

Pantex Implementation of High Reliability

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Objective:

The Pantex Plant mission is to support the maintenance of the nation's nuclear weapons stockpile by assembling, disassembling, and inspecting nuclear weapons. Severe accidents must be prevented to protect the local population, the environment, and to ensure the plant is available to support our nation's nuclear deterrence. Accidents that must be avoided can be thought of as "pinnacle events." The Pantex Plant has well established and highly reliable formal processes to identify and provide controls at the "shop floor" to prevent pinnacle events. However, an increased level of sustained assurance can be achieved by explicitly considering the challenges presented by organizational behavior (i.e. by applying the concepts of High Reliability Organizations [HROs]) to the entire infrastructure that supports the work on the shop floor.

Method:

Pantex developed a systems approach to high reliability by adopting Deming's Theory of Profound Knowledge (TPK). Deming's four TPK tenets include: Knowledge of Systems, Knowledge of Variation, Knowledge of Psychology, and Knowledge of Knowledge.

Pantex applied Deming's systems approach by developing and publishing a practical HRO Guide.¹ The guide uses four HRO practices (based on Deming's TPK) to provide high level, yet practical principles for the leaders to follow. From these principles, logical steps (Break-the-Chain (BTC) framework) were developed for the workers. The HRO practices as implemented with the BTC framework are designed to prevent a system accident. When efforts fall short of high reliability expectations, Causal Factors Analysis (CFA), a form of root cause analysis that focuses on understanding and correcting the underlying organizational issues behind errors, is used to help the organization learn. The six steps in the BTC framework are:

- Step #1 – Focus on the Consequences
- Step #2 – Recognize and Minimize Hazard
- Step #3 – Recognize Threat Posed by Human Error
- Step #4 – Manage Defenses
- Step #5 – Foster a Culture of Reliability
- Step #6 – Learn from Small Errors

In January 2009, Pantex made a commitment to implement its HRO concepts plant-wide. The approach is simple in concept, first educate, then implement, then assess and improve and, lastly communicate results. The components of each are highlighted below:

Educate

- Continue senior management professional development in organizational culture and leadership
- Educate all managers on the HRO process
- Integrate HRO into all leadership development classes for new managers
- Introduce HRO process to new hires
- Continue to evolve and share HRO and CFA classes with external audiences

¹ Copies can be obtained from the Government Printing Office at <http://bookstore.gpo.gov/collections/hro.jsp>

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Implement

- Define from the top down the desired HRO end-state, perform gap analyses between current operations and the desired end-state, and close the gaps
- Conduct exploratory barrier analysis on processes critical to preventing system accidents
- Focus, lean, and streamline processes to focus on what is truly important

Assess and Improve

- Assess safety culture as a measure of HRO effectiveness
- Improve performance indicators to provide feedback on HRO processes
- Conduct focused assessments on barriers are designed to prevent system accidents
- Benchmark best in class HROs
- Continue to conduct and learn from CFA Investigations
- Lead HRO and CFA applied research using Pantex as a test-case

Communicate

- Communicate externally by sharing Pantex HRO implementation experiences
- Communicate internally to improve understanding

Results:

Pantex began its HRO journey in 2007 and has great confidence that the HRO approach works and has great merit in further enhancing operational safety because:

- Pantex has a significant number of HRO-like business processes, particularly those dealing with nuclear operations which have proven very successful in maintaining nuclear safety.
- Based on many years of safe nuclear operations, the four HRO practices align very closely with and produce the HRO attributes that high reliability theorists see in other highly successful high hazard organizations.²
- The BTC framework enhances existing processes for identifying shop floor controls by developing additional upstream, people-oriented, processes and controls that strengthen the direct work-process controls.

Conclusions:

The push for high reliability is quickly becoming a major focus of the National Nuclear Security Administration sponsored contract to manage Pantex. As part of its HRO effort, Pantex continues to improve its nuclear processes and is evaluating which other Plant processes need to become more reliable. Pantex's efforts to strive to become an HRO are not without challenges. The greatest of these is the struggle to not be "normal". Perrow states the biggest challenge to enjoying the attributes of HROs is the daily fight to ward off the tendency to be human and succumb to "normal" organizational tendencies, that is complacency. This is the ultimate challenge since the desired output of becoming an HRO is to reduce the organizational events that could result in catastrophe. However, success breeds contempt, because the "normal" reaction to this type of success (i.e. lack of consequential events) is to relax ones' guard. It is a struggle any organization should be glad to take on.

² As summarized by Sagan and reconfirmed in comparison with Karlene Roberts (University of California Berkeley) and Karl Weick