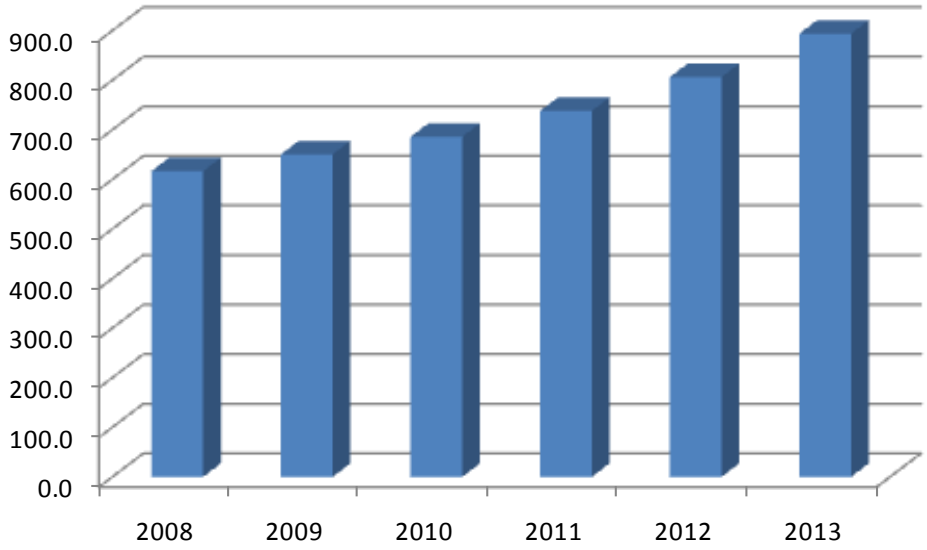
ARC WHITE PAPER

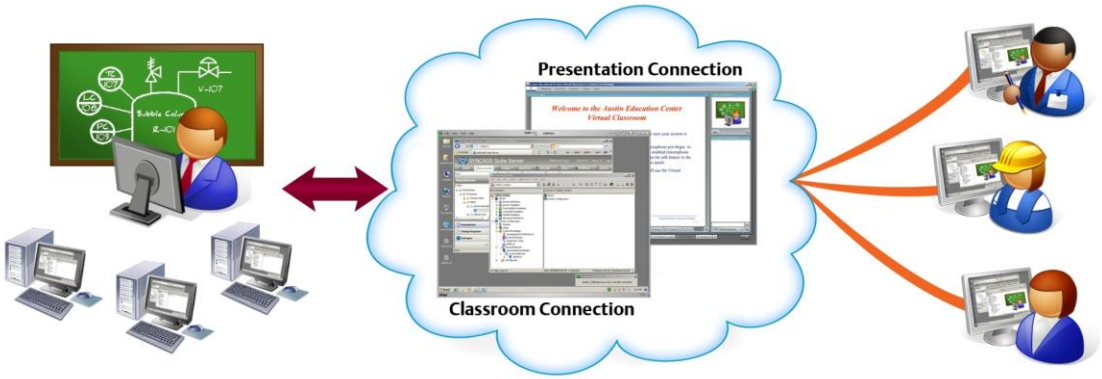
By ARC Advisory Group

SEPTEMBER, 2010

Emerson Virtual Classroom Makes Automation Training more Accessible



ARC Forecast for Automation Supplier Provided Training Services (Millions of Dollars)



Emerson Virtual Classroom Allows for Hands on Training as Well as Workshop or Lecture-Based Training

Executive Summary

In ARC's opinion, the automation suppliers are going to train the next generation of operators and technicians in the world's process plants. We believe this for many reasons. Foremost among these is the global shortage of qualified personnel to fill positions in the process industries. Employees with years of experience are exiting the workforce through layoffs and retirements. In light of the recent recession, many end users companies have even stepped up their worker reduction programs. In developing economies, there is just a plain scarcity of highly qualified workers. At the same time, companies are tighter on capital and expenses continue to be tightly controlled. The new generation or workers lack experience and require decent training, but at the same time they are much more IT-savvy and can adapt to different models of learning that go beyond the traditional classroom environment.

Emerson Process Management is one supplier that has invested in the infrastructure that is required to provide a deep and highly interactive training experience that captures the classroom experience and allows for secure hands on training.

All of these factors create an environment that is ripe for remote training solutions. Automation suppliers are in a great position to provide this remote offsite training. They know their products and systems better than anyone does. They can also provide the infrastructure required for remote training. Many suppliers already do remote control system and equipment monitoring of their installed base using secure technologies. Through remote operations, in house experts can monitor many facilities at the same time. The same holds true for automation training and education. One expert can reach out remotely to hundreds of people that need training in all areas of the globe.

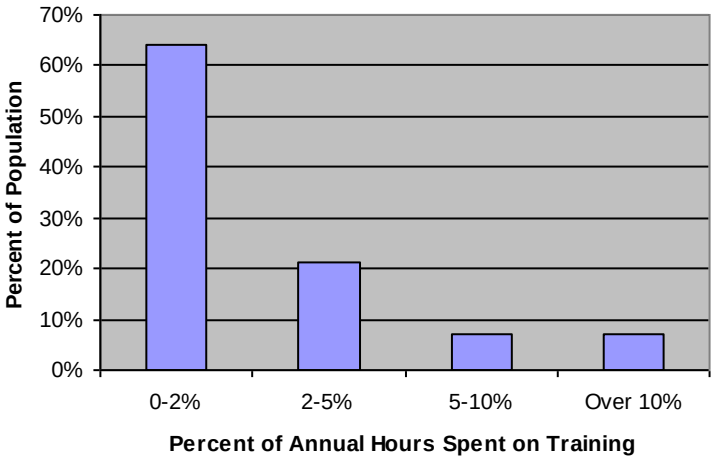
Emerson Process Management is one supplier that has invested in the infrastructure that is required to provide a deep and highly interactive training experience that captures the classroom experience and allows for secure hands on training. Their Virtual Classroom is a real time, certified training solution that eliminates the cost of travel and the impact of being out of the office or out of the plant. The curriculum, the pace and the instructors are identical to the on-site training courses, and ARC believes that the remote access to Emerson systems and devices adds a unique element compared to many other remote training solutions that rely heavily on lecture format.

The Increasing Importance & Strategic Value of Training

Proper training is essential for capital projects, modernization or expansion projects, and day-to-day operations. If operators are not properly trained, they cannot run the plant at optimum efficiency. Keeping operators well trained and able to handle unforeseen process upsets is paramount, especially when you add the element of advanced process control.

The influx of less experienced workers into the world of automation and manufacturing is spurring extremely high growth in the training segment, with both suppliers and end users stepping in to fill the need. Even during the 2008 to 2010 global economic struggles, companies continued to spend money to ensure that their workers are properly trained.

It is clear that employee and skills retention will become more important than they have been for many years. Replacing a lost employee is already a costly exercise, especially for specialists such as process control engineers and process operators. However, that presupposes that the replacements are available. Statistics show that they will be less available as time goes on.



ARC Survey Showing Training Hours Spent per Year as a Percentage of Total Hours

ARC research has shown that manufacturers are trying to raise the standards for qualifications when hiring new operators. However, the reality is that many manufacturers are accepting applicants with lower qualifications than they would like and must provide training, followed by a testing and certification process, to bring them up to speed. ARC research has shown that manufacturers have been slow to react to the impending skills crisis, as most of them still provide less than two percent per year of training time for their employees. Process industry leaders, though, are responding by putting programs and standards in place to ensure skills are retained and employees are given the training they need to do their jobs.

It could take as long as seven years to train a worker to be experienced enough to make the right decisions. As an end user, you have to assume that in the future your operators, maintenance technicians, and other employees will not have a lot of experience in the process automation industry, and you will have to make things as easy as possible for them to adapt to their new roles, eliminating unnecessary work and processes along the way.

With traditional classroom training, travel-related costs like transportation, housing and meals can roughly equal the cost of the actual training courses. Time spent away from the job traveling and the personal cost of being away from families can contribute to making location-based training costly on many levels.

Where do end users go to receive training and updated skill development as technologies and systems continue to change? In most cases, it is to the automation supplier. Suppliers have invested heavily in both online and classroom training resources over the past decade to ensure that their customers know how to properly use their solutions. This includes dynamic simulators designed to train process operators and verify control system functionality.

Training Should Have the Goal of Developing Knowledge Workers

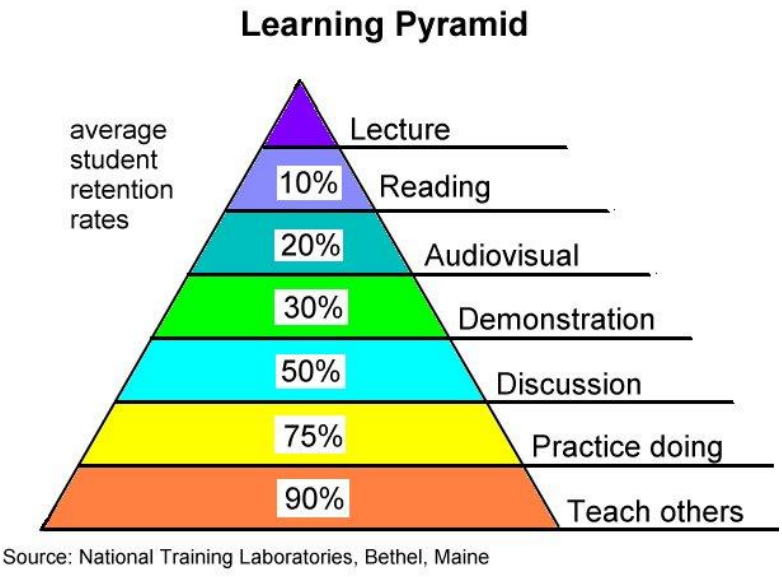
The new breed of candidates for process plant staff do not want your "father's job," they want to be knowledge workers with the opportunity to contribute directly to the business. They are computer-literate and tend to have a higher level of native, multidimensional problem-solving ability than displayed by workers who did not grow up in the computer age. The best are not afraid to make decisions as long as they have enough relevant information. Rather than just being responsible for blindly completing a set of manual tasks, they want to be engaged and in a position to demonstrate their economic contribution. These are the same people you will be competing against Silicon Valley and other high tech locations in the world to obtain.

The Rise of Virtual and Remote Training

Virtual training is becoming an attractive option to the traditional on-site instructor-led classes offered by all the major process automation suppliers. Virtual or remote training is becoming a viable and increasingly popular alternative for end users with tight travel budgets who are still faced with the issue of training a force of increasingly inexperienced workers. With traditional classroom training, travel-related costs like transportation, housing and meals can roughly equal the cost of the actual training courses.

Time spent away from the job traveling and the personal cost of being away from families can contribute to making off-site training costly on many levels. Nobody wants to be the person out of the office when everyone is nose to the grindstone trying to make money for the company.

Remote and virtual training is available in several different configurations, from training via DVD on our own time to attending remote lectures, where the student essentially sits through a lecture via WebEx or some similar technology. While lecture-based training has its place, it has limited effectiveness for many automation related applications such as configuration of automation systems, development of control strategies, and other tasks that are highly application specific and require a number of specific steps to accomplish.



Source: National Training Laboratories, Bethel, Maine

According to National training Laboratories, we Retain More when we Learn by Doing

Virtual Training Should be Experiential

Much research has been done on the comparative effectiveness of learning techniques. When it comes to rote learning versus experiential or hands on learning, experiential learning (learning by doing) provides superior results every time. Learning by doing also results in longer-term retention of information. Research has shown that using some kind of interactive simulation type of environment results in a 75 percent retention rate versus a 5 percent retention rate for lecture-based classes.

Virtual Training Should be Interactive

Aside from providing an environment for learning by doing, virtual classroom sessions must also be interactive. It is much easier to hold participants' attention when you are in a face-to-face environment. Instructors in virtual classrooms must strive to be interactive with their audience, so a video connection is highly recommended, preferably on both sides, but at the very least on the instructor side. Classroom size should also be manageable. If you want a truly interactive learning experience, it is difficult

to do when you have 50 people in the classroom. The instructor should be able to answer questions and view the performance of everyone in the classroom effectively, and that means limited classroom size of not much more than a dozen participants.

Virtual Training Should Stick

We already noted that virtual classroom training should be experiential. End users should take additional measures, however, to ensure that knowledge is retained in the long term. If you are going to make the investment in training, it makes sense to ensure that training stays with your operators, engineers, and technicians. Aside from any hard copy materials, it is a good idea to have some kind of playback functionality. Depending on the application, periodic refresher courses may be required.

Virtual Training Should be Certified

Training programs can vary greatly in quality. A certified training program, depending on the body doing the certification, can ensure that a training program follows best practices in developing curriculum, quality of instruction, record keeping, and documentation. Some certifying bodies for automation related training programs include the International Association for Continuing Education and Training (IACET), American National Standards Institute (ANSI), and the National Institute for Certification in Engineering Technologies (NICET).

Technology Should be Reliable and Secure

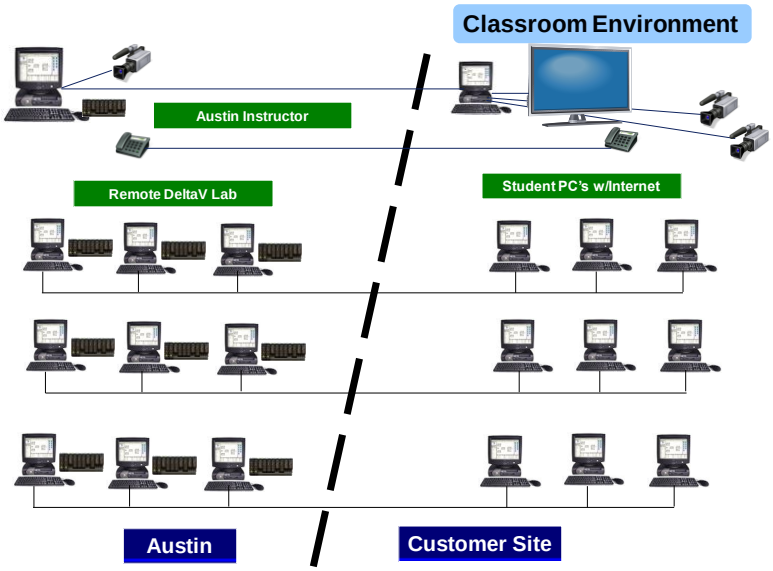
The technology underlying the virtual classroom must be reliable and secure. That typically means using industry standard software such as those offered by WebEx and Adobe. To provide interactive online training, a separate application is required such as GoToMyPC or Remote Desktop type of application.

Virtual Training is not just for Customers

A good virtual training course is valuable to the supplier's own employees and business partners, whether they be systems integrators, representatives, or other alliance partners. Most automation suppliers are truly global corporations, and the need to train people in remote locations around the globe is greater than ever.

The Emerson Virtual Classroom

Emerson Process Management offers virtual training for process automation with its Virtual Classroom offering. The company conducts on-site training courses and has a series of educational centers located in North America, Europe, Asia, Latin America, and the Middle East. The company also offers e learning courses that are based on Flash technology, and are more self paced. The Virtual Classroom courses offer the same content as the ones taught face to face at the educational centers, complete with online access to actual systems and applications.



Emerson Virtual Training Provides Users with Hands on Access to Remote DeltaV Systems and Equipment

Tested extensively with customers to achieve the optimal experience and performance, Emerson's "Virtual Classroom" permits students to take each course from their desktops connected to factory-based systems via the internet, including bidirectional audio and video. Emerson's Virtual Classroom provides the factory-quality instruction without the time, cost and inconvenience of travel.

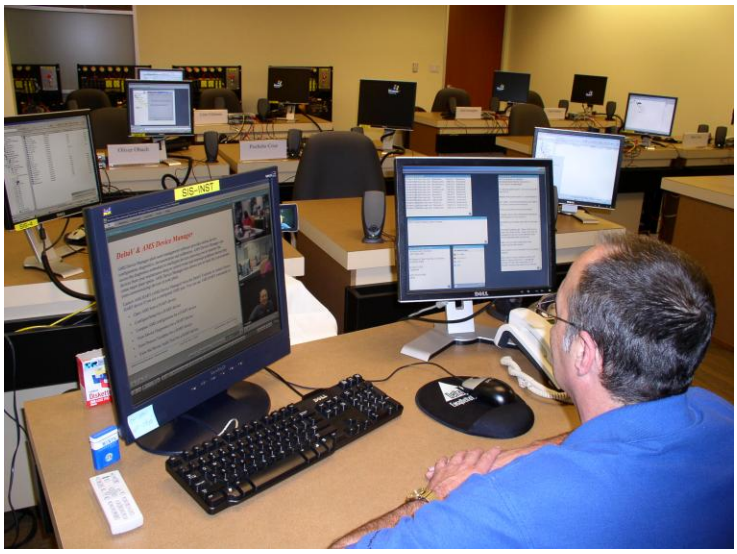
Emerson's Virtual Classroom courses are covered at the same pace, with the same content and are delivered by the same subject-matter experts as in-house training courses. Each course is led by a single professional trainer who interacts with and answers participants' questions in real-time. Course content can be customized for specific topics and course times can be adjusted to accommodate different time zones and world areas.

Trainers and Resources

Emerson currently has 25 people dedicated to training in their Educational Center in Austin, Texas. Right now, Austin is the center for all Virtual Classroom training, although the company has plans to expand into other regions to address local language requirements and local times.

Combining Lecture Capabilities with Hands on Training

As we said earlier, Emerson's Virtual Classroom technology includes both lecture-based capabilities with audio and video as well as hands on training capabilities. The lecture format material uses we based presentation tools that allow the instructor to share their desktop with the rest of the class, provides for video, VoIP, notes, chat, and whiteboarding. User can also ask questions of the instructor privately. Users can connect from any compatible PC and audio can be done over IP phone or dedicated line. When a student signs up for a Virtual Classroom course, they receive hard copy materials relevant to the course as well as a USB compatible computer headset so they can use IP phone capabilities.



The Virtual Classroom Setup Showing Individual Student Monitors and Nameplates with the Instructor in the Foreground
Note the DeltaV SIS Systems in the Back of the Room

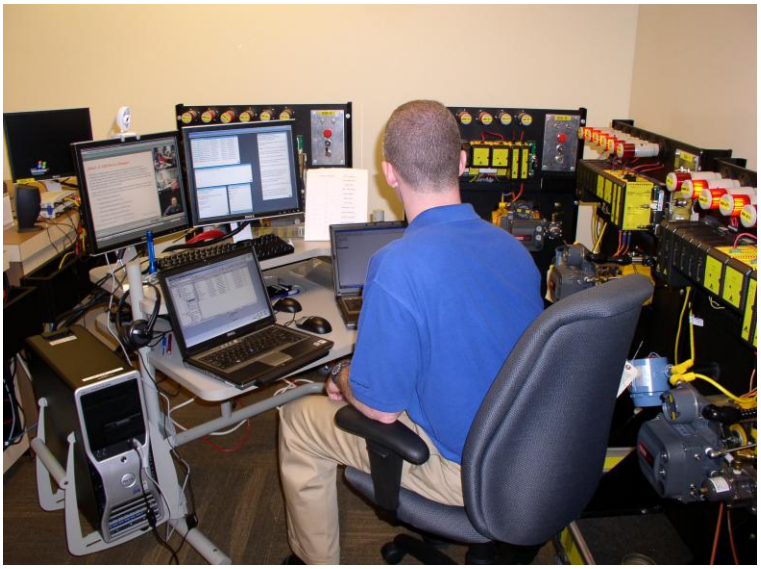
Remote PC access tools are used for the hands on training portion of the Virtual Classroom. These tools also allow the user to access the remote workstations and systems in the classroom and perform actual configuration, visualization, and other tasks. In fact, the "Virtual Classroom" sessions are held in a real classroom with desks and monitors for every student in the class, accompanied by a nameplate for each student. This allows the instructor to actually look out at the classroom and see what each student is doing on his or her monitor.

Being able to view actions on student monitors is important because on average, class time is evenly divided between workshops and hands on training. In the workshop session, procedures are explained for a specific action to be taken -- take startup bypass in DeltaV SIS configuration for example. After the workshop session, the instructor does a brief demonstration of the actions to be performed, and the students then get a chance to do it on their own systems.

ARC attended part of the DeltaV SIS configuration training and were able to witness students configuring and programming the DeltaV SIS systems that were there in the classroom hooked up to SIS pressure transmitters and FieldVue digital valve controllers.

Teacher and Producer Model Ensures Smooth Operation

In addition to the primary instructor, every Virtual Classroom session has a "producer" who ensures that all the software and IT infrastructure is working correctly. The producer also keeps an eye out for any text-based questions or "raised hands" enabled by the web based presentation application that the instructor may miss, and can help monitor each student's progress on the monitors in the classroom. This is an additional investment on Emerson's part, since even their on-site courses have only one lecturer. In general, the technology is stable and reliable, and there is no security threat on the student end. Many students take their courses from home, and the systems they are working on are located in Austin, so there is no threat to their own facility, and it affords a certain degree of freedom to make mistakes that does not exist when performing the same tasks on their own system.



A Virtual Classroom Producer Makes Sure Everything Runs Smoothly and all Questions are Answered

Reaching out Around the Globe

The DeltaV SIS training session that ARC attended had students from Vietnam and other parts of Asia, as well as North America. Emerson does many sessions at night to accommodate the needs of Asian clients. Asia is facing just as much if not more of a training crisis than North America is facing. While many graduate as engineers every year, the specific skill sets needed to operate process plants, automation systems, and process instrumentation may be lacking or may need real world reinforcement. For example, despite the often-cited statistic that China graduates over 600 thousand engineers every year, more than half of the engineering degrees handed out in China are sub-baccalaureate degrees.

Course Offerings and Customized Content

Current Virtual Classroom courses offered by Emerson include DeltaV control system implementation to batch operations and implementation, alarm management, SYNCADE production management applications, DeltaV SIS

configuration, and advanced control. Almost 20 courses are currently available, and new courses are being added all the time. As the Virtual Classroom program expands, we can expect to see many additional courses from the many locations and organizations within Emerson Process Management,

- 7009 - DeltaV™ Implementation I
- 7012 - DeltaV Operate Continuous
- 7014 - DeltaV Operate Batch
- 7016 - DeltaV Batch Implementation
- 7017 - DeltaV Implementation II
- 7025 - DeltaV Advanced Graphics
- 7041 - Simulation with MiMiC
- 7045 - Alarm Management DeltaV Analyze
- 7080 - Syncade™ Suite Overview
- 7081 - Document Control and Archiving
- 7082 - Training and Development
- 7083 - Equipment Tracking
- 7084 - Materials, Inventory and Order Management
- 7085 - Recipe Authoring I
- 7086 - Recipe Authoring II
- 7095 - SYNCADE™ Suite Recipe Authoring 4.0
- 7201 - DeltaV Advanced Control
- 7202 - DeltaV Model Predictive Control

Currently Available Virtual Classroom Courses

The Virtual Classroom is a good vehicle for providing customized coursework. With access to a wide range of systems and software, courses can potentially be built around any Emerson Process Management system or application. Not having to travel and provide all the logistics means that customized courses can be scheduled and delivered more quickly. All pricing and availability can be seen on the Emerson Virtual Classroom web site at http://www2.emersonprocess.com/en-US/brands/edservices.

Courses Cover Both Products and Concepts

Courses are not limited to just using Emerson products. In the safety system course, for example, topics were covered such as safety system architecture, (where to use 1oo2, 1oo1, 2oo2), and the use of diagnostic capabilities in intelligent SIS devices. Working in key concepts and strategies in addition to the physical requirements of programming the system or using the application is necessary for effective learning and can lead to new ideas about how to apply the product in end user facilities.

An Internal and an External Tool

Emerson is using Virtual Classroom to train its own employees and local business partners in addition to their end user customers. Virtual Classroom provides a consistent learning platform and, like their end user clients, Emerson saves considerably on travel costs. Of course, Virtual Classroom does not displace the expertise of the company's several training and education centers. They have 30 training centers globally that do DeltaV training. Emerson also continues to ship trainers out to customer sites, which still accounts for a large portion of their overall training.

Training for New Projects and Existing Facilities

Training is essential for both existing facilities and new projects. There is more of a drive to train employees to work effectively on new plants before they are built, and new plant training currently represents about half of the business for Virtual Classroom today. Decisions made in the early stages of the project have an impact throughout the plant lifecycle, and training is no exception. Virtual Classroom training makes it easier for end users to get up to speed more quickly on a more flexible schedule.

Certification Ensures Quality Level and Good Practice

ARC recommends that all training and education programs achieve some level of certification appropriate to the materials being taught. In Emerson's case, they have received Authorized Provider Status for awarding Continuing Education Units (CEUs) from the International Association for Continuing Education and Training (IACET). The International Association for Continuing Education and Training is a non-profit association dedicated to quality continuing education and training programs. During the certification process, IACET had to conduct an extensive review of Emerson's Education Services organization, including its procedures and practices, through an on-site audit. The ANSI/IACET 1-2007 Standard has been adopted worldwide by thousands of educational programs.

Conclusions and Recommendations

The appeal and benefits of virtual training are great. The Emerson Virtual Classroom offering goes way beyond many of the other online training programs that are available today, which consist mainly of lecture style or self guided courses. Aside from the obvious benefits of reduced travel costs and time out of the office, the addition of hands on training ensures retention of knowledge and greatly reduces the potential for user error in real world applications. Making it easier for people to be trained on your systems and applications is a key component of a good customer relationship strategy and has a big impact on future sales. Making training accessible and easy should be a top priority for all process automation suppliers.

Analyst: Larry O'Brien
Editor: Dick Hill

Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/Research/IndustryTerms/

API	Application Program Interface
B2B	Business-to-Business
BPM	Business Process Management
CAGR	Compound Annual Growth Rate
CAS	Collaborative Automation System
CMM	Collaborative Manufacturing Management
CPG	Consumer Packaged Goods
CPM	Collaborative Production Management
CRM	Customer Relationship Management
DCS	Distributed Control System
DOM	Design, Operate, Maintain
EAM	Enterprise Asset Management
ERP	Enterprise Resource Planning
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
ISA	International Society of Automation
MPA	Modular Procedural Automation
OpX	Operational Excellence
OEE	Operational Equipment Effectiveness
OLE	Object Linking & Embedding
OPC	OLE for Process Control
PAS	Process Automation System
PLC	Programmable Logic Controller
ROA	Return on Assets
RPM	Real-time Performance Management
SFC	Sequential Function Chart
SHE	Safety, Health and Environment

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