Electronics, Instrumentation & Control (EI&C) in Chemical Engineering

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Chemical Engineering is one such discipline which has been dynamic over the years in terms of developing interdisciplinary approach and challenges & changes that it can absorb in this process. The beauty of this discipline lies in its versatility and ability to adapt itself to various new and interdisciplinary fields of engineering and science. Whether it is environmental engineering, or bio-chemical engineering, or energy engineering, or optimization, or process control & instrumentation; all can come under the single umbrella of chemical engineering discipline. Same is true with Instrumentation & Control Engineering discipline also.

Electronics, Instrumentation & Control (EI&C) technology plays an important role in any industry; be it chemical, petrochemical, pharmaceutical, pulp & paper, fertilizer, textile, electronic, electrical, computer, metallurgical, mechanical, manufacturing industry. There are two arenas in which EI&C plays a prominent role: (1) industrial process control and manufacturing, and (2) embedded Instrumentation & Control (I&C) systems in commercial products. As examples of the first application area, process I&C systems are critical to efficient and reliable electric power production, pulp and paper making, food processing, and refining. In the second area, many consumer products contain EI&C systems; one might cite the fuel and emissions controls in automobiles as well-known applications, and sophisticated "fuzzy-logic" I&C systems in appliances such as dish washers as a more recent example. In all of these cases, the I&C system serves to make processes or equipment more efficient, reliable, precise and functional. Other applications of EI&C include Intelligent model-predictive control, Intelligent sensors (adaptive, self-interpreting, "smart"…), Autonomous sensors (self-calibrating, self-monitoring, self-learning …), Applications of model predictive control and smart sensors to plastics processing. Strong emphasis is being laid on issues, analysis methods and design approaches for practical controls in engineering systems. Modeling, simulation, and analysis of uniquely nonlinear problems such as determining stability regions and limit cycle conditions are also have wide applicability in industry. Design techniques for nonlinear control systems are equally important. Currently in the areas of research in EI&C, particular stress is laid on visualization, developing intuition and reasoning capabilities about nonlinear effects and systems, and powerful computational techniques

using the MATLAB analysis software package. This list is may not be complete without the inclusion of the concepts related to design of experiments, time series analysis, system model identification, statistical process control, basic multivariable controls, and constrained and unconstrained optimization, intelligent model predictive control, intelligent sensors, autonomous sensors, applications of model predictive control and smart sensors to plastic processing, all in the context of controlling industrial processes.

Chemical engineering and EI&C go hand in hand. There are many more challenging and upcoming areas of common interest to these two versatile disciplines. The days of narrowed and specialized areas of research have taken back seat as it is like a 'frog in a well', being specialized in a specific area. The systems approach is the buzz word nowadays and truly so. We have to break the barriers of individual disciplines and enter into the beautiful interdisciplinary areas by moving in lateral direction along with going in vertical depth. Then the understanding would be complete.