



Where do oil and gas industry engineers go for training courses, workshops and seminars taught by experienced professionals and leading industry consultants?

*You just found it.*

## Technical Training

### Background

All portions of the oil and gas industry have undergone tremendous change in recent years. The departure of experienced personnel, in combination with an influx of new engineers and continued work demands, has increased the training needs of owner and contractor companies. However, these companies often do not have the time to develop and present training courses with their own resources.

Carmagen Engineering, Inc. develops and presents training courses, workshops, and seminars that are tailored to the specific needs of our clients. While most of our courses to date have dealt with engineering technology disciplines, we can also prepare and deliver courses on process technology.

**But we do more than just training.** We are actively involved in providing a broad range of engineering consulting services to the oil & gas and related industries. Accordingly, our technical training presentations are made by engineers who are both active in the industry and have the training and experience to effectively deliver the content of the courses.

### Effective Training

In an ideal world, we could provide training to match the need of each member of a client's professional staff, according to the range of technical responsibilities assigned to the individual. While real-world limitations of cost and time make classroom training the norm, we nonetheless strive to give the best possible balance between "standardized" and "customized" course content.

An essential part of every presentation is the material prepared prior to the classroom sessions, and we take great care to make this material clear, comprehensive, and useful. We have created "standardized" text for each course in our catalog to ensure accuracy; we don't "wing it" in the classroom. That said, however, we are willing and able to modify course content to the extent required to fit the particulars of a client's situation.






*All the right people in all the right places.™*

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## Customized Full-Length Courses

Here are a few examples of technical training assignments that we have successfully completed by customizing our full-length courses to client particulars:

-  Five-day course developed for an international petroleum refining company. The course scope included the fundamentals of materials selection and design requirements for piping systems, pressure vessels, heat exchangers, and storage tanks.
-  One-day course covering atmospheric storage tank inspection and maintenance, emphasizing API-653 requirements.
-  Three-day course developed for a domestic petroleum products marketing company. The course scope included piping system and storage tank design and maintenance.
-  Five-day course developed for an oil production and refining company in the Middle East. The course focus was the mechanical design, fabrication and maintenance of piping systems. Additional courses either developed or under development for the same company include:
  - ⇒ Five-day course covering the design and maintenance of storage tanks
  - ⇒ Five-day course covering pressure vessel mechanical design, maintenance, and repair
  - ⇒ Five-day course covering heat exchanger mechanical design, maintenance, and repair
-  Three-day course prepared to focus on design and maintenance requirements for API-650 storage tanks.

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**The oil industry's next generation of refinery engineers will need mentoring that can be situational and institutional. That can last days, months, or years. That includes academic consultants and experienced experts.**






***We're all that.***

## **Training the Current and Next Generation of Refinery Engineers**

The engineering expertise available in the petroleum refining industry is graying at an alarming rate. The average age of engineers supporting refineries today is well over 50. The decrease in refinery expertise began in the mid-1980's when the price of crude oil sank to \$8 per barrel and a number of veteran personnel elected early retirement. In previous down cycles, the oil industry was able to quickly recover with the help of a strong, talented work force, whose members served as valuable mentors. This is no longer the case; the industry is struggling with training young engineers while its remaining refinery experts are swamped with technical demands that limit their availability for mentoring. Technical consultants are being employed to fill this gap.

### **Demographic Shifts**

The decrease in personnel available for mentoring can be attributed to three factors:

-  Rapid merger/acquisition activity since 1986 that eliminated duplication of tasks. This activity also tended to reduce the size of engineering staffs.
-  Re-engineering of traditional corporate structures that reduced "careers" to "jobs" in order to reduce engineering costs.
-  Increases in new technology that led companies to expect more efficient working methods so that one person could do the work previously done by several.

A combination of these factors with a perceived "old smokestack" industry inhibited hiring until after 2002 when the price of crude oil began its increase. At this point, the remaining experts who are approaching retirement are so stretched handling their work that they have little time for mentoring. It has been estimated that it takes 7-8 years for a young graduate to become fully capable in the industry. The absence of qualified mentors may extend this period. In the interim, less experienced engineers are handling tasks for which they are not necessarily qualified.



## Engineer Mentoring

Mentoring is a learning partnership between an experienced engineer (mentor) and a new professional (protégé) for the purpose of sharing knowledge and information. It is an interpersonal relationship, outside the direct chain of command, where an individual receives advice, coaching and/or counseling that will benefit the company. Mentoring can be situational (short term, random, casual, creative, problem driven), informal (voluntary, personal, loose, responsive) or formal (institutional, information driven). Open communications (face-to-face or electronic) allow a protégé an opportunity to develop both personally and professionally. An effective mentor listens without questioning why, provides feedback without dictating, puts problems in perspective without building barriers, suggests ideas without discounting alternatives, and challenges decisions without negative criticism. Over time, a protégé may have many mentors depending on his development. While some relationships may last several years, they may last only days or months. A key to successful mentoring is management sanction and support.

## Consultants as Mentors

Consultants are hired because of well-established, long term expertise in a field that includes “institutional memory” that may be hard to access otherwise. To compensate for the loss of internal experts, organizations have created “knowledge databases” using information technology. Often, the databases have been built rapidly with little evaluation of information quality. If there is no internal expert to guide a young engineer in gathering adequate background, progress in solving refinery problems can be slow. Even with data mining technology, an inexperienced engineer may face a large body of conflicting data before moving forward. An experienced consultant, on the other hand, knows how to interrogate the database to obtain relevant, reliable data and quickly move forward.

In many ways the role of a mentor parallels that of a consultant:

For the Client, the Consultant	For the Protégé, the Mentor
🏠 Is Available	🏠 Is Available
🏠 Provides Technical Expertise	🏠 Provides Technical Expertise
🏠 Is Contracted from the Outside	🏠 Comes from Outside Line Organization
🏠 Brings Broad Experience	🏠 Has Industry Knowledge
🏠 Provides Problem Perspective	🏠 Puts Problems in Context
🏠 Suggests Technical Options	🏠 Helps Identify Approaches
🏠 Identifies Other Active Experts	🏠 Suggests Contact People
🏠 Listens/Shares Career Experience	🏠 Counsels on Career Concerns
🏠 Avoids Institutional Barriers	🏠 Provides Advice on Internal Systems
🏠 Reviews Results and Reports	🏠 Reviews Results and Reports



The role of consultant and mentor differ in two important ways. First and foremost, a consultant addresses problems directly while a mentor guides an individual addressing a problem. Second, a mentor can provide company career advice based on knowledge of the inner working of the organization while a consultant can only reflect on his experience to give feedback on career path options.

## Consultant Mentoring Programs

Consultant mentoring supplements company training programs for young engineers. For years, industry has used academic consultants as mentors. Professors "working at the cutting edge" are contracted to visit company sites periodically and maintain informal networking contacts with those working in their fields of expertise. Similar programs may be established with experienced (often retired) experts who remain actively engaged in their field. This requires an interest on the part of a company to sponsor a consultant and a willingness by young employees to take advantage of his availability.

There are many ways that a company may structure a consultant mentoring program once it recognizes its need for outside expertise in a specific area. One approach is to contract the consultant for a number of site visits and a number of hours of availability over the course of a year. For example, a consultant may be hired for two site visits per year and to provide up to 40 hours of on-line or phone contact. The details of the site visit (seminar, face-to-face mentoring, management contacts, etc.) and remote contacts must be structured to satisfy company requirements.

Hired as a mentor, a consultant is available as a sounding board rather than as a problem solver. While making suggestions, asking questions, or pointing to alternate options as a technical consultant would, the mentor consultant refrains from pushing decisions and often plays the role of devil's advocate to force the protégé to defend a position. By challenging him to "look at the big picture" (e.g., cost, scale, by-products, available space, materials of construction, institutional prejudice, etc.), the mentor helps his protégé develop into a valued, experienced engineer.

A consultant mentor program is a way for a young engineer to access expertise and experience that can help in his growth personally and professionally. Such a program also clearly benefits the company by helping it to develop the technical capabilities of its staff comparable to the way it was done in the "old days."

*Win Robbins has extensive analytical expertise in the areas of reactive sulfur/naphthenic acids characterization, HPLC-2 ring type definition technology, and polynuclear aromatic hydrocarbons (PNA) characterization. Please contact Jerry Lacatena (jlacatena@carmagen.com) if you'd like more information on Carmagen's expertise in this area.*

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