

## Let's talk about machinery operators...

In our last column we discussed the training of our machinery maintenance mechanics. This time we would like to think about training our machinery operators.

No reliability without operator involvement! Just as the most well-designed and best-maintained automobile will fail in the hands of a thoughtless or inexperienced driver, the best and most reliable machine will not perform optimally if the operator lacks training, care or motivation. We accept the responsibility of viewing the dashboard instruments of a modern automobile; similarly, the operator in a modern process plant must accept equipment surveillance as his or her prime responsibility<sup>1</sup>.

According to the Abnormal Situations Management Consortium (ASMC), U.S. process plants lose over \$20 billion a year from abnormal situations; \$8 billion (40%) is directly attributable to human error. The losses are caused by insufficient employee knowledge and operator and maintenance worker errors.

Further analyses indicate that most of the personnel related causes are due to a lack of:

- Properly designed jobs
- Properly structured training
- Performance support.

Recently we were asked to assess the need for what our client called "Advanced Operator Training" (AOT) around large compressors and their drivers. We decided to interview the operators, both field and control (DCS) operators in their facility. We used a thirty-minute adult interview format as shown in Fig. 1.

We also asked the operators simple questions such as: How do you start up a centrifugal pump or how do you recognize surge on a centrifugal compressor?

After we had convinced ourselves that we had identified most of the training needs of

this organization we sat with the managers in a debriefing session where we listed three of the most urgent needs:

- There are gaps in knowledge and skills concerning machinery among process operators
- Skill erosion is no doubt a factor affecting training and needs to be considered
- Continuity and uniformity of training is not sufficiently guaranteed

Sounds familiar?

<p><b>A. Tell us about yourself----</b></p> <ul style="list-style-type: none"><li>♦ Job related training courses</li><li>♦ Prior Experience</li><li>♦ Current Responsibilities</li></ul> <p><b>B. Describe your job function----</b></p> <ul style="list-style-type: none"><li>♦ Who provides you day-to-day operations directives/training?</li><li>♦ What is your area of operations responsibility?</li></ul> <p><b>C. Where do you see the greatest training needs?</b></p> <ul style="list-style-type: none"><li>♦ At your level</li><li>♦ At other levels</li></ul> <p><b>D. What would you like to know more about (train in) to make the performance of your job easier, safer, and/or enhance your confidence?</b></p> <p><b>E. Current Training Received ----</b></p> <ul style="list-style-type: none"><li>♦ Do you view current training as adequate or sufficient to do your job?</li><li>♦ Is current training relevant to your job?</li><li>♦ What areas can current training be improved in?</li><li>♦ What additional training is required?</li></ul> <p><b>F. When a new project makes changes to the base system where and how are training and training needs documented?</b></p> <p><b>G. Safety &amp; Reliability ----</b></p> <p>Where do you see areas that have potential impact on the reliability of your plant operations?</p>
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Figure 1. Adult interview format for operators.

When the manager asked us how his operation ranked among those others we had contact with we said that our standard was determined by the licensed operating engineers<sup>2</sup> environment in Canadian (Ontario) process plants. This standard calls for competencies and competency testing of personnel operating machinery. Compared with this standard, the manager's organization was at the leading edge with their competency-based training program soon to be implemented.

Now, we used to suffer the odd ridicule from our colleagues outside Canada: "There

<sup>1</sup> H.P. Bloch, "Operator's role in achieving equipment reliability", HYDROCARBON PROCESSING / MARCH 2002, p.21

<sup>2</sup> See Operating Engineers Act, Province of Ontario (Canada), [www.tssa.com](http://www.tssa.com)

they go again, talking about their licensed operating engineers – we also have good operators!” Admittedly, you have capable and efficient operators around process machinery without licensing them, but what you must do, something common to both concepts, is training them and checking them out.

Process machinery operators must have a set of competencies which would most likely be applicable to all process operators. There are two types of competencies:

**Core competencies** which include adaptability, critical thinking, the desire for continuous improvement, communication skills, teamwork ability and problem solving abilities.

**Technical competencies** which comprise a sense for loss prevention and control, equipment and process understanding, troubleshooting, monitoring, equipment feeding, care and maintenance – especially in an environment where more and more integration of maintenance and operations is being promoted.

What does all this mean in the context of machinery availability? Competent process machinery operators pay attention to details such as:

- Subtle signs of impending trouble, for example, changes in noise, vibration and other indications noticeable by using their five senses to avoid or reduce consequences of equipment failures.
- Know pressure, temperature, vibration and shaft position shutdown limits.
- Lubrication requirements of each lubrication point.
- Check oil reservoirs for discoloration, contamination and presence of water.
- Feel or measure bearing surfaces for temperature.
- Know condition of centrifugal compressor balance lines.
- Report oil leaks and determine cause.
- Clean oil bubbles, level glasses and gauges as required.

- Check seal flush lines for proper operation.
- Check cooling lines for effective operation.
- Check for proper operation of heat tracing.
- Check if steam traps operate normally.
- Steps of initial start-up routines.
- Points of normal shutdown routines.
- Phases of emergency shutdown response.
- Startup routines following an emergency shutdown.
- Safety procedures.

There are certainly more items that can be added to this list – they all should be part of a competency inventory to be verified by field observation and actual check-out.

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