

Rock Science VS Rocket Science

The Importance and Advantages of a Petroleum Engineering Education

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Petroleum engineering is a unique discipline. When you examine a typical petroleum engineering curriculum, you will find an array of courses not only intended to train and educate one as a petroleum engineer, but also as an all-purpose engineer. A petroleum engineering graduate, in many instances, holds some of the knowledge of a chemical engineer, a mechanical engineer, a civil engineer, an electrical engineer, and especially of a geologist. Therefore, it is not surprising that many think of a petroleum engineer as a jack-of-all-trades.

The petroleum engineer is typically the common denominator in oil and gas projects, providing the design specifications and applying the end product. The problem for most engineers without the petroleum engineering education is that they lack the geosciences background needed to make best use of the advanced technologies for petroleum E&P. Every engineering discipline sets claim to a mother science. Geology is considered the mother science of petroleum engineering, as chemistry is for chemical engineering. One of the major factors that sets the petroleum engineer apart from other engineers is the vast amount of imagination and creativity so intertwined with petroleum E&P. As economist and author Lester Thurow put it, "The oil industry still produces oil, but it has been infused by so many new technologies that it should be thought of as one of the new manmade, brainpower industries like biotechnology."

Traditionally, rocket science has been

the point of reference for sophisticated science and technology. I argue that petroleum engineering is as sophisticated, if not more so, than rocket science.

Petroleum engineering is also rooted in imagination and dealing with unknowns, except that as rocket scientists venture into the space above, the petroleum engineers venture into the earth below to unlock the mysteries of the porous media. The subsurface formations hold numerous peculiarities that are only

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deciphered by integrating basic science and high-level technology—work done by creative and clever petroleum engineers. It is a pointless and futile exercise to concern yourself with oil prices as you start your career and progress several years into it. Even the so-called experts do not know what prices are going to be. Look at the events of the last several months, if one needs proof. Furthermore, to complicate the matter, we do not even know how much oil and gas is left in the world to produce. Even if we did, we still could not account for what will be

discovered in the future. The petroleum era, marking the period in which oil and gas has contributed significantly to society, is 125 years old by conservative estimate. And by all conservative predictions (which we have already dismissed), it should last for another 50 years, on the basis of current reserves estimates. Adding the two, one could define an era comprising 175 years of sustained petroleum production.

This "crude" analysis encompasses 5,000 gigatons of fossil fuels. However, there will be a new player in the near future: gas hydrates. The current known deposits of gas hydrates are 10,000 gigatons. The technology is now limited for the production of gas hydrates, but as the technology advances, gas hydrates will be produced. And when that begins to happen, guess who will be most responsible for the exploration and production of gas hydrates? If you guessed petroleum engineers, you would be right. If we assume the current world petroleum consumption, the current known levels of gas hydrates will last us another 350 years. That would call for another eight generations of petroleum engineers to guide the production of carbon-based energy. Thus, we have a well-founded argument by which we should dismiss any notion that petroleum is a "sunset" industry. The petroleum engineering discipline and the petroleum industry are synonymous in a way unlike any other such pairing of engineers and an industry. Therefore, the petroleum industry has an unusual amount to say about the education and training of petroleum engineers. The industry's role in this is widely and enthusiastically embraced by the academic community. The infusion of ideas and mentoring by the petroleum-

industry professionals into the education and training of new petroleum engineers is an important ingredient of the future of petroleum engineering.

What discipline, what profession offers you the opportunity, and the challenge, to work for the common good in a way comparable to petroleum engineering? Where can a professional 22 or 23 years old be in charge of millions of dollars of assets, have the vast responsibility to care for the health and safety of many, be responsive to the sensitivity of our environment, and make a profound, positive impact on the lives and the quality of life of millions? In many ways, petroleum engineers are world citizens in the work they do and the way they work.

In my years in the industry and in academia, I have frequently observed the dilemmas that young graduates face as they enter the workforce. One question they debate is what type of company they should start with, an E&P company or a service company? Earlier in this article, I pointed out the importance of a strong petroleum engineering curriculum and the role of high-level technology in the petroleum industry. My advice to engineers entering the industry has been constant over the years. I believe the name of the game for young professionals is the accumulation of knowledge and experience. As long as you can gain technical know-how, it does not matter what type of company you work for.

Entry-level petroleum engineers must develop the skills to apply to the conditions and environment in the field. For decades, lasting into the 1980s, there was a belief that you would gain more technical skills from E&P rather than service companies. This may have been true, when the E&P companies were handling nearly all the technical and operational designs and executions of the jobs. The service companies were there to supply the equipment and the personnel that operated the equipment. The events of the mid-1980s, with the

drop in oil prices, changed the role of the service companies. The downsizing of E&P companies created a vacuum that was enthusiastically picked up by the service companies. The service companies became more actively involved in the design and implementation of the operations themselves. We now see that many service-company engineers are actually housed within the E&P companies to oversee the daily operations. The E&P companies are now highly dependent upon service companies to design and execute the jobs for them.

Many of the best practitioners of any technical area in the oilfield are now in the service sector. Therefore, my point should now be clear that as long as you can learn and gain the experiences that you lack, there is no major reason why you should choose one type of company over another. Of course, many look at additional factors to supplement their decision, such as financial incentives and benefits. My advice is that the technical gain from a job offer is the most critical, and if all is equal, then one can look at nontechnical factors to make a job-acceptance decision.

The other question that young petroleum engineers so often debate, usually after a few years on the job,

is whether to choose a technical or a management ladder to advance in their careers. My advice has been constant here, as well. I believe a manager cannot perform well without solid technical credentials. I believe a mediocre technical person can never be a *good* manager. (I and perhaps you have come across many managers who lack good technical foundation.) That is the reason I have emphasized *good*. Being a good and a competent manager can be a rewarding career for the individual and the company. We desperately need such managers in this industry. So, if you hold solid technical capabilities and have developed the soft skills and acumen for leadership, then you would be a *good* candidate for a management position, if that is the direction you wish to take.

In conclusion, petroleum is a high-tech industry that needs talented professionals and experienced individuals who can mentor the younger professionals coming in and moving upward. It needs innovative technology, capital, and skillful collaboration, and it needs to foster and implement socially responsible development. Why are all these needs so important? Because the industry is going to be around for many generations. **TWA**



Ali Ghalambor is American Petroleum Institute-endowed professor and head of the Department of Petroleum Engineering at the University of Louisiana at Lafayette. He received BS and MS degrees in petroleum engineering from the University of Louisiana and a PhD from Virginia Polytechnic Institute and State University. Ghalambor has more than 30 years of industrial and academic experience. He held engineering and supervisory positions at Tenneco, Amerada Hess, and

Occidental, and has served as a consultant to more than 50 petroleum production and service companies, many of them Fortune 500 companies, as well as government agencies, professional organizations, and the United Nations. He has authored or coauthored 10 books and manuals and more than 140 technical articles, published in various journals and conference proceedings. Ghalambor has received the Distinguished Achievement Award for Petroleum Engineering Faculty, the Production and Operations Award, and the Distinguished Member Award from SPE.

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on the technical ladder, even while we maintain our focus on developing our leadership pipeline. The challenges should be attractive enough on both ladders.

What more can the SPE and the industry do to assist in rebalancing the technical and managerial ladders?

SPE has the opportunity to provide inspirational role models for talented young people. It should also challenge businesses to build

and provide such models.

What involvement have you had with professional organizations such as the SPE, and what benefits do you see from them?

In general, I think professional organizations are important arenas for networking and for sharing knowledge and experience. Our people contribute to and benefit from SPE's activities in a number of ways. Our technical specialists often sit on program committees for

international SPE conferences. Some of our employees publish SPE articles to share experience and results in areas such as R&D, reservoir modeling, drilling, and field development.

We also participate actively in the SPE talent council. We share experience, market trends, and benchmarks. In addition, we deliver and improve learning programs within the oil and gas industry. **TWA**

CAREER PROFILE /

Simon Ayat /**Chief Financial Officer and
Executive Vice President,
Schlumberger**

As I look over my career, which will soon enter its 28th year, it is very evident to me how much I have benefited from all kinds of opportunities that have exposed me to a variety of challenges and how, increasingly, I have had the chance to draw on experiences from many different environments. As a result, I have been able to build a common language, something essential in such a diverse industry as ours. The multinational aspect of our workforce and the challenges of dealing with operations in different tax regimes, with different requirements, and under different governmental regulations are things that I have especially enjoyed in working for Schlumberger. The variety itself is a motivation.

For me, everything started in August 1982, when as a graduate in business administration from the University of San Francisco, I was recruited to work for Schlumberger. My first appointment was to work in Dubai for Forex Neptune, our drilling division at the time. It was an opportunity made possible by my multicultural background and ability to communicate efficiently with clients in their native language. A year later, I was moved to Singapore, from where I covered a larger area of drilling activity.

From that point, I was transferred out of drilling into wireline, moving back to the Middle East to serve as an operational controller for a segment of the company. In this position, I worked closely with field engineers and clients. I then progressed through a series of financial positions in the Middle East and North and South America, which eventually led to my appointment as worldwide controller for the wireline organization.

Management had begun to suggest to me that I had managerial potential beyond the scope of finance, and thus my next position was to serve as unit president for Schlumberger's Far Eastern operations.

Then in 1998, the company restructured into an area-driven oilfield

services business from one that had been driven by the individual technology segments. I was appointed GeoMarket manager for Indonesia. Although I was only in the position for 8 months, it was an exceptionally good learning experience. As a line manager, I was responsible for many segments and thousands of people. I learned a great deal through interactions with clients, government officials, and operations people and enjoyed the marketing aspects and negotiations, as well.

From there I was appointed Oilfield Services controller and then, in 2001, vice president of finance for Schlumberger. Subsequently, I was named controller and vice president of business processes for Schlumberger, and then treasurer and vice president, before being appointed to my current position in 2007.

I believe that solving a challenging issue in any business requires highly motivated individuals. Yet at the same time, every individual has something unique that motivates him or her. In my case, I am motivated by the challenge of seeking a solution to a difficult problem and by those moments when you can see the results of your work and anticipate new achievements. There is always a better way, and you had better

find it, otherwise your competitor does. Interaction with diverse people and working jointly with team members to implement new ideas are motivating to me, as is receiving constructive feedback from my subordinates and chiefs, which allows us to modify various methods and processes and enables me to see a business activity from a different side.

I think one needs a continuous willingness to learn; adaptability and the ability to build relationships are key components to success in the oil and gas industry. One should always be learning more about the field, operations, technology, cultures, and all other aspects of your company and your profession. One should be mobile and open to accepting new jobs and responsibilities that expand your area of knowledge. As a young professional, it is important to be thankful and to develop good relationships with people you meet—colleagues, managers, and subordinates. Make sure that communication is a two-way street. Share what you know with them, but just as importantly, listen and learn from their experiences, knowledge, and skills. If you have joined our industry, or are thinking of doing so, believe in yourself, move, dream, and you could possibly come out on top. **TWA**



Simon Ayat has been chief financial officer and executive vice president of Schlumberger since March 1, 2007. He has been with the company 27 years and has held numerous management and senior-level positions in France, the United States, the Middle East, and the Far East. Before appointment to his current position, Ayat served as treasurer and vice president, Schlumberger (2005–07); controller and vice president, Business Processes (2002–05); and vice president, Finance (2001–02). Previously, he served as Oilfield Services controller, Indonesia GeoMarket manager and in a variety of other posts in finance and operations. Ayat joined Schlumberger in 1982 as division controller for drilling subsidiary Forex Neptune in the Middle East. He holds a bachelor's degree in business administration, with emphasis on finance and accounting, from the University of San Francisco.