EDITORIAL

The Commodity Engineering Market

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Recently a colleague returned from a visit to a university in China where he was invited to give a talk to students in aerospace engineering. I asked him about the size of that particular department, and he said that there were 30,000 students. I said I meant the department, not the whole university. He said the department ***is*** the whole university!

Countries such as India and China are producing large numbers of engineering graduates. Some statistics indicate that U.S. universities are graduating around 70,000 engineers per year . . . a number that is declining as a percentage of our population. I am not sure of the numbers for European countries but I have read of their declining enrollments as well. Meanwhile, India reports graduating 350,000 engineers a year, and China produces another 600,000 engineers each year.

Most engineering students throughout the world receive the same science-based curriculum that was born when Russia put Sputnik in orbit. If you talk with engineers who received their degrees before 1960, you will hear about engineering curricula filled with "machine shop and foundry" courses, "steam labs and engine labs." After Sputnik, engineering educators believed that the best way to regain technological leadership was to have a science-based engineering curriculum. This curriculum has remained basically unchanged for the last 47 years, and it has served us well. In today's world, however, the science-based engineering education taught at our universities has become a global commodity that is available to students all over the world. This has resulted in a large quantity of engineering talent being produced by developing countries like China and India. This massive group of engineers is available at 20% of the cost of U.S. and European-educated students.

If you want to start a heated debate among engineering professionals, bring up the topic of outsourcing engineering jobs that have been traditionally filled by 'homegrown' engineers. Some argue that this will lead to unemployment, a lower standard of living and a loss of world economic leadership. The other side claims that this globalization will result in greater innovation and prosperity. The reality is that global corporations will acquire their engineering talent from a source that will give them the most value for their investment. If competent and creative engineering talent is available at 20% of the cost of a traditional supplier, why not take advantage of it?

Another side of this issue is the number of young people enrolling in engineering programs. Recent data provided by the Engineering Workforce Commission of the American Association of Engineering Societies (EWC) show a 10% increase in first-year undergraduate enrollment in engineering programs from 1997 to 2003. Since then, first-year enrollment has remained at 100,000 students. More important, however, is the number of bachelor of engineering degrees awarded. When degrees per capita are considered, the data are not nearly as positive. At the present time, the number of bachelor's degrees per capita for US citizens is only 18.3% higher than it was 35 years ago and 20.8% lower than it was 25 years ago. (Source: *Engineering Trends*, www.engtrends.com). This suggests that the percentage of our population in the engineering profession is declining.

So what does this all point to? Why should we care? As an engineering educator I have pride in my product. I want the graduates of my program to be competitive, if not the best in the world. In this time of declining interest in the engineering profession by young students, how do we get them excited about engineering as a career? I fear that many students are getting the message that U.S. engineering jobs are being outsourced, so they are looking to other careers. Perhaps we can solve this problem by raising the value of our engineering graduates to potential employers. If we can return the engineering profession to its former, highly valued status, enrollment in the profession will follow. The question is: "How do we accomplish that?"

Many educators and employers are trying to determine a solution to this issue. Scores of articles and papers have been published in engineering and education journals and periodicals advocating a variety of approaches. Recently I learned of an NSF-sponsored workshop dedicated to this issue with specific emphasis on mechanical engineering. The workshop, titled "The 5X-ME Workshop: Transforming Mechanical Engineering Education and Research in the USA," was an effort to lay a foundation for transforming mechanical engineering education and research in light of the issues stated above. The workshop concluded that for our engineering graduates to be "excellent in their craft," they must "have a broad ground in fundamentals, possess intellectual flexibility and agility, be creative innovators with a global focus, and have superior communication, teamwork, and leadership skills." Information and a complete workshop report can be obtained at: www.umich.edu/~ulsoy/5XME.htm. If you are interested in the future of our engineering profession, I encourage you to review it.

I could take up many more pages with this discussion, and maybe you'll hear more from me on this subject in the future. Meanwhile, I would like to hear from you. Whether you are an educator or employer of engineers, if you are interested in this issue and you have some ideas for our consideration, send them to me. As an engineering educator, I welcome your thoughts on this subject. I will collect your comments and report back to you with a synopsis. Let's work together to raise the value of our profession. S/V

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