Training is Key to Safe Application of Industry Technologies

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Thank you for the invitation to present our views on Science and Technology as it pertains to training in the oil and gas industry. The University of Texas through PETEX (Petroleum Extension Service) has been providing training and training materials to the oil and gas industry since 1944. We work with the industry through its many organizations and associations to define its needs and produce quality training, publications and audiovisual products. I have personally worked in the industry for 40 years and have seen many changes, and what hasn't changed is the impact of technology on the industry. It has been a technology-driven industry almost from its inception. From locating oil from natural seeps to having the ability to drill in 12,000 feet of water to a total vertical depth of 30,000 feet, technology has enabled the industry to succeed. Without relatively inexpensive oil and gas, growth in world economies would have slowed.

Training is a critical component of this industry. As we drill deeper in more remote locations, the need for technology has become greater along with the need for training to apply technology safely and effectively. A trend that I have observed over my 40 years of experience is a shift from an investment-based industry to a more cost-focused business. Technology drives cost down. Unfortunately, training is looked at as a cost and not an investment. Without appropriate training, technology comes with risk. Today, training is down by over 25% from levels experienced in 2008. I would challenge the industry through their associations to have their

members step up and increase their funding for training. The American Petroleum Institute, the leader in setting standards in many places for the industry, should also be the leader in training standards. My perception is that there has been a reluctance to put capital into training because it is difficult to measure the return you get from that investment. On the other hand, everyone in a leadership role in the oil and gas industry has been educated and trained both as an undergraduate and in further development during in their career. I believe that they feel it was a wise investment. I am not sure that they feel that a similar investment in training for entry-level personnel is as valuable. I notice a very direct correlation to profitability of the industry and the amount of investment in training. With fluctuating investment in training, it should not be surprising that the results and effectiveness of the training fluctuates.

There are two different kinds of training required to safely and successfully operate a drilling rig, whether on land or over water. The first type of training relates to the operation and maintenance of the drilling rig itself. The second type of training is very specific to the oilfield services provided to support the drilling activities. These include, cementing, casing, drilling fluids, logging while drilling (LWD), measurement while drilling (MWD), running wireline, perforating, etc. The first type of training is usually provided by third-party training providers or carried out in-house. The second type is usually provided by the companies that are providing the oilfield services, because it is very specific to each individual company's equipment and products. I am going to address the first type of training.

The oil and gas industry faces many challenging issues in training, now and in the future. For the most part, the industry has created relevant content that should allow anyone who is trained in this content and passes appropriate testing to become knowledgeable about drilling rig safety and drilling rig operations. The knowledge gap created by "The Great Crew Change" that exists in most companies has been well documented and discussed. This knowledge gap was caused by inconsistent hiring during periods of low oil and gas prices. The problem is not one of filling the gaps. There are sufficient numbers of people entering the workforce to do that. The problem is one of "experience attrition," and it is a challenge that must be addressed. We should not expect that in replacing a retiring person with over 30 years of experience with an entry-level person that performance would not decline without extra efforts to replace years of experience with a significant increase in training. I don't see this situation being addressed. With large gaps in experience, personnel are promoted from one position to the next at a faster rate than in the past.

The characteristics and expectations of 'Generation Y' or the 'New Millennials' have been examined and debated. They learn differently and in much shorter spans of time. The real issues at hand are the growing multigenerational aspects of the workforce with its mix of four distinct generations with disparate life experiences, varying ways of communicating, and distinctly different goals for their professional careers. The first of the baby boomers reached age 60 in 2008. In perspective, the average age for retirement in the oil and gas industry is 59. Along with the global economic slowdown and stock market slump is a rise in the average

retirement age. These three impacts—boomers, industry retirees, and economic changes--are all interrelated and impacted by the cyclical nature of the oil and gas industry.

This cyclicality is our industry's hurdle in trying to resolve issues surrounding the employment of top talent going forward. Cyclicality is also the area over which the industry has least control. It is inevitable that the industry will be cyclical because it is based, quite simply, on supply and demand.

Why is cyclicality so important? The answer becomes clear from the perspective of career time spans and talent management. Most employees in the oil and gas industry are responsible for developing a career spanning an average of 35 to 40 years. During the last 40-year time span, there have been seven business cycles. Driven by Wall Street and shareholder interests, the industry has always reacted to these cycles by reducing fixed costs as they would in any downturn in the economy. However, the main element of fixed costs is employee expense. So if the oil and gas industry is driven by quarterly earnings, as are many other industries, then it will respond by driving down fixed costs and therefore, employee costs. This industry will need the brightest and the best to deliver what the world needs, which is energy to drive economic growth. Energy means oil and gas accompanied by great technological advances that require great technical talent. Is the industry ready to attract, train, and--the biggest challenge--*retrain* professionals to step up to the plate? Companies seem to have little difficulty in investing in new technologies and equipment that have long payout times but are reluctant to invest in training that could have immediate results. There are no easy answers.

A look forward to 2025 forecasts an increasing worldwide demand for oil, from 85 million BBLS/day to 115 million BBLS/day. Fossil fuels--oil, natural gas, and coal--make up 86% of the world's energy supply. Matters are complicated by the fact that fossil fuels are under attack by proponents of global warming. Production will have to increase by 30 million BBLS/day in the next 15 years or equivalent substitutes for oil will be necessary. Currently, 98% of transportation fuels come from crude oil, yet production from existing fields is declining anywhere from 10% to 60% depending on the field.

Another contemporary issue is that new supplies of oil and gas are coming from deeper and more difficult formations. The technological challenges in locating, drilling for, and producing hydrocarbons have taken a quantum leap forward in complexity. The 93% of conventional resources that currently exist are owned or controlled by National Governments (NOG) or National Oil Companies (NOC). This leaves only 7% of conventional hydrocarbons, and a large part of the unconventional ones, in play to the highest bidder. Of course, the NOGs and NOCs still require a full suite of technically skilled personnel.

The question arises: What are unconventional hydrocarbons anyway? Put simply, they are either very heavy oils or hydrocarbons held tightly in reservoirs of very low permeability. What new technologies will be required to extract these unconventional hydrocarbons and what training is going to be needed to support these technologies?

Locating and reaching these hydrocarbons requires new technologies in the form of highly sensitive equipment, higher speed processing of seismic data, better

software algorithms, electromagnetic field interactions to supplement seismic and visualization techniques--all requiring significant and continuous training investments. The new frontiers of exploration and production will require not only training in those regimes but also new materials and modes of operations to succeed.

The petroleum industry started globalizing in the 1920s. This movement has accelerated in the past two decades and has significantly impacted the types of skills required to succeed. These tend to be the "soft skills" needed in relating to a multicultural workforce and in dealing with NOGs and NOCs.

The immediate challenge today is transmitting the soft and hard skills necessary to quickly bridge the gaps between new and existing personnel. Productivity is an ongoing training concern, both in time to train and time to be trained. Today, training is moving closer to sites of operations—a trend that will only increase as the number of new entrants to the industry increases. Those personnel who might be released for extended periods of time from the worksite to train will be in short supply. To decrease time away and increase productivity at the worksite, travel time must be eliminated or reduced.

New technologies in training are invaluable. Ironically, it is the new generation who invented many of the new multimedia technologies. Fortunately, they are also very comfortable using them. Although online training has existed for some time, in most cases, it has not been very interactive or intuitive. It is therefore necessary to rethink and reposition online training in formats that are familiar to a newer generation of petroleum professionals.

Company trainers and good trainers in general are also in short supply; so as a consequence, training of employees will be done in smaller increments and more frequently, allowing more time on duty. The qualifications for being an effective trainer in the oil and gas industry need to be researched. But if we rely on distributed training, blended learning, and smaller increments of training, how do we track the extent and effectiveness of our training? Learning management systems become important in tracking training effectiveness and e-learning comprehension through testing both written and on-the-job skills application. The whole area of blended learning needs to have a lot of attention paid to it. There is no clearly defined mix of learning modes that gives the greatest outcome.

Companies, government agencies, and society at large demand that training provide competence. It is going to be the joint responsibility of training providers and companies to certify competence. At the end of the day, companies want a measurable return on investment (ROI). They want to achieve a reduction in accidents, an improvement in oil and gas measurement yield, and fewer lost days of production. The measured ROI will require considerable effort to develop a system that can isolate the effects of training on an organization.

Moving forward, the industry will be challenged by its cyclicality of financial results. There will be an intense need to hire the brightest and most technically competent employees to meet the future challenges. The industry cannot afford to be seen as an unstable workplace.

What role if any should the government take in training? I think that there are three things that the government should be prepared to do. The first is to

develop a set of best practices from all of training underway in the industry today and communicate them to all of the involved parties. This could include a training reporting system similar to the Financial Reporting System (FRS) that focuses on key metrics for training. The second is audit the effectiveness of training providers. This can be done by testing the personnel that have been trained after they have been on the rig for a period of time. This should be "surprise" testing to determine the retention rate of training. This will do a number of things: it will allow an assessment of the training providers and it will provide metrics to determine the retraining periodicity. This can be done in conjunction with API and the International Association of Drilling Contractors (IADC) who have certification criteria for training providers. The third area is to encourage the industry to fund fundamental research in how to train and retrain the multigenerational work force that exists in industry today. We need to determine the best mix of learning delivery systems that is the most effective in delivering results.