How New-Generation 3D Visualization Technology Will Transform The Workforce Of Tomorrow
Did you know ...

that more than half of the workforce in the process industries will be eligible for retirement in the next ten years? Learn how a new generation of 3D visualization technology, combined with totally integrated data models, will help you transfer the combined knowledge and experience of your aging workforce to your high-performing workforce of the future — from engineers to operators and technicians. This technology presents users with an unprecedented, immersive graphical environment using dynamic real-time data to guide personnel through training scenarios that would be impossible using actual physical assets — or prior-generation technologies.

What you will learn in this must-attend session:

- how immersive training using 3D visualization and virtual reality address critical workforce issues
- why this methodology has proven to be by far the most efficient way to train your workforce
- how to improve collaboration of multidisciplinary personnel whether working on a single asset in a single plant … or multiple process facilities across the globe
- how this technology can improve process efficiency, increase uptime, prevent accidents, and mitigate incidents whose costs and consequences are incalculable.
A new generation of workers
What’s driving the need for new and better training methods? For one, the shifting tectonics of an aging workforce. In the petrochemical industry, more than half of the workforce will be eligible for retirement in the next ten years. This will require process facilities to be extremely adept at capturing the knowledge of experienced workers and passing that knowledge onto a new generation of technical professionals.

Knowledge retention from the retiring workers is a key challenge as companies struggle with a labor shortage, most notably a shortfall of qualified engineers, operators, and technical workers. This generational shift in workers and the loss of their decades of knowledge and experience are forcing companies to invest in new, more robust training programs to ensure that new employees become fully competent and operational as quickly as possible.

The reason has become apparent to companies already affected by the loss of skilled workers: A lower “organizational IQ” reduces a company’s ability to operate efficiently and identify production problems accurately. In turn, an inability to diagnose production deviations before they become larger problems affects an organization’s ability to take corrective actions quickly.

The safety imperative
A less knowledgeable workforce and the resulting incidents of human errors are costly not only with regard to waste, equipment failure, and unscheduled downtime but also in terms of the risks for environmental catastrophe and worker safety. This is another key driver for companies seeking better ways of capturing and transferring the knowledge of experienced workers to newer employees.

The imperative to find new and better training methods is especially critical at this time of increasing health, safety, and environmental regulations; associated compliance requirements; and various related threats to safety, security, efficiency, and profitability. The cost of noncompliance, or even a workforce lacking in the best training possible, is significant and can be catastrophic.

Beyond compliance with safety standards is the need to avoid accidents such as the BP Deepwater Horizon incident in the Gulf of Mexico and the Fukushima Daiichi nuclear disaster in Japan. In fact, many of these types of accidents could have been avoided with improved operator training, mainly using methods that can simulate the relative effectiveness of various actions used to mitigate the impact of such incidents.

Accident prevention, therefore, is another major driver for increased investment in new training technologies.

The good news is that the new generation of training simulator systems is now commercially available.

Did you know that 80% of downtime and slowdowns are caused equally by human error and equipment sources? Moreover, that the remaining 20% are due to lack of compliance with established procedures?
New-generation 3D visualization
Another factor driving companies to invest in enhanced training is the advancement of computer simulation technology for process plants. Process industry organizations are increasingly recognizing the role new simulation technologies will play in capturing the knowledge of experienced workers and developing the workforce of tomorrow.

The challenge to implementing new, more robust training methods is, in a word, time.

Training simulators have been maturing for decades as a primary means of instructing operators on the safe, reliable, efficient plant design, operation, and maintenance. They have been instrumental in reducing operator error, equipment failure or damage, and process downtime.

The problem with traditional process simulators is that they have been limited by a lack of visualization. At their core, they employ 2D mathematical models based on real-world process data. Today, however, totally integrated 3D graphical object models enhance user-friendliness in training simulators much as the advent of the graphical user interface helped to foster the mastery of DCS and SCADA systems decades ago.

While conventional simulators have made gains with graphical presentation features, the new generation of 3D visualization tools provides a much deeper, integrated environment to immerse trainees in a significantly more accurate representation of the physical world. These new solutions can employ conventional screens as well as virtual reality goggles to providing more than a user interface; the user delves into the world of the asset, process, or plant being modeled.

The benefits of 3D visualization-based training are measurable and immediate.

A 3D solution, with a totally integrated 2D data set embedded into its graphical representations of reality, has proven to be far and away the most powerful of all training tools. Research has found that this technology results in a 78% retention rate — far greater than the use of other training methods such as audiovisual presentations, assigned readings, and lectures.
Part of the reason this training is so effective is contextualization: Trainees gain the benefit of repeating training scenarios in a software environment in which they interact with plant assets that look and act identically to the real thing, but without the risk of upsetting actual physical assets. This helps them learn more quickly and efficiently with better retention.

The justifications for investing in immersive 3D visualization-based training are many. According to data from ARC Advisory Group, NAMUR, and the U.S. Department of Energy, the top justifications for immersive training environments include avoiding incidents or abnormal plant behavior, improving process knowledge among operators, speeding start-up and shutdown operations, and enhancing process troubleshooting.

The justifications for 3D visualization-based training directly translate into benefits such as:

- greater avoidance of costly incidents
- a workforce with greater process knowledge
- more efficient and effective start-ups and shutdowns, troubleshooting, and ongoing operations
- greater understanding and cross-disciplinary teamwork
- increased productivity and profitability, lower TCO, and a more rapid return on investment.

Off the shelf in the here and now
Technology advances, particularly the availability of off-the-shelf (OTC) solutions, will continue to drive successful deployments of 3D visualization. This reduces the investment in simulation technology through rapid deployment, fewer engineering hours, and more immediate training results. In fact, it would be impossible in practical terms to customize a system that provides a holistic, standards-based engineering and design environment of today’s leading offerings.

Siemens’ COMOS plant engineering software solution provides one leading example of this technology. Specifically, with COMOS Walkinside, highly complex process plant models can be represented realistically in three dimensions, with COMOS acting as a global data center. Up-to-date plant data is always available and can be used not only for engineering and monitoring purposes, but also for operation and training. Service and maintenance work can be planned, simulated and executed efficiently. The COMOS Walkinside Immersive Training Simulator (ITS) provides a powerful, 3D, real-time visualization interface that automatically renders large, complex, computer-generated models.

In addition to training field operators with 3D models, its compliance with standards such as the OPC-UA interoperability standard to migrate data throughout an automation network. This allows the ITS to populate virtual replicas of a plant’s distributed control and asset management systems, where it becomes an Operator Training Simulator (OTS). The result is a unified ITS/OTS platform with the full breadth and depth of physical assets and entire organizations. Operator training, for example, can include Standard Operations Procedures and Health, Safety, and Environment incident scenarios, such as how to react to a fire, gas leak or a “man down” situation.

Benefits of an integrated 3D visualization platform include:

- fast rendering of even the largest 3D CAD models
- easy-to-use and game-like navigation enables users without previous CAD experience to immediately step inside the VR model and contribute effectively
- navigating 3D plant models through the eyes of a virtual human character uniquely emulates real-life experiences, such as bringing up awareness of obstacles and accessibility constraints
- realistic visualization and virtual operation of modeled assets of large process facilities in which avatars — depictions of individual trainees — can interact
- personnel can train in a “real” environment even before the asset, or plant, is built, providing trainees with an unprecedented level of familiarization, productivity and time savings
- greater safety results from virtual training; accidents and improper use of assets can be created in software without harm in the physical world
- real-time collaboration allows multiple trainees or instructor-trainee groups to work together more efficiently whether viewing a single asset or the full plant, in high-resolution simulation, regardless of the size or complexity of the model
Because the models efficiently handle massive real-time plant data sets, the benefits go beyond training to support engineering reviews and presentations, as well as training operations and maintenance personnel.

Using this technology, highly complex process plant models have been represented realistically in three dimensions, with COMOS acting as a global data center to allow viewing in various ways. These range from computer monitors to 3D theater-style stereo projectors to head-mounted virtual reality viewers. Once inside a simulation, users can control their experience using various devices, from game controllers to custom visual reality devices.

Consider the value of these simple training lessons that have been deployed in virtual space, with no risk to actual physical assets:

- teaching operators to execute standard operating procedures for daily tasks, such as how to properly open valves, start pumps, and check values of various devices (click on the image at right to see an example)
- teaching health, safety, and environmental compliance practices, such as how to respond in the event of a gas leak or explosion (click on the image at right to see an example)
- performing maintenance work orders (click on the image at right to see an example)
- interfacing with third-party vendors’ data models, such as those that comply with multivendor interoperability via the ISO 15926 standard for open information exchange.

Multivendor interoperability is a relatively new development in the world of 3D virtualization, but leading companies are beginning to comply. For example, COMOS can embed data from piping and instrumentation diagrams (P&IDs), allowing trainees to work “virtually” with leading third-party instrumentation vendors’ process instruments and controls. Standards-based integration of
data with 3D models eliminates manual engineering chores, and errors, to speed deployment. This is true for training as well as engineering of projects from initial designs to troubleshooting and lifecycle upgrades.

**Global deployment**

New-generation 3D visualization technology must support companies operating facilities worldwide. COMOS does this by allowing multilingual operation, which facilitates the critical need for communication and collaboration between users at company locations in countries across the globe.

**Using this technology, process industry organizations gain a seamless, globally consistent information management platform accessible anywhere, anytime.** Access can be accomplished using any device that can access the platform’s secure Web servers — from VR goggles to iPad app, albeit with provisions for secure data exchange allowing access only to authorized users.

By delivering a common view of data across all disciplines and through all phases of the plant lifecycle, plant engineers, and operators have access at all times to data that is always up to date — in real time, independent of time zones. By doing so in a collaborative environment, all project stakeholders gain a better and common understanding of work projects and plant status.

In addition to directly addressing the need for transferring knowledge and empowering tomorrow’s high-performance workforce, the new generation of ITS/OTS technology is positioned to foster greater safety, efficiency, reliability, compliance, and profitability for all stakeholders — and the global community as a whole.