PCIC EUROPE
PETROLEUM & CHEMICAL INDUSTRY COMMITTEE

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14th Annual European Conference ///////////// May 16th-18th, 2017
Vienna Marriott Hotel, Austria //

Electrical and Instrumentation Applications & Automation

FINAL PROGRAM

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PETROLEUM & CHEMICAL INDUSTRY COMMITTEE

Conference Site

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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.

Welcome to Vienna!

Dear conference attendees,

The Petroleum and Chemical Industry Committee (PCIC) Europe is carefully selecting its conference venue cities. We try to be in the vicinity of chemical industrial production locations to attract local engineers and by choosing a different city each time expand our attendee's network. Vienna is a great capital with an emperial history, which you will hopefully be able to explore during our conference week. The Oil, Gas and Chemical industry in Austria can be found at the borders of the Danube River. In Vienna, OMV has a large petrochemical complex. I'm happy to announce that one of their leaders will deliv er a key note speech this year. Other major players in the chemical industry in Austria are Asota, Borealis, Evonik, Henkel and Sunpor. Hopefully their Electrical Engineers join us in this year's conference.

Between early 2015 and early 2016 the oil price dropped from more than $100 to nearly $30 and is now stabilizing at $50. This has put a break on investments in the oil and chemicals sector. The focus of the chemical industry is currently on consolidation. I challenge Electrical Engineers to find opportunities in the conference program to help them suggest improvement proposals on costs, effectiveness and efficiency in their company. I would be happy to receive such feedback that helps us to select the most attractive papers from the abstracts that you submit for next year.

This year we introduce a new opportunity to give feedback. The PCIC-Europe conference started in 2004, without any advertisement. Only peer-to-peer word of mouth was practiced. A revolution in social media took place since. It goes without saying that, to involve the next generation of Electrical Engineers in the knowledge sharing, these social media shall play an important role. In Vienna we will record video testimonials, which, only after your approval, will be published. When, what and how is still under development. Even when using different ways to attract attendees, we still need our network to practice the word of mouth. I especially call on the Electrical Equipment Manufacturers and Electrical Service Providers, because you have the closest contacts with the end-users and with your positive voice about the conference content and network opportunities, PCIC-Europe conferences we will continue to provide this knowledge sharing platform.

PCIC-Europe for the first time this year has a code of conduct that all participants, sponsors, authors and committee members are requested to acknowledge. With this code we want to demonstrate the priority of ethical behaviour and focus on technical content regeardless of origin.

I close this prefix with a big "thank you" to the Local Committee. Thanks for all the details they have been taken care of and it is because of their teamwork that we join today in this beautiful environment and I assure you that they have done the utmost to make this conference enjoyable.

Welcome to Vienna

Peter Pieters
Chairman PCIC Europe

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Welcome to Vienna

Dear conference attendees,

After the success of the Berlin Conference in 2016, the choice of Vienna in Austria came to the Petroleum and Chemical Industry Committee (PCIC) Europe as an evidence. These cities are more and more emerging in Europe as international cities, not only for diplomatic reasons but also as the cross road of various economical and industrial dynamics.

The digitalization of the oil & gas and petrochemical sector as many other branches have opened access to multiple new players from all sizes but with a common point: All these companies bring value because of their innovative solutions. Over the last three years the brutal cut by 50% of the oil and gas prices has tilted a mental chock and triggered a major cultural change in our industry, moving from religious conservatism to open innovation as the only condition to survive in the new economic environment.

In this context where technology becomes again the key driver of success to reduce costs, improve performances, protect people and preserve environment, PCIC Europe is very pleased to take its role as major contributor to this new paradigm through its annual conferences in Europe and in Middle-East.

The technical program for this Vienna edition is promising to be very exciting and rich of learning as the result of an intensive competition between the largest ever submission of papers from highly diversified profiles of authors and companies. A couple of years ago, only happy few experts had an idea about Industrie 4.0, today this topic and all associated technologies, and applications, are a master piece of our program.

As usual you will have the opportunity to extend your relationships and exchange of experiences in the Hospitality area and hospitality suites where the sponsors will be more than happy to welcome you regardless your company. These good practices are also part of PCIC Europe culture and we are proud of it as they settle the success of these conferences over the years.

Welcome to Vienna!

Jean-Charles Guilhem
Chairman of the GA Board PCIC Europe

14th Annual PCIC Europe Conference 2017 in Vienna

Dear guests,

On behalf of the local committee, *"Willkommen in Wien"*.

Following on from Berlin in 2016, Vienna is both a cultural center and business powerhouse of Europe. Historically evidence has been found of continuous habitation since 500 BC when the site of Vienna on the Danube River was settled by the Celts. In 15 BC the Romas created a military Camp, called "Vindobona". Vienna grew to an important trading site in the 11th century, became capital of Babenberg dynasty and the Austrian Habsburgs. During 19th century Vienna became the capital for the Austrian Empire and later Austria-Hungary.

The United Nations founded their third official seat here. Since the fall of the Iron Curtain 1989 Vienna has expanded its position as gateway to Eastern Europe – more than 300 international companies have their Eastern European headquarters in Vienna and its environs. The number of international business is still growing.

Vienna is the capital and largest city of Austria located in the eastern part of Austria, has a population of more than 1,8 million and is the 7th largest city in the European Union. Apart from being regarded as the "City of Music" bause of its musical legacy, Vienna is also said to be "The City of Dreams" because it was home of the world's first psycho-analyst Sigmund Freud. The historic centre of Vienna is rich in architectural ensembles including Baroque castles and gardens, and the late-19th-century Ringstraße lined with grand buildings, monuments and parks. Vienna's centre was awarded as UNESCO World Heritage Site.

Art and culture has a long tradition in Vienna, including theatre, opera, classical music and fine arts (Burgtheater, State Opera, Vienna Philharmonic Orchestra…). The most famous museams are located in The Hofburg with the Imperial Treasury of the Habsburg dynasty, a number of museums are located in Museumsquartier, the former Imperial Stalls which were converted into a museum complex in the 1990s. It houses the Museum of Modern Art (MUMOK) the Leopold Museum (largest collection of paintings of Egon Schiele)

Culinary specialities include: Wiener Schnitzel and Tafelspitz and has a long tradition of producing cakes and desserts (Apfelstrudel, Sachertorte) which you can enjoy in the famous Viennese cafés and do not forget the Austrian wines. Vienna is one of the few remaining world capital cities with its own vineyards.

"This year's conference location will offer the participants an environment for learning, networking and relaxing with industry experts from all corners of the globe." We hope you enjoy the conference and your stay in the wonderful city of Vienna.

The Local Committee PCIC Europe 2017
Jeremy Andrews – Chair | Alexandra Soares | Karin Kerstin Glatz-Krainz | Gerlinde Racek | Wolfgang Feger | Manfred Engleder | Thibaut Jouvet | Paul Donnellan | Bert Engbers

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The 2017 PCIC Europe technical program

Dear attendees,

Welcome to PCIC Europe and welcome to Vienna.

Following the success of the conference in Berlin 2016, we have endeavoured to continue to incorporate control and automation into the conference schedule. This reflects the increasing level of integration of systems which we see coming into petroleum, chemical and pharmaceutical industries, including upstream and downstream activities. The programme also reflects the continued industry focus on cost-effectiveness and plant security, reliability and availability.

On day one we have arranged a morning of tutorials with a high level of end-user experience included. The longer length of the sessions allows a more in-depth exploration of the subject matter and plenty of time for questions and discussion. The topics range from ageing asset integrity, cost-efficient design, equipment protection, developments in automation and cyber security.

We have plenary sessions with a wide range technical content, aimed at a broad cross-section of the attendees, with the intent to inform and provoke discussion. Parallel sessions are arranged so that papers with more control and automation focus are presented as far as possible in one room for the convenience of presenters and attendees.

In the following pages you can find details of our technical programme complete with short abstract summaries of the individual sessions to help you plan your PCIC Europe experience.

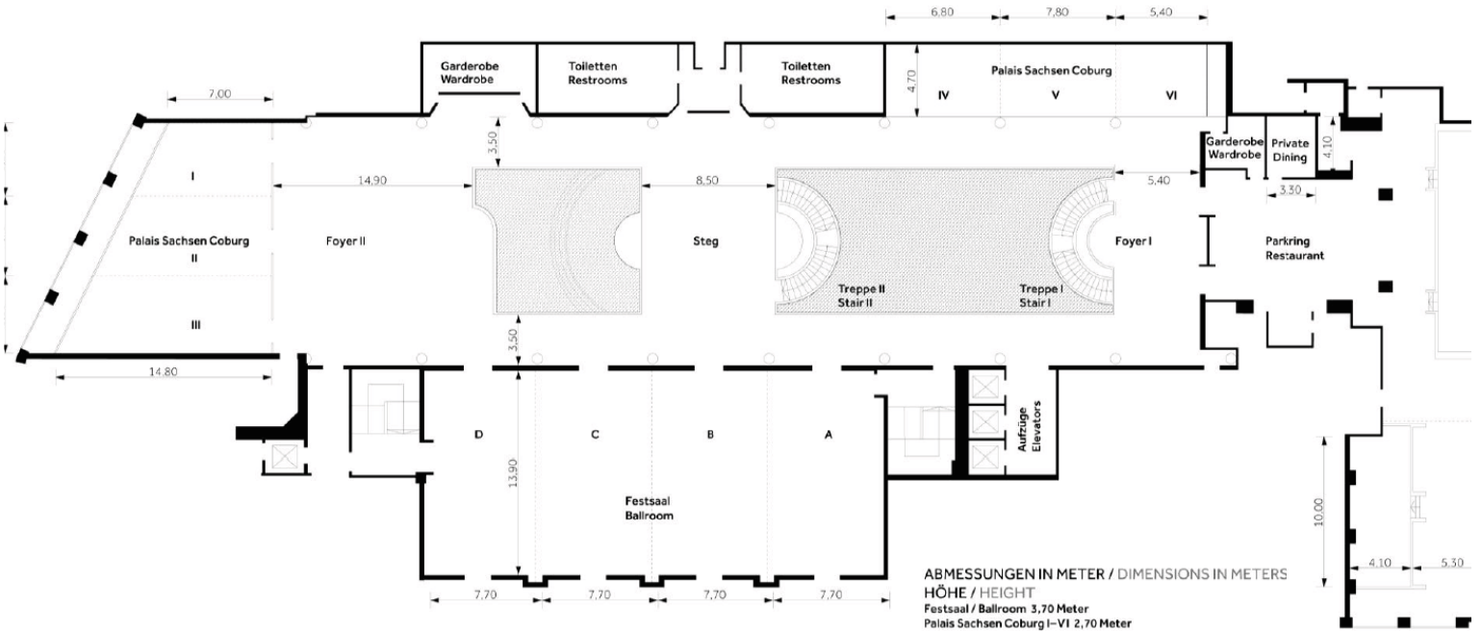
Please take opportunity to ask questions, meet with the presenters, authors, exhibitors and conference organising committee. We are happy to discuss your ideas to contribute to the future conference events and welcome your input: What subjects would you like to see more of? Would you like a new or different subject to be covered?

Lastly, a reminder that PCIC Europe depends upon contribution from attendees, including preparation and presentation of papers. If you have an idea for a future contribution, please contact any member of the organising committee; we are happy to discuss and help.

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

Paul Donnellan
PCIC Europe Vice Chair (Technical Chair)

Conference Rooms



Hospitality Suites:

Room #202: SELINC
Room #302: Dialight
Room #324: WEG International
Room PSC IV/V/VI: ABB AG
Room PSC I: QHi Group

Programme

Monday 15th May 2017

18:00 – 21:00 Registration at welcome desk
18:00 – 0:00 Hospitality suites are open

Tuesday 16th May 2017

Time	Ballroom A/B	Ballroom C/D	Coburg I/II/III
8:45 – 10:15	EUR17_60 How to start your large motors: typical solutions or new motor design?	EUR17_45 Reliability and Life Extension for Aging Industrial Power Systems	EUR17_65 Industrie 4.0 Architecture Update in Respect with international standards
10:15 – 10:45	**Coffee**		
10:45 – 12:15	EUR17_62 Protection of electric motor in the oil and gas industry		EUR17_63 Cyber Security in Energy Automation with IEC 62443
12:15 – 13:15	**Lunch**		
13:15 – 13:30	Notices		
13:30 – 14:15	EUR17_68 Where lies the costs? Identification and mitigation in offshore projects		
14:15 – 15:00	EUR17_73 Reliability Center BASF - Condition Monitoring as Driver of Operational Excellence		
15:00 – 15:30	**Coffee**		
15:30 – 16:15	EUR17_66 High Integrity Electrical Power System for Offshore Oil & Gas Facility		EUR17_58 IIOT Decision Making with Process and Energy Control Architectures
16:00 – 18:15	Hospitality suites are open		
18:30 – 19:00	Keynote speech		
19:00 – 22:00	**Social event at the Marriott Vienna Hotel**		
20:30 – 0:00	**Hospitality suites are open**		

PCIC EUROPE
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Wednesday 17th May 2017

Time	Ballroom A/B	Ballroom C/D	Coburg I/II/III
8:30– 9:15	EUR17_53 Protection of VSD Transformers	EUR17_39 Robustness validation for electrical and electronic devices	EUR17_72 DIMA - Creating more value by modular automation
9:15 – 10:00	EUR17_56 Operational performance of high speed motors on active magnetic bearings.	EUR17_40 Hybrid Protection and Control for the Petroleum & Chemical Industry	EUR17_47 Benefits to the Asset Owner When Seeking to Use an Accredited FSMS Supply Chain
10:00 – 10:30	**Coffee**		
10:30 – 11:15	EUR17_52 The Installation and Setup of a Variable Speed Drive for Optimal Performance	EUR17_36 Measuring Partial Discharge on Operating HV Motors Fed by Variable Speed Drives	EUR17_44 Human Factors and their Impact on Plant Safety
11:15 – 12:00	EUR17_49 Turbine replacement by electric drive systems provides significant benefits	EUR17_67 Identification and location of PD in MV switchgear using RF detection techniques	EUR17_69 The considerations and benefits of Ethernet based Low Voltage motor control.
12:00 – 13:00	**Lunch**		
13:00 – 13:45	EUR17_70 Remote and dangerous: finding UPS solution for unmanned hazardous installations	EUR17_41 Medium Voltage Cable Water Tree Failures the Legacy: Problems and Solutions	EUR17_42 Impact of changes in Functional Safety Standards on Installed Safety Systems
13:45 – 14:30	EUR17_50 UPS short-circuit not to be calculated acc. to IEC60909	EUR17_54 Implementation of Partial Discharges measurements follow-up on E-Motors	EUR17_34 Employing Micro Gas Chromats for Flare Analysis to meet Emission Regulations
14:30 – 15:00	**Coffee**		
15:00 – 15:45	EUR17_43 Corporate-wide power factor correction: economic and technical assessment	EUR17_51 Application of IEC/IEEE 60079-30 for Trace Heating	EUR17_61 The rocky relationship between safety and security
16:00 – 0:00	**Hospitality suites are open**		

Thursday 18th May 2017

Time	Ballroom A/B	Ballroom C/D
8:30– 9:15	EUR17_38 Study of full load test method for large VSDS driven by non-regenerative VSI	EUR17_48 Security by design as a methodology for reducing Cyber Security Risk
9:15 – 10:00	EUR17_57 Practical guidelines for planning network connection of electric drive systems.	EUR17_35 VALHALL HVDC Power From Shore - Experience of 5 years operation
10:00 – 10:30	**Coffee**	
10:30 – 11:15	EUR17_71 Criticality for Plant Control and Power Assets to be Safe From Cyber Attacks!	
11:15 – 12:00	EUR17_46 Supplying Control Power to the Asgard Subsea Compression System	
12:00 – 12:30	**Closing**	

The following papers will be presented at the PCIC Europe Conference.

Ref.	Title	Authors
EUR17_34	**Employing Micro Gas Chromats for Flare Analysis to meet Emission Regulations** Climate change is one of the most urgent worldwide challenges partcularly after the 1997 Kyoto protocol. A major contribution to green house gases (GHG) originates from gas flaring. In the EU the key regulation to limit flare GHG emissions is the Emissions Trading Scheme (ETS) Carbon Credit Trading principle since 2005 for new plants. The INEOS Grangemouth polymer plants have combined high pressure and low pressure flare stacks. Since 2013 the GHG emissions had to be declared. At this time INEOS' analysis meant that it had to be assumed that any flared material was all hydrocarbons to be combusted unless known to be nitrogen. This resulted in the potential to over-report with significant financial impact on the ETS system. Therefore it was decided to install micro gas chromatographs (GC) to analyse actual hydrocarbon and hydrogen composition to the stacks as well as measuring flare nitrogen and oxygen levels. The new measured approach would have a short payback period. This paper describes the implementation and operation of the new micro GCs at the INEOS Grangemouth chemical complex in Scotland during 2014.	**Steve Jackson** *Siemens UK* **Gavin Dewar** *INEOS O&P UK* **Davie Plenderleith** *INEOS O&P UK* **Andrew Eady** *Siemens UK*
EUR17_35	**VALHALL HVDC Power From Shore - Experience of 5 years Operation** Traditionally power to offshore platforms has been provided by local generation with gas turbines of fairly small sizes. These gas turbines have several drawbacks such as low efficiency, maximum 30-40 %, high emissions of CO2 and NOx, and high operating and maintenance cost. Possibilities to provide power from shore with more efficient and less polluting generation has been achieved by the invention and ascent of VSC power transmissions as a competitive solution for long distance transmissions from shore to platforms. VSC-HVDC links are increasingly being deployed to connect remote renewables to consumption centers, and to enable cross-border connections, power-from-shore links and city-center in-feeds, where space is a constraint. The offshore converter can have a compact and lightweight design, which can be placed onto an existing platform or together with other installations on newly built platforms. Power from shore also improves the safety for personnel as well as for equipment in a production and processing environment.	**Gunnar Persson** *ABB AB* **Kjell Eriksson** *ABB AB* **Bo Westman** *ABB AB* **Harry Myklebust** *AKER BP AS*

Ref.	Title	Authors
EUR17_36	**Measuring Partial Discharge on Operating HV Motors Fed by Variable Speed Drives** Partial discharge (PD) testing has long been an important tool for assessing the condition of the high voltage insulation in petrochemical plant motors. In the past several years, many motors have been powered from invertors which facilitate variable speed motor operation. The most common drive today is the voltage source, pulse width modulation (VS-PWM) type. Such drives generate high voltage spikes in the kV range with risetimes in the sub-microsecond range. These high voltage spikes are a form of severe electrical interference that can make the detection of partial discharge (with magnitudes 1000 times smaller) difficult, due to the overlapping frequency content in PD and in the spikes. Thus PD detection on medium voltage VS-PWM systems has been a challenge. This paper discusses the stator winding failure mechanisms which produce PD, including the insulation problems that VS-PWM drives can accelerate. A research project that lasted several years is reviewed. It culminated in a prototype on-line PD monitoring system suitable for motors fed by VS-PWM drives. Results from application of this system on a number of such motors are presented and discussed.	**Greg Stone** *Iris Power-Qualitrol* **Howard Sedding** *Iris Power - Qualitrol* **Connor Chan** *Iris Power - Qualitrol*
EUR17_38	**Study of Full Load Test Method for Large VSDS Driven by Non-regenerative VSI** Full load back-to-back test of VSDS is sometimes required for oil and gas project. VSI is becoming a choice of drive system for super large compressor drive system, targeting up to 100MW. Special consideration / facility is necessary to perform back-to- back test for VSDS driven by VSI, because the type of converter used for such large VSI is usually realized by diode rectifier with no regenerative capability. To realize a back-to-back test for this type of VSDS, a VSI with regenerative converter, usually using PWM converter, is necessary. But it is a heavy burden to prepare such super large VSI with regeneration capability as a test facility. This paper proposes a test method to increase the load test capacity of back-to-back test facility up to two times the regenerative converter capacity. This idea is to apply a VSI with regenerative converter as a soft-starter during startup of back-to-back connected motor and generator system and as a constant voltage and constant frequency power supply during testing of VSDS.	**HIROYUKI MASUDA** *TOSHIBA MITSUBISHI-ELECTRIC INDUSTRIAL SYSTEMS CORPORATION* **Keiko Tada** *Mitsubishi-Electric Corporation* **Kazunori Hashimura** *Toshiba Mitsubishi-Electric Industrial Systems Corporation* **Akira Satake** *Mitsubishi-Electric Corporation*
EUR17_39	**Robustness Validation for Electrical and Electronic Devices** A significant number of electrical and electronic devices control critical systems and equipment, where a failure leads to unplanned shutdowns, production losses and safety risks. Depending on the manufacturer, the same device can have a higher or lower reliability performance. The internal components of the devices get damaged or age prematurely due to external or internal factors, inappropriate design or assembly, producing the failure of the system. For example, internal working temperature, which has a severe impact on the device's life cycle, can differ up to 100 ºC depending on the manufacturer. The Automotive Industry introduced the methodology "Robustness Validation" for the design and production of more reliable systems and components. The purpose of this paper is to apply this methodology for the Consumer Industry of electrical and electronic devices, establishing a framework for their reliability evaluation. The proposed work process is based on the analysis of the design technical specifications related to reliability.	**Ramón Olmos Castelo** *SABIC*

Ref.	Title	Authors
EUR17_40	**Hybrid Protection and Control for the Petroleum & Chemical Industry** This paper describes a centralized substation protection and control (CPC) system for the Petroleum and Chemical industry using a hybrid approach. The developed CPC system is based on the partial or entire shift of the bay level functions to the substation level via the Ethernet network based on the IEC 61850 standard. The hybrid solution integrates the existing secondary system, in which the relays perform basic protection and control functions, and the substation level, which comprises the CPC unit, that performs the backup and high-complexity functions. In combination, this results in a functionality-redundant system. For that, this paper describes: (i) the centralized protection and control concept and its benefits; (ii) the hybrid system architecture; and (iii) the benefits from the latter to the P&C industry. The main results show that the hybrid approach aggregates benefits from both centralized and decentralized architectures and it divides protection and control functions into the station and bay levels, according to their criticality and complexity, including state-of-the-art communication features.	**Bruno de Oliveira e Sousa** *ABB Medium Voltage Products* **Janne Starck** *ABB Medium Voltage Products* **Jani Valtari** *ABB Medium Voltage Products* **Ganesh Kulathu** *ABB India Limited*
EUR17_41	**Medium Voltage Cable Water Tree Failures the Legacy: Problems and Solutions** Recent test report documents continued failures in underground cables due to "Water Tree" failures. Cable failures in the report cover a 11kv cable with a lead sheath in a chemical plant. Medium voltage cables failures can often cripple vital machinery and have outages costing much higher than the cable replacement cost. In addition to documented failures this paper would testing methods and include many different solutions in cable design to mitigate water treeing and substantially increasing the effective lifetime of the cable.	**Wilber Powers** *Southwire Company* **Mark Coates** *Edif ERA* **Jason Couch** *BP Chemical Limited*
EUR17_42	**Impact of changes in Functional Safety Standards on Installed Safety Systems** It is estimated that about 66% of the Programmable Electronic Systems (PES) running in the process industry as Safety Instrumented Systems were installed before the first publication of International Safety Standards IEC 61508 and IEC 61511. Many of those installation face numerous challenges that include obsolescence of the technology, changes in the users' requirements affecting the technology in place and last but not least new requirements from recent editions on Functional Safety standards and other industry application standards. This paper covers the changes in the Functional Safety standards affecting those Brownfield installations, including new technologies and requirements for application in Safety Instrumented Systems such as Functional Safety certification, human factors, use of technology redundancy and security; as well as design and implementation practices and other work processes, that place greater emphasis on the impact of human activities over the system life cycle including management of competence, periodic testing requirements and Management of Functional Safety.	**Luis Duran** *ABB*

Ref.	Title	Authors
EUR17_43	**Corporate Wide Power Factor Correction: Economic and Technical Assessment** The Electricity and Cogeneration Regulatory Authority (ECRA) in Saudi Arabia issued a directive to charge commercial and industrial customers for reactive power consumption. Consequently, Saudi Aramco formed a team to assess the economic and technical impact on the company as a result of the new ECRA resolution. Relevant data were collected from more than eight hundred (800) sites and potential increase in utility charges was estimated to be twenty million dollars ($20MM) on annual basis. Corrective measures were studied from both technical and economic standpoints and recommendations were made for each applicable facility. The recommendations included utilizing onsite synchronous machines and/or installation of Power Factor Correction (PFC) capacitor banks to locally support the reactive power requirements. PFC capacitor banks, being the most common solution, were studied in detail, and directions were provided to avoid potential compromises in system reliability.	**Rakan El-Mahayni** *Saudi Aramco* **Roland van de Vijver** *Saudi Aramco*
EUR17_44	**Human Factors and their Impact on Plant Safety** History is full of technology breakthroughs, all striving to increase productivity and efficiency, from the steam engine and the telegraph; we've seen technology changing the way we get things done, sometimes in a disruptive way. Most recently mission critical computing systems have been introduced in manufacturing processes and automated tasks, resulting in increased safety and productivity during normal operation, but can these technologies help keep the plant safe during abnormal process conditions? That's where technology can support but not replace humans. The industry relies on human ability to respond to the unexpected, to handle the odd conditions and ask the right questions to fix the problems at hand. Today, operators are loaded with numerous activities, is it reasonable to expect they'll be able to respond appropriately to all conditions, what are the human elements that should be taken in to consideration in the design and implementation of modern automation systems? This presentation discusses some of the capabilities available in a modern automation system.	**Luis Duran** *ABB* **Hampus Schäring** *CGM/ABB*
EUR17_46	**Supplying Control Power to the Åsgard Subsea Compression System** The Åsgard subsea compression station has been in commercial operation for over a year and has been described as working like a Swiss watch. An essential part of the system is providing subsea control power to the station. This paper will describe the design, component qualification, fabrication, testing, installation and commissioning of the CPDUs (Control Power Distribution Units). These redundant units are mounted on the subsea template close to the compressor and other equipment is supplies with auxiliary power. A major factor for cost control was being able to use commercially available components for these subsea CPDUs. Extensive qualification testing was performed to ensure that these components would meet the constraints associated with subsea operations.	**Terry Hazel** *PCIC Europe Advisor* **Pierrick Andrea** *Schneider Electric Norway*

Ref.	Title	Authors
EUR17_47	**Benefits to the Asset Owner in Using a Certified Functional Safety Supply Chain.** Asset Owners and their principal Engineering Procurement Contractor partners (EPC's) need to ensure that functional safety requirements are being managed appropriately within the relevant safety lifecycle phases covering the design, engineering, operation & maintenance requirements of suitable SIL capable safety elements. This is required in order to provide a safety instrumented system that meets the necessary risk reduction requirements for the operating facility. For the Asset Owner Operator, the problem is a common one; how can you convince your stakeholders both internally and externally to the company, that functional safety processes within your selected supply chain are in alignment with recommended 'good practice' and how can you ensure that the outcome of the installed SIS is fit for purpose when the project execution phase concludes and is sustainable during the longer term operation and maintenance lifecycle phase?	**john walkington** *ABB Ltd.* **Luis Duran** *ABB Inc.* **Suresh Sugavanam** *ABB Limited.*
EUR17_48	**Security by Design as a Methodology for Reducing Cyber Security Risk** Security by design as an efficient, cost-effective methodology for reducing Cyber Security risk in Electrical Monitoring and Control Systems The petroleum and chemical industry is now starting to have a mature view on Cyber Security for their industrial and process automation systems. While in many cases the process side has been analyzed and reviewed for security risks and measures implemented to help reduce this risk, the Electrical Monitoring and Control Systems (EMCS) that manage the electrical power for these electro intensive process automation systems has been largely ignored. This paper will describe some of the potential impacts of compromised security on typical electrical systems such as Fast Load Shedding and Power Management Systems and then the consequences of failure up to complete loss of production. We will then describe a pragmatic approach for how to apply Cyber Security measures in an existing system while making a cost-benefit analysis for implementing Cyber Security at design stage in new EMCS projects.	**Adam Gauci** *Schneider Electric* **Mathieu Salles** *Schneider Electric* **Sandeep Pathania** *Schneider Electric*
EUR17_49	**Turbine Replacement by Electric Drive Systems Provides Significant Benefits** Stricter emission regulations, higher process availability, improved fuel utilization and reduction of OPEX costs are some of the reasons to think about alternative ways to modernize old/conventional turbine trains. All these benefits could be realized by electric drive systems along with the additional technical advantages of higher overall efficiency, optimized start and stop conditions and more flexibility for operation by wider speed range. Replacing a turbine with an electric drive requires clarification and pre-engineering in order to analyze the existing drive train, electric grid, foundation, processing machine and process control system and to confirm the feasibility and calculate savings and the RoI. This paper describes in general, the requirements needed to be considered as part of an "overall" solution in order to properly define the final technical concept and capture the technical as well as overall economic advantages.	**Gunther Schwarz** *Siemens AG* **Hans Keller** *Siemens AG*

Ref.	Title	Authors
EUR17_50	**UPS Short-circuit not to be Calculated to IEC60909** If a short-circuit occurs, it is expected that the protective device on the feeder will clear the fault swiftly and the remaining distribution system will be unaffected. A UPS system will normally switch to bypass during fault clearing but if this is not possible, the current shall be provided by the inverter which has a totally different characteristic due to the current limiting behavior. IEC60909 states that the normal load current from fault free circuits can be disregarded when the voltage is zero during fault clearing. But if a short-circuit occurs at the end of a long cable, the voltage on the distribution board might be 50 % of nominal value and fault free circuits will draw current. At 50% voltage, the passive circuits will draw 50% current and computer equipment with large voltage tolerance might draw 200%, and since the total current is limited, the available current for fault clearing is greatly reduced. If the available current is not enough to activate the instantaneous trip, the UPS system will typically switch off after a few 100 ms and the total distribution system will lose supply.	**Preben Jakobsen** *Ramboll* **Jens Storm Westergaard** *Maersk Oil* **Stig Oest** *Semidan*
EUR17_51	**Application of IEC/IEEE 60079-30 for Trace Heating** In September, 2015 the IEC National Bodies and the IEEE Standards Association approved and published this dual logo standard as IEC/IEEE 60079-30. This two-part standard established the basis for certification as well as gives application information and guidance. Applying the requirements of this standard to designs for everyday trace heating applications can reduce a user's cost of ownership by taking advantage of specific requirements for control to reduce a trace heater's sheath temperatures. Users can also improve performance, longevity, and reliability by instituting the guidance and recommendations found in Part 2 of this standard. This paper will review specific examples and case studies where this standard has been applied and benefits realized.	**Ben Johnson** *Thermon* **Peter Baen** *Thermon* **Olivia Miljo** *Thermon*
EUR17_52	**The Installation and Setup of a Variable Speed Drive for Optimal Performance** A variable speed drive (VSD) is a versatile piece of equipment which must, by necessity, be designed to suit a wide range of industries, applications, and power systems. This flexibility requires that there are numerous parameters which must be programmed in the control which are specific to the installation. The drive must also be installed in accordance with the manufacturer's guidelines in order to achieve the stated performance specifications. This combination makes the installation and commissioning of the VSD one of if not the most critical stage of the project and often where things can go wrong. The commissioning of a VSD for optimal performance is a highly desirable goal for all parties involved in the project. It is common for the commissioning phase to be completed or accepted once the equipment has been energized and the motor operated at speed. This may mean that the drive may still have default protection settings and the setup or calibration of a number of operating parameters for the system may still have to be optimized to achieve the highest level of equipment uptime.	**Richard Paes** *Rockwell Automation* **Mark Throckmorton** *Shell Ltd.*

Ref.	Title	Authors
EUR17_53	**Protection of VSD Transformers** The Variable Speed Drives (VSD) protect themselves as well as the driven motors. In contrast, the isolation input VSD transformer typically requires its dedicated protection. Unlike distribution transformers, the protection of VSD transformer needs to consider several additional aspects, such as the harmonic content in current, multi-winding design, phase-shifted windings etc. This paper aims to explain the challenges related to protection of VSD transformers. A guideline for reliable transformer protection is proposed. Finally the possibility to integrate the transformer protection into VSD control and protection scheme is being explored.	**Martin Bruha** *ABB Switzerland* **Joseph von Sebo** *ABB Inc.* **Marcel Visser** *Shell Global Solutions* **Esa Virtanen** *ABB Oy, Transformers* **Pasi Tallinen** *ABB Oy, Transformers*
EUR17_54	**Implementation of Partial Discharges Measurements Follow-up on E-Motors** "Implementation of Partial Discharges measurements follow-up on E-Motors with predictive maintenance target" The purpose of the paper is to present the implementation of PD measurements on HV E-motors within production plants. We will explain the reason why the operating company decided to implement the PD measurements on the HV E-motors and which steps were followed from the first measurements to the strategy of using them for predictive maintenance. The implementation was started in 2002 on motors in France and Belgium; then on world wide basis. In the beginning, measurements were done on-line twice per year on each motor and later a data base was created. Need of qualifying people for measurement and analysis was identified; training modules were created and R&D projects were launched. The targets of these projects were to identify the noise to be filtered and the correlation between PD and other motor parameters. Success stories but also doubts from management will be presented. The conclusion will explain where we are and what will be the next steps.	**Cécile GAUDEAUX** *Air Liquide* **Hervé RYCKELYNCK** *Air Liquide*
EUR17_56	**Operational Performance of High Speed Motors on Active Magnetic Bearings** In 1998 due to the declining reservoir pressure of the Groningen gas field in northern Holland additional compression was required to maintain production. Multiple variable speed driven compressor packages with high speed motors (23MW @ 6300rpm) using active magnetic bearings were installed and have been successfully operating since. This paper will cover the following main topics:- Decision criteria for the selection of VFD and AMB (mechanical v electrical) Technical challenges New development challenges Availability measurements Examples of failures Lessons learned Looking forward to the next 10 years, what would be done differently today compared to 20 years ago. AMB motor solutions are still relatively small market, due to end user lack of experience and perceptions of new technology this paper will provide operational experience and lessons learned from nearly 20 years' experience of multiple units (20+). The objective is to provide end users with operational data in favour of electrical drivers compared to mechanical drivers and detail how the original customer performance targets have been exceeded.	**Jeremy Andrews** *Siemens AG* **Rien Luchtenberg** *Shell / NAM* **Paul Donnellan** *Shell* **Dr. Horst Kuemmlee** *Siemens AG*

Ref.	Title	Authors
EUR17_57	**Practical Guidelines for Planning Network Connection of Electric Drive Systems** Connection of high power medium voltage drives and motors has increased significantly over the last 25 years, the power level of individual drives in oil & gas applications is in excess of 50MW and multiple drives of high power can be connected to the same grid on either national networks or island grids. The paper will describe what the owner has to think about with combinations of VSI, LCI, induction, synchronous motors. How different topologies of drive require different considerations and what to think about for high speed motors, fixed speed bypass, redundancy, cooling and site layout restrictions. Content examples for Paper: · Describe the implications of connecting medium voltage variable speed drives to networks · Questions for the supplier to answer · Justification factors for different technologies · How is a VFD connection different to a fixed speed motor · Soft starter alternatives – implication of high torque at low speed etc.. · Kinetic buffering · Input voltage fluctuation implications and performance The paper will have simulation examples for these main topics.	**Jeremy Andrews** *Siemens AG* **Ahd Hateem Gheeth** *Saudi Aramco* **Vijay Ganesan** *Siemens*
EUR17_58	**IIOT Decision Making with Process and Energy Control Architectures** Energy and Process control systems were once conveniently separated. Tighter integration is now required because of more widespread use of higher efficiency motors and variable frequency drives as well as faster dynamic load management schemes for plants with a minimal spinning reserve capability. Digital age IIoT interactions between the ANSI/ISA95 and IEC61850 Bus Architectures present challenges for security, data flow, equipment life-cycle, translation and decision making. The paper reviews how these newer technologies and design drivers can be arranged to provide better quality decision making at the operational level. In addition the various challenges of exposing high availability critical plant subsystems to the various components of an IIoT based architecture for better analytic and machine learning purposes are explored.	**Christopher Smith** *Schneider-Electric*
EUR17_61	**The Rocky Relationship Between Safety and Security** An industry practice reflected in the international safety standards (i.e. IEC 61508) is the need for independence among the multiple protection layers on an industrial site “…the EUC control system shall be independent from the E/E/PE safety-related systems and other risk reduction measures…” however even the 1st generation of digital Safety Systems (Electronic/Programmable Electronic Systems) had communication ports with support for open protocols (i.e. Modbus RTU) in order to provide diagnostics and other information relevant for the operation of process (EUC). Users have connected (interfaced) safety systems to BPCS since mid 1980s and aimed to develop tighter connectivity at least since 1995. These efforts were based on proprietary protocols until the adoption of open network protocols and Windows on industrial control systems increased the connectivity to business systems and at the same (at least in theory) exposed them to the same issues (virus, cyber attacks, etc).	**Luis Duran** *ABB*

Ref.	Title	Authors
EUR17_66	**High Integrity Electrical Power System – Offshore Oil & Gas Facility** The electrical power generation and distribution system for one of the Platform (Platform 'A') was designed different from earlier fixed drilling and production platforms in the North Sea. The main difference is that there is no dedicated emergency generator on board. Instead each of the three main generators has been upgraded to a standard normally associated with the emergency sets. This provides higher reliability of the electrical supply system and enables essential consumers such as firewater pumps to be powered by electricity. The system known as the High Integrity Electrical Power System (HIEPS) was originally used at another platform in order to save diesel units for the combined Firewater/Seawater (FW/SW) pumps. The Platform 'A' design went one step further. The design used combined FW/SW pumps (to eliminate two diesel driven FW pumps) and also eliminated two diesel driven emergency generators. This paper discusses details of objectives leading to this design 25 years back and analysis based on the operator experience whether those objectives were met or not. The paper also discusses recommendations for any new facility to be built on above concept....	**Shailesh Chauhan** *Shell* **Bjørn Kongshaug** *Shell*
EUR17_67	**Identification and Location of PD in MV Switchgear Using RF Detection Techniques** In this paper the propagation of radio frequency energy, emanating from partial discharges, inside medium voltage metal-clad switchgear shall be investigated as a mechanism for the detection and location of partial discharges. Artificial partial discharge sources of varying type and magnitude will be introduced into metal clad switchgear and a novel RF antenna based PD detection system used to detect their activity and estimate their location. It will be shown that partial discharge sources can be detected in the switchgear and that the attenuation of the emissions between compartments used to determine their location.	**Charles Pestell** *Powell Industries* **Sean Broderick** *Powell Industries* **Dion Caves** *Powell Industries*
EUR17_68	**FPSO Electrical Network Optimization for Significant Savings:Where Lies the Cost** In the past decade, the cost of FPSO projects has increased significantly while the oil price dropped drastically. This paper aims to outline several technical options often specified in FPSO electrical network (architecture and switchgear) and analyses their impact on the installation global cost, footprint and weight reduction. A specification on a particular equipment may not have a significant impact on the equipment itself, but it could lead to a huge reduction on some other parts of the electrical network. For example, use of a "higher" low voltage does not really impact the motors cost but will significantly reduce the size of the cables and the space required for their installation. Unnecessary over specifications linked to habits could generate also additional costs in the electrical architecture. Simplifications exist with the same level of reliability and operability, for instance a 2xN architecture can be optimized into innovative N + 2 architecture. This paper explains several options representing a potential 20% cost reduction of the FPSO electrical installation with additional footprint and weight reduction.	**Caroline Vollet** *Schneider Electric* **Avelino De-Oliveira** *Schneider Electric* **Philippe Angays** *Technip* **Philippe Grandperrin** *Schneider Electric*

Ref.	Title	Authors
EUR17_69	**The Considerations and Benefits of Ethernet Based Low Voltage Motor Control** This paper presents the latest concepts for motor management using intelligent electrical devices. It starts with the widely accepted concept that smart Motor Control Centres are generally more compact as well as easier to deploy, evidencing why, and builds from this point exploring how the latest generation of devices, their safety and diagnostic capabilities and networking possibilities offer the end user even more technological benefits and opportunities for commercial savings (both in OPEX and CAPEX budgets). Using the case study of BYK Additives, UK, it explores why the user chose to adopt Ethernet connectivity within the MCC, rather than the more widely installed Fieldbus. It looks at the challenges this change of approach to networking presented (if any) and reflects these against what benefits were realised; summarising BYK's considerations and how they incorporated the lessons learnt within their strategies for smart motor management.	**Dave Holcroft** *SIEMENS*
EUR17_70	**Remote and Dangerous: Finding UPS Solution for Unmanned Hazardous Installations** This paper focuses on addressing the challenges of usage and reliability of AC and DC uninterruptible power systems (UPS) in hazardous locations. The biggest challenge of such application comes with heat dissipation limitations associated with material and internal layout of sealed enclosures as well as with higher ambient operating temperatures typical for such applications, especially with the new industry requirements: such as high power ratings, limited footprint and limited weight. The paper presents several important considerations that need to be made while designing and selecting power electronic components used in such power back up systems. Operation inside the hazardous location also requires rethink the use of standard materials typical for such applications including stainless steel that may pose unexpected threats. Illustrations for the paper are based on a recent projects executed on unmanned offshore oil platforms and presented by Total and ADMA OPCO.	**Elena Chernetsova** *Emerson* **Bruno Leforgeais** *Total* **Pierre Queyroi** *Emerson*
EUR17_71	**Criticality for Plant Control and Power Assets to be Safe from Cyber Attacks** As our world becomes smaller and smaller and the threats become bigger and bigger, refreshed technology, online monitoring, and cyber-security of systems now must be even more robust. This paper will be a part 2 discussion and technology update from the first paper titled “YIKES! ARE PLANT CONTROL AND POWER ASSETS SAFE FROM CYBER-ATTACKS?” that was presented at PCIC Europe in Amsterdam 2014. How everything is connected for Oil and Gas Producers is critical to their overall reliability, health, and protection of their assets. Discussions will be based on current plant installations and the various methods that are currently being installed to protect and monitor major Oil & Gas facilities. Advances in areas that will be addressed are Closed Loop Management of Change for Controls, Product Recall / Safety Advisory, Impact Analysis, Performance Monitoring, Condition Based Maintenance, and Scenario Based Analytics. Best practices and lessons learned from implementing several advances into these facilities will be discussed.	**Janet Flores** *Rockwell Automation* **Antonio Martinez** *Chevron* **Joseph Zaccaria** *Rockwell Automation* **Richard Paes** *Rockwell Automation*

Ref.	Title	Authors
EUR17_72	**DIMA - Creating More Value by Modular Automation** The reduction of the required effort for integration of a module into a production plant is the fundamental aim of modular plant architectures. An essential prerequisite for efficiency is to shift engineering efforts from the classical site-engineering to the engineering of plant modules. In such a scenario, the engineering of the entire system can be subdivided into two separate engineering phases, namely: a) the module supplier engineers and builds the module and b) the plant engineer uses the modules. This article shall present the DIMA (Decentalized Intelligence of Modular Applications) architecture mirrored to the requirements and concepts for the integration of different utility systems/ auxiliary equipment on an offshore production platform. The efficient and effective engineering of modular oil or gas production system defines requirements concerning two aspects. First, it concerns the automation domain from a technical point of view, and second, it concerns the organizational aspect regarding the engineering workflow. Both aspects shall be described with practical example applications on an offshore platform.	**Benjamin Böhm** *WAGO Kontakttechnik GmbH & Co. KG* **Idar Pe Ingebrigtsen** *Statoil ASA*
EUR17_73	**Reliability Center - Condition Monitoring as Driver of Operational Excellence** Our society stands on the brink of a technological revolution. Developments on connectivity (e.g. Internet of Things, IoT) and Big Data analytics bring new opportunities and will change our daily life. The identification of appropriate use cases and the adequate strategy of implementation will make the difference to reach success. The Reliability Center is one case of application of this kind in BASF, with the clear target to optimize operation of chemical plants. BASF has more than 350 production sites distributed all around the world. Having expert knowledge available onsite makes a big difference to assure reliable operation, especially for complex and business critical machinery. General trends like extended connectivity capabilities and advanced data analytics are offering now opportunities to bring expert knowledge from remote to exactly where and when is needed on sites. Reliability Center has been created as a platform to offer remote support worldwide in BASF combining expert knowledge in condition monitoring and advanced data analytic-methods in order to recognize anomalies earlier and avoid unexpected failures.	**Haritz Ugalde** *BASF SE* **Matthias Schley** *BASF SE*

The following tutorials will be presented at the PCIC Europe Conference.

Ref.	Title	Authors
EUR17_45	**Reliability and Life Extension for Aging Industrial Power Systems** This paper propose a new way to make a decision for extending the life of aging industrial power systems. It includes three main phases: Phase I “Assessment” – includes detailed visual inspection and testing (if necessary) for the condition of all equipment and protection systems in the electrical power system. Reliability statistics from open sources is used to adjust reliability of each component considering its current condition. As result, one ample reliability model is build and analyzed for the entire industrial power system. Phase II “Options” – potential options for extending the power system life are proposed, based on the results of the analysis performed in Phase I and the specific requirements for the facility. Reliability model is built and evaluation is performed for each of the proposed life extension options. Phase III “Optimal Solution” – in addition to reliability, each of the proposed options is evaluated from economic point of view. The total life cycle costs are calculated including investment cost, O&M costs and cost of power interruption. As result, an optimal solution for industrial power system life extension is selected....	**Krassimir Kutlev** *ABB* **Jose Ignacio Garrido** *ABB Switzerland* **Bo Malmros** *ABB Sweden*
EUR17_60	**How to Start Your Large Motors: Typical Solutions or New Motor Design?** In the context of low oil prices and an increasing demand for cost reduction of the electrical installations, optimizing the starting solution of high power electrical motors could be highly contributive. In this tutorial different solutions for high power MV motors starting will be presented and compared with respect to their application field, flexibility of adaptation to changes in motor data, complexity during installation and set-up, overall performances with respect to the electrical network and mechanical load and economic aspects. On focus are traditional methods, such as direct on-line, auto-transformer, soft-starter, variable speed drive and also recent solutions, as motors designed with reduced inrush current.	**Delcho Penkov** *Schneider Electric* **Fredemar Runcos** *WEG* **Elder Stringari** *WEG* **Edouard Thibaut** *TOTAL* **Cecile Gaudeaux** *AIR LIQUIDE GLOBAL E&C SOLUTIONS*
EUR17_62	**Protection of Electric Motor in the Oil and Gas Industry** Good electrical protection of motors is mandatory to ensure a good availability of the plant. The target is to have a protection that prevent any damage to occur to equipment , but not being too sensitive to avoid spurious trip. The aim of this tutorial is to remind the good engineering practice to reach that objective. Choice of the neutral earthing method, Role and action of the different type of protection, In case of use of VSD ? Choice of the protection in accordance with the philosophy of operation, Coordination and setting of the protections	**philippe Angays** *Technip* **Cecile Gaudeaux** *Air liquide* **Caroline Vollet** *Schneider*

Ref.	Title	Authors
EUR17_63	**Cyber Security in Energy Automation with IEC 62443** Cyber-attacks have evolved over the recent years from the untargeted propagation of viruses to increasingly sophisticated attacks tailored against specific companies or entities. The Oil&Gas and process industries as well as the Energy domain have not been left exempt from this phenomenon, which calls for action on all stakeholders. Fortunately, a number of security best practices have emerged, as well as common approaches to dealing with cyber risks. This has been integrated into now maturing industrial process control standards. Of specific interest is the IEC 62443 framework of security standards that defines the responsibilities of various players, notably of system integrators, EPCs, end customers, and service providers. The framework and related efforts are introduced, and realization approaches are motivated from an energy automation perspective. The authors take great care to make it accessible to participants with basic or no knowledge on cyber security.	**Dirk Kroeselberg** *Siemens* **Frederic Buchi** *Siemens* **Hans Meulenbroek** *Siemens*
EUR17_65	**Industrie 4.0 Architecture Update in Respect with International Standards** This tutorial will remind the key milestones for the deployment of the Industrie 4.0 architecture in its international environment for a connected world in the Oil & Gas and Petrochemical industry. We shall analyze the specific features of Industrie 4.0 concepts and we shall describe in more details the Reference Architecture Model of Industrie 4.0 (RAMI 4.0) developed to facilitate the connectivity between the things across companies and users. This presentation will be illustrated with examples of applications. Then we shall review the international standards and regulations environment (IEC, ISO, UL, EU Connectivity regulation, ...) related to industry digitalization in highlighting the areas where the proposed Industrie 4.0 architecture may have an impact. We shall conclude the tutorial on the potential next steps for an international recognition of the Industrie 4.0 architecture for a safe and secured connected Oil & gas and Petrochemical sector.	**Jean-Charles GUILHEM** *2B1st Consulting* **Dieter Wegener** *ZVEI*

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.

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

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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.

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- Then complete your abstract, after having chosen strategic topics, sub-strategic topics, etc.
- Follow the simple instructions to complete your submission

Instructions and deadlines

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