

## **N234. Use of Image Transmission and Virtual Reality at Nuclear Plants**

Virginia Power is a leader in the area of transmitting photographic images electronically for plant operations and maintenance purposes. They have been using videodisc-based surrogate travel systems for years. Beginning in 1991, they developed the ability to send almost any image to a properly equipped PC anywhere within their system. As the cost of color laser printers falls, individual users will be able to produce prints right at their desks. The image transmission system is widely used at Virginia Power. Recently they transmitted images to a vendor's network to be viewed on the vendor's PCs. In that application, the vendors technical experts were able to solve a plant problem over the phone without the delay and expense of a plant visit.

Virginia Power personnel are experimenting with adding audio boards to PCs. Supervisors conducting plant walkdowns will take still video photographs and put them on the network. Each photograph will carry its own verbal narration recorded by the supervisor. When a staff person turns on his PC he will get a message that his walkdown report is waiting. He will then scroll through the photographs, listen to the narration, and take appropriate action.

### **Virtual Reality**

Virtual reality places a person inside a computer-created environment and allows interaction with it. This is done by creating a computer model of the environment, wearing goggles that transmit images of the environment to the eyes (different images to each eye to create a 3-D perspective), and putting sensors on a person to track body movements and feed them back to the computer model. This fuses the subject and model, giving him or her the ability to interact with the environment. The subject can experience a physical reality (such as picking up an object) or a physically impossible reality (such as feeling the strength of a chemical bond). Nuclear plant applications can include: (1) practicing a maintenance task on a computer model instead of a mockup, (2) walking through the plant in ways that are more realistic than surrogate travel with photographs. With a virtual reality walkthrough a worker could:

- Turn his head from side to side and gaze anywhere as he walked,
- Feel the temperature of a pipe through his gloved hand, or
- See radiation (perhaps the "air" would shimmer if he stepped into a radiation field >1 R/hr, perhaps a radioactive object would glow an increasingly brighter red as it was approached).

(3) Operators might have an almost instinctive sense of their plant's operation if they could see the physical reality behind their actions (tanks filling, valves closing) or travel places they will never see (inside the primary system piping).

Most advanced imaging tools can be recommended without reservation because the cost recovery period is so short. Even where quantitative analyses of benefits have not been done, the anecdotal evidence of their value is convincing. Considering replacement power costs, the value of a person-rem avoided, steadily increasing personnel costs, and with many utilities planning major repair or refurbishment tasks costing tens of millions of dollars, any tool that saves time and exposure and promotes efficiency should be evaluated. Power plant staff have always required images in one form or another to do their jobs. Advanced imaging tools make creating, storing, locating, distributing, and using these images easier and faster.