to further understand harmonic studies and expected results. The author of this paper is the co-chair of IEEE Std. 3002.8 working group.	**JJ Dai** *Eaton Corporation*

Ref.	Title	Authors
EUR20_04	**Implementing IIoT and smart electrical distribution systems in an existing FPSO** Abstract — As connected technologies and Industrial Internet of Things (IIoT) prove their effectiveness along the value chain in industry, digital solutions are now being considered at the heart of business transformation for various major Oil & Gas players for their electrical infrastructure. Monitoring has been implemented for many years using IED (Intelligent Electronic Device) and ENMCS (Electrical Network Monitoring and Control System) allowing smarter operation. IIoT and predictive analytics are a step further to allow informed decision making to reduce unscheduled downtime and optimize maintenance operations by leveraging the data available. Many details must be considered to implement a smart electrical distribution system: Iot sensors, data collection, communication infrastructure, cybersecurity, on premise and cloud-based monitoring service. This paper explores the design, considerations, issues, and implementation of such smart electrical distribution system on an existing FPSO (Floating, Production, Storage and Offloading).	**Mark Pacelle** *Schneider Electric* **Francois Deturck** *TOTAL Exploration & Production* **Mark Pacelle** *Schneider Electric*
EUR20_06	**Hybrid Technique Load Forecast and Estimation for upstream Oil & Gas Industry** Investment of power generation infrastructure is one of the key portions in Oil & Gas production projects. The infrastructure must support all production facilities covering requirements of sales agreement and long term field development plan. The load forecast and estimation shall be developed at the early phase to identify the power demand which significantly impacts on project CAPEX. As the traditional practice, the total load demand is calculated based on equipment rating. The result is satisfy for mid- and downstream of Oil & Gas industries. However, this method does not satisfy for upstream industry, because of uncertainty from process variation and production profile. The “Hybrid Technique” was thus invented and implemented to two (2) Oil fields in the year 2014 and 2017 which benefit in CAPEX saving of $30 million and early production gain of six (6) months respectively. This paper presents the new methodology to estimate the load forecast by taking the digital data of process and related operation parameters into account. Moreover, the method has been tested and validated to ensure a satisfactory result for all similar upstream projects.	**Boonyalit Tangjitkongpittaya** *PTTEP* **Niyom Kanokwareerat** *PTTEP*
EUR20_07	**ARC FLASH HAZARD MITIGATION TECHNIQUES IN PRACTICE** Abstract – This paper presents practical mitigation techniques to reduce incident energy, by graphically visualization of theoretical and empirical studies in order to understand the dynamics of parameters that influence the energy released during an arc flash fault event. The practical use of mitigation techniques is based on the hierarchy of control measures from NFPA 70E. The subjects in focus are; Substitution of existing equipment and recommendations for good design practices, Engineering controls to reduce the arcing current or the arc duration, increase the working distance and introduce work procedures. All is to make electrical work safer and to ensure high reliability of electrical system performance. For further considerations a method to handle cases of generator near nature in relation to arc flash calculations is proposed.	**Jeppe Olander** *ABB* **Thomas V. M. Nielsen** *ABB*

Ref.	Title	Authors
EUR20_08	**A Sucess Story of Steam Turbine Replacement by High Speed Electric System** Thanks to the development of high-speed induction motor and voltage source inverter, standalone electric drivers are today an alternative to traditional train driven by steam and gas turbine when regulating the operating speed of compressor, improving the system efficiency and reducing significantly the emission of greenhouse gases as requested by the new European regulations. This will be developed in the first introductory part of this paper. The second part of this paper describes the main expectations and challenges of the end-user in term of project time line, reliability, inter-changeability and site electrification based on actual business case in Nederland operating at 5.5MW at 6400rpm. The third part overviews the selected architectures of electric systems delivered to the end-user, including the induction motors and Voltage Source Inverters technologies. The last part is dedicated to the key technical milestones, during the design phase, Factory Acceptance Tests and commissioning with a focus on the mechanical integration when using oil lubricated bearings. The conclusion highlights the learnings and the win-win cooperation of this project.	**Lionel Durantay** *General Electric* **Damien Spannagel** *General Electric* **Daan Van Gemert** *Shell* **Jackie Lava** *Shell*
EUR20_09	**Heat tracing of 1500 km pipeline** This publication will identify the design, functional requirements and installation challenges for a Long Line Heat Tracing system (LLHT) which will be used to the safe and efficient operation of an onshore export pipeline in Africa. LLHT cables will be installed in a raceway under the insulation on the pipeline in order to keep the waxy crude oil from precipitating wax (Temperature shall be maintain above 50°C at all times). LLHT system will be supplied by sections of 30 km in length arranged so that the entire pipeline, around 1500 km, is covered by LLHT cables. LLHT system principle is a new technical approach based on Joule effect phenomena (finite element modeling by Comsol has been performed to validate and qualified the heating system) , on the use of a standard 6 kV/10 kV, 35 mm² XLPE cable in place of classical heat tracing system (e.g. skin effect) and for a very long distance .	**FREDERIQUE ESTER** *TOTAL EP* **FRANCK REY-BETHBEDER** *Total*
EUR20_10	**Energy Management System - interconnected O&G OFFSORE facilities - Success story** From FEED to start-up, the key aspect and focus turning out successfully each phase of the project FEED: set definition of network architecture - communication protocols - contractual interface and coordination with other packages (e.g. OPC, SCADA, UCP and IED) - I/O list - functions (control) and supervision (HMI) of power generation and electrical distribution systems - data acquisition, storage and monitoring – obsolescence. Detail design: execution of the above definitions – issuing testing procedures - run interface validation tests with other packages – assembly of ECS and simulator (dummy) ECS hardware – development of ECS software - FAT and iFAT Worksite: Supervision of Installation and mechanical completion on site. At-shore, Offshore commissioning and start-up - Performance, availability, reliability and maintainability. Future: extension, expansion, interconnection, upgrade – versatile, hybrid, combining existing gas power generation with several renewable energy resources (wind, solar, hydropower) and storage systems (battery, fuel cell).	**GUILLAUME ROBINE** *TOTAL SA* **Philippe AUSCHER** *GE Power Conversion*

Ref.	Title	Authors
EUR20_11	**Electrical Equipment Design Considerations for Now and the Future** We are living in exciting times as engineers with the consolidation of many new innovations that we know of and many new capabilities on the horizon. Along with these introduction technologies come greater expectations by the end user of the equipment that we are implementing today in many areas including, but not limited to, integration, safety, predictive maintenance, ease of use, efficiency, etc. . Further to this, how do we anticipate the further changes which are to come in the areas of artificial intelligence, augmented reality, and those that are yet unknown? As we become more connected, there are the concerns related to security. The intention of this paper is to look at the changing landscape for the designer in terms of Industrie 4.0 (IIoT), data management, asset management, lifecycle, etc. with the intention to review these new requirements and how to manage them.	**Richard Paes** *Rockwell Automation* **Jitendra Bharthi** *Fluor Canada* **Terence Fernandes** *Rockwell Automation* **Janet Flores** *Rockwell Automation*
EUR20_12	**Power System Automation Key Performance Indicators** Power System Automation has high impact to electrical power systems Safety, Reliability, Cybersecurity In addition to the performance Evaluation of plants'. However, if the power system has not been utilized properly and the health was not maintained, the PSA will lose its effectiveness and the positive impacts to the overall power system. The PSA has a lot of distributed component in several substations and control room that has to be functioning properly. This paper will introduce a method to measure health, utilization and safety aspects.. The method addresses the measures in three categories 1. Health of each component of the PSA; i.e., IED, IT/Computer, Annunciator panel, Switches, GPS Clock and DCS Connection 2. The proper utilization of the PSA by responding to the alarms in time 3. Safety measures, which is related to monitoring local and remote switching Well known key performance indicators (KPIs) from other fields of automation and according standards will be evaluated and transferred to the PSA domain. Those adapted or newly created KPIs will enable the identification of areas of improvement and upgrade the overall PSA performance.	**Hussain Marzoug** *Saudi Aramco* **Felix Steinlechner** *COPA DATA* **Mohammad Al-Emam** *Al Mashariq*
EUR20_13	**Electrical Control Systems – process control interface design** Adoption of integrated Electrical Supervisory Control and Data Acquisition systems for the control and monitoring of electrical distribution equipment has presented challenges across a global portfolio of projects and operating assets. The former transition from discrete hardwired to serial interfaces mainly suffered due to interface latency due to the hardware and software limitations. The subsequent natural progression to serial interfaces over Internet Protocol network communications has to some degree mitigated the early latency issues. However, this paper outlines the investigations findings as a result of a global portfolio of major projects and operating assets suffering process control interface issues, where the majority impacted the project start-up schedule. The investigation team established several lines of enquiry encompassing the system interface designs, technology limitations, contractual framework with equipment suppliers and personnel competence. The work concluded in the development of an Upstream Segment specification and associated proof of concept testing of less utilised protocols for process control interfaces.	**Alex Waslin** *BP* **Michael Wilson** *Powell Industries* **Dibyendu Bhattacharya** *BP*

Ref.	Title	Authors
EUR20_14	**CREATING AN ALGORITHM TO IDENTIFY PATTERNS FROM TIME SERIES DATA & IOT SOLUTIONS** Engineers recognize the importance of oscilloscope measurement to troubleshooting issues. Digitalized signals from electrical, mechanical and other physics are already available at automation level. Using specific triggers to catch relevant events, this data can be framed into "pictures" and recorded, characterizing the operation of industrial assets. The trigger and the sampling frequency are key factors, which must consider the event nature and data analysis technique. This data will become the machine “memory”, the training data set. For advanced data analysis, the time series analysis from steady state and dynamic events can offer valuable insights, helping on finding operation patterns and deviations. Create a machine with “feeling” to distinguish normal and anomalous operation is a trick challenge, which need adequate data and high-level team to use and develop specific techniques to reduce the learning process. This paper is intended to present a data analysis exploratory work using synthetic and real data from a power generation asset. Some findings and important conclusions about pattern recognition are commented.	**Mateus Nicoladelli de Oliveira** *WEG*
EUR20_15	**Differences between the ATEX directive, the IECEx Scheme and N.A. regulations** In this globalized world, projects are awarded to international engineering firms and vendors located outside of the end user country. This scenario brings additional challenges to all parties involved and requires a full understanding about the differences between standards and regulations of many different countries.Depending on the end user country, exporters and manufacturers of Ex equipment will be regulated by different standards, codes and regulations that will govern the product approval process and the necessary factory inspections. This paper will address some of the most damaging misconceptions about the electric motors certification for North America and the main differences to the ATEX Directive and the IECEx scheme. It is really important to have a full and clear understanding of these myths and differences in order to make informed decisions, assuring this way compliance with the standards, codes and regulations whilst guaranteeing the safety of people and installations.	**Pedro Maia** *WEG* **Amir Kianimanesh** *CSA Group* **João Cardante** *WEG*
EUR20_16	**Subsea electrification applications and technology qualification results** The use of subsea processing equipment’s, which maintains, increases and speeds up oil and gas production, is now more and more widespread on offshore subsea oil and gas field developments. To meet the technical challenges of these developments, subsea transmission, distribution and conversion electrical equipment’s are developed through the ABB Subsea Power JIP where ABB, Equinor, Chevron and Total are partners. In the first part of the paper, Equinor and Total will present the foreseen subsea processing applications to use electrical subsea transmission, distribution and conversion equipment’s. In the second part of the paper, ABB will present the subsea Medium Voltage Variable Speed Drive and Medium Voltage Circuit Breaker modules developed to enable subsea factory vision, then give the technology Subsea Power JIP qualification results and technology readiness level.	**Edouard Thibaut** *Total E&P* **Svein Vatland** *ABB* **Øyvind Holm Snefjellå** *Equinor* **Faradj Tayat** *Total E&P*

Ref.	Title	Authors
EUR20_17	**Important Considerations for Testing and Commissioning Digital Relays** The advantages of digital technology for power system protective relays are now commonplace within the industrial power producing industry. Digital relays provide unsurpassed reliability and extended capabilities at a very economical cost. Keeping pace with testing and commissioning requirements of these devices has proven to be a challenge for both protective relay engineers and technicians. While testing procedures have been well-defined for single function electro-mechanical protection devices, modern relay test procedures have been left up to individuals to develop, creating possible shortcuts that may compromise the protection system operation.In this session, we will show examples of some common mistakes typically observed during testing and commissioning process, and suggest ways to avoid them with simple to understand guidelines. Whether the commissioning and testing process is left up to independent testing companies, or performed in-house, we will provide guidelines to avoid possible misoperations.	**Drew Welton** *Intellirent*
EUR20_18	**Competency management for explosive atmospshere fom an EPC poin of view** Managing explosion risk in our industry is a must have. It is not a question of chosing the right equipment for a given risk, but also to deeply understand the context in order to mitigate all possible risks. This paper will present the organisation put in place in an EPC company to cover both the competency management along the complete supply chain and the procedures attached in order to control the job down to the establishment of the Ex register and the verification dossier required by IEC 60079 - 14	**philippe Angays** *Technip*
EUR20_19	**Tyra Redevelopment – Newest all-electrical platform in Danish North Sea** The Danish Tyra field has been producing for over 30 years and the central processing and accommodations platforms are now being renewed. The design of the new process platform includes 3x32MW@11kV generators which are supplying the load where largest VSD driven compressor motors are 15.9MW and in a gearless design operated at up to 250Hz. The paper has a general description of the power generation and distribution system with over 100 switchboards in Internal Arc Classified (IAC) design. The considerations for generator time constants, switchboard rating, switchgear breaking capability, VSD design with transformers, harmonics etc. are discussed. The new process platform shall provide power to existing wellhead platforms (WHP) over sub-sea cables and to avoid modifications on existing WHPs, there are additional requirements to voltage drop and minimum short-circuit levels etc.	**Preben Jakobsen** *Ramboll* **Ellert Traustason** *Total*

Ref.	Title	Authors
EUR20_20	**Large Battery Integration in LNG plants** The Paris Climate Agreement has set the long-term vision for the management of Green House Gases (GHG). For the LNG industry, it means a significant reduction in carbon footprint. The electrical power generation for LNG plant typically has a spinning reserve philosophy of “N+1” Gas Turbine Generators (GTGs). An abatement opportunity is the replacement of part-load GTGs with a Battery Energy Storage System (BESS), allowing the plant to turn off the operating spare power generation unit and operate as (N+BESS). By doing this, the remaining units will operate at higher load and consequently at a higher efficiency. This paper examines the technical aspects of deploying a large BESS, based on Li-ion batteries, into onshore LNG plants. For an example feed gas constrained plant, the benefits are: GHG and NOx reduction GTG running hours reduction LNG production increase Improved power quality and faster dynamic response The aspects addressed in the paper are: Will it work? The functionality of the BESS to stabilize the electrical system in case of a trip of the running GTG Is it safe? The safety aspects of a large-scale BESS installed on an operating LNG plant	**Ekansh Aggarwal** *Shell* **Paul Donnellan** *Shell* **Arie Bal** *Shell*
EUR20_21	**Electric motor fault diagnosis based on advanced analysis of the stray flux** This paper presents the most novel research concerning the application of novel technologies for condition monitoring of electric motors based on the advanced analysis of the stray flux. The analysis of the magnetic field in the vicinity of the motor has proven to provide very useful information for the diagnosis of several failures. This technique has drawn recent attention due to the advance in the technology of necessary sensors, simplicity, non-invasive nature and low cost. The paper presents the different variants within this technology including the classical method based on the stationary analysis of the flux as well as recent techniques relying on the advanced analysis of transient flux signals. The paper includes experimental results in motors with different failures as well as real industrial results and proves the potential of this technology for becoming a reliable source of information for the determination of the motor health.	**JOSE ALFONSO ANTONINO-DAVIU** *UNIVERSITAT POLITECNICA DE VALENCIA* **ALFREDO QUIJANO-LOPEZ** *Universitat Politecnica de Valencia* **VICENTE FUSTER-ROIG** *Universitat Politecnica de Valencia* **PEDRO LLOVERA-SEGOVIA** *Universitat Politecnica de Valencia*

Ref.	Title	Authors
EUR20_22	**Integrate System Computer Model and Monitoring Date Into Digitalization Platform** Digital lifecycle of a facility really starts from system design phase. From electrical system perspective, during conceptual design, data and information are generated, evolved and carried over following a roadmap as system status changes from As Design, to As Construction, finally to As Build at which point a static digital-twin of the electrical system is created. Computer software tools used to perform electrical system design and studies provide a natural and perfect storage for digital information on system structure, configuration, operation philosophy, and equipment details. Further, when the system is in online operation, real-time measurements will continuously provide information on system operating status, equipment performance, energy consumptions, etc. These measurements together with system computer model form a dynamic digital-twin of the system in operation. This paper explains how to integrate all data to overall digitalization platform of the facility, suggests applications to reduce OPEX cost, improve operation safety, enhance preventive maintenance, and protect system from downtime by intelligent and advanced algorithms.	**JJ Dai** *Eaton Corporation* **Richard Dourian** *Eaton Corporation*
EUR20_24	**Recent changes in IEC Standards for rotor and stator winding insulation testing** Testing of the insulation systems of rotating machines is a key element in ensuring the fitness for service for new machines and those currently in operation. There are numerous international standards that govern the testing of rotating machine insulation systems including those published by IEC and IEEE. A number of these standards have been in common use for many years, however, recently a number of new standards have been (or are being) developed, or existing documents substantially revised (or under revision) to address issues such as, Off- and on-line partial discharge testing of stator windings Dielectric dissipation factor testing Insulation resistance testing Qualification testing of partial discharge resistant insulation systems for inverter fed applications Off-line PD testing of rotating machines subject to repetitive voltage impulses Turn insulation testing of rotor and stator windings The proposed paper will briefly describe the purpose of these new or developing standards and the changes from existing documents.	**Howard Sedding** *Iris Power* **Greg Stone** *Iris Power* **Mladen Sasic** *Iris Power*

Ref.	Title	Authors
EUR20_25	**Excitation of natural frequency in large motors dy double frequency test** 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. 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. 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. 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.	**Lucas Selonke Klaas** *WEG* **Lucas Klaas** *WEG*
EUR20_26	**Remote Smart IOs Gain : Myth or Reality ?** For the last few years, Control System vendors have proposed as basis to use the new technologies of Input/output cards , named by TECHNIP “Smart I/O” to replace conventional Input/Output cards and racks and they can be directly mounted in field instead of using conventional junction boxes. Many projects could be equipped with this Remote Smart IOs technology in order to ease engineering studies, to simplify construction activities and to improve schedule. However, most of projects hare facing multiple complex environment such as hazardous area classification, blast constraints, environmental specificity, local regulation etc. that request multi-discipline works and detailed benchmark to evaluate cost saving solution. We propose to share as an engineering company our current point of view on this topic.	**Frederic Lambert** *TechnipFMC*
EUR20_27	**Min. Terminal Voltage on Running Synchronous Motors During Large Motors Starting** 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.	**Ali Alameer** *Saudi Aramco/Consulting Services Department* **Joachim Zwick** *SIEMENS/Dynamowerk* **Rami Dabbousi** *Saudi Aramco/Consulting Services Department* **Hussain AlMarzoug** *Saudi Aramco/Consulting Services Department*

Ref.	Title	Authors
EUR20_29	**Digital Twin (DTW) What is this animal?** Digital twin is today a buzzword around the planet and not everybody can have a comprehensive understanding of what it is and what it is for. In this article, our intention is to explain/define what is a digital twin, to introduce the different types of DTW, with some illustration (aerospace & building). In a second part, the intention is to describe what are the prerequisites in an engineering organisation to reach the maturity of being able to do a DTW (integrated tools, data driven organisation…) and how to manage DTW during a project execution (from front end engineering to hand over to operation, with the added complexity of change orders). In a third part, we will write about digital twin for industrial operation: what are the customers/operation expectations from engineering : easy access to the complete project documentation (3D, 2D, process and technical specifications, operational manual, maintenance data and PM linked to MMS…), and to the process simulation part, what needs to be done for the real time process modeling part (with real time data acquisition and real time data reconciliation)	**Cécile GAUDEAUX** *Air Liquide* **Jean-François RAUCH** *AIR LIQUIDE* **Jean GUILHEM** *2B1st Consulting*
EUR20_30	**OPPORTUNITIES FOR FURTHERING THE ELECTRIFICATION IN HEATING PROCESSES** Fifty years ago, the concept that “steam was not free” became a reality in the process industry. The process industry has realized and perfected the use of electric heating as a highly efficient and in many cases a less costly energy source. Electric process heater manufacturers provide heating solutions for temperatures under 780°C. These solutions are utilized in trace heating, space heating, heating of process fluids (gases and liquids) and conductive heating of solids. Centralized large-scale power generation can allow improved efficiency in converting fossil fuel to electrical energy. The growing production of renewable power gives excess power to the grid. Combining this with targets for the industry on the reduction of the use of natural gas for process heating, a substantial contribution in the reduction of greenhouse gases can be achieved. This paper will present numerous process heating applications where conversion to electric heating source opportunities may exist. A feasibility study will be presented that transforms a cogeneration based steam energy supplied production unit to one that uses an electric steam boiler.	**Ben Johnson** *Thermon* **Wilbert Witteman** *SABIC* **Roy Barth** *Thermon* **Alenjandro Maldonado** *Thermon*

The following tutorials will be presented at the 17th PCIC Europe 2020.

Ref.	Title	Authors
EUR20_23	**Enabling Edge and Cloud Computing in the O&G Industry** 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.	**Brian Canney** *Schneider Electric*
EUR20_28	**How Medium Voltage Cables Fail – Fundamentals to Ensure Long Cable Life** 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.	**Rene Hummel** *IMCORP* **Michael WALLACE** *Duke Energy, (USA)* **Ben Lanz** *IMCORP USA*

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