The Next Step in Collaborative Training

The shift in oil company management toward asset-based structures has impacted the way companies train their employees. NExT, a new industry-university consortium, has adopted best practices from its partners and plans to develop new training methods for the future.

In some visions of the future, obtaining new technical or safety information about a product or a process will be as simple as buying a new chip for a brain implant, or aiming a wireless universal mind connector at the nearest data feed. Knowledge will be imprinted on our brains instantaneously, and we can be confident that our procedures incorporate the latest innovations and safety enhancements. Biofeedback receptors will provide assurance that results of our actions are as planned.

This science fiction scenario does not exist, of course, and to many this extreme of instant knowledge is a frightening, Orwellian possibility. Yet, because many petroleum industry jobs are complex and potentially hazardous, employees need to keep abreast of the latest developments in their industry, their discipline and their specialized job tasks. By the same token, employees, shareholders and the community at large expect companies to provide a modern, safe environment.

Many operating companies now believe economic advantage comes from a rapid and proper implementation of technology, rather than being the first to develop a new idea. The turmoil within the industry over the past 15 years has generated a tremendous drive to focus on core activities, emphasizing what the company does best. Outsourcing noncore functions—such as accounting, building services, engineering and construction, and often technology development—has become common.

Traditionally, major oil companies had in-house training departments designed to teach new employees approaches to technical tasks and to keep experienced staff current in their technical disciplines. Company or industry experts taught the classes. Trainees worked for the company or, in some cases, for national oil companies that partnered with the company. However, after the crude-oil price drop of 1998, many in-house training departments experienced reduced course attendance as companies sought to control costs.

The extended depressed business environment led many large operating companies to restructure around their asset bases, with profit and loss responsibilities assigned to lower levels of management. Training departments had to demonstrate their value to a new, larger set of managers, each of whom set different business priorities. Some traditional aspects of training...
Restructuring technical training. Corporate training departments once provided most training needs for large corporations, ranging from new-hire training to safety and courses for continual career improvements (left). Now, asset teams often control training, with an emphasis shift toward cross-training and obtaining technology required to give projects a quick start (right).

Distance learning. The student and instructor no longer must be in the same room. Communication can be through e-mail, telephone or video conferencing. Lectures can be stored on videotape or CD-ROM, or transmitted across the internet using streaming-media presentations. Interactive learning is available through computer-based training (CBT).

didn’t fit with the needs of newly formed asset teams, such as new-hire and professional development training. As the goal shifted to satisfying the immediate needs of the asset team, training inevitably became more focused (left).

Smaller oil companies have historically approached training differently, often following the current asset-based philosophy of the majors. These companies normally contracted for training on an as-needed basis whenever and wherever it was available—calling upon organizations that specialize in training, such as Oil and Gas Consultants International (OGCI) or Subsurface Consultants and Associates (SCA).

These training organizations provide centralized or on-site classroom training to fill the needs of both small and large oil companies across a broad range of topics. Other firms—such as GeoQuest or Landmark—offer training that complements their products and technologies. Many other organizations exploit niches in the training field, or like International Human Resources Development Corporation (IHRDC) specialize in distance learning and computer-based training (CBT) (below left). Many professional societies sponsor developmental training for their members; some are collaborating on multidisciplinary training.

Some operating companies consolidated or merged portions of existing training programs, such as the PetroSkills program developed by BP, Shell and OGCI. Parts of training programs from the three companies were combined to form a common set of courses for the companies and the industry. The two oil companies retain classes with proprietary content in-house.

Universities continue to offer traditional courses leading to degrees in petroleum-related subjects such as petroleum engineering, geology and geophysics, and their professors conduct research that is incorporated into course work. Degree-granting programs require a major time
commitment from the participants—often a difficult undertaking in mid-career. Some universities also offer short courses that compete with or complement industry training but generally have been separate from degree-granting programs.

The depressed E&P business environment of 1998 to 1999 created an opportunity to change the way training is conducted. The new approach combines academic programs with industry training, mentoring and competence assurance. It also provides a bridge between short-course training and advanced degree programs in an intensive subsurface integration program, focused on solving specific problems of importance to asset teams while providing general professional training in a broad range of topics. Combining innovative courses at many locations presents lifelong learning possibilities.

The Approach of Asset Teams

The move by the major oil and gas companies to restructure around core assets has given the asset team a specific focus—improve the return from that property. Activities that do not lead to this goal are difficult or impossible to fund.

The current ideal for an asset team is “just-in-time” training delivered to team members in their own location, addressing the immediate technical needs of the team. Traditional company training was not designed to satisfy that need. Rather, scheduling was the responsibility of the training department with classes usually offered only a few times a year at a centralized training facility. Training was designed to enhance the employee’s longer term value to the company.

In today’s climate, the asset team staff is lean. Each member must be able to do the job with minimal guidance from senior people. Training time is precious because the team can’t afford the absence of staff for an extended time. Specialized training is offered when the work on the asset dictates, not when a training department schedules it.

This targeted management style creates additional pressures for training. Because a multi-disciplinary team manages an asset, members are expected to have a greater understanding of the skills and expertise applied by their colleagues. Today, geologists must understand drilling concerns, and engineers must know how seismic lines are interpreted. The team may face risks—in project economics, reservoir integrity or safety—with higher potential for errors caused by lack of training. Despite these new pressures on employee training, asset-based organizations view training departments as expensive overhead.

During the period from 1987 to 1999, the 25 largest oil and gas companies reduced their overall employment levels by an average of 5.2% per year (above). This has impacted the age distribution of oil industry professionals. Deferred hiring has resulted in fewer young employees, and as the aging population retires, a “talent gap” will open that may be difficult to fill.

The cyclic nature of the oil and gas business has had a direct effect on training departments. During periods of high crude-oil prices, companies were more likely to send technical staff for training. As prices dropped, companies focused on cost cutting. Within training programs, cancellations increased and enrollment fell.

In response to recent higher oil prices, the industry might turn to the skilled labor pool terminated during the latest downturn. However, many of those terminated defected to other industries or retired permanently. Companies might make up the shortfall by cross-training or retraining workers not originally educated in petroleum-related areas, increasing costs for recruitment and training. The already lean asset-based budget structure will have to absorb these costs.

Training Takes a New Path

Recognizing this training gap, large multinational service companies could step into the breach to provide industry training as another outsourced service. They have the breadth and depth of expertise needed, and for years have provided in-house training for their own staffs and those of some oil companies. However, the current needs of the industry invite a new approach with a broader charter.

Four partners—three major petroleum-oriented universities and Schlumberger—have created a limited liability company called NEt,
the Network of Excellence in Training consortium (right). Texas A&M University, College Station, USA, the University of Oklahoma, Norman and Tulsa, USA, and Heriot-Watt University, Edinburgh, Scotland, combine their academic excellence and close links with industry with the operational experience of Schlumberger professionals to provide NExT with an extraordinary wealth of expertise.

Texas A&M has the largest petroleum engineering and geoscience department in the USA and is ranked first in academic excellence. The Mewbourne School of Petroleum and Geological Engineering at University of Oklahoma, founded in 1927, also has one of the most highly rated study programs in the USA. Heriot-Watt University offers the largest and strongest concentration of professional education and academic research in petroleum engineering in Europe, and is a world leader in distance learning.

All three research universities give NExT access to the latest developments in petroleum-related technology. The NExT program represents a broad spectrum of the industry—no single viewpoint dominates the classroom. This is important because most companies do not want to be unduly influenced by a competitor’s philosophy.

For Schlumberger, creation of this consortium helps satisfy a wide variety of requests by asset owners. In some cases, the reduction of an oil company’s internal training group made it difficult to satisfy existing contracts in countries with a national oil company, where license concessions can include provisions for training of the local staff. Companies caught between reduced training capabilities and contractual obligations usually have turned to external training.

With training for the oil and gas industry at a turning point, NExT sought a new value model for training (below). Because course subject matter remains the essential core of technical training, NExT has instituted processes to assure the highest standard for course content, building on the internal systems of the partner universities. NExT also has changed the way some course work is structured and how training is delivered. Effective knowledge transfer and skills development are essential to incorporate the subject matter into the daily actions of the trainee. A competence-assurance process can be established to show that newly learned skills and behaviors are enacted.

For some students, the course may be just one part of a program leading to certification or accreditation. NExT does not award degrees, but, in some cases, NExT courses could contribute to one, provided the awarding university’s standards and conditions are met.

One goal for NExT is to establish closer collaboration and cooperation between the industry and universities to improve the effectiveness of petroleum industry training. NExT aims to modernize training methods and create strategic partnerships to facilitate quality global technology transfer. For trainees, NExT provides an opportunity to broaden their knowledge base for career development. All four NExT partners will underwrite a certificate indicating completion of training.

NExT management is assisted by two types of boards representing each of the four partners and the petroleum industry: program-specific peer review boards and an industrial advisory board. Each peer review board works with one of the four
program-area curriculum directors to assure courses are up to date and conform to the highest industry and educational standards. Instructors must be competent, both in technical qualifications within their discipline and in teaching ability.

The four program areas and the school directing them are as follows:

- Reservoir Engineering at Texas A&M University
- Well Engineering and Operations at University of Oklahoma, Norman campus
- Petrophysics and Geosciences at University of Oklahoma, Tulsa campus
- Distance Learning and Petroleum Engineering at Heriot-Watt University.

The industrial advisory board oversees the entire program. This board makes sure NExT offers the right types of programs to satisfy current and future industry needs. General managers, directors and presidents of oil companies serve on this board, providing NExT with a broad overview of industry trends (above right).

Joining Courses
The first step for NExT was developing the program areas, arranged by technical discipline. The curriculum directors manage the courses and instructors through these program areas. Courses are included in the NExT curriculum only after thorough examination by the peer review boards. Each board selects courses within its discipline that will be included in the NExT program. Board members from each of the universities and Schlumberger, with an industry representative on an ad-hoc basis, ensure that the courses in the curriculum meet university academic and industry commercial standards. This rigorous review ensures a high level of instructor competence and quality course material.

The curriculum consists of more than 90 courses, many on advanced topics in geosciences, petroleum engineering and well engineering (right). All four NExT partners are involved in course design, and continually strive to broaden and deepen the scope of offerings. The peer review boards are responsible for ensuring that the offerings from the three universities and Schlumberger are properly integrated.

A course catalog is only the first step in meeting the needs of industry. A company, or an asset team within a company, can design its own training program by selecting specific courses from the catalog. NExT works to incorporate company data, problems and software into a workshop associated with training classes where appropriate. Discussing problems already encountered by the student brings new insights directly and immediately into the company. NExT can also design comprehensive solutions to training needs. For example, after mergers or formation of joint ventures, NExT can examine the skill sets of the combined entities and set forth a program to fill gaps in training. Such programs can be held at a NExT training site or at the company’s location.

NExT operates with a “virtual faculty.” Instructors are subject-matter experts from the partnering universities, Schlumberger or consulting-industry professionals. The peer review board examines the NExT faculty as closely as it does course materials.

The NExT education features several advanced concepts in training. Well engineering and wellsite operations are month-long courses with an added feature to improve technology retention. Students are assigned an experienced industry mentor who stays with them during their training, establishing a relationship that continues over the following five months. The mentor assures that concepts learned become a part of the student’s work ethic.

Another special feature, derived from the Schlumberger Integrated Project Management (IPM) group, is competence assurance. The complete operational needs of a specific project are examined, and staff are tested and trained accordingly.

A third major program was transferred to the NExT curriculum from BP. The heritage Amoco Petrophysics Training, now called the NExT Subsurface Integration Program, NSIP, is an intensive 11-month program that includes major project work for the student’s asset team.

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4. Schlumberger owns 50% of NExT, with the other 50% shared by Texas A&M University, University of Oklahoma and Heriot-Watt University.

A mix of classroom and on-the-job training. Mentors work with students during a one-month class and then for an additional five months supervising their completion of assigned tasks while on the job. This mentoring period ensures that the material learned is rapidly applied in operations.

The NExT program uses an ancient method of teaching and coaching updated into 21st century technology—mentoring. Mentoring is a key aspect of the NExT plan for the future. It will play a role in local as well as distance learning, providing greater depth to the material. The NExT curriculum offers two courses that serve as a pilot for mentoring.

The Well Engineering and Construction class is designed for recent college graduates with up to two years of work experience. Nongraduates with significant field experience who are planning to transfer to this discipline also may participate. The course introduces new concepts in well construction using interactive training to design, execute and evaluate a drilling program. Students learn to use the Drilling Systems, Ltd., DTS Drilling Training System software suite, including the DOT Drilling Operations Trainer, DMT Drilling Management Trainer and MUDSIM Mud Treatment Simulator packages. The syllabus includes conceptual well design, detailed well planning and development of a well program. Actual field examples are discussed, and students are encouraged to share their own examples of problems or successes.

The more advanced Wellsite Operations class focuses on engineering techniques for maximizing the return on investment of operational dollars. Students should have at least two years of field experience as wellsite supervisors. Some mathematical and equipment knowledge is required. Since class members have substantial field experience, the problems they offer for discussion can be quite complex. The program is comprehensive and covers drillstring design, directional drilling, casing design, wellbore stability, logging, cementing and drilling fluids, completions and formation damage. Students learn management techniques to deal with personnel and costs; quality, health, safety and environment issues; and avoidance of nonproductive time. Each course comprises prestudy material, one month in class and five months of practicum, involving supervised work in the field or office (left). Both courses can be taken in sequence for a full-year training program that provides the attendee with an understanding of the well from conceptual design to abandonment. NExT faculty offers the program at several locations worldwide, and its modular design allows a company flexibility in selecting content.

The mentoring and follow-up task book distinguish NExT courses from other industry offerings. A practicing professional, expert in the discipline, attends the classroom instruction with the students and during this period has the opportunity to become acquainted with each student. After the in-class portion, the mentor visits students and their supervisors to discuss the follow-up tasks that are expected during the subsequent five months. This is codified in a task book of more

### Selected Wellsite Operations Tasks

#### 8. Directional drilling

8.1.1. Evaluate technical assurance of the directional well plan.
8.1.2. Look at a well plan to determine if the path and trajectory are calculated properly.
8.1.3. Identify potential problems associated with the designed plan.
8.1.4. Take preventive or corrective actions if required.

#### 9. Formation damage and completion considerations

9.1 Identify potential formation damage mechanisms associated with your particular drilling and completion process.

9.1.1. Review a drilling program and completion design and describe the inflow system and formation characteristics.
9.1.2. Identify potential problems associated with the drilling and completion program and design.
9.1.3. Substantiate, with documentation, the programmed process or recommend potential preventive or corrective actions.

#### 10. Safety and environmental considerations

10.2.1. Describe the local laws and regulations pertaining to waste management.
10.2.2. Identify the disposal plan for the waste and describe the downstream activities such as methods of treating the waste when it is onshore or offshore as logistics can be a problem.

Wellsite Operations practicum. Shown are a sampling of the 40 tasks given to students to perform during the five-month practicum. They must complete at least 30 of them.
than 40 items related to the technical subject matter. At least 30 of these tasks must be successfully completed during the practicum period, giving the student an immediate, supervised opportunity to apply new learning. Performing the task impresses it more strongly in memory than only learning it in class.

These tasks are not theoretical exercises. Rather, they are actual, day-to-day duties the trainee will be expected to know how to perform after completing the course (previous page, bottom). The mentor works with the company supervisor to make sure that the student has an opportunity to complete these tasks during the five months. If the student’s work team is not performing relevant work, the mentor helps arrange a temporary transfer to a team where those experiences are available. The student has a CD-ROM self-study guide, the company supervisor and the mentor for resources.

A student’s progress is kept updated on a Web site with restricted keyword access. The mentor tracks progress and intervenes if the student is not completing tasks in a timely manner. At the end of the practicum period, the mentor administers the certification examination at the student’s work location. Upon successful completion of the course requirements, NExT certifies that the student has acquired the knowledge, skills and competences taught in the class.

The program is a major investment—the student is away from the office for a month and must be involved in specified tasks for five more—but provides substantial return to the company. The direct benefit is a more knowledgeable and skilled employee, certified to perform more tasks than previously. The five-month practicum period helps engrain classroom information in the trainee’s work habits. Thus, the employee’s increased responsibilities translate into increased competence at the wellsite, improved safety and decreased risk. This satisfies a major drive for management, improving return on investment in the asset.

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Leading Competence Assurance—Hibernia

One true test of training and preparedness is reaction to disaster. When a tragedy involves a man-made structure, such as a bridge collapse, a crash of a commercial airliner, or massive loss of life on an offshore platform, there is a strong impulse to determine why, what went wrong, and how recurrences can be prevented. Lack of training has been a key factor in several disasters in the oil and gas industry.

The sinking of the Ocean Ranger platform and loss of 84 crew members in a severe storm offshore Newfoundland, Canada, in 1982, led authorities to examine operating practices for offshore oil operations in Canadian waters. An inquiry found platform design deficiencies and inadequate training of the staff. This disaster and others, such as the Piper Alpha explosion offshore UK and loss of the Alexander Kielland accommodation platform during a storm in Norwegian waters, led to major regulatory changes and new industry-wide safety programs.

As more oilfield companies join alliances or merge, there is a growing need to ensure an adequate level of competence for the combined staffs. To meet this need, NExT has developed a program for competence assessment and assurance in complex operating environments like offshore platforms. The foundation for this initiative is a program developed by the IPM group in conjunction with Hibernia Management and Development Co. Ltd., for an integrated services alliance for the Hibernia field, located off the eastern coast of Newfoundland.

The Hibernia alliance partners and contractors outlined all jobs for offshore positions, defining more than 60 roles ranging from accommodation coordinator to wellsite geologist (below). After breaking every task down into its component parts, the group identified the product of that task, or the result of successful completion. They codified the skills and competences necessary to achieve that result. With this complete map for safe and effective operation in hand, the alliance partners could evaluate the platform crew.

This systematic and auditable process assesses candidates against a set, baseline standard and not against one another. An effective assessment has three characteristics: validity—the evidence collected must be appropriate to the task; reliability—the process must be consistent and fair to all employees; and practicability—the process shouldn’t be cumbersome to perform.

The competence-assurance process helps each employee achieve a level of ‘core’ competence in safety and business-critical areas associated with platform operations. Every Hibernia employee

6. The original Mentor was the man Odysseus charged with the responsibility of raising his son and teaching him the ways of leadership. Mentor carried out this task while Odysseus was on his adventure.
receives a copy of a manual outlining the process (right). The assessment determines whether the individual is competent to perform the tasks. If not, the employee may be given more supervision or additional training to achieve competence.

At Hibernia, assessment is divided into units, with the first unit focusing on basic competence required for all platform roles and the second unit dealing with critical safety, health and environment roles and basic business behaviors. The third section deals with the specific role of the employee, and the final part covers tasks critical to the current work assignment.

In the assessment, the employee must present evidence that is valid, authentic, current and sufficient. The candidate must demonstrate an ability to effectively carry out the skill to this standard, using knowledge, experience and proper attitude to perform work safely and effectively.

Competence can be established several ways. The candidate could show historical evidence from work experience or documentation of training. An assessor or other appropriate person can witness the candidate performing the specific task, or simulating it in situations when it is not possible to actually do it for safety or other reasons. In some cases, written answers to items on the assessment form would be acceptable. In all cases, the basis for acceptance must be documented.

Verifiers provide a quality check, examining all assessment records and providing feedback to the candidate. The verifier can request additional evidence of competence if the documentation presented is inadequate.

The assessment process has several benefits. Most important is increased safety on the platform because of demonstrated competence of personnel. It also helps to identify training and development opportunities for an employee. The process helps in evaluating various job tasks, which could lead to improvements in the way tasks are performed.

Following the process helps to ensure that ability is not confused with attempt—the amount of effort should not influence the assessment decision. Because competence must be demonstrated to meet a baseline standard, bias has been removed from the assessment process.

Inclusion of the competence-assurance program in NExT training is natural. The unique combination of NExT industrial experience and academic rigor will be used to define a wide range of tasks within the industry. In some cases, training needs can be met through NExT courses. The NExT certification process will be able to provide appropriate documentation of proof of competence.

Progress in Subsurface Integration
Most NExT courses are brief, lasting a few days to a few weeks. At the extreme in length and complexity is the NExT Subsurface Integration Program (NSIP). This 11-month course teaches the application and integration of multidisciplinary subsurface technologies. Each participant brings a business problem to solve that will deliver significant economic impact for the sponsoring asset team. Inclusion of the business problem, which could be in any stage of an asset’s life cycle, is key to this program—the training is immediately applied to achieve the business goals for the asset.

Course work focuses on reservoir geology, geophysics, reservoir engineering and formation evaluation, but offers exposure to a wider range of exploration and production technologies as needed. Participants are taught to integrate disciplines and solve problems to improve return on the asset.

NSIP has as its foundation the heritage Amoco Petrophysics Training school. From the program’s inception in 1972 though 1999, 319 participants graduated, including 186 geoscientists and 133 engineers. In that period, projects added over $500 million in value for their assets. After Amoco merged with BP, the new company transferred this petrophysics training to NExT. Two of the 12 to 16 openings each year are reserved for BP employees.
The program has two main thrusts—training, which is concentrated within the first half of the course, and project activity (previous page, bottom). While project activity occurs throughout the course, it becomes most intense, almost full time, during the final third of the course.

Each participant sets specific objectives for individual project work. These objectives should be clear before the participant arrives at the University of Oklahoma in Tulsa to start work. The NSIP program team leaders become familiar with each of the dozen or more business problems during discussions with the asset teams as the projects are set up. Normally, they do a quick-look scoping study to be sure the problem is appropriate for NSIP and that adequate information and a comprehensive data set can be obtained before or during the class period to solve it (see “Roadmap for Project Solution,” next page). Then they work to ensure that all information relevant to the project is available when the training period begins in November. If the asset team has high-priority needs, the NSIP program team leaders help find ways to satisfy those needs as soon as possible.

Over 65 linked courses of half- to five-day duration are integrated with project work (above right). The course work starts with a fundamental method of subsurface integration. Additional modules include applied lithofacies analysis, rock and pore types and flow units; analysis of capillarity, saturation, permeability and relative permeability; and integration of core analysis with wellbore, surface and production data.

Participants learn deterministic and probabilistic formation-evaluation processes and methods and how to integrate wellbore-pressure responses into their interpretations. They also learn to combine seismic attributes with core, log and production data and to use seismic responses for reservoir characterization and prediction. Additional course work comprises integrated reservoir engineering, performance analysis and prediction, including probabilistic and stochastic methods, and applied reservoir simulation and management.

Throughout the program, participants practice project management and documentation methodologies, and they learn computer graphics and visualization. Since many graduates anticipate moving to higher positions after returning to their asset team, classes in leadership practices and communication skills are included.

Most projects demand considerable laboratory work. Participants learn how analyses are performed and how to check results for quality—technical assurance is required for all projects. Participants also learn to document their project for delivery back to the asset team.

The participant maintains close contact with the sponsoring asset team throughout the class (below). Every month, mentors approve a progress report for each participant, which is posted on a Web site accessible by the asset team. This describes the current findings and status of the project.

Upon completion of the NSIP program, a participant returns to the asset team with a deep and broad understanding of petrophysics. The business problem has undergone intense scrutiny, with assistance from a wide range of industry experts and mentors. The asset team has value-based business recommendations to act on, complete with comprehensive technical documentation that will be useful for years.

NSIP takes advantage of the university involvement in NExT training, drawing on the combined faculty for expertise. Some professors teach NSIP modules, while others lead workshops and mentor participants. Access to this large pool of expertise within the NExT community is a great boon for project work. The benefit can work both ways, as problems encountered through class projects can fuel research endeavors at the universities.

NExT management is evaluating further possibilities for the NSIP program, including using some of the modules for stand-alone short courses. Some companies in the industry are interested in mini-NSIP programs, such as the Petrophysical Integration Process Model, or PIPM, training for quick-look evaluations.

At the center of things. Students remain in contact with their asset team, keeping up-to-date on the problems and activities in the field. Meanwhile, they learn from their instructors and mentors to integrate data and analysis into the course work.
NSIP teaches the Petrophysical Integration Process Model, or PIPM, methodology to examine a wide variety of reservoir issues (below). Petrophysics is viewed as the process of integrating multiple disciplines to characterize rock, pore and fluid systems. The first step is determining the units of study—the rock types. Relevant information comes from petrology, mineralogy, diagenesis and porosity. These impact capillarity and relative permeability, so rock typing must be consistent in these measurements. Lithofacies are mapped to rock types also.

Based on a consistent rock typing, log models can be created to determine net pay and other factors obtained through formation evaluation, such as pressure profiles. The process uses a Lorenz plot as a model of flow units to indicate storage and flow capacity.1 With this in hand, vertical flow profiles of these parameters can be obtained, indicating where hydrocarbons are in the strata and whether they will flow.

Then, PIPM moves up in scale, focusing on seismic models, type-curve analysis and well performance to fine-tune the interpretation. Reservoir models provide tools for determining areal distribution of pay, which may lead to information about bypassed hydrocarbons for improved recovery. PIPM provides understanding and, more importantly, diagnostic tools for reservoir management.

NExT mentors use a modified version of PIPM for a quick look at potential projects before the NSIP class program even begins. This evaluation can be done in a day or two for each project. It does not solve the problem, but provides useful information about the approach that should be taken and points out the data that will be required to solve the business problem.


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**Roadmap for Project Solution**

A systematic approach to petrophysics problems. The Petrophysical Integration Process Model, or PIPM, provides a methodology to evaluate a reservoir. Cores provide data on the rock and pore types, which are used to characterize capillarity and flow. Addition of log and well data determines flow units and storage and flow capacity. With this basic picture of the reservoir, seismic data, well data and reservoir flow simulation provide a model of the reservoir. The ultimate goal is improved reservoir management.
Learning at a Distance

The three initiatives described above—mentoring, competence assurance and training integrated with intense project work—share several traits. First is an excellence in content, assured by rigorous supervision from the peer review boards associated with each of the four disciplines and the NExT industrial advisory board. They all incorporate follow-up to assure that knowledge gained can be applied successfully on the job. For example, the Well Engineering and Construction and Wellsite Operations courses both have designated mentors to oversee the practicum period, and within NSIP full-time staff and the virtual faculty provide direction throughout the course. The competence-assurance program has assessors who observe the employee directly to be sure tasks are performed properly.

Both the well programs and the competence-assurance process involve objective learning—a student must demonstrate competence in a topic to move ahead to subsequent sections. Just attending a class does not certify a student, nor does expending a great effort without actually learning the material. Certification is based on objective criteria and evidence that goals have been accomplished or knowledge obtained.

One goal for NExT is to incorporate more distance-learning concepts. Tools such as direct streaming video are now available to supplement video conferencing, chat-room type interactions, on-line roundtables and recorded lectures on tape or CD-ROM. The University of Oklahoma uses a broadband fiber-optic network in Oklahoma to provide interactive courses at a distance. NExT plans to convert many standard classroom lectures into interactive computer-based training (CBT), using distance-learning tools in conjunction with exercises on the computer. This could be done in a classroom situation or with students in remote locations.

Objective learning is an important aspect of the NExT program’s plans for CBT. Any course translated to computer must be interactive. Text on the screen, or translating a lecturer’s notes to an on-screen slide presentation, is not sufficient to show the student has learned the material. Problem sets will be incorporated in the course work to engage the student more directly. In many cases, answers to workshop exercises will not have one “right” or one “wrong” choice.

There will be decision trees within the problem, allowing the student to select among a series of actions from project initiation to conclusion. The scenarios and decision-tree results should be as close to actual situations as possible. Once the student has “solved” the problem, the decision tree shows the path of choices taken and the practical and economic consequences of the choices made (above). One choice taken may cost an extra day of rig time, while another might save on cost of material but have a higher safety risk.

While the course material may be on the computer, the student will still have access to a subject matter expert, either in class or directly accessible on-line. The expert can answer questions, monitor class progress on course work, decide when everyone is ready to do problem sets, and conduct workshops on special topics.

Course content will be updated rapidly as technology progresses, incorporating new interpretation methods, new tools or new processes quickly and easily. To make quick revisions, information within the course can be divided into small, self-contained units—nuggets of information. An example is the Schlumberger Oilfield Glossary in which each term is a nugget.

Continuing Education

The three partner universities in NExT are leaders in petroleum engineering education; independently each has an outstanding reputation. It is fair to wonder what drives them to work together and partner with an industry service company.

Universities exist to educate. With more competition for attention and information brought by the Internet, universities are examining their brick-and-mortar campuses with an eye toward a revolution in interactivity. NExT provides a framework for testing ideas that could be carried over to a university curriculum, and vice versa. Some of the CBT courses and ideas can be, and in some cases already have been, taken to the university setting, either for the traditional on-campus student or for the distance learner pursuing a course of continuing education.

Another benefit for the universities is wider exposure, since NExT courses are offered throughout the world. This works both ways, with plans under way to use NExT for the short-course portfolio at the Abu Dhabi Petroleum Institute where 14 Scottish universities, including Heriot-Watt, provide curriculum.

Universities are also places of research. NExT courses benefit from university advances with the potential for rapid dissemination of new discoveries to professionals who can use the information. The link can feed back to university research in exposing additional sources of both funding and inspiration. Students attending classes can bring new problems and ideas to the faculty.

NExT is discussing with the partner university administrations and boards ways to incorporate NExT classes into degree programs. An intriguing idea for the future is accepting completion of NSIP as at least partially fulfilling the requirement for a Master’s degree. Other NExT courses could be accepted toward satisfying advanced degree requirements.

It is uncertain what university or industry training will look like ten years from now, but clearly the NExT program will help define that look.

—MAA