JET FIGHTER TACTICS FOR TRAINING

PolySim^{sm} - A "flight" simulator for Process and Packaging Operations.

Rande Allen
Technology Transfer and Training

Some organizations have realized the benefits of emulation to test the automation of an operation or a full system. However, beyond aerospace and military applications, the marriage of simulation/emulation and training has not fared nearly as well.

Introduction

Polytron is one of a few organizations who are helping their clients realize this value. They have made the appropriate commitments to develop and integrate emulation technology into their training processes in addition to the testing of their automation design. Unfortunately, training in the process, packaging and manufacturing environment is still plagued with service technicians who "train" when time allows; organizations who provide "hands-on training" on a system that is not operational; and trainees who are open to learn only that which they believe affects their job.

These factors negatively impact the effectiveness of training, decrease the likelihood of knowledge retention and overall understanding, and in most cases, negate the return on training investment dollars.

Now, imagine a training event structured around participative tasks where you are able to spend time in the classroom testing specific scenarios on a virtual system – one that, like a flight simulator, immerses you in the world you are learning to work in. Imagine an event where you are encouraged to make mistakes, because resolving those mistakes is the most direct path to learning. Imagine a training event where line downtime occurs without impacting production. These are the desired descriptors of a successful training event integrated with up-to-date and modern emulation technologies.

What is emulation in the context of the Process, Packaging & Manufacturing environment?

Think, flight simulator. Instead of sitting in a cockpit, the Process or Packaging trainee sits in front of their Human Machine Interface (HMI) and interacts with actual HMI control buttons that drive the system controller (PLC).

Instead of a large screen or heads-up display providing topographical views, enemy aircraft, or other typical obstacles pilots might encounter during plane navigation, operators and technicians view packages conveying down a computer generated, scaled model of their system while encountering obstacles introduced by the trainer.

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And finally, instead of a mainframe computer making pinpoint decisions based on input from the pilot, spatial information from the model, and the control response of a plane, PolySim℠, Polytron's proprietary emulation and data-management model, provides direct system control feedback based on typical system variables, i.e., conveyor speeds, package sizes, conveyor geometry, photoeye feedback, valve and motor specifics, tank levels, meter pulses, etc.

How does emulation help adult learners?

In school, most children are motivated to listen and learn by external factors such as teachers, grades, parents, etc. However, as we age, those external motivators are replaced by internal goals and desires. In work related environments, such as the packaging and manufacturing industry, the main goal or desire is to apply what is learned to problems operators or technicians face day-to-day. Typical training classes in the manufacturing industry consist of trainers describing the functionality of major components, reviewing general system operation, and analyzing troubleshooting scenarios.

These topics are covered using presentation slides, manuals, and in those cases where the line is actually operational, hands-on exercises. Unfortunately, to describe, review, and analyze alone often falls short when training adults in the packaging and manufacturing industry.

A PolySim℠ Emulation fills those gaps because it addresses the internal goals and desires of adult learners: it is relevant to their situation, assists in solving a given problem, draws upon the learners' experiences, and supports their desires to improve performance – their own, and that of the system they're running. Emulation provides a means to demonstrate relevancy, illustrate importance of the subject matter, develop creative solutions to problems, and create a path to draw upon experiential data.

Relevancy – "That's not my job"

There are numerous positions, functions, and levels within manufacturing organizations. Too often, trainers fail to demonstrate to participants the importance of each individual's task; it is not surprising that in these situations participants often feel training topics are unnecessary if they do not pertain to their job function. Emulation provides an avenue for demonstrating relevancy.

For example, technicians often dismiss the importance of understanding detailed system operation and prefer to spend time delving into the details of the PLC code. Although this approach will ultimately help the technician find the correct answer, relying on PLC code alone for troubleshooting will typically take longer and require additional thought and consideration.

Similarly, labeler operators may question the importance of why they need to understand the function of infeed population photoeyes on the conveyors feeding their machine. As long as bottles are arriving at the labeler, the operator's world is spinning normally.

Using emulation, the trainer illustrates to the trainee the importance of bottle population by showing how too few or too many bottles impact overall line operation and system throughput. Visually, the trainee can see how too many bottles on their infeed will begin to shut down upstream equipment and how too few bottles can increase the on/off cycle of their labeler. The operator is then less likely to defeat the photoeye by taping the reflector to the sensor – for example.

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In "real-time" training, this translates to unnecessary downtime for the production line and results in fewer cases heading out the door. Using emulation-based training, the trainer introduces a system operational problem and request that the technician troubleshoot and remedy the issue first using the HMI (operational tool), then falling-back to the PLC code. This approach teaches the technician the importance of when to connect to the PLC and increases her/his familiarity with the operational tool without impacting real-time production.

Solving problems

One item most employees will agree with is the desire to work as efficiently as possible. Therefore, if training classes demonstrate ways in which knowledge learned in class will assist with problem solving and make the lives of trainees easier, motivation to listen and learn increases tremendously.

Emulation provides a "no fear" factor approach to solving problems during training. In the model, the trainer can stop "line production," introduce as many problems as she/he chooses, and give the trainee as much time and coaching as the training class allows to solve system problems. All of this is done without impacting actual product out the door. This environment is conducive to creative solutions, enhanced troubleshooting techniques, and most importantly, growing trainee confidence.

Simply put, a PolySim℠ emulation addresses training challenges by providing an avenue to demonstrate learnings.

For example, an operator may question what will happen if they place a valve in the "Manual" mode and open it while their batch is running in "automatic." Using PolySim℠ emulation-based training, the trainer can respond to this what-if scenario with "Try it." The operator will experience the results of their actions rather than merely being told "Don't do that." The operator is then provided the time to correct any problems their actions caused.

Oftentimes electrical technicians are warned against making changes to PLC code on the line; however, these technicians are rarely given the opportunity to demonstrate how their PLC changes will impact the operation of the line in a safe environment. Using emulation, the actual PLC code is available in the classroom to not only make the changes, but also provide the opportunity to observe the direct impact of those changes as depicted in the model. In this way, optimization can be tested and verified without risk of shutting down production.

Drawing upon their experience.

How often are trainers given the opportunity to have trainees describe a specific problem encountered in the past and then model that problem during a training class? Using emulation, the trainees can take an active role in the event by having their trainer duplicate problems encountered in the past and have the expert walk through the process of solving the issue. This increases interest and retention of information by drawing on the real-life experiences of the trainee.

Simply put, a PolySim℠ emulation addresses training challenges by providing an avenue to demonstrate learnings. Therefore, training classes with emulation in the manufacturing industry consist of trainers demonstrating the functionality of major components, demonstrating general system operation, and demonstrating system troubleshooting...all with the expected outcome of increasing trainee knowledge transfer and knowledge retention.

Ultimately, this helps the operations staff – and the system – perform better.

POLYTRON

855.794.7659 Toll Free
678.328.2999 Local
678.328.2880 Fax

3300 Breckinridge Boulevard
Suite 100
Duluth, GA 30096-8983

www.polytron.com