



Editorial Message

Dear Reader,

Today, more than 54% of the world's population lives in urban areas, a proportion that is expected to increase to 66% by 2050. As per "The 2014 revision of the World Urbanization Prospects" by UN's Department of Economic & Social Affairs (DESA) Population Division, the largest urban growth will take place in India, China and Nigeria. As a result, these countries will face numerous challenges in meeting the needs of their growing urban populations, including housing, infrastructure, transportation, energy and employment, as well as basic services such as education and health care.

Recognizing the importance of sustainable infrastructure, the Government of India is working on structural policy changes to provide a big push to the Indian economy. 'Make in India', one of the major national initiative that focuses on making India a global manufacturing hub with the objective to ensure that manufacturing sector which contributes around 15% of the country's GDP is increased to 25% in the next few years.

As a result, the Cement sector is expected to gain large benefits from this. Today, with a current production capacity of around 366 MT, India is the second largest producer of cement after China in the world. To meet the rise in demand, cement capacity is expected to increase to around 550 MT by FY20.

Cement being a commodity item does not allow much premium pricing and thus most manufacturers are price takers in the markets they operate in. In such a scenario, control over operating expenses is essential not only to maintaining cost competitiveness but maximising profitability.

The major operating cost for cement companies is power and fuel. The vintage of a cement plant also significantly influences its cost structure. While an older plant enjoys the advantage of lower capital cost, such benefit is usually offset by higher power and fuel costs, significant repair and maintenance expenses, and generally higher manpower expenses. Size is another factor that determines the overall cost structure of a cement plant, as larger plants usually enjoy better control over infrastructure and overhead expenses. Taking into consideration these facts, Indian cement manufacturers are setting up larger capacity plants to leverage volume handling.

From mines to packing, electrical and automation plays a vital role in the production of consistent high-quality cement, caring about environmental responsibilities, cost effective production and reducing capital employed. Automation solutions play a vital role in increasing the efficiency and reliability of cement production.

C&A has been committed to the cement industry since 1975 and continually developed standards for this industry. During the last 37 years, C&A has delivered successful process control systems to various cement plants with total capacity of 100 MTPA in India and abroad.

In this edition of CANVAS, we are featuring a case study on the latest automation system deployment at Gulf Cement Company for Waste Heat Recovery Based power Plant that highlights C&A's technical competence and automation expertise.

As a leading system integrator, C&A also offers Electrical & Automation solution to the Cement industry. Its engineering department, with their industry-specific validation procedures, ensures consistently high quality solutions in E&I domain.

Hope you will find this issue interesting and informative as always.

Happy Reading !!



Sandeep Bhat



Waste Heat Recovery and Cyber Security - helping Cement Industry to increase Plant efficiency

Cement industry plays a pivotal role in the infrastructure development. With the government giving a boost to large scale infrastructure development, the cement industry in India is set for a big growth. To meet the rise in demand, cement companies are focusing on adoption of massive modernisation and assimilation of state-of-art technology to become energy-efficient and comparable to the best in the world in all respects, whether it is kiln size, technology, energy consumption or environment-friendliness.

Faced with the challenge of efficient use of energy, major players of the cement industry are adopting best manufacturing practices to optimize energy, natural resource consumption and technology. Energy saving varies on a case-to-case basis depending on the actual selection of process and equipment, quality and consistency of fuel, raw material characteristics, etc.

Waste Heat Recovery System

The cement industry is currently focusing on five broad categories: thermal and electrical energy efficiency, co-processing of alternate fuels and raw material, clinker substitution, waste heat recovery for power generation and adoption of new technologies like use of bio-fuels. In this context, the upcoming plants are considering alternative fuel and raw materials (AFR) and waste heat recovery (WHR) system for power generation.

It is imperative to make WHR a mandatory requirement for any



new cement plant, as is the case in some emerging countries. A significant portion of the energy requirement can be sourced through utilisation of waste heat from the pre-heater and cooler.

Typically, cement plants do not have significant low-temperature heating requirements, so most waste heat recovery projects have been successful. The amount of waste heat available for recovery depends on kiln system design and production, the moisture content of the raw materials, and the amount of heat required for drying in the raw mill system, solid fuel system and cement mill. Waste heat recovery can provide up to 30% of a cement plant's overall electricity needs and offers the following advantages:

- Reduces purchased power consumption (or reduces reliance on captive power plants), which in turn reduces operating costs
- Mitigates the impact of future electricity price increases
- Enhances plant power reliability
- Improves plant competitive position in the market
- Lowers plant specific energy consumption, reducing greenhouse gas emissions (based on credit for reduced central station power generation or reduced fossil-fired captive power generation at the cement plant)

A WHR installation is a relatively complex system with multiple inter-related subsystems. The basic package for a steam-based system consists of heat recovery boilers or heat exchangers, steam turbine, gearbox, electric generator, condenser, steam and condensate piping, lubrication and cooling systems, water-treatment system, electrical interconnection equipment and controls. Total installed cost, which includes design, engineering, construction and commissioning can significantly vary depending on the scope of plant equipment.

Industry is looking forward to electrical and automation solutions that will help in better power management and waste heat recovery. Automation helps in understanding how much energy each unit is using, thereby revealing the 'energy wasters' that can be replaced by more efficient systems. Automation also monitors energy imports, and helps to stay within contractual limits, for example, through selectively switching off non-critical defined parts of the plant.

Cyber Security

Aside from desire to become energy-efficient, some companies are investing in advanced technologies to boost manufacturing flexibility and speed, supply chain responsiveness, and customer satisfaction.

For years, traditional factories have been operating in isolation and disconnected with corporate business systems, where managers have only poor visibility into downtime and quality problems, and



where the root causes of inefficiencies are hardly understood or addressed. To get ahead, modern manufacturers are adopting new plant architectures where in plant network converges with global IT networks.

In such a scenario, it is absolutely critical to protect your Control Network infrastructure, as today, global cyber attacks are not just restricted to the IT world. More and more process/manufacturing industries are falling prey to various attacks that are designed to cripple the entire organization.

Lack of awareness and inability to update the process control systems on regular basis are the major loop-holes which act in the favour of the attackers. Apart from financial losses, there can be significant impact to the environment and human lives; such attacks could also affect the very existence of the organization in the long run.

Some of the primary causes of lost production leading to financial loss and impact to environment are incorrectly configured firewalls, viruses and un-installed or outdated system patches. To effectively address security, people, processes and technology must be considered. Advance requirements like remote monitoring and diagnosis on real time basis of critical equipments by the OEM, which may happen on the internet, calls for implementation of secure and robust infrastructure for integrating the PCN environment with the Enterprise network.

There is a significant difference between the security philosophies of enterprise IT and Process Control Network (PCN). The purpose of enterprise security is to protect the data residing in the servers from attack. The purpose of PCN security is to protect the ability of the facility to safely and securely operate the automation activities which may consist of systems like DCS, SCADA, HMIs and equipment like PLC, RTU and sensors, regardless of what may befall the rest of the network. The use of mainstream operating system environments such as Windows, UNIX, Linux and various open sources systems as well as COTS (commercial off-the-shelf) networking components for running PCN applications leave them just as vulnerable as IT systems. However, the application of

mainstream IT security technical solutions may not work as effectively for automation systems primarily because of their deterministic operation; they are not designed for 'patching' since their mission critical applications do not permit a 'reboot' for these upgrades to take effect.

The biggest challenge in making plant automation, protection and control systems more secure thus relate to human behaviour and organizational processes.

The first step in any security programme should be the development of a security policy – a document identifying the overall security goals and objectives and defining what the valuable assets are that need to be protected. The security policy is the basis for any technical, procedural, or organizational security mechanism, yet clearly defined security policies do not exist for many control systems today. Creating, communicating, and enforcing a security policy are management's responsibility and should no longer be neglected. After developing a security policy, the next step is to build in processes to help establish and enforce it. These processes, for example, would include employee hiring and leaving, but should also describe incident handling and disaster recovery.

Additionally, the security policy should offer a well-documented plan about how to deal with possible security incidents or breaches and address questions such as what should be done, who must be involved, and how to restore the system. Just as important as having these processes documented is exercising them regularly to ensure they work.

Overall, the demand for cyber security, both from technical as well as from process perspectives, will increase in the near future. Cyber security will become mandatory requirements in products, systems, solutions, and processes as industry standards are developed and regulations are adopted as law.



E&A offerings for Cement Plant



Today, for a cement plant, consistently producing high-quality cement is just not enough as the challenge lies in achieving continual operational excellence in terms of reducing input cost, usage of fewer resources and meeting stringent environmental regulations. All of these cannot be achieved by only enhancing process control. It actually requires technologically advanced and innovative solutions.

The solutions that the Control & Automation's (C&A) business unit of L&T Electrical & Automation offers and helps you effectively meet the challenges are built on over four decades of experience in the cement industry. We offer the right blend of advanced control technology, optimal sizing of electrical equipment and seamless data connectivity from field instruments to the board-room, which helps users in taking faster decisions / actions to increase overall plant efficiency. From mines to packing plant operations, our subject matter experts with domain knowledge of control and engineering processes play a front role in providing seamless integrated solutions. These are cost effective solutions that improve the reliability, availability, maintainability and safety of operations. Our services provide you with the opportunities to maximize production uptime and lower the life cycle cost. We engage with your project team upfront during pre-bid stage to facilitate the basic engineering and critical specifications. It helps us to deliver total solutions on-time with minimum cost of ownership.

Our end-to-end offerings for Cement Plant include:

Integrated Electrical & Automation solution for Cement Plants, Grinding Units, Captive Power Plants and Waste Heat Recovery Systems.

We undertake turnkey contracts for Design/Engineering, Procurement, Erection and Commissioning of complete Electrical

and Automation system for cement plants. Our Integrated solutions include Switchyard, Power /Distribution Transformers, MV/LV Switchboards, PF Correction Equipment, MV/LV AC Drives, Plant Instrumentation, DCS, **iVision_{max}**-SCADA, Plant Surveillance System, Lab Automation, IT Backbone and Plant Information System.

Our service includes Switchyard Design, Fault Level Calculation, Preparation of Relay Co-ordination Chart, Cable/Core Schedule, Instrument Sheets, Loop Diagrams, Earthing Design and Automation Network. We also provide services such as Erection of Equipment, Statutory Approvals, Integrated Trials and O&M.

Integrated Solution for long conveyer system

Today, coastline plants & mines are planned and designed to handle bulk material economically and reliably. Therefore, operators are investing in bulk material handling system which includes conveying, stacking and wagon loading. Each facility has its own cargo handling capacity and requirement and it, therefore, requires customised solution to avoid material spillage, equipment damage and dust emission. Our electrical and automation solution plays a vital role in improving operation speed, efficiency and safety of these systems.

C&A provides seamlessly integrated E, C&I system for a facility comprising conveyors, stacker reclaimer, storage yard / silos, truck or wagon loading / unloading including wagon tippers. Our tailor-made solution optimizes the overall performance, reliability and energy efficiency.

Our offering:

- Instrumentation comprising Pull Cord/Belt Sway switches, Belt Weighing system, Belt monitoring system, Silo level monitoring, Condition Monitoring systems etc.
- Power Distribution system including power & distribution

- transformers, MV and LV power distribution
- Motors and Variable Speed Drives for long conveyor control
- Automation system with redundancy at various level servers, data network, controllers, power supplies and IO network for maximum plant availability
- Automatic operation and visualisation of entire facility from Control Room using SCADA platform
- Lifecycle Services including system upgrades and long term AMC contracts

Energy Saving Drives and Slip Power Recovery Systems (SPRS):

Energy Saving Drives are used in applications ranging from small fans and pumps to the large Mill drives and compressors. With recent advancements in IGBT devices, VFD technology can now address Medium Voltage and, therefore, directly operate Medium Voltage motors resulting in energy saving of larger magnitude and reduction of electrical assets like transformers and associated switchgear. We offer a compact design with Smart Harmonics™ Technology which ensures a very low THD, without the need for additional filters.

C&A continues to be a dominant player in SPRS for over three decades. With our new technology, we bring SPRS with IGBT based Inverter and Active Front End (AFE) which overcomes the legacy problem of poor power factor, while providing energy saving. **G-Vertor** SPRS is now available for speed control of Slip ring motors up to 5 MW.

Power Management System

Cement plants need electrical power which is sourced from utilities, captive power plants and renewable energy systems. The emphasis is on efficient use of all such power sources along with effective management of loads, power quality and assets. To achieve this, one needs an integrated and comprehensive power management system which can meet current and future requirements.

C&A provides complete Power Management Solution for a cost effective and efficient energy utilization by maintaining continuous and reliable power, avoiding penalty in case maximum demand is exceeded, improving power quality, reducing maintenance cost and thus increasing profitability in terms of lower production costs. For some industries, energy costs constitute as much as 20-30% of their total operating costs and hence even a small improvement in operational efficiency can have a dramatic impact on its bottom line.

L&T's **iVision_{max}** provides comprehensive information on optimization potentials and utilization parameters to be correlated with KPIs viz., energy efficiency, production rates, process efficiency, power quality, asset optimization and further supports the decision-making process with up-to-date information. It enables clear overview of the electrical network and provides means for monitoring and managing load. Tight integration of all subsystems ensures system stability and helps avoid system collapse. It incorporates all the features of high-end electrical SCADA system. The features include: Real Time Control, Load Shedding, Alarm, Event & Reporting, Synchronization & Load



Sharing, Energy Accounting, Power Quality Monitoring, Asset Management, Load Forecasting, Economic Dispatch, Availability Based Tariff (ABT) functionality, Renewable Integration.

Asset Management & Optimization Solution (AMOS)

C&A offers Asset Management & Optimization System (AMOS) for managing the asset life cycle through a pool of application and product experts. The systems vary from simple Drives & Automation to large E,C&I installations in Power, Infrastructure, Oil & Gas, Cement, Port and Nuclear sectors. The services result in improvement in the plant availability and productivity and, thereby, maximise asset sweating. Our services start right from the project implementation stage and are available till the end of life cycle and beyond through optimized migration plans.

Our Service Modules cover:

- Spares Management
- Remote Monitoring & Assistance
- Annual Maintenance Contracts
- Operation & Maintenance Services
- Energy Audits
- Training Services

Post site hand-over, our engagement with you goes up manifold. We undertake comprehensive O&M of your plant's E&I assets. In the event of technological advancements, we provide suitable upgrade solutions with minimal cost of ownership.

Cyber Security

With over three decades of experience in technology improvements and changes in the industry needs as well as processes, C&A today is well equipped to offer its expertise in securing an organization from cyberattacks for an uninterrupted growth in a highly competitive economy. C&A leverages on its own experience to secure your information assets and infrastructure to avoid business disruption and achieve regulatory compliance in the changing threat landscape. We offer proven methodology to help our customers put up an in-depth defence and compliance to global security standards. Our team of experts work in close co-ordination with customers in order to ensure that all gaps are identified for the necessary critical infrastructure. This ensures data protection, compliance to mandatory requirements as well as ensuring that industry best practices are implemented.

Our services include:

- Assess the Cyber Security Risk
- Study Organization's Security Standard and map it with Global Standards
- Formulate Audit approach
- Prepare assessment checklist / templates
- Assessment / Discovery of compliance of Assets
- Publish Gap / Compliance Analysis Report
- Prepare remedial plan
- Evergreen Compliance
- Conduct training & awareness programmes



E,C&I Solutions from L&T-C&A helps GCC enhance WHRS operation

About Customer:

Gulf Cement Company (GCC) is a leading cement producer in the United Arab Emirates. Based in Ras Al Khaimah with an installed annual production capacity of 2.5 million tons cement and 1.3 million tons clinker. GCC is leading regional cement exporter in the United Arab Emirates. GCC Ras Al Khaimah (U.A.E.) operates 2 cement kilns – the first one of 4100tpd capacity & the second one of 7500tpd capacity.

The Need

Electrical energy is a significant contributor to the cost of manufacture of cement. In its endeavour to remain competitive, the cement industry remains pre-occupied with figuring out measures to reduce energy consumption or the cost of energy. Since the unit cost of captive generation turns out to be well below that of grid power, most cement plants prefer to set-up a captive power plant. As an additional measure, several cement plants have invested in power generation based on the recovery of heat from kiln & cooler exhaust gases, which would otherwise have been vented to the atmosphere; so called Waste Heat Recovery Systems (WHRS).

To meet its electrical energy needs and reduce demand on the grid supply or captive power, GCC decided to invest in Waste Heater Recover system which could also bring down the burning of fossil fuels. The GCC required advanced WHRS in order to quickly and efficiently reduce greenhouse gas emissions and attracts CDM benefits.

As a consequence, GCC contracted ThyssenKrupp Industries India Pvt. Ltd (TKII) to set-up a 35.5MW Waste Heat Recovery based Power Plant utilizing waste heat from the preheaters & coolers of both kilns and exhaust gas from a gas turbine operating in open cycle. TKII in turn entrusted L&T – Control & Automation (C&A) the responsibility for design, supply, erection supervision, testing & commissioning of the Electrical, Control & Instrumentation System for WHRS.

The Solution

L&T-C&A was responsible for a complete design, engineering, procurement, supply, supervision of installation and commissioning of Electrical Power Distribution System, Instrumentation & Control and DCS system for the WHRS Auxiliaries.

The scope of supply included all the electrical, control and instrumentation equipments – from the electrical balance of plant



to the substation, and from the instrumentation and field devices to the distributed control system, across the entire delivery chain.

This involved detail layout engineering pertaining to electrical equipments, cable trays, lighting fixtures & earthing & lightning protection system based on the existing plant layout & the GA drawings of the various plant structures, i.e. STG building, boiler structures, electrical rooms

On the electrical side, L&T-C&A designed, engineered, supplied Generator Power Transformer, MV switchboards, LV Power Switchgear and protection system to ensure reliable and uninterrupted power supply from and to the power grid.

During design and planning stage, the space availability on site was a major challenge. The situation was challenging, due to this being a brown-field project, L&T was responsible to ensure the accommodation of equipments in existing available space. The responsibility was also to ensure modification in existing switchboards to facilitate interface with the existing power distribution system, understand existing as well as new load, P&IDs and plant Layout.

However L&T-C&A team adopted innovative engineering strategies to overcome these challenges, and ensured installation of equipment did not constrain in any way.

In addition to the electrical package, L&T-L&T-C&A was also responsible for complete design/sizing of a Distributed Control System (DCS), development of application software to control & monitor the entire WHRS operation.

L&T-C&A provided DCS to maximize WHRS efficiency and reliability through the automation, integration and optimization of

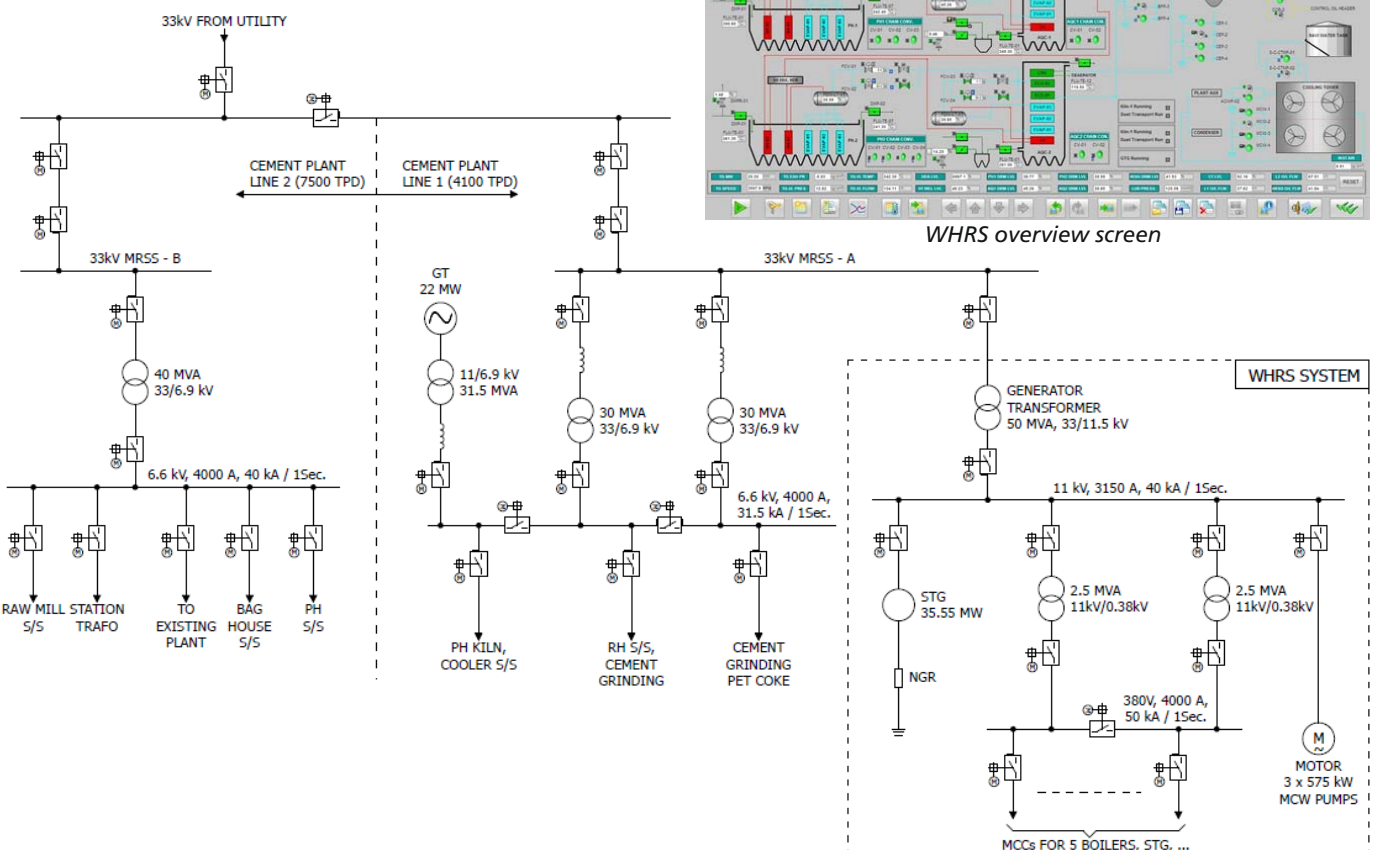
the entire plant. The system handles some 400 I/Os for each WHRS it and 600 I/Os for the common system, including remote I/Os for cooling water, auxiliary cooling water, cooling towers and other plant components.

In this project, L&T-C&A also implemented Steam & Water Analysis System (SWAS), covering supply of Sensors & Transmitters for measurement water of level, temperature, pressure / differential pressure along with process hook-up hardware, control valves for feed water to condensate flow to the boilers, to provide exact precise measurements of critical parameters and analysis of steam & water from 24 locations in the WHRS System.

The Result

The system was commissioned & synchronized with the grid in Aug 2013 and is working satisfactorily. Apart from the monetary benefit involved, WHRS is playing vital role in energy conservation, as GCC do not need any additional fuels to generate electricity and hence directly help conserve fuels and reduce overall carbon emissions. The WHRS at GCC is expected to lead directly to a reduction a tonne of carbon dioxide (CO₂) emissions per annum.

- L&T-C&A The Waste Heat Recovery System encompasses:**
- 2 boilers for each kiln :
 - PH Boiler: Horizontal boiler with vertical tubes for uniform dust disposal – for heat recovery from preheater exhaust gases
 - AQC Boiler: A vertical boiler with horizontal tubes – for heat recovery from cooler exhaust gases
 - 1 HRSG for heat recovery from the exhaust gases from a Gas Turbine
 - 1 Steam Turbine of 35.5MW rating
 - Boiler Feedwater & Deaerator system
 - Steam s system
 - Condensate system
 - Water treatment plant
 - Cooling water system
 - C&A provided an integrated , E,C&I (electrical, control and instrumentation,) solution for the entire project, including medium and low-voltage switchgear, motor control, protection system, inverters, and a state-of-the-art distributed control system (DCS)



Power distribution scheme



Learn Today, Lead Tomorrow



Education and training are necessities that open the doors to a gainful employment and enhance an individual's skills and knowledge. This capability, in turn, increases productivity and accelerates the economic growth of a country.

The government of India has already set ambitious targets for increasing the share of manufacturing in GDP to 25% by 2025. To accomplish this goal, companies are setting up modern manufacturing infrastructure which requires skilled workforce.

Ironically, most industries in India are struggling with scarcity of skilled labour. Besides academic studies, a specialised training is also required to build necessary skills and knowledge which allows individuals to expand their abilities.

To bridge this gap, C&A has launched a Training Academy that offers relevant and adequate training to the youth. It is the first of its kind in India, offering a unique integrated training course for the Automation Industry professionals in technical association with IEEE Bombay section.

It is formulated as a comprehensive full time six-month course, wherein the initial two months comprise classroom lectures coupled with requisite hands on experience on modules like Drives, PLC, SCADA, Instrumentation, Networking and Project Management. The next two months cover on-the-job training, wherein students are rotated through different departments in C&A like project software development, testing (on shop-floor) and service centre.

To transform graduates into trained Automation professionals, during the last two months, students are given site exposure and accompany C&A's service team members on visits to project sites. On conclusion of the training course, students are awarded certificates, as 'L&T certified Automation Engineer'.

C&A also offers short-term courses arising from the need for industry-ready automation engineers, exclusively laid out by the Training & Placement officers of engineering colleges. The colleges wanted their third and final year students to utilize their mid-semester breaks to capitalize on the insights of automation and felt that C&A's Academy had the right platform to serve these needs.

The courses are led by field-proven and experienced instructors who combine extensive application and automation knowledge with seasoned training and experience in a hands-on environment. Having successfully organized five batches in the year 2014-15, C&A is pleased to announce a new batch of 'Integrated Automation Training Course' at its Electrical & Automation Campus in Navi Mumbai.

The Academy is poised to achieve bigger heights with its motto "Learn Today, Lead Tomorrow".

For details, contact us at automation.academy@LNTEBG.com