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* “ The Chemical Engineer – His Role in Electrical Manufacturing” by N. R. Maleady

The article is about the role of chemical engineer in manufacturing transformers in the electrical manufacturing sector. The important components of the transformer are copper wire, cellulosic insulation, insulating varnish and dielectric liquid. Wire enamel or resin is the insulting structure for copper wire. The resin can either applied as a solution or in solventless form. Mechanical arrangement and proper temperature between each dip are needed to be controlled to provide necessary multiple coats of resin to cure when resin is applied as a solution. Suitable dies and preheaters must be used when the resin is applied in solventless form to extrude the material on the moving wire. Cellulosic insulation is used to separate metal conducting parts. The cylinder on which the wire is wound is composed of continuously wound paper, bound together by suitable impregnants and adhesives. To produce a stronger cylinder, modifications of the paper and adhensives and method of application are to be carried out. Insulating varnish is used in the treatment of components parts and assembled units to provide both insulation and mechanical strength. Viscosity of the material is ought to be maintained within certain limits and its electrical properties must be held at a high level through proper periodic filtration. A dielectric liquid - askarels (highly refined mineral oils and the newer non-inflammable insulating liquids) is used thoroughly free of air for insulating and cooling. Processing of assembled finished transformers is an important phrase of work in the transformer manufacture.

Firstly, the insulated wire is wound about the cylinder. By applying heat to the unit while under vacuum, the high percentage of water, which is 8% of the weight of the cellulose present in cellulose insulation resulting in the low dielectric strength may be removed. Vacuum bake tank is used to provide rapid heating of the units through good air circulation, followed by removal of the absorbed water. By immersing the whole assembly into suitable insulating varnishes, which when cured, give it high mechanical strength to withstand the tremendous short circuit forces.

Separate coils of wire are assembled and mounted on suitable laminated iron cores. The use of hot air baking and high vacuum resulting in high velocity air which cuts down the skin resistance of the insulation to heating and the heating-up time. When the final drying process which is free of both moisture and air have been completed, the dielectric fluid is run into the treating tank to completely immerse the coils for the absorption of water and allows the units to be handled before dropping into their own enclosures. The contributions of the chemical engineer are many and varied. In both the application of basic chemical knowledge and in the electrical design, the use of the chemical engineer principles and the solving skills in electrical manufacturing problems helped to supplement the specialized knowledge of the electric engineer in the processes involving physical and chemical changes. The cooperation of electrical engineers and chemical engineers has created many beneficial and useful tools in our life.

* “ Getting students to approach microelectronics Processing as Chemical Engineer” by Koretsky et al.

The article is about the ways of getting students to approach microelectronics processing as a chemical engineer. About 70% of the B. S. ChE graduates from Oregon State University (OSU) have been employed in the microelectronics industries. To enable the students to apply core ChE skills towards microelectronics processing, experiences in the microelectronics processing are being synthesized into the undergraduate program on four levels – Lab-based microelectronics unit operations, Options programs utilizing Thin Film Materials Processing (ChE 444/544), Multiple Engineering Co-op program (MECOP)InternshipProgram, and Undergraduate Research Projects and the University Honors College.

In the lab-based microelectronics unit operations, there are six unit operations (Plasma Etching, Chemical Vapor Decomposition, Spin Coating, Electrochemical Decomposition, Silicon Oxidation and Chemical Mechanical Planarization) containing complex systems that involve the interaction of physical and chemical processes. Both lab-based and class room based instruction are carried out to reinforce the fundamental engineeringsciencetaught in the curriculum. Students are required to integrate into the lab based on the Unit Operations Laboratories (ChE 414 and 415) and Thin Film Materials Processing (ChE 444).

The first quarter of the two-quarter senior lab sequence (ChE 414) focuses on the students to complete 3 unit operation experiments while the second quarter of the senior lab course (ChE 415) focuses on the students to work independently, develop a project proposal, complete experimental work and write a final technical memorandum. Class room based instruction will give out example exercise or homework problems to be integrated into a core chemical engineering science or design course to draw upon core fundamentals.

Some ABET criteria are also considered in the microelectronics unit operations so that the students can master both technical skills and professional practices (effective oral and written communications, project planning, time management, interpersonal interaction, teamwork, and proactive behavior). Students can choose the program they prefer from transcript visible Options in the microelectronics processing or material science and engineering, but Thin Film Materials Processing (ChE 444) is a must for the students.

The course is to help the students to broaden and strengthen the undergraduate ChE curriculum. The Film Materials Processing (ChE 444) is mainly focusing on the application of core chemical engineering sciences (transport. kinetics, thermodynamics and reactor design) to thin film process. This approach creates a mind set in the process engineer to apply engineering skills in problem solving. Guest seminars are important feature of this course. Popular industrial scientists are brought to share their industrial perspective and lectures in their areas of specialization.

After the seminar, the students are required to submit a critical analysis on the talk to catalyze interest effectively and show the interaction between the speakers and the class. A Final Design Project consisting of a detailed design of an apparatus for a given thin film process, performed in teams, is a Final Exam for the students. Written report have to be prepared to explain and justify the design whereas oral presentation of the design is made to their classmates for critique.

The Multiple Engineering Co-op program (MECOP) offers two six-month internship program at different companies so that the student gets exposure to contrasting industrial environments. Written applications and aninterviewprocess are carried out when placing a student into an internship program. Second interview is held to focus on the students’ abilities and interests. There are midterm and final appraisals at the company where the intern is working.

The intern’s performance and the company’s supervision are evaluated by the intern and the supervisor. The undergraduate research projects and the University Honors College (UHC) play a key role in getting students to approach microelectronics processing as a chemical engineer. Undergraduate research is to promote active learning. Undergraduates work with graduate students on independent, creative research projects to pursue independent long-term initiatives and to follow an idea to its logical conclusion.

The University Honors College (UHC) Senior Thesis is not only a UHC curriculum, but an incredibly rewarding learning tool that provides the students with the skills to undertake similar projects in their Masters Program orcareerfield. Chemical engineer is a professional skilled in the manufacture of chemical products. They use their specialized chemical knowledge and chemical engineer principles to create functional tools in our life.