WHAT YOU WILL GAIN:

• Skills and competencies in E & I oil and gas engineering
• Knowledge of the latest technologies in E & I oil and gas engineering
• Key techniques in operating your facility to the highest level of safety and in protecting the environment
• Tremendous boost to your E & I oil and gas career – no matter whether you are a new engineering graduate or a technician
• Decades of real experience distilled into the program presentations and materials
• Guidance from real E & I oil and gas experts in the field
• Hands-on practical knowledge from lecturers with extensive real-world experience
• Credibility as the local expert in E & I oil and gas
• Networking contacts in the oil and gas industry
• Improved career choices and income
• An EIT Advanced Diploma of E & I Engineering for Oil and Gas Facilities

Visit our website: www.eit.edu.au

** A note regarding recognition of this program in the Australian education system: EIT’s sister company, IDC Technologies, is the owner of this program. The qualification is officially accredited within the Australian Qualifications Framework by the Training Accreditation Council, and is approved by the Australian Skills Quality Authority (ASQA) for delivery by EIT in all Australian states. EIT delivers this course program to students worldwide.
**Introduction**

There is a growing shortage, and hence opportunity, for Electrical and Instrumentation (E & I) technicians, technologists and engineers in the oil and gas industry. This is due to an increasing need for higher technology methods of obtaining and processing oil and gas as a finite declining resource. The price of oil is heading upwards steadily, thus making personnel and their associated oil and gas expertise in these industries even more valuable. The technical challenges of extracting oil and gas are becoming ever more demanding, with increasing emphasis on more marginal fields and previously inaccessible zones such as deep oceans, Polar regions, Falkland Islands and Greenland. The aim of this 18-month e-learning program is to provide you with core E & I engineering skills so that these opportunities may be accessed, to enhance your career, and to benefit your firm.

Often universities and colleges do a brilliant job of teaching the theoretical topics, but fail to actively engage to provide you with core E & I engineering skills so that these opportunities may be accessed, to enhance your career, and to benefit your firm.

This advanced diploma program provides a practical treatment of electrical power systems and instrumentation within the oil, gas, petrochemical and offshore industries. Whilst there is some theory this is used in a practical context giving you the necessary tools to ensure that the Electrical and Instrumentation hardware is delivering the results intended. No matter whether you are a new electrical, instrumentation or control technician/technologist/graduate engineer or indeed, even an employed facilities engineer, you will find this program beneficial in improving your understanding, skills and knowledge of the whole spectrum of activities ranging from basic E & I engineering to advanced practice including hazardous areas, data communications along with a vast array of E & I equipment used in an oil and gas environment.

**About the Engineering Institute of Technology (EIT)**

The key objective of the Engineering Institute of Technology (EIT) is to provide an outstanding practical engineering and technology education; from Diplomas to Master degrees and beyond. The finest engineering lecturers and instructors, with extensive real engineering experience in industry, are drawn from around the world. The learning is gained through synchronous, online [e-learning] technologies. EIT offers awards in a growing array of engineering fields. With the internationalization of education, EIT ensures approval from a growing list of reputable accreditation agencies. Many (perhaps, most) engineering faculties at universities and colleges experience a significant challenge delivering the program-work affordably and with excellence. EIT achieves this using online based education – economical class sizes are attainable, international experts are engaged to instruct and remote laboratories and simulation software are employed. EIT is a sister company of the well known and reputable engineering training organization, IDC Technologies. IDC has been operating for over 20 years, from offices throughout the world, delivering practical short programs to well over 500,000 engineers and technicians.

To apply please contact enquiries@eit.edu.au

**VALUE plus!**

As part of the incredible value we have built into this program, you also receive:

- Two places on any IDC Technologies public 2-day workshop*

**OR**

- Two places at any IDC Technologies conference (conference component only, excludes workshop if available)*

**PLUS**

- A library of 30 technical eBooks

All of this is valued at over US$5000!

You may also be eligible for a tax deduction on your personal income tax – contact your tax advisor for more information.

* to be used within 2 years of program enrolment and subject to availability. Your fee for this program must be up to date. The offer is for workshop or conference fee only and does not include travel, accommodation or other costs. EIT is not responsible for cancellation or postponement of IDC Technologies workshops and conferences. Please note: IDC workshops will only run should there be enough full paying registrations to cover costs. When registering for an IDC workshops or conference, please specify you are claiming the Value Plus offer. Other conditions may apply at our discretion.

**EIT Program Delivery Methodology**

Not all e-learning is the same.

See why our live fully mentored methodology is so unique and successful.

Visit:

www.eit.edu.au/eit-program-delivery-methodology

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“"This has been the best study process I have gone through and for advancing the career it is a must. The program content is extremely good and practical as I have baffled my engineers with some of the questions in the assignments making them question the content they actually studied.” Henk Barnard

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Accreditation & International Standing

EIT (and many individual programs) has received recognition, endorsement and/or accreditation as a training provider from authorizing bodies based around the world, including those listed below. Please ask us for specific information for your location.

AUSTRALIA
EIT is registered and accredited to offer both degree and vocational (diplomas and certificates) programs. EIT is authorized by the Australian Government Tertiary Education Quality and Standards Agency (TEQSA) as a Higher Education Provider (www.teqsa.gov.au/national-register with registration number PRV14008). EIT is a Registered Training Organization (RTO) in the Vocational Education and Training (VET) sector – provider number 51971.

EIT is thus registered with and regulated by the Australian Skills Quality Authority (ASQA) and the Tertiary Education Quality and Standards Agency (TEQSA). ASQA is the national regulator for Australia’s vocational education and training (VET) sector. TEQSA is Australia’s independent national regulator of the higher education sector. They both regulate programs and training providers to ensure nationally approved quality standards are met.

Many of the programs offered by EIT are nationally accredited and recognized qualifications and are listed on the training.gov.au (TGA) [for VET qualifications] or on the National Register (for Higher Education qualifications).

TGA is the Official National Register of information on VET Training Packages, Qualifications, Programs, Units of Competency and Registered Training Organizations (RTOs). EIT VET qualifications accredited to date can be viewed on EIT’s registration page on TGA under the “Scope” tab. You can find EIT on TGA by searching for our provider number – 51971.

The purpose of the Higher Education National Register is to be the authoritative source of information on the status of registered higher education providers in Australia. Information on EIT and our accredited higher education courses can be viewed at http://teqsa.gov.au/national-register/provider/prv14008.

Please note that many additional programs are also in the process of accreditation.

A note regarding recognition of this program in the Australian education system: EIT’s sister company, IDC Technologies, is the owner of this program. The qualification is officially accredited within the Australian Qualifications Framework by the Training Accreditation Council, and is approved by the Australian Skills Quality Authority (ASQA) for delivery by EIT in all Australian states. EIT delivers this course program to students worldwide.

Members of Engineers Australia (EA) – are entitled to claim CPD hours for private study, short programs, and learning activities at the workplace. CPD hours can be claimed for our programs in most cases, but we would always advise individual members to check with EA regarding specific programs.

NEW ZEALAND
The New Zealand Qualifications Authority recognizes individual qualifications gained overseas on a case-by-case basis. Advanced Diplomas, for example, when registered at the time of award under the Australian Qualification Framework (AQF) are typically recognized as broadly comparable to a National Diploma at level 6 on the NZOF.

SOUTH AFRICA
The Engineering Council of South Africa (ECSA) which aims to promote a high level of education and training of practitioners in the engineering profession, has validated a large number of EIT programs. Members can check details on the ECSA website. South African students who successfully complete an EIT Advanced Diploma and other qualifications have the option to apply for recognition by SAQA, who have determined in the past that an Australian Advanced Diploma program is at Level 6 in the South African National Qualifications Framework (equivalent to Higher Diploma) in South Africa’s educational system. However, in most cases formal individual recognition by SAQA is not required as the international validity and accreditation of this credential is very sound.

UNITED STATES
IEEE is the world’s largest professional association advancing innovation and technological excellence. EIT is an IEEE Continuing Education Provider. IEEE Continuing Education Programs are peer-reviewed by content experts. This peer review guarantees both quality of the technical content of learning materials, as well as adherence to IEEE’s strict criteria for educational excellence. All programs that pass this strict process are entitled to award IEEE Continuing Education Units (CEUs), recognized as the standard of excellence for continuing education programs in IEEE’s fields of interest.

The International Society of Automation (ISA) is a leading, global, non-profit organization that sets the standard for automation around the world. ISA develops standards, certifies industry professionals, provides education and training, publishes books and technical articles, and hosts conferences and exhibitions for automation professionals. ISA has reviewed the curricula of the programs offered by EIT as they relate to the instrumentation, control and automation discipline and has endorsed them. EIT is an endorsed partner of the ISA.

UNITED KINGDOM
Nationally recognised qualifications that have been achieved at EIT can be compared by UK NARIC to the UK framework. UK NARIC is the UK’s national agency responsible for the recognition of qualifications from overseas and provides services for individuals and organizations to compare international qualifications against UK qualification framework levels. UK NARIC is managed by ECTTIS Ltd (see www.ecttis.co.uk/naric/Default.aspx) which administers the service for the UK Government. Graduates of EIT’s Advanced Diploma programs in the UK can be confident that their international qualification has been officially evaluated as comparable to the BTEC/HND standard/Foundation Degree Standard. A BTEC Higher National Diploma is at the same level of the National Qualifications Framework as NVQ/SVQ Level 4. Recognition will be at a higher level for graduate programs.

The Institute of Measurement and Control in the United Kingdom is Britain’s foremost professional body for the Automation Industry. An EIT Advanced Diploma is recognized by the Institute of Measurement and Control as contributing to the ‘initial professional development’ required for eventual registration as Chartered or Incorporated Engineers. The Advanced Diploma is also approved by the Institute as providing CPD.

CANADA
EIT is a Participating Partner with the Engineering Institute of Canada (EIC) and EIT programs can be used by members to register for Continuing Education Units (CEUs). EIC’s Continuing Education Program is supported by The Canadian Council of Professional Engineers, The Association of Consulting Engineers of Canada, and The Canadian Academy for Engineering. EIC is a member of the International Association for Continuing Education and Training, with headquarters in Washington, DC.

OTHER COUNTRIES
Students who successfully complete an EIT Advanced Diploma and other qualifications may be able to apply for recognition of their qualification within the local (home country) education system. Many countries have a process for “recognition of foreign qualifications” which is used by new residents when they have qualifications earned overseas. Although you will be studying from your home country you will be awarded an Australian qualification from EIT, so your EIT qualifications may be able to be recognized as a “foreign qualification” if you apply through your local system. If you would like to find out more, please contact your local education authorities because it is not practical for EIT to know the systems that apply in all countries. However, in many cases formal individual recognition within the home country may not be required because the international validity and accreditation of this credential is very sound.

Members of other engineering organizations may be able to claim credit for professional development and are advised to check with their own organization.

For additional information please see www.eit.edu.au/international-standings.
Program Structure
The valuable oil and gas program has five main streams:

1. Electrical engineering
2. Instrumentation and control engineering [onshore and offshore]
3. General oil and gas engineering
4. Subsea instrumentation and control
5. Floating Production, Storage and Offloading (FPSO) Facilities

Oil and Gas Electrical Engineering – Design, Installation, Commissioning and Maintenance
Electrical power systems within the oil, gas, petrochemical and offshore industries have significantly different characteristics to a typical power utility and associated consumers of electricity. This program provides an excellent balance between basic applicable mathematical theory and practical know-how which is so essential in applying this immediately to your work. Solid, practical knowledge is provided in the electrical systems equipment used in off-shore production platforms, on-shore separation and production plants, drilling rigs, pipelines, refineries and even general petrochemical plants. Because of the hazardous nature of oil and gas plants there is particular emphasis on the design, installation, commissioning, maintenance and use of electrical equipment in hazardous areas. You will gain confidence in basic design, selection, and operation of the typical electrical equipment used in these areas. Numerous practical rule-of-thumb examples are given to enable you to make quick estimates and assessments whilst engaged in your work.

Oil and Gas Instrumentation and Control Engineering – Design, Installation, Commissioning and Maintenance
Instrumentation and control engineering is the most diversified and challenging area in the oil and gas industry. It covers a whole gambit of engineering such as:

- Instrumentation Engineering - You will learn about design documentation and specification, field measurement devices, control elements, condition and machine monitoring, field bus, actuators, control valves, severe service valves, solenoids, hydraulics, testing and calibration, wireless instrumentation, instrument fittings:monoflanges/monofiands/tubing and accessories, “on-line” process analysers and sample systems, pressure relief valves, choke valves and associated “real world” applications.
- Control System Engineering – This extremely interesting area covers Programmable Logic Controllers (PLCs), Supervisory Control and Data Acquisition (SCADA), Distributed Control Systems (DCS), control system tuning, basics of advanced process control, control applications, compressor surge control, pneumatic controllers, programmable automation controllers, process control security, OPC and smart plant concepts.
- Safety Instrumented Systems – SIS is a very important part of any oil and gas plant in that these systems provide the most important safety layer necessary to protect a facility. You will learn about Safety Integrity Levels (SIL), the importance of maintaining SIS instrumentation, safety logic, Burner Management Systems (BMS), emergency shutdown systems and their certification, shutdown and blowdown valves, SIL standards, fire and gas detection and protection systems and devices along with combined safety systems.

In addition you will get some insight into High Integrity Pipeline Protection Systems (HIPPS).

General Oil and Gas Engineering
This covers critical aspects which are applicable across all disciplines associated with oil and gas engineering including:

- Corrosion – as many oil and gas installations are either on the coast or in offshore locations, a basic understanding of corrosion and how to mitigate against its effects is very important. By just installing a fitting of the wrong material, the safety of a multimillion dollar facility can be compromised.
- Health, Safety and Environment, including facility safety cases, legislation, spill reporting, hazards, work permits, safe working practices, working with high pressure hydraulics and Job Safety Analysis (JSA) documentation.
- Basics of oil and gas process plant, the importance of understanding how a plant works with real examples of an offshore oil and gas platform, refinery and LNG plant.

Presentation Format
The program features real-world applications and uses a blended approach involving interactive online webinars, simulation software and self-study assignments with a mentor on call.

The program consists of 72 topics delivered over a period of 18 months. Presentations and group discussions will be conducted using a live, interactive software system. For each topic you will have an initial reading assignment [which will be delivered to you in electronic format in advance of the online presentations]. There will be coursework or problems to be submitted and in some cases there will be practical exercises, using simulation software and remote labs that you can easily do from your home or office.

You will have ongoing support from the lecturers via phone, fax and e-mail.

Live Webinars
During the program you will participate in 72 live interactive sessions with the lecturers and other participants from around the world. Each webinar will last approximately 60 to 90 minutes, and we take student availability into consideration wherever possible before scheduling webinar times. Please refer to “When will the sessions take place?” in the Frequently Asked Questions. All you need to participate is an adequate Internet connection, speakers and a microphone. The software package and setup details will be sent to you prior to the program.

Time Commitment for the Program
Successful students are likely to spend between 10 and 15 hours per week in order to cover the material adequately and to gain sufficient knowledge in each program topic. This includes the preparatory reading, attendance at each webinar [1 hour plus 15-30 minutes for discussion], which runs once a week, and the time necessary to complete the assignments and laboratory work. This time would be required to ensure the material is covered adequately and sufficient knowledge is gained to provide sound, enduring and immediately useful skills in engineering. EIT operates almost all year long, so your studies will continue most weeks of the year to enable you to achieve the qualification in an accelerated time period when compared to a traditional semester-based system.
Program Structure (continued)

You will then work through a project such as a three-phase inlet separator, its components, design, operation, control and instrumentation and maintenance. You will gain a strong introduction to Front End Engineering Design (FEED) with coverage of flow diagrams, P&IDs, control system philosophy, safety instrumented system logic, specification, cost estimates and design approval. You will then be exposed to final design activities including authorization for expenditure, specifications, power systems, wiring and connection diagrams, logic diagrams and bill of materials. Finally, the construction, installation and commissioning phase will be covered with an emphasis on factor acceptance testing (FAT), commissioning, start up and maintenance.

Subsea Control Systems Engineering

Subsea manifolds are commonly used in offshore applications, these are either tied back to platforms or piped onshore. These have instrumentation and control systems that are specifically designed for deepwater use. You will learn about the basic concepts and how these systems are monitored, controlled and maintained.

Floating Production, Storage and Offloading (FPSO) Facilities

Floating production, storage and offloading facilities receive crude oil and gas from deepwater wells and store it until the crude oil can be pumped into other vessels for transport to shore. This facility is especially useful for extending extraction processes into deep water areas previously inaccessible. The processing facilities onboard the FPSO separate the produced oil, water and gas. Floating LNG (FLNG) facilities are the latest oil and gas facilities being deployed around the world. The electrical and instrumentation systems relevant to FPSOs will be examined during this program.

Core Modules

The 23 modules will be completed in the following order:

**Fundamentals**
1. Fundamentals of Electrical Engineering
2. Fundamentals of Process Instrumentation

**Electrical Engineering**
3. Electrical Drawings, Documentation and Schematics
4. Power Distribution
5. Power Transformers
6. Switchgear for Power Distribution
7. Cables and Wires – Maintenance and Installation Practice
8. Power System Protection and Co-ordination
9. Electrical Safety and Grounding/Earthing, Bonding and Lightning Protection
10. Power Quality, Uninterruptible Power Supplies, Surge Protection and Noise Control
11. Troubleshooting, Maintenance and Protection of AC Electrical Motors and Variable Speed Drives for Instrumentation and Control Systems
12. Electrical Equipment in Hazardous Areas
13. Electrical Applications to Oil and Gas Platforms and Sites

**Instrumentation and Control**
14. General Instrumentation Standards in Oil and Gas, and Best Practice in Process, Electrical and Instrumentation Drawings and Documentation
15. Process Control Basics
16. Calibration, Installation and Maintenance of Instruments
17. Control Valve Sizing, Selection and Maintenance
18. Programmable Logic Controllers
19. SCADA and Distributed Control Systems
20. Industrial Data Communications
21. Safety Instrumentation and Emergency Shutdown Systems for Oil and Gas (IEC 61511 and IEC 61508)
22. Wellhead and Flowline Control
23. Oil and Gas Specific Applications for Floating Production, Storage and Offloading (FPSO) Facilities

For detailed information on the content and breakdown of modules, see pages 13 to 33

Why EIT?

- Our lecturers are selected and recruited from amongst the top engineers/lecturers in their fields. They are highly skilled at presenting challenging concepts and ideas to students of varying levels and abilities.
- Programs are designed to give hard-hitting practical know-how, relevant to today’s market and is aimed at people working in industry. We design and select case studies and practical exercises in the program based on real-world needs. Feedback from the tens of thousands of students we have trained over many years has allowed EIT a unique understanding of real world business requirements and we have tailored our programs accordingly.
- We have experience in training over 500,000 engineers and technicians throughout the world and have built up a library of outstanding reference materials which focus on what engineers and technicians need on the job in industry, oil & gas and mining. The value of these materials is considerable and they are a great asset to industry professionals. These reference materials are all included in the cost of the program.
- The program content is challenging and designed for those already working in industry. We assume a general understanding of the demands of the workplace. A student without practical experience would be unsuited to the program.
Practical Exercises, Remote Labs and Assignments

You will participate in practical exercises using a combination of remote laboratories and simulation software, to ensure you get the requisite hands-on experience. This will give you a solid practical exposure to the key principles covered in the program and ensure you are able to put theory into practice.

As research shows, no matter how gifted and experienced a lecturer is (and we believe ours are some of the best worldwide), no one learns from a lecturer only presenting program materials to them in lecture format. It is only by the engaging activities of hands-on exercises using simulation software, remote laboratories, practically based assignments and interactive discussion groups, with both your peers and the lecturer that you are able to absorb the knowledge, “take ownership of it”, and apply it successfully in the real world. You should note that there is some degree of overlap between the practical sessions or the different units to reinforce the concepts and to look at the issues from different perspectives.

Traditional distance learning thus presents challenges in achieving these goals but we believe today with the modern e-learning technologies available combined with outstanding lecturers that we can give you an equivalent or indeed even better experience than on a traditional university campus.

Practical sessions may be added, deleted or modified by the lecturers to ensure the best outcome for students.

Benefits of Live E-learning

- Attend lessons in a live, virtual classroom with your lecturers and fellow students
- Upgrade your skills and refresh your knowledge without having to take valuable time away from work
- Receive information and materials in small, easy to digest sections
- Learn from almost anywhere - all you need is an Internet connection
- Have constant support from your program lecturers and coordinator for the duration of the program
- Interact and network with participants from around the globe and gain valuable insight into international practice
- Learn from international industry experts
- Live interactive webinars, not just a ‘book on the web’
- Revisit recordings of webinars whenever and as often as you wish
- Receive an EIT Advanced Diploma of Electrical and Instrumentation (E & I) Engineering for Oil and Gas Facilities

Who Would Benefit

This program would be ideal for you if you are within the below categories and seeking to get know-how and expertise in the oil and gas business.

- Instrument and process control technician or technologist
- Instrument fitter
- Chemical or mechanical engineer
- Electrical engineer currently working in a different area to oil and gas
- Experienced electrician
- A recent graduate electrical, instrumentation or mechanical engineer

Even if you are highly experienced you will find this a great way to become familiar with the oil and gas technology as quickly as possible.

For more information or to apply, please contact us at enquiries@eit.edu.au

Entrance Requirements

This Engineering Institute of Technology advanced diploma is an accelerated, practical, work-oriented program. It is designed for engineers and technicians who have some background in the field. This includes those who have technical or ‘trade’ qualifications who want to move to the next career step, those with substantial relevant work experience who need to formalise and enhance their achievements, and those with higher level qualifications in a related field who wish to develop specialist knowledge. Practical work experience in related areas of engineering would help enormously. It would not be suitable for a student with no relevant work experience. We will review your enrolment application and may recommend pre-program studies if required.

Advanced Diploma Preparation Program

If you are unsure if you have a strong enough grasp of the fundamental knowledge required for this program, or you simply want to refresh your skills and experience e-learning in a shorter program, we recommend that you consider the EIT’s engineering studies preparation program. This intensive 4-month program covers the fundamentals of engineering maths, physics and chemistry. Please ask your advisor for the brochure. If you don’t currently have an existing qualification and/or experience, please contact us for advice. Most important, however, is a determination to persist and complete this program.

On completion of this program, 50% of the program fees can be used as a credit towards your fee for an EIT Advanced Diploma program.

Prior Learning Recognition and Exemptions

EIT can give you full or partial credit for modules where you can demonstrate substantial prior experience or educational background. An assessment fee may apply. If you wish to find out more please ask us for your copy of the policy for recognition of prior learning.
Comprehensive e-Books and Associated Documentation

You will receive 30 of our up-to-date technical e-Books to add to your library. Together these texts contain over 8000 pages of valuable know-how distilled from years of experience in presenting these programs throughout the world.

Participants only completing selected topics will receive only the relevant documentation.

1) Electrical Drawings and Schematics
2) Practical Power Transformers: Operation, Maintenance and Testing
3) Practical Power Distribution
4) Grounding/earthing, Shielding and Surge Protection of Electrical Equipment for Instrumentation and Control
5) Practical Power System Harmonics, Grounding/Earthing and Power Quality - Problems and Solutions
6) Practical Instrumentation for Automation and Process Control
7) Practical Control Valve Sizing, Selection and Maintenance
8) Practical Programmable Logic Controllers (PLCs) for Automation and Process Control
9) Practical SCADA Systems for Industry
10) Practical Troubleshooting and Problem Solving of Industrial Data Communications
11) Practical Safety Instrumentation and Emergency Shutdown Systems for Process Industries
12) Practical Hazardous Areas for Engineers and Technicians
13) Best Practice in Process, Electrical and Instrumentation Drawings and Documentation
14) Practical Power System Protection for Engineers and Technicians
15) Practical Process Control
16) Practical Troubleshooting and Problem Solving of Modbus Protocols
17) Practical Fundamentals of Telecommunications and Wireless Communications
18) Safe Operation & Maintenance of Circuit Breakers and Switchgear
19) Practical Energy Efficiency, Design, Engineering and Auditing
20) Lightning, Surge Protection and Earthing of Electrical & Electronic Systems in Industrial Networks
21) Electrical Maintenance for Engineers and Technicians
22) Practical Shielding, EMC/EMI, Noise Reduction, Earthing and Circuit Board Layout
23) Practical Analytical Instrumentation in On-Line Applications
24) Practical Alarm Management for Engineers and Technicians
25) Practical Industrial Flow Measurement for Engineers and Technicians
26) Practical Intrinsic Safety for Engineers and Technicians
27) Fundamentals of Process Plant Layout and Piping Design
28) Practical Mechanical Seals - Selection, Maintenance and Troubleshooting
29) Practical Machinery Vibration Analysis and Predictive Maintenance
30) Leading Your Engineering Team to Top Performance

Please Note: Students who choose to pay upfront will receive all 30 e-Books in advance. If you opt to pay by installments you will receive e-Books periodically throughout the program.

e-Books are available in hard copy at 50% of the recommended retail price. Contact us for pricing details.

Program Fees
Your program fees include weekly webinars with leading engineering and technical experts, 30 technical eBooks, all program materials, software and postage, plus grading and support from the program coordinators and lecturers. We provide payment options and can accept fees in a variety of currencies. Please contact your advisor for fees in an appropriate currency for your location.

Hardware and Software Requirements
All you need in order to join the webinars once registered for the program is an adequate internet connection, PC, speakers and a microphone. The software package and setup details will be sent to you prior to the program.

We are Flexible With Your Commitments
We understand that personal circumstances can make it difficult to complete the program in the time available. We will be flexible about the time you require to complete the program. You can “pause and restart” by joining a subsequent intake (a rejoicing fee may apply). We will allow up to 3 years from your original start date to complete the program.

You can withdraw from the program at any time and receive a Statement of Attainment for the topics you have completed. However, completion of all 72 topics will earn you the EIT Advanced Diploma of Electrical and Instrumentation (E & I) Engineering for Oil and Gas Facilities.
WHAT OUR STUDENTS HAVE TO SAY

QUOTES FROM PAST STUDENTS
on a recent EIT survey
to the following question:
What made you choose
an EIT program[s]? 

“Good reputation, had attended good full-time programs previously.” Worley Parsons

“Program facilitator CV, ...reputation, e-learning flexibility.” SMK, New Zealand

“Content tends to practical and targeted.” MIPAC, Australia

“Non-vendor specific training and lower program costs with online training capabilities.” Worley Parsons

“The content of the program and the way the program was broken down were the key factors.” GEA Group

“I can do those programs at my own free time which made it more convenient for me.” Iluka, Australia

“Content was applicable to my job and industry. Taught by industry experts not academics. E-room delivery mode. Accreditation in various nations.” Sanofi Pasteur, Australia

“Because it is specialist, and so many available programs.” Kacst, Saudi Arabia

“Covered all my criteria and gave me recognised qualifications on completion.” Netafilm

“I took a previous program, IDC [sister company] is professional.” Cat Group

“I have done other programs with IDC [sister company] and was happy with the service provided.” GHD

“Had completed programs previously. Good content.” Woodside

“I understood from friends that it is good quality.” Rio Tinto

“Better choice of topic.” Rockwell RA

“Believed to be good quality based on previous training programs I have done in person.” BHP Billiton, South Africa

“It was referred to me by a colleague and I have attended seminars run by IDC before. The program that I am currently enrolled in also had all the outcomes I was looking for to further my career.” Rio Tinto

“The program content was relevant to my work environment and practical.” Alcoa

“I have done a few IDC programs in the past and found them to be very good and delivered by people with practical knowledge of the subjects.” Kalgold

“It provides good online program delivery including its quality support structures.” OneSteel

“Program interest and content.” ABB, Australia

“The fact the I could do it online and it was in line with furthering my knowledge for work.” CAED, Australia

“It ticked all the boxes ... quality, suitability, depth, length.” Powerco, New Zealand

“Better choice of topic.” Rockwell RA

“Program was visible and relevant.” Schneider Electric, UK

“Convenience.” Rio Tinto

“To be perfectly honest with the small amount of research on various programs I did the programs are generally the most relevant to my area of work. That’s not to say they are perfect but they seem to be superior to others readily available in this part of the world.” WEL Networks, New Zealand

“Program content seems practical and applicable. I already have a BSc where the focus is on the theory.” BHP Billiton, South Africa

“Industry recognition and recommendation by colleagues.” CPIT, New Zealand

“Seemed the most convenient option, and it was!” Nestle, South Africa

“Program content ease of study option.” GHD

“The content of the program made up my mind.” Transportadora de gas del Norte, Argentina

“Their programs are standard and program material as well as lecture are okay.” Shell, UK

“Its international recognition with body endorsing certification. Easy to attend lessons after work hours. Easy way of program payment.” Kinyara Sugar Ltd, Uganda

“The most practical and technical offerings by the most qualified lecturers for distance learning.” Encana Natural Gas

“On line references, price, and various time frames available to sit in on the class. Also, one more important item was being able to converse with the lecturer and class instead of working totally on my own.” Mitchell Technical Institute

“Program content. Accreditation of the training institution. Cost.” MODEC

“Offer the correct program, timing and affordable cost.” Folec, Brunei

“Possibly the most recognised online institution within my industry.” DRA, South Africa
Frequently Asked Questions

What are the advantages of studying online?
We know that many potential students have part or full-time employment as well as family commitments, so finding the time to study a classroom-based program is not always possible. Many students also have geographical, travel and time limitations and do not have an accessible institution or training provider. We have taken this into consideration and developed an affordable, flexible, online approach to training. This means that you can study from anywhere, with minimum downtime from work – but still have the necessary interactive learning experience. The software we use does not require very fast Internet connection or a sophisticated computer. A basic connection and hardware are sufficient.

What are the fees?
The EIT provides distance education to students located almost anywhere in the world – it is one of the very few truly global training institutes. Program fees are paid in a currency that is determined by the student’s location. A full list of fees in a currency appropriate for every country would be too complex list here and, with today’s exchange rate fluctuations, difficult to maintain.

To find out the fees for your location, contact us at enquiries@eit.edu.au.

What do I need?
An adequate Internet connection, speakers and a microphone. A headset is recommended. The necessary software and program materials are provided by us.

Doesn’t it get boring? How can an e-Learning program be interactive?
Boredom can be a real risk in any form of learning; however, we use an interactive approach to our e-Learning – with live sessions (instead of recordings) for most presentations. The webinar software allows everyone to interact and involves participants in group work; including hands-on exercises with simulation software and remote laboratories where possible. You can communicate with text messages, or live VoIP speech, or can even draw on the whiteboard during the sessions. This all helps to keep you motivated and interested.

What do live webinars involve?
These are live, interactive sessions over the Internet. You will join the lecturer and other participants from around the world in an online ‘virtual classroom’ where you are able to watch a presentation, and communicate with the lecturer and other students via audio, text messaging or drawing on the whiteboard. Each webinar is between 60 and 90 minutes in duration and the sessions may be scheduled at 2 or 3 different times, depending on class size, during the presentation day. This allows you to select the session which is most convenient.

What if I cannot join or I miss a live webinar?
Webinars are recorded and available to students upon request. One requirement of the program is that you join at least 70% of the live sessions. The live webinars offer the opportunity to interact with the presenter and other participants from around the globe - an essential yet enjoyable part of the learning process. Circumstances such as on-site work can make attendance difficult at times. These situations need to be clearly communicated with your e-learning coordinator. Feedback from the recordings may be required and assignment submission maintained.

When will the sessions take place? When will I receive a webinar schedule?
The webinar schedule is not put together until after registrations close. The reason for this is that the program is promoted globally and we often have participants from several time zones. When you enrol you will receive a questionnaire which will help us determine your availability. When all questionnaires are returned we create a schedule which will endeavour to meet everyone’s requirements.

Each webinar may run 2 or 3 times depending on class size during each presentation day and we try our best to ensure that at least one session falls into your requested time frames. This is not always possible, however, due to the range of locations of both lecturers and students. If you are unable to attend the webinars scheduled, we do have some options available. Contact EIT for more details.

Can I complete the program in less time?
Our programs actually require ‘attendance’ and participation at the live webinars. The interaction which takes place is an important part of the learning process. Our experience has shown that the interactive classes work exceptionally well and students are far more likely to stay motivated, enjoy the program, and complete the program successfully. See also ‘What if I cannot join or I miss a live webinar?’ In addition, accelerating the program would be quite onerous for most students.

How much time do I need? How long is the program?
The program reading and assignments may consume anywhere from 10 to 15 hours per week. This will vary depending on the program subject matter and your existing knowledge. EIT does not use a traditional semester-based system, which means that you can complete the qualification faster without long breaks. Each advanced diploma program is normally delivered over an intensive 18 months. We do break for about 4 weeks per year for traditional festive seasons.
International Expert Speaker Faculty

Your team of professional presenters and facilitators are drawn from experts in their field. They will work closely with you for the duration of the program. Please note: Lecturers are subject to change. Students will be notified in the event new lecturers join the faculty.

PROGRAM DESIGNER AND CONSULTANT

Jim Russell  IEng (UK) FIICA MinstMC

Jim has been working in the Instrument and Control engineering discipline for over 40 years, mainly in the oil and gas industry. After studying in the UK, he started his career as an Instrument Apprentice with Esso Fawley, rapidly followed up as an Assistant Instrument Engineer with British Gas, which he regarded as his “real apprenticeship”. On moving to Australia, he then progressed to Instrument Engineer with Worley Engineering on the Woodside Energy North Rankin “A” platform, before becoming the Instrument focal point at WAPET. Following this his role was Lead Control Systems Engineer on the Woodside Energy Goodwyn A platform design with responsibility for the Process Control and Safety Systems, where he pioneered the successful introduction of new technologies such as industrial data communications underpinning the traditional instrumentation and Distributed control Systems. After successful completion of this project Jim joined rapidly growing Australian multinational, Woodside Energy, as Principal Instrument Engineer with responsibilities for standards, technical integrity, new technology and instrument systems. Jim now consults in a wide range of mainly oil and gas topics.

As a public service to engineering professionals, Jim has set up what must surely be one of most comprehensive (free or pro bono) resources on Instrumentation, Control, Fire and Gas and Safety System called iceweb [http://www.iceweb.com.au]. He has also acted as chair of the Foundation fieldbus End User Council Australia, and was one of only five engineers worldwide who are members of the Foundation fieldbus End User Advisory Council. When not consulting and reading, Jim enjoys time with his family and at his beloved beachside cottage “down south”.

PROGRAM DESIGNER

Dr Steve Mackay  PhD, BSc(ElecEng), BSc(Hons), MBA, MMR, CP Eng, FIE (Aust)

Steve has worked in engineering throughout Australia, Europe, Africa and North America for the past 30 years. A registered professional engineer in electrical, mechanical and chemical engineering, he believes university engineering programs need to be strongly focused in industry. He has presented numerous industrial automation and industrial data communications programs worldwide to over 18,000 engineers and technicians, and has a particular interest in practical and leading edge aspects of marketing, business and engineering practice. He is a fellow of Engineers Australia. He has acted as the author or editor of over 30 engineering textbooks sold throughout the world. He feels that all engineering businesses need to think globally and keep experimenting with new approaches. Currently, he is actively involved in research and implementation of remote lab technology.

LECTURER

John Piperides  BE(Electrical)

John is a professional electrical engineer with over 25 years experience in industrial maintenance, production, management, sales and improvement. He has held management positions in several manufacturing and sales companies. His diverse responsibilities have included contract negotiation, authoring and responsibility of departmental budgets, daily management of over 20 reports, practice of cGMP, auditing in a pharmaceutical plant, and system administration and programming of diverse IT and embedded systems. He has been directly involved with industries including building management, pest control, mining, power utilities, food, pharmaceutical, steel, building products, sugar, paper and pulp, rail and airports.

John has completed many years of further education including developing, writing and delivering many work based programs and seminars. He has spent 10 years as a part-time teacher at college in electrical engineering, and 15 years delivering structured programs in thermography, power quality, instrument safety, motor drive theory, PLC, SCADA, and pest inspection.

LECTURER

Geoff Bottrell  HNC, DMS, MIIE

Geoff has been working in the instrumentation, measurement and control fields for over twenty-five years and has spent the past fifteen years specializing in Hazardous Areas, Intrinsic Safety and Instrumentation Drawings. Geoff began his career at Kent Instruments, as a service engineer working in both the UK and East Africa. His experience ranges from systems design functions, on-site trouble shooting to technical and commercial customer support.

Recently Geoff has taken on the responsibility of mentoring engineers in training, in addition to the presentation of engineering workshops in the process control and measurement field. His positive interactive style to teaching has made him popular with students worldwide.
International Expert Speaker Faculty

**LECTURER**

G. Vijayaraghavan  
**BE (Hons) Electrical**

Vijay’s experience is primarily in the field of industrial power distribution systems. He has contributed to the design, engineering, commissioning and operation of HV distribution equipment in steel industries for over 15 years which includes outdoor switchyards, indoor MV switchgear and distribution substations. He has also been trained in the operation of large captive power plants forming part of integrated steel plant systems. He has worked as the head of testing of protection and HV equipment in a large 4 MTPA integrated steel plant.

He has also served as the head of the electrical and instrumentation group for over 2 decades in a firm of consulting engineers handling several large international projects, including the power distribution systems of large metallurgical industries and the integrated power generation plants, the captive thermal power generation unit of an Aluminium smelting and refining complex and Tonnage oxygen plants associated with steel manufacturing, among several others.

Vijay has been associated with IDC/EIT for over 10 years and has designed and presented training programs on various topics related to electrical power engineering. Vijay is a popular lecturer. His students often seek his advice in analysing and solving technical problems at work, sometimes long after the completion of the program itself.

**LECTURER**

Frikkie Marx  
**BSc(Eng), Pr Eng**

Frikkie has over 20 years of experience in the fields of power electronics from design to industrialization. Starting his career on the power system protection side, he migrated to EMC and power supply systems. Frikkie’s portfolio of achievements includes the design of power systems, switch mode power supplies, UPS, high precision servo amplifiers, battery and inverter design solar panel applications, vehicle management, specialised computer systems and high current starter for vehicle plants. He is a lecturer and program developer of industrial and power electronics for Technikon SA [UNISA]. He is also a project manager/system engineer for the development of electro-optical systems which include video systems for UAV's and a high resolution infra-red camera.

Other training activities include the mentorship programs of Kentron, industrial electronics, rockets and robots training programme for the Denel Youth Foundation Bridging Program as well as training consultant. He has also successfully started and managed an IT company specialising in wireless internet and networks. In this new venture he has done strategic technical research, business development with regard to new services/products, wireless management system for repossessed properties, electrified palisade as well as development and presentation of wireless and VoIP technical programs. An enthusiastic lecturer with a wealth of knowledge under his belt, you will gain much from his entertaining style, as thousands of others have benefited from his knowledge.

**LECTURER**

Behrouz Ghorbanian  
**MSc, BSc, MIEAust**

Behrouz completed his degrees in Telecommunications and Electrical Engineering in 1985 and 1993 respectively, and then concluded his studies in Electrical Utility Engineering at Curtin University [Perth] in 2004. Behrouz started his career in the oil and gas industry where his role got him involved in the maintenance and repair of electronic and navigational marine equipment (VHF and SSN radios, Sat Nav, engine control panels etc). He then moved to the power industry and was involved in the design, installation, and commissioning of substations mainly for consultancies and utilities. He has also established a good reputation in teaching power system protection over his long term services lecturing at Curtin University, and also over the period he worked as a Protection Engineer in New Zealand.

Over the past years, Behrouz has been involved in many major projects across Australia (Port Hedland, Barrow Island, Tamar Valley, Karratha, and Newman for example). His most recent experience is related to cost estimation and risk assessment of major substation projects with a special focus on the secondary systems [Protection, COMM, SCADA]. He has also worked as an Engineering Manager and Senior Project Engineer on major copper mine projects overseas.

Behrouz has also gained good knowledge in substation design, HV cables sizing and installation, transmission system design, earthing system design and applications, and power system protection design and applications.

**LECTURER**

Hashemi Ford  
**ME(Elec), BE (Hons)(Elec)**

Hashemi has over 20 years international experience in electrical power industry with a focus on modelling, analysis, planning and operation of power systems including distribution, sub-transmission and transmission networks. He has been involved in modelling and analysis of major projects including HVDC interconnectors and Wind farms. Currently Hashemi is working as a Principal Engineer for a power utility in Australia.
International Expert Speaker Faculty

LECTURER
Deepak Pais  BE [Electrical & Electronics]
Deepak started his career within the Zinc mining & smelting industry as Project Engineer in Substation & Distribution Greenfield project. He then worked in a Marine and Logistics firm in the Bahamas as Maintenance and Commissioning Engineer. Following this he worked with Japanese and German automobile firms as Maintenance Engineer for Distribution and Utility related systems. He currently works as an Engineer in a regional NSW electricity Distribution utility.
Deepak has hands on experience in Distribution, Utility and Substation related systems. He has a particular interest in the consistent interpretation and implementation of Greenfield and Brownfield Standards with an emphasis on safety, reliability, economy and whole of life cost analysis.

LECTURER
John Lawrence  MSc, BSc[hons]
In today’s hyped up world, one is hesitant to describe anyone as ‘outstanding’, but John Lawrence has distinguished himself over the last 20 years with excellent program reviews.
John has 20 years of experience as a project and departmental manager for a multinational oil company, focusing on designing and managing the infrastructure of the telecommunications, data communications and IT systems. In the past 5 years, John has worked extensively for a number of multi-national clients, managing projects including facilities management, budgeting and financial forecasting.
When John is not consulting or lecturing, he enjoys increasing his own skills by reading and writing about state-of-the-art technology topics and how to optimise Return On Investment (ROI) for the overall IT infrastructure. John is a dedicated professional who has trained engineers and technicians throughout the world.

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LECTURER
Terry Cousins  MBL, BSc(Elec Eng), BComm, PrEng
Terry has over 30 years of experience in electrical power and distribution systems in various South African industries including the mining and steel sectors, with national companies such as ISCOR and Chamber of Mines Research.
He is currently a director of TLC Engineering Solutions who develops a wide range of instrumentation and measurement systems for industry. He also presents numerous programs on electrical power distribution and power quality, both in South Africa and throughout the world.
Terry is a Senior Member of the SAIEE, and a Member of the IEEE [USA] and has also has served on the South African National Standards committee for power quality instruments (SANS 1816). Terry is an accredited professional with the Green Building Council of Australia

LECTURER
Justin Shute  AssocDeg(Electrical-Electronic Eng), AdvDip(Elec Eng), CertIV (Train)
Justin has over 20 years electrical engineering experience and holds an advanced diploma in electrical engineering and is a fully qualified electrician. Justin has spent time working for Power & Water in Alice Springs, Minara Resources and Cockburn Cement and up until recently has been working in catastrophic HV design for Nilsen as their High Energy Engineering Manager. Justin specialises in high voltage design and solutions and also lectures for the Engineering Institute of Technology.

For more information or to apply, please contact enquiries@eit.edu.au
Module 1: Fundamentals of Electrical Engineering

You will learn how to:

- Describe the fundamentals of power systems and electric power generation
- Describe the equipment used for power transmission and distribution
- Discuss related issues such as utilization, power quality and safety

For the detailed assessment criteria of each learning outcome, please contact your EIT Learning Advisor or Program Coordinator.

Overview

This module gives a quick overview of the key areas of electrical engineering. It reviews the fundamentals of electricity, alternating current systems, electrical generation, transmission, and distribution as well as the key equipment of electrical systems. It also examines the distribution concepts followed in the oil and gas industry.

THE PROGRAM

Topic 1.1: FUNDAMENTALS OF POWER SYSTEMS AND ELECTRIC POWER GENERATION

Concepts Behind Electric Power Generation, Transmission, Distribution And Utilization [1.1.1]
- Historical overview
- Electricity production and use
- Generation: non-renewable and renewable sources
- AC and DC
- Single and 3 phase AC systems
- Relationship between frequency and poles in a generator
- 3 phase circuit relationships

Electric Power and Energy [1.1.2]
- Electrical power and energy
- Active and reactive power
- Power triangle

Fundamentals of Electrical Networks [1.1.3]
- Transmission and distribution
- Electrical networks

Topic 1.2: ELECTRICAL EQUIPMENT FOR POWER TRANSMISSION AND DISTRIBUTION AND RELATED ISSUES

Electrical Equipment Used in Transmission, Distribution and Utilization [1.2.1]
- Transformers
- Isolators
- Fuses
- Circuit breakers

Electrical Utilization, Basics of Power Quality And Electrical Safety [1.2.2]
- Electrical rotating machines AC and DC
- Power electronics applications
- Power quality problems
- Protection of electrical systems
- Electrical safety, legislation and compliance
Module 2: Fundamentals of Process Instrumentation

Duration: 7 Weeks

You will learn how to:

- Outline the fundamentals of process measurement
- Describe the methods used for pressure measurement
- Describe the methods used for level measurement
- Describe the methods used for temperature measurement
- Describe the methods used for flow measurement
- Examine and discuss process considerations in selecting instrumentation
- Examine and discuss the integration of process instrumentation systems

Overview

A clear understanding and rigorous application of instrument design, specification, selection, commissioning and maintenance principles is the most important factor in an efficient process system. Proper control of a processes can only be achieved when instrumentation provides the correct information.

This module focuses on real applications, with attention to special installation considerations and application limitations when selecting or installing different measurement or control equipment.

THE PROGRAM

Topic 2.1: PROCESS MEASUREMENT

FUNDAMENTALS

Process Measurement Concepts and Terminology [2.1.1]
- Basic measurement concepts
- Definition of terminology
- Pressure, level, temperature and flow overview
- Essential safety considerations

Pneumatic and Hydraulic Instrumentation Systems [2.1.2]
- Pneumatic instrumentation systems
- Hydraulic instrumentation and controls

Related Hardware and Accessories [2.1.3]
- Instrument tubing, fittings and accessories
- Instrumentation process interface
- Double block and bleed valves
- Monoflanes and instrument manifolds
- Process close coupling techniques

Topic 2.2: PRESSURE MEASUREMENT

Pressure Measurement Concepts [2.2.1]
- Principle of pressure measurement
- Pressure sources

Pressure Measurement Devices and Accessories [2.2.2]
- Pressure transducers
- Load cells
- Transmitters, gauges, indicators, switches, elements and accessories
- Specifications

Overpressure Relief Devices [2.2.3]
- Overpressure relief valves
- Rupture discs

Issues Related to Pressure Measurement [2.2.4]
- Installation considerations
- Impact on the overall control loop
- Future technologies

Topic 2.3: LEVEL MEASUREMENT

Level Measurement Techniques [2.3.1]
- Visual/optical
- Capacitance
- Nucleonic
- Buoyancy
- Hydrostatic pressure
- Differential pressure
- Radar and microwave
- Ultrasonic
- Radiometric
- Electromechanical
- Density
- Bubbler systems

Level Measurement Devices and Accessories [2.3.2]
- Level transmitters
- Level switches
- Tank gauging equipment

Issues Related to Level Measurement [2.3.3]
- Fiscal measurement of level
- Profiling techniques
- Level calculations
- Elevation and suppression
- Reference legs
- Installation considerations
- Impact on the overall control loop
- Future technologies

Topic 2.4: TEMPERATURE MEASUREMENT

Measurement Based on Thermoelectric Effect [2.4.1]
- Thermocouples

Measurement Based on Resistance [2.4.2]
- Thermistors

Measurement Based on Radiation [2.4.3]
- Pyrometers

Measurement Based on Expansion [2.4.4]
- Liquid filled glass
- Bimetallic

Issues Related to Temperature Measurement [2.4.5]
- Thermwells
- Natural frequency and vibration checks
- Installation considerations
- Impact on the overall control loop

Topic 2.5: FLOW MEASUREMENT

Measurement Based on Volume Flow Rate [2.5.1]
- Differential pressure
- Positive displacement
- Turbine
- Variable area (Rotameter)

Measurement Based on Mass Flow Rate [2.5.2]
- Coriolis
- Thermal dispersion

Measurement Based on Flow Velocity [2.5.3]
- Magnetic
- Target
- Ultrasonic
- Vortex

Other Types of Flow Measurement [2.5.4]
- Multiphase flow measurement
- Wet gas flow measurement
- Open channel flow measurement
- Oscillatory flow measurement

Topic 2.6: PROCESS CONSIDERATIONS IN SELECTING INSTRUMENTATION COMPONENTS

Transmitters [2.6.1]
- Noise [2.6.2]

Materials Of Construction [2.6.3]

Topic 2.7: INTEGRATION OF PROCESS INSTRUMENTATION SYSTEMS

Tank Farm Instrumentation [2.7.1]
- Calculation of Individual Instrument Error and Total Error for the System [2.7.2]

Integration of Pressure, Level, Temperature and Flow Systems [2.7.3]

Integration of New Smart Subsystems with Data Communication Links [2.7.4]

Testing and Commissioning of Subsystems [2.7.5]
Module 3: Electrical Drawings, Documentation and Schematics

DURATION: 2 WEEKS

You will learn how to:

- Interpret drawing types, symbols and attributes
- Examine and discuss the basics of CAD, drawing layout and drawing management

Overview

Drawings are used to communicate and share information between different teams of people; the design engineer who conceptualizes the equipment or system, the production engineer who plans the manufacturing of the required components and subsystems, the assembly-line workers who put the components together, the testing personnel who test the complete system, the system installers, and the maintenance crew.

This module will cover all these aspects with respect to engineering drawings in general and electrical drawings in particular. Various types of electrical drawings and their application, the steps in planning a drawing, selection of drawing size and scale, use of standardized symbols etc. will be described in detail with commonly used examples from industry practice.

Computer Aided Drafting (CAD) has brought about a major change in the way drawings are prepared and has caused a phenomenal improvement in drawing office productivity. No organization can afford to use the older manual methods of preparing drawings today. Apart from re-use and easy modification of existing drawings to create new ones, complete or partial automated drawing preparation has also become a possibility. The module discusses the advances made in this field and the links between drawings and manufacturing using 3D visualization tools and Computer Aided Manufacturing (CAM) approach.

The use of CAD-CAM tools presents its own challenges in the way drawings are stored, shared between different groups of users, and revised for re-use. The module also covers these aspects and takes a look at future possibilities in the way drawings will be used to disseminate information.
Module 4: Power Distribution

You will learn how to:

- Explain the fundamentals behind power distribution
- Discuss distribution system planning and the sizing of equipment
- Perform short circuit calculations
- Discuss in-plant generation and associated requirements
- Describe the use of diesel engines for standby power

Overview

This is a practical module in power distribution, focusing on medium voltage (1kV-36kV) power considerations, switchgear, and network studies. It provides technical know-how in these areas that are typically not covered by university or college programs.

THE PROGRAM

Topic 4.1: FUNDAMENTALS BEHIND POWER DISTRIBUTION

Characteristics and Components of Distribution Systems [4.1.1]
- Typical characteristics of an industrial distribution system
- Main components of an industrial distribution system
- Distribution system equipment
- Electrical safety and power security

Choice of Voltage Levels [4.1.2]
- Voltage classification
- Voltage levels in a distribution system

Distribution System Configuration [4.1.3]
- Types of distribution
- Typical distribution configuration

Distribution in Oil and Gas Industry [4.1.4]
- O&G distribution - special requirements and practices

Topic 4.2: DISTRIBUTION SYSTEM PLANNING AND SIZING OF EQUIPMENT

Planning of Power Distribution Systems [4.2.1]
- System planning approach
- Data needed for planning
- Collection of data

Demand Assessment and Other Studies for Equipment Sizing [4.2.2]
- Studies needed
- Distribution equipment sizing
- Load assessment
- Factors considered
- Equipment requirements and selection of rating
- Device coordination (type 1 and 2)

Factors Involved in Arriving at Cable Sizing [4.2.3]
- Cable sizing

Topic 4.3: SHORT CIRCUIT CALCULATION AND ITS APPLICATIONS

Fault Types and Characteristics [4.3.1]
- Definition
- Types
- Asymmetrical/symmetrical
- Balanced/unbalanced
- Effects
- Limiting of damage by reducing fault currents

Fault Calculations in Simple Systems [4.3.2]
- Per unit representation
- Impedance and per unit impedance
- Base kVA-what is it and why is it needed?
- Equivalent network
- Reduction techniques
- Typical transformer/generator impedance values
- Motor fault contribution
- Example calculations

Use of Fault Current Calculations [4.3.3]
- Equipment selection/withstand
- Dynamic stresses
- CB rupturing capacity
- Cable sizing
- Protection setting and coordination

Topic 4.4: IN-PLANT GENERATION AND ASSOCIATED REQUIREMENTS

In-Plant Generation: Need and Types [4.4.1]
- Why in-plant generation?
- Emergency power, standby power
- Consideration in planning
- Preferred generation practices in industrial installations

Integrating Emergency Sources with Plant Distribution [4.4.2]
- Parallel operation of generator with external supply
- Points to note in parallel operation

Preferences in Oil and Gas Industry [4.4.3]
- Typical O&G practices and applications in onshore and offshore facilities

Topic 4.5: DIESEL ENGINES FOR STANDBY POWER

Options for Power Generation in O&G Industry [4.5.1]
- The need for emergency generators in the O&G industry

Diesel Engine Theory and Ratings [4.5.2]
- Theory of IC engines-technology and classifications
- Diesel engine internals
- Engine ratings and characteristics

Performance Enhancement Measures [4.5.3]
- Efficiency enhancement
- Turbochargers and after-coolers
- Water pre-heating

Engine Packages [4.5.4]
- Diesel generator packages
Module 5: Power Transformers

DURATION: 2 WEEKS

You will learn how to:

- Describe the theory, types, construction and characteristics of power transformers
- Outline procedures for the installation, maintenance and testing of power transformers

Overview

The installation of high voltage distribution and transmission equipment has increased significantly over the years due to the ongoing global demand for power. As a result, the need to ensure the reliability of operation of power systems is paramount. Power transformers are among the most important and most expensive components of power systems, and their failure can impose extraordinarily high costs on plants, factories and utilities of all descriptions. It is critical that all personnel operating and working with such equipment have a sound knowledge of their operational requirements and maintenance.

This module covers both the theory and operation of power transformers. It will develop and enhance an understanding of what is involved in the maintenance of these essential components of power systems, through the expertise developed by some of the world’s preeminent electrical engineers.

THE PROGRAM

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Overview

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Theme 5.1: TRANSFORMER THEORY, TYPES, CONSTRUCTION AND CHARACTERISTICS

Fundamentals of Power Transformers [5.1.1]
- Transformer principle
- EMF equation of a transformer
- Vector diagram of transformers
- Equivalent circuit
- Impedance and voltage regulation
- Polarity, vector group and connections

Transformer Construction [5.1.2]
- Shell type and core type
- Power and distribution type transformers
- Transformers in power stations (GT, UT and AT)
- Construction aspects and main components
- Insulation and cooling

Transformer Types [5.1.3]
- Dry type transformers and applications
- Ratings and specifications

Transformer Protection [5.1.4]
- Surge protection, Buchholz relay, pressure relief relay
- Thermal devices and instruments (oil temperature alarm and trip, winding temperature alarm and trip)

Theme 5.2: INSTALLATION, MAINTENANCE AND TESTING

Power Transformer Installation [5.2.1]
- Electrical schemes and plant layouts
- Transformer layouts
- Indoor locations
- Outdoor installation
- Core-and-coil assembly
- Noise considerations
- Power circuit connections
- Changes in design parameters
- Site installation practices
- Pre-commissioning checks
- Transformer operation and maintenance
- Transformer inspection intervals
- Moisture in transformers
- Removal of core and assembly

Ensuring Power Transformer Oil Quality [5.2.2]
- Transformer oil analysis
- Water, acidity, dissolved gas
- Dielectric breakdown, moisture, resistivity, interfacial tension, specific gravity, power factor, furan analysis
- Recovery voltage measurement test

Electrical Tests and Preventive Maintenance on Power Transformers [5.2.3]
- Routine tests
- Type tests
- Special tests
- Transformer standards
- Tests on parts
- Transformer oil tests
- On site acceptance tests
- Recommended transformer field tests and checks

Duration: 2 WEEKS
THE PROGRAM

Module 6: Switchgear for Power Distribution

DURATION: 2 WEEKS

You will learn how to:

- Examine and discuss the basics of medium voltage and low voltage switchgear
- Examine and discuss medium voltage and low voltage circuit breakers

Overview

This is a practical module in power distribution, focusing on medium voltage (1kV-36kV) and low voltage switchgear. It provides technical know-how in these areas generally not covered by university or college programs.

Topic 6.1: MEDIUM VOLTAGE AND LOW VOLTAGE SWITCHGEAR

- Mv Switchgear Construction [6.1.2]
- Metering, Protection and Control [6.1.3]
- Asset Management [6.1.4]

Module 7: Cables and Wires – Maintenance and Installation Practice

DURATION: 2 WEEKS

You will learn how to:

- Examine and discuss cable construction and selection
- Outline procedures for cable installation, termination and jointing

Overview

Faults in underground cable may cause loss of supply to customers and loss of revenue for suppliers. It is imperative that the fault location process is efficient and accurate to minimize excavation time, which results in reducing inconvenience to all concerned. For fault locating to be efficient and accurate, technical staff need to have expert knowledge accompanied with experience in order to attain service reliability. This module is designed to ensure that those responsible for the selection, laying, operation, maintenance and monitoring of power cables understand the technical issues involved and comply with relevant specifications and requirements.

Topic 7.1: CABLE CONSTRUCTION AND SELECTION

- Cable Construction [7.1.1]
- What is a cable?
- Cable components
- Different types of insulation materials and applications
- Manufacturing
- Storage and handling

Topic 7.2: CABLE INSTALLATION, TERMINATION AND

- Cable Installation [7.2.1]
- Key installation aspects
- Storage requirements
- Type of laying
- Handling and transportation
- Unreeling and laying
- Different types of installation
  - Fire prevention
  - Passive fire protection
  - Active protection

- Fire detection
- Fire alarm
- Fire extinguishing

Theory and Practice of Cable Jointing and Termination [7.2.2]

- Cable terminations
- Indoor and outdoor terminations
- Equipment terminations
- Cable joints/splices
Overview

This module has been designed to give plant operators, electricians, field technicians and engineers a better appreciation of the role played by power protection systems. An understanding of power systems along with correct management will increase your plant efficiency and performance as well as increasing safety for all concerned. The module is designed to provide excellent understanding on both a theoretical and practical level.

Starting at a basic level and then moving onto more detailed applications, it examines the need for protection, fault types and their effects, simple calculations of short circuit current, and system earthing. The module includes some practical work, simple fault calculations, relay settings and the checking of a current transformer magnetization curve.

THE PROGRAM

Topic 8.1: FUNDAMENTALS OF PROTECTION
The Need for Protection [8.1.1]
- Selectivity, stability, sensitivity, speed, reliability, dependability, security
System Earthing/Grounding [8.1.2]
- Solid, impedance, touch potentials
- Effect of electric shock on human beings
- Earth leakage protection
- Limitation due to grounding/earthing circuit impedance involving the cable armor (incl. obtaining cable arming impedance data)
Fuses as Protection System Components [8.1.3]
- History, construction, characteristics
- Energy, let-through, application
- Notations used in standards and by manufacturers
Instrument Transformers [8.1.4]
- Current transformers: Construction, performance, specification, magnetization, curves
- Voltage transformers: types, accuracy, connections
- Trend towards combining measurement and relaying requirements from common CTs and VTs.
- Special purpose CTs, e.g. bus-zone and differential protection
- Issues of modern relays generally requiring much less burden
Circuit Breakers [8.1.5]
- Purpose and duty, fault clearance times, types and applications

Topic 8.2: FUSES, RELAYS AND BATTERIES
Fuse-Contactor Combinations [8.2.1]
- Purpose and duty, clearance times, types
- Coordination required by the standards
Tripping Batteries [8.2.2]
- DC circuitry (closing, tripping, spring charging, indication and protective relay requirements for AC or DC supplies)
- Protection of loss of auxiliary supplied, dual redundancy
- Trip circuit supervision principles
Relays [8.2.3]
- Inverse, definite minimum time (IDMT) relay: construction principles and setting
- Calculation of settings – practical examples
- New era – modern numerical relays and future trends
- Understanding modern notation

Topic 8.3: PROTECTION TYPES
Principles of Unit Protection [8.3.1]
- Differential protection – basic principles
Feeder Protection [8.3.2.a]
- Cables, pilot wire differential, overhead lines
- Distance protection (basic principles, characteristics, various schemes)
Transformer Protection [8.3.2.b]
- Phase shift, magnetising in-rush, inter-turn, core and tank faults
- Differential and restricted earth fault schemes
- Buchholz relay, oil and winding temperature
- Oil – testing and gas analysis
Switchgear (Bus Bar) Protection [8.3.2.c]
- Requirements, zones, types
- Frame leakage, high, medium and low impedance schemes, reverse blocking

Motor Protection [8.3.2.d]
- Thermal overload, time constants, early relays
- Starting and stalling conditions
- Unbalanced supply voltages, negative sequence currents, de-rating factors
- Phase-phase faults
- Earth faults – core balance, residual stabilising resistors
Generator Protection [8.3.2.e]
- Stator and rotor faults
- Overload and over-voltage
- Reverse power/unbalanced loading
- Loss of excitation and synchronism
- Typical protection scheme for industrial generators
Overhead Line Protection [8.3.2.f]
- Basic principles of the distance relay
- Tripping characteristics
- Application onto power lines
- Effect of load current and arc resistance
- Various schemes using power line carrier
Management of Protection [8.3.3]
- Routine testing, annual testing, investigation and performance assessment, up-grading
- Organization, training, records, access planning
Module 9: Electrical Safety and Grounding/Earthing Bonding, and Lightning Protection

DURATION: 4 WEEKS

You will learn how to:

• Describe the use of earthing and bonding to avoid electric shock hazards
• Explain the nature of arc flash and the mitigation thereof
• Outline electrical safety principles
• Describe methods for lightning protection of structures and other installations

Overview

Electrical grounding/earthing plays a vital role in safety of personnel and equipment. This module explains the basics thereof in a simple way so that safety in oil and gas installations can be assured by correct application of first principles. Electrical safety is an extensively legislated subject, as the handling of electrical equipment has several inherent hazards. A brief overview of electrical safety legislation will also be given.

It is a well-established fact that lightning is the second-most dangerous of all natural phenomena, [the first being flash floods] based on reported fatalities on a long-term average basis. Lightning can also cause extensive damage when it strikes buildings and facilities. Equipment failures and disruption of services on account of lightning strikes on electrical lines and substations is a matter of constant worry to T&D system managers. Protection of structures by lightning protection systems and electrical lines and substations by shielding are discussed in elaborate detail, as well as protection measures for offshore facilities.

THE PROGRAM

Topic 9.1: EARTHING AND BONDING TO AVOID ELECTRIC SHOCK HAZARDS

System Earthing [9.1.1]
• Types adopted
• Unearthed systems
• Comparison of solid earthing, resistance earthing

Protective Earthing and Bonding for Mitigation of Shock Hazard [9.1.2]
• Objectives of protective earthing
• Electric shock
• Touch and step voltage
• Sizing of earthing conductors
• Equipotential bonding
• Supply system classifications; TN, TT and IT

Earth Electrodes [9.1.3]
• Soil resistivity
• Enhancement measures
• Resistivity measurements
• Electrode configurations
• Chemical electrodes
• Corrosion and maintenance practices

Topic 9.2: ARC FLASH AND MITIGATION

Causes of Arc Flash [9.2.1]
• Arc flash - a major hazard of electricity
• Arc hazards
• Causes of arc faults

Effects of Arc Flash [9.2.2]
• Arc effects
• The three degrees of burns

Arc Flash Hazard Assessment and Mitigation [9.2.3]
• Hazard assessment [Calculations as per IEEE 1584]
• Minimizing arc fault incidents through maintenance practices
• Arc containment measures
• Warning labels

Topic 9.3: ELECTRICAL SAFETY PRINCIPLES

Safety Through Design [9.3.1]
• Electric shock prevention
• Enclosures
• Placing beyond reach
• Safe clearances from live components
• Fire hazards

Electrical Safety in Operation and Maintenance [9.3.2]
• Electrical safety through isolation
• Earthing
• Safety interlocks
• Main indicators of problems
• Safety precautions during operation and maintenance

Substation Safety [9.3.3]
• Switchyards-special safety measures
• Gas safety

Safety Rules, Enterprise Procedures and Organizational Measures [9.3.4]
• Safety legislation
• Organisational measures
• Safety policy
• Accident reporting and investigation
• Record keeping

Topic 9.4: LIGHTNING PROTECTION OF STRUCTURES AND OTHER INSTALLATIONS

Lightning Physics, Hazards and Risks [9.4.1]
• Lightning physics
• Lightning effects: electrical, thermal and mechanical
• Direct and indirect effects
• Types of damage and risk levels

Lightning Protection [9.4.2]
• Protection basics and protection levels
• Protection design
• Zone of protection and evaluation methods
• Lightning protection components
• Protection of electrical lines and substations
Module 10: Power Quality, Uninterruptible Power Supplies (UPSs), Surge Protection and Noise Control

DURATION: 5 WEEKS

You will learn how to:

- Discuss the basics of power quality and dealing with voltage variations and/or interruptions
- Describe the use of batteries for critical power supplies
- Describe methods used for surge and transient protection
- Identify methods for controlling harmonics and noise
- Explain the principles of Power Factor compensation and Power Quality studies

Overview

Supplying reliable electric power for critical systems is an essential part of modern industrial installations. Very often the supply received from a distribution network has quality issues such as voltage sags and swells, transients, harmonics, and interruptions. While it is impossible to guarantee 100% availability of power at all points in any system, vulnerable sections can be provided with alternative emergency power supply to ensure more reliable power availability, thereby avoiding the problems caused by power interruption. Measures against power interruptions, voltage variations, transients and harmonics will be discussed in this module.

THE PROGRAM

Topic 10.1: INTRODUCTION TO POWER QUALITY AND DEALING WITH VOLTAGE VARIATIONS/INTERRUPTIONS

Power Quality [10.1.1]
- Definition of power quality
- Important quality aspects
- Typical power quality issues in practical systems

Voltage Variations and Interruptions [10.1.2]
- Voltage variation and reasons
- Sag effects
- Swell effects
- Sensitivity curves

Ups Systems [10.1.3]
- Static UPS systems
- UPS sub-types

Topic 10.2: BATTERIES FOR CRITICAL POWER SUPPLIES

The Importance of Having Uninterrupted DC and AC Supply [10.2.1]
- Load sensitivity to power failures
- Direct and indirect effects of power failure

Batteries [10.2.2]
- Construction, charging and discharging
- Semiconductors as rectifiers and inverters
- Battery sizing
- Battery installation
- Failure and disposal

Topic 10.3: SURGE AND TRANSIENT PROTECTION

Surge Coupling [10.3.1]
- Resistive, inductive and capacitive coupling

Surge Protection [10.3.2]
- Basic principle of surge protection
- Surge protection devices
- Graded surge protection
- SPD selection criteria

Topic 10.4: HARMONICS AND NOISE

Sources of Harmonics [10.4.1]
- Linear and non-linear loads
- Harmonic components and Fourier transforms
- Non-linear loads as harmonic current sources
- Problems caused by harmonics in supply systems

Controlling Harmonics [10.4.2]
- Controlling harmonics by decoupling
- Controlling by rectifier configuration and phase shifting
- Controlling harmonics by filters

Noise Control [10.4.3]
- Effects on sensitive circuits (S/N ratio)
- Coupling of noise between circuits
- Mitigation by electrostatic screening
- Shielding against EMI
- Use of optical and transformer coupling for noise mitigation

Topic 10.5: POWER FACTOR COMPENSATION AND POWER QUALITY STUDIES

Power Factor (PF) Compensation Methods [10.5.1]
- Active and reactive power
- Problems due to high reactive power
- PF compensation methods
- Dynamic compensation and applications of SVC (Static VAR Compensators)

Power Quality (PO) Site Studies [10.5.2]
- Power quality issues commonly found
- Normally adopted solutions
- Power quality studies
- Objectives of a study
- Levels of study as per IEEE 1100
- Aspects studied and instruments used
Module 11: Troubleshooting, Maintenance and Protection of AC Electrical Motors and Variable Speed Drives for Instrumentation and Control Systems

DURATION: 5 WEEKS

You will learn how to:
- Explain the fundamentals of AC motor construction, operation, and maintenance
- Describe the design, components, and operation of induction motors
- Describe the operation of Variable Speed Drives for AC induction motors
- Examine and discuss power electronic converters, electromagnetic compatibility (EMC) and protection
- Outline installation and fault-finding techniques for AC Variable Speed Drives

Overview

It is estimated that electrical drives and other rotating equipment consume about 50% of the total electrical energy consumed in the world today. The cost of maintaining electrical motors can be a significant amount in the budget item of manufacturing and mining industries. This module provides a thorough understanding of an electrical motor's working, maintenance and failure modes and describes the tools to maintain and troubleshoot electrical motors.

The module also covers the installation, operation and troubleshooting of variable speed drives. Typical practical applications of VSDs in process control and materials handling, such as those for pumping, ventilation, conveyors, compressors and hoists are covered in detail.

THE PROGRAM

Topic 11.1: FUNDAMENTALS OF AC MOTOR CONSTRUCTION, OPERATION, AND MAINTENANCE
- Efficiency, Torque, Inertia, Horsepower, Power Factor [11.1.1]
- Torque-Speed Curves [11.1.2]
- Basic Construction and Physical Configuration, Windings [11.1.3]
- Principles of Operation and Maintenance [11.1.4]

Topic 11.2: THREE-PHASE AC INDUCTION MOTORS: PRACTICAL ASPECTS, TESTING AND PROTECTION
- Design, Components, and Operation of Induction Motors [11.2.1]
  - Components and theory of operation
  - Induction motor design
  - Duty cycles, insulation and cooling requirements
  - Starting and selecting methods
- Determination of Losses and Efficiency [11.2.2]
  - Standards and losses
  - Tests for measurement and computation of losses and efficiency
  - Dynamometers
  - Principles of load application by braking
  - Torque measurement basics
- Motor Protection [11.2.3]
  - Thermal overload, over current / overload
  - Under-voltage / over-voltage
  - Under frequency
  - Current unbalance or negative phase sequence
  - Earth fault protection
  - Pole slip / out of step
  - Loss of excitation
  - Inadvertent energization

Topic 11.3: VARIABLE SPEED DRIVES FOR AC INDUCTION MOTORS
- Characteristics and Application of Variable Speed Drives [VSDs] [11.3.1]
  - Types and principles of speed control
  - Efficiency, torque, inertia, horsepower/ power factor
  - Calculating induction motor run-up
  - Torque -speed curves
  - Influence of varying frequency and applied voltage
  - Effects of harmonics in induction motors
  - Control of air-gap flux density

Special Considerations for Hazardous Area Use [11.3.2]
- Non-hazardous and hazardous types
- Hazardous type certificates and label markings
- Inertia and torque-speed curves

Topic 11.4: POWER ELECTRONIC CONVERTERS, ELECTROMAGNETIC COMPATIBILITY (EMC), AND PROTECTION
- Power Electronic Converters and Inverters [11.4.1]
  - Power electronic and inverters
  - Gate commutated converters and gate controlled devices
  - 6, 12 and 24-pulse systems
  - PWM rectifier for AC converters
  - Soft switching
- EMC Issues when Using VSD Equipment [11.4.2]
  - Electromagnetic interference
  - Effect of harmonic distortion
  - Thermal Overload Protection
- Protection of Motors and Converters [11.4.3]
  - AC frequency converter protection
  - Fault diagnostics
  - Electric motor and thermal overload protection

Topic 11.5: INSTALLATION AND FAULT FINDING TECHNIQUES FOR VARIABLE SPEED DRIVES
- Control System for AC Variable Speed Drives [11.5.1]
  - Power supply and VSD control loops
  - Vector control
  - Current Feedback and speed feedback
- Selection of AC Converters for Variable Speed Drive Applications [11.5.2]
  - Operation in the constant power region
  - Nature of the machine Load
  - Starting and stopping VSDs
  - Calculating acceleration torques and times
- Installation and Fault Finding Techniques [11.5.3]
  - General installation and environmental requirements
  - Installing contactors and AC converters
Subsequently explained. The information is taken from the harmonized International Standard Series IEC60079. Engineers in this industry must understand the workings of explosion protection systems and how they are implemented with respect to process plant control and instrumentation, and other electrical equipment. This is so that safety is designed into the process plant and is managed technically and organizationally for the operational life of the plant.

The requirements of installation, operation, inspection and maintenance aspects of such equipment used in hazardous areas are subsequently explained. The information is taken from the harmonized International Standard Series IEC60079. Engineers in this industry must understand the workings of explosion protection systems and how they are implemented with respect to process plant control and instrumentation, and other electrical equipment. This is so that safety is designed into the process plant and is managed technically and organizationally for the operational life of the plant.

Overview
During the phases of extraction and processing, prior to eventual use as fuels or feed-stocks, the oil and gas industry handles ignitable substances. Inadvertent combustion can cause, and has caused, major disasters and loss of life.

This module provides instruction on how explosion protection is applied. It looks at hazardous area terminology, together with the many basic principles involved, and some applications to explain the subject. The processes of area classification in plant design are introduced by examining the characteristics of flammable gases and vapors. This forms the basis of the classification systems for equipment (i.e. grouping and temperature rating) such that suitably rated equipment can be selected for a given hazard.

The requirements of installation, operation, inspection and maintenance aspects of such equipment used in hazardous areas are subsequently explained. The information is taken from the harmonized International Standard Series IEC60079. Engineers in this industry must understand the workings of explosion protection systems and how they are implemented with respect to process plant control and instrumentation, and other electrical equipment. This is so that safety is designed into the process plant and is managed technically and organizationally for the operational life of the plant.

**THE PROGRAM**

**Topic 12.1: BASIC CONCEPTS OF HAZARDOUS AREAS**

**Background to Hazardous Areas [12.1.1]**
- Accidents and explosion consequences
- Definition of hazardous area
- Introduction to standards, testing
- Authorities and equipment certification

**Characteristics of Flammable Gases [12.1.2]**
- Properties of flammable gases
- Ignition sources
- Use of electricity
- Protection requirements

**Hazardous Zones and Associated Definitions [12.1.3]**
- Definitions
- Risk assessment
- Normal and abnormal plant operation
- Sources of release
- Assessment procedures
- Ventilation consideration
- Zoning principles
- Examples
- Documentation

**Equipment Classification Systems [12.1.4]**
- Classification of apparatus
- Equipment grouping and temperature rating
- Labeling on equipment
- Overview of types of protection and comparison

**Topic 12.2: PRINCIPLES OF TYPES OF PROTECTION**

**Explosion Protection Concepts [12.2.1]**
- Definition, principles and applications

**Flameproof Concept Ex d [12.2.2.a]**
- Flamepath attributes as part of enclosure design

**Increased Safety Concept Ex e [12.2.2.b]**
- High integrity connection and insulation quality

**Non Sparking Concept Ex n [12.2.2.c]**
- Basic protection for zone 2 only

**Intrinsic Safety Concept Ex i [12.2.2.d]**
- Systems approach useful for instrumentation circuits

**Pressurization Concept Ex p [12.2.2.e]**
- Artificial safe area creation permits wide variety of application

**Other Types of Protection [12.2.2.f]**
- Lesser known types: Ex o, q, m and s
- Advantages and limitations

**Combined Protection [12.2.2.g]**
- Using combinations of protection to solve application problems

**Topic 12.3: INSTALLER AND USER PRACTICES**

**Mitigation of Electrical Hazards Through Earthing and Bonding [12.3.1]**
- Basic terminology and principles
- Reasons for good earthing practice
- Fault current routing consideration
- Noise and interference control for instrumentation
- Static discharge paths
- Lightning and surge protection
- Electric shock, step and touch potentials, IEEE 80-2000

**Code of Practice for Selection and Installation of Ex Equipment [12.3.2]**
- Equipment selection criteria
- Documentation requirements
- Structure of code of practice
- Precautionary requirements
- Cabling requirements

**Standards, Certification, Marking, and the Atex Directive [12.3.3]**
- Summary of standards and codes of practice
- Summary of certification
- Scope of directive
- Conformity verification

**Inspection and Maintenance of EX Equipment In Accordance with Atex Directives [12.3.4]**
- Types of inspection
- Integration with planned maintenance
- Procedures
- Key activities
- Repair of equipment
Module 13: Electrical Applications to an Oil and Gas Platform and Site

THE PROGRAM

You will learn how to:

- Develop solutions for industrial problems related to sustainable energy and harmonic resonance
- Propose measures to minimize the risk of fire to plants

Overview

This module focuses primarily on sustainable energy sources, harmonic resonance (e.g., on ships and offshore platforms) and plant fires started through lightning and electrostatic discharge. The course work is based primarily on case studies, and delegates will consider all electrical problems holistically, combining elements of grounding/earthing, protection, hazardous areas, and switchgear. They will also draw on each other’s experience in recommending solutions to the individual cases.

Topic 13.1: SUSTAINABLE ENERGY AND HARMONIC RESONANCE

Sustainable Energy [13.1.1]
- Meaning of sustainability
- Fundamental principles
- Sustainability indicators
- Applicability of sustainability to industrial activities
- Sustainability in oil and gas terms

Solving Harmonic Resonance Problems [13.1.2]
- Harmonic resonance in industrial systems
- Harmonic resonance in ships
- Harmonic resonance in offshore platforms

Topic 13.2: FIRE PREVENTION

General Nature of Oil Fires [13.2.1]
- Fires in oil installations
- Special situations needing attention

Fires Due to Lightning [13.2.2]
- Lightning as a source of fires
- Reduction of hazards

Fires Due to Static Discharge [13.2.3]
- Static electricity as a source of fires
- Control of static electricity
- Static problem areas in oil and gas industry

CASE STUDIES

- Power source of Yokon Mines and reason for selecting natural gas
- LNG plant in Yemen, selection of motors for LNG gas compressor drives
- Harmonic resonance in an industrial system
- Cable ship harmonic problem
- Harmonic problem in offshore platform
- Refinery fire
- Oil rig fire
- Major refinery fire
- Fire in an Egyptian oil processing plant
You will learn how to:

- Examine and discuss the basics of drawings, standards and components
- Interpret plant-related diagrams and documentation
- Interpret drawings related to pneumatics, hydraulics, ladder logic and electro-pneumatics

Overview

The module serves as an introduction to the local, national and international standards used in the oil and gas field. This module is designed for engineers and technicians from a wide range of abilities and backgrounds and will provide an excellent introduction to mastering plant documentation and diagrams, covers the flow of documentation from design through manufacture to maintenance and operations.

The module looks at the applications of each diagram type, detailing where and when the document should be used. During the life span of any plant, a multitude of different vendors will supply plant modifications and equipment as the plant is continuously enhanced. The quality of the documentation produced will vary enormously with each new supplier.

Delegates will be given the skills to apply a standardized internationally acceptable set of standards to their plant documentation.

THE PROGRAM

Topic 14.1: DRAWING TYPES, STANDARDS AND COMPONENT FUNDAMENTALS

Plant Documentation [14.1.1]
- The role of plant documentation, standards and specifications

Drawing Types and Standards [14.1.2]
- Standards organizations (ISA, IEC, ISO)
- Understanding diagram layouts and formats
- Cross references
- ISO 9002 and document control
- API RP14F – Section 12.2 – electronic instrumentation
- ISA Standards Library for Automation and Control
- Specification forms – ISA S520 – specification forms for process measurement

Component Fundamentals [14.1.3]
- Relays
- Transducers
- Switches
- Gate logic
- Fail safe design

Topic 14.2: PLANT-RELATED DIAGRAMS AND DOCUMENTATION

Piping and Instrument Diagrams (P&ID) [14.2.1]
- Process flow diagrams
- An introduction to the PFD, P&ID, UFD, MFD
- Control loops on the P&ID
- HAZOP
- Mass balance
- Functional spec

Instrumentation Documentation [14.2.2]
- Document types
- Instrument lists
- Logic diagrams
- Wiring diagrams
- Indexes
- Schedules and lists
- Block diagrams
- Data sheets
- Loop diagrams
- Hands-on circuit function
- Fault finding
- Standards and symbols
- Nomenclature

Electrical Documentation [14.2.3]
- Electrical standards
- Electrical document types
- Main circuits
- Control circuits
- Symbols
- Nomenclature

Pneumatics & Hydraulics [14.3.1]
- Introduction
- Standards
- Layout and symbols
- Basic circuits
- Deducing principle of operation

Ladder Logic [14.3.2]
- Introduction and overview
- Standards and layout
- Power supply circuits

Electro-Pneumatic Circuits [14.3.3]
- Overview
- Truth tables
- Fault finding
- Principle of operation

Instrumentation Acronyms [14.3.4]
- Common acronyms (e.g. P&ID)
Module 15: Process Control Basics

THE PROGRAM

You will learn how to:

- Explain the basics of process control
- Examine and discuss issues related to stability, algorithms and cascade control
- Examine and discuss controller action, feedforward control and long dead time
- Perform loop tuning

Overview

This module covers the essentials of process control, as well as the tools to perform effective loop tuning. It is aimed at engineers and technicians who wish to have a clear understanding of the essentials of process control and loop tuning, as well as how to optimise the operation of their particular plants or processes. Mathematical theory has been kept to a minimum, with the emphasis on practical application.

Topic 15.1: PROCESS CONTROL BASICS
Reasons for Process Control [15.1.1]
Definitions of PV, SP, CV, GAIN, LAG and DT [15.1.2]
Types of Feedback Control [15.1.3]
Set Point Tracking [15.1.4]
Proportional or Gain Action of PID Control [15.1.5]

Topic 15.2: STABILITY, ALGORITHMS AND CASCADE CONTROL
Stability [15.2.1]
Ideal vs. Real Algorithms [15.2.2]
Cascade Control [15.2.3]
Integral or Reset Action of PID Control [15.2.4]

Topic 15.3: ACTION, FEEDFORWARD AND THE EFFECTS OF DEAD TIME
Direct vs. Indirect Action of a Controller [15.3.1]
Derivative or Reset Action of a Controller [15.3.2]
Feedforward Control [15.3.3]
Combined Feedforward and Feedback Control [15.3.4]
Effects of Dead Time on a Controlled Process [15.3.5]

Topic 15.4: PROCESS CONTROL BASICS
Objectives of Tuning [15.4.1]
Open Loop Tuning [15.4.2]
Closed Loop Tuning [15.4.3]
Tuning with Some Overshoot [15.4.4]
Tuning with No Overshoot [15.4.5]
THE PROGRAM

**Topic 16.1: INSTRUMENT MAINTENANCE AND TESTING**

**Maintenance Concepts [16.1.1]**
- Corrective, preventative and predictive maintenance
- Troubleshooting
- ISO 9000 and 9001

**Electrical Measurements [16.1.2]**
- Use of multimeters and calibrators
- Voltage, current and resistance measurement
- Analog and digital meters
- Oscilloscopes
- Current-to-voltage conversion
- Multiple loop devices
- Diodes and resistors
- Soldering and component preparation
- Open and short circuits
- Testing of diodes, DIACS and TRIACS
- Components out-of-tolerance
- Isolation and grounding/earthing

**Instrument Performance [16.1.3]**
- Basic measurement and control concepts
- Accuracy, range, hysteresis, linearity, repeatability, response, dead time
- Zero/span
- Process dynamics
- Specifications

**Instrument Documentation and P&IDs [16.1.4]**
- Control loops on the P&ID
- Instrument lists
- Wiring diagrams
- Schedules and lists
- Data sheets
- Loop diagrams
- Standards and symbols

**Topic 16.2: CALIBRATION AND SIMULATION**

**Standards, Certification, Marking and Approval [16.2.1]**
- Standards
- Authorities
- Marking and identification
- Apparatus certification

**Calibration [16.2.2]**
- The basis of transmitter calibration
- Standards for calibration
- Five point calibration
- Charts
- Shop calibration
- Electro-pneumatic calibrators
- In-shop or field calibration
- Calibration of RTDs and thermocouples

**Simulation [16.2.3]**
- The basis of signal simulation
- Transmitter simulation
- Transducer simulation

**Field Bus and Digital Transmitters [16.2.4]**
- Configuration
- Rearrangement
- Digital trimming

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You will learn how to:
- Explain the basics of instrument maintenance and testing
- Examine and discuss the basics of instrument calibration and simulation

**Overview**

This module is designed for engineers and technicians from a wide range of abilities and backgrounds and provides an excellent introduction to installation, calibration, commissioning and maintenance of electronic instrumentation. The module is begins with coverage of the basics of electrical measurements. Instrument performance and calibration principles are then covered with rules for calibrating transmitters. Hereafter the procedures for calibrating and installing smart transmitters are covered.

Typical documentation requirements for instruments are examined, with a focus on instrument data sheets, P&IDs, and wiring diagrams. During the life span of any plant a multitude of different vendors will supply plant modifications and equipment as the plant is continuously enhanced. The quality of the documentation produced will vary enormously with each new supplier.

Instruments in hazardous areas are then detailed. The module is finalised with a discussion on the integration of the entire system, as well as testing and commissioning procedures for instruments.
Module 17: Control Valve Sizing, Selection and Maintenance

DURATION: 3 WEEKS

You will learn how to:

- Outline the essentials and capabilities of control valves
- Describe the sizing, actuation, and essential accessories of control valves
- Discuss the material, standards, applications, maintenance and installation of control valves

Overview

This module covers the essentials of control valves, as well as release valves. It deals with all aspects of control valves such as construction, standards, maintenance, installation, actuation and selection as well as sizing.

THE PROGRAM

Topic 17.1: CONTROL VALVE ESSENTIALS AND CAPABILITIES
- Introduction to Control Valve Theory [17.1.1]
- Different Types of Control Valves [17.1.2]
- Characteristics [17.1.3]
- High Pressure Drop Applications [17.1.4]

Topic 17.2: SIZING OF CONTROL VALVES, ACTUATION AND ESSENTIAL ACCESSORIES
- Use of Computer Programs for Valve Sizing [17.2.1]
- Examples of High Pressure Drop Applications [17.2.2]
- Actuators [17.2.3]
- Positioners [17.2.4]
- Pneumatic Circuits [17.2.5]

Topic 17.3: CONTROL VALVE MATERIAL, STANDARDS, APPLICATIONS, MAINTENANCE AND INSTALLATION
- Materials [17.3.1]
- Quality Standards [17.3.2]
- Severe Service Applications [17.3.3]
- Pressure Relief Valves [17.3.4]
- Installation and Maintenance [17.3.5]
Module 18: Programmable Logic Controllers

DURATION: 3 WEEKS

You will learn how to:

- Explain the fundamentals of PLCs
- Develop PLC programs for specific applications
- Examine and discuss safety controllers, programming standards and communications for PLCs

Overview

This module is designed to benefit participants with practical, up-to-date information on the application of PLCs to the automation and control of process plants and factories. It is suitable for people who have little or no exposure to PLCs, but who expect to become involved in some or all aspects of PLC installation. It aims to give practical advice from experts in the field, to assist delegates with correctly planning, programming, and installing a PLC with a shorter learning curve and more confidence. While the module is ideal for electricians, technicians and engineers who are new to PLCs, much of the module and additional material in the reading material will be of value to those who already have some basic skills, but need a wider perspective for larger and more challenging tasks ahead.

THE PROGRAM

Topic 18.1: PLC FUNDAMENTALS

Overview of PLCs and Their Applications [18.1.1]
- A brief history of PLCs
- Alternative control systems – where do PLCs fit in?
- Why PLCs have become so widely accepted
- Lingering concerns about PLCs

Fundamentals of PLC Hardware [18.1.2]
- Block diagram of typical PLC
- PLC processor module – memory organization
- Input / output section – module types
- Power supplies

Fundamentals of PLC Software [18.1.3]
- Methods of representing logic
  - Boolean algebra
  - Instruction code
  - Graphical presentation
  - Functional logic diagrams
  - Ladder logic
- Fundamental ladder logic instruction set
- Comparison of different manufacturers
  - Memory and data representation
  - Instruction code

Using Ladder Logic for Simple Digital Functions [18.1.4]
- The basic rules
- Comparison with relay ladder diagrams
- The concept of the ‘scan’ and how to apply it
- Infinite fan-out
- Contact ‘normal’ states
- Positive and negative logic
- Basic Boolean functions
- The usefulness of De Morgan’s Law

Using Registers (Words) [18.1.4]
- Number systems
- Types of register data
- Timers
- Counters
- Bit shift / rotate
- Table functions
- Register [matrix] logic functions

Advanced Control With PLCs [18.1.3]
- The concept of reusable logic
- Use of advanced programming functions
- Matrix logic
- Table functions and indirect addressing

Batch Processes and Sequential Control [18.1.4]
- Remembering the program state
- Creating a ‘stepper’
- Step advance
- Fault detection and recovery
- Operator Intervention
- Multiple recipes or alternate paths
- Sequential function charts

PID Control Issues [18.1.5]
- The importance of timing and scan time
- When PID is not always appropriate

Topic 18.3: SAFETY CONTROLLERS, PROGRAMMING STANDARDS & COMMUNICATIONS

Safety Programmable Systems [18.3.1]
- Why regular PLCs should not be used for safety functions
- Programmable electronic logic solvers
- Safety certification
- Certified programming systems
- Application examples
- Growth of networked safety devices and certified networks
- Integrated safety systems

Data Communications [18.3.2]
- Interface standards: RS-232, RS-422/423, RS-485
- Protocols: Modbus, DH+
- Local Area Networks: Ethernet
- Monitoring communication links and simple watchdog timers

Introduction To IEC 61131-3 [18.3.3]
- Concepts
- Common elements
- Programming languages: structured text
- Function block diagrams
- Ladder diagrams
- Instruction list
- Sequential function chart

OPC [18.3.4]
- Functionality
- Architecture

System Checkout and Testing [18.3.5]
- Development and verification of code
- Factory acceptance testing
- Testing procedures
- Emulating missing hardware
- Emulating process responses
You will learn how to:

- Describe the use of SCADA for monitoring installations across a wide geographical area
- Describe the use of SCADA for process plants
- Explain the essentials of DCSs
- Describe DCS operator interfacing, control and implementation

Overview

SCADA has traditionally meant a window into the process or a plant, or gathering of data from devices in the field, but now the focus is on integrating this process data into the actual business and using it in real time. The emphasis today is on using ‘open’ standards such as IEC 60870, DNP3 and TCP/IP and ‘commercial-off-the-shelf’ (COTS) hardware and software to keep the costs down.

The first part of the module covers the essentials of SCADA systems, such as found with water and electrical utilities. This gives an introduction to the SCADA hardware and software. It then focuses on the main plant communication systems using Industrial Ethernet and one or more of the field buses. Finally, there is an examination of many of the common issues involved in all SCADA systems. These include Alarm Management, Human Machine Interfaces (HMI), network security, Historians, troubleshooting, maintenance and specification issues.

This module also covers the practical application of modern Distributed Control System (DCSs). Whilst all control systems today are distributed to a certain extent, there is a definite merging of the concepts of DCS, PLCs and SCADA.

THE PROGRAM

Topic 19.1: SCADA FOR MONITORING INSTALLATIONS ACROSS A WIDE GEOGRAPHIC AREA

Overview of Wide Area Scada Systems [19.1.1]
Scada System Hardware [19.1.2]
Scada System Software [19.1.3]
Scada Communication Protocols [19.1.4]
Scada Human Machine Interface (HMI) [19.1.5]

Topic 19.2: SCADA FOR PROCESS PLANTS

Overview of Process Plant SCADA Systems [19.2.1]
Alarm Management [19.2.2]
Network Security [19.2.3]
Historian [19.2.4]
System Installation and Commissioning [19.2.5]
Troubleshooting and Maintenance [19.2.6]

Topic 19.3: DISTRIBUTED CONTROL SYSTEMS (DCSs)

DCS vs. SCADA and PLCs [19.3.1]
DCS System Elements [19.3.2]
Data Communications [19.3.3]
DCS Controllers [19.3.4]
- The basic controller
- Basic controller configuration
- Advanced controllers
- Programming

Uninterrupted Operation and Security Issues [19.3.5]

Topic 19.4: DCS OPERATOR INTERFACING, CONTROL AND IMPLEMENTATION

DCS Operator Interfacing [19.4.1]
- The operator interface
- Alarm management
- Reporting

DCS Configuration And Control [19.4.2]
- DCS configuration
- Advanced control strategies

DCS Implementation Issues [19.4.3]
- Maintenance considerations
- DCS applications
- Comparison of offerings from DCS vendors

DUrATION: 4 WEEKS
Module 20: Industrial Data Communications

DURATION: 3 WEEKS

You will learn how to:

• Explain the fundamentals of data communication systems
• Select appropriate standards, technologies and methodologies for the installation of Industrial Data Communication Systems
• Describe the commissioning, testing and troubleshooting of Industrial Data Communication Systems

Overview

The objective of this module is to outline the best practice in designing, installing, commissioning and troubleshooting industrial data communications systems. In any given plant, factory or installation there are a myriad of different industrial communications standards used and the key to successful implementation is the degree to which the entire system integrates and works together.

With the vast number of different technologies and standards currently on the market, the debate is not "what is the best", but rather how does industry assess and select the most appropriate for given applications. The next challenge is to ensure that best practice is followed in designing, installing and commissioning the data communication links to ensure they run fault-free.

The industrial data communications systems in a plant underpin the entire operation. It is critical that personnel apply best practice in designing, installing, troubleshooting and fixing any problems that may occur. The most critical component of any industrial data communications system is, in fact, the medium (i.e. the fibre or copper cable). This module outlines the critical rules followed in installing the data communications media, and then ensuring that the installation will be trouble-free for years to come.

Delegates are not required to know the minute details of the actual protocols used, but rather how to select, install and maintain the system in the most cost-effective and beneficial manner.

THE PROGRAM

Topic 20.1: FUNDAMENTALS OF DATA COMMUNICATION SYSTEMS

General Attributes of Industrial Data Communication Systems [20.1.1]
• OSI model
• Attributes of typical communication systems:
  • Media
  • Physical connections
  • Protocols
  • Applications

Noise and Ingress Protection [20.1.2]
• Noise
• Earthing
• Shielding
• Ingress protection

Copper and Fiber [20.1.3]
• Cable standards
• Cable distribution standards
• Connector standards
• EMC conformance standards
• Splicing
• Connector attachment
• Drivers and detectors
• Grounding/earthing
• Termination
• Protection against transients

Common Physical Layer Standards [20.1.4]
• RS-232
• RS-485
• IEC 61158-2

Industrial Networks [20.1.5]
• Industrial Ethernet
• ASI
• DeviceNet
• Profinet
• Foundation Fieldbus H1
• Modbus Plus
• Data Highway Plus
• HART
• Ethernet/IP
• Profinet
• Foundation Fieldbus HSE

Industrial Protocols [20.1.6]
• TCP/IP
• Modbus Serial
• Modbus TCP
• DNP3
• IEC 60870

Wireless Technologies [20.1.7]
• VSAT
• Wireless
• Wireless point-to-point

Topic 20.2: SELECTION AND INSTALLATION METHODOLOGIES

Which Standards or Technologies to use at Device, Operator, and Enterprise Level [20.2.1]
Which Standards to use for Long-Distance Scada/Telemetry Links [20.2.2]
System Design, Installation, Tips, Tricks and Pitfalls for: [20.2.3]
• Copper cabling and connectors
• Fiber cabling and connectors
• Wireless

Topic 20.3: COMMISSIONING/TESTING/ TROUBLESHOOTING

Copper Infrastructure [20.3.1]
Fiber Infrastructure [20.3.2]
Wireless Infrastructure [20.3.3]

Networks [20.3.3]
• Physical layer issues (OSI Layer 1)
• Data Link layer issues (OSI Layer 2)
• Network layer issues (OSI Layer 3)
• Transport layer issues (OSI Layer 4)
• Application and ‘user’ layer issues (OSI Layers 7 and 8)
• Client/server issues
You will learn how to:

- Analyse safety life cycle, risk reduction and safety targets
- Plan system integration, documentation, diagnostics and testing

Overview

This module has been designed for project managers and engineers involved with hazardous processes, and focuses on the management, planning and execution of automatic safety systems in accordance with IEC 61511, the international standard for process industry safety controls.

IEC 61511 has been recognised by European safety authorities and by USA-based process companies as representing the best practices available for the provision of automatic safety systems. The standard captures many of the well-established project and design techniques that have been described, since 1996, in ANSI/ISA standard S84 whilst introducing many newer principles based on the master standard IEC 61508.

IEC 61511 [published in 3 parts] combines the principles of IEC 61508 and S84 into a practical and easily understood code of practice specifically for end users in the process industry. This module is structured into two major parts to ensure that both managers and engineering staff are trained in the fundamentals of safety system practices.
Module 22: Wellhead and Flowline Control Systems

THE PROGRAM

You will learn how to:

• Explain well control methods and related issues
• Describe well control equipment and related issues

Overview

This module covers the essentials of instrumentation and control methods related to wellhead and flowline control systems.

Topic 22.1: WELL CONTROL METHODS

Control Methods [22.1.1]
• Basic considerations in wellhead and flowline control
• Constant bottomhole pressure well control methods
• Procedures

Kicks [22.1.2]
• Causes and detection

Pressure [22.1.3]
• Pressure concepts and calculations

Properties of Gases and Fluids [22.1.4]
• Gas characteristics and behaviours
• Fluids

Topic 22.2: WELL CONTROL EQUIPMENT

Blow-Out Preventer [22.2.1]
• Blow Out Preventer (BOP) Configuration
• Function and performance of BOP closing unit

Manifolds and Piping [22.2.2]
• Manifolds
• Piping

Well Control Equipment [22.2.3]
• Well control equipment arrangement
• Well control related instrumentation
• Control systems

Module 23: Oil and Gas Specific Applications for Floating Production, Storage and Offloading (FPSO) Facilities

THE PROGRAM

You will learn how to:

• Describe smart maintenance techniques and key platform systems for FPSO facilities
• Describe process safety and emergency response systems for FPSO facilities

Overview

This module covers some miscellaneous systems that are applicable to the oil and gas industry, yet not covered in the core engineering parts of this course.

Topic 23.1: SMART MAINTENANCE TECHNIQUES AND KEY PLATFORM SYSTEMS

Smart Maintenance Techniques [23.1.1]

Instrumentation and Safety Systems for Cranes [23.1.2]

Platform Navigational Audible Warnings/Signals [23.1.3]

Compressor Surge Control: Basic Considerations [23.1.4]

Topic 23.2: PROCESS SAFETY AND EMERGENCY RESPONSE SYSTEMS

Flare Flame Front Generator and Ignition Monitoring System [23.2.1]

Communication and Alarm Systems Viz.: [23.2.2]
• Public address systems
• Audible and visual alarms
• Status lights