Avoiding Pitfalls with Variance-Waiver Process

An Online Continuing Education Course for Engineers

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Avoiding Pitfalls with Variance-Waiver Process

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Background

Policies and procedures are developed to control process operations, ensure safety, protect the environment, our communities, and assets. Often, portions of procedures are born out of prior accidents, injuries, and process upsets. However, we allow measures to creep into our administrative controls that allow our employees to bypass the very procedures we have developed from our experiences.

One of these processes is sometimes called the "Three Wise Men Rule." For those that may not know what this is, the rule allows an authorized operator executing the procedure and two other knowledgeable employees on the unit to skip steps, change the order, omit and even change limits set by process design. The unit supervisor must be one of the other two wise men.

The formal review processes that created these procedural limits, such as engineering design, process hazard analysis (PHA), previous incidents, hazard and operability reviews (HAZOP), are invalidated. The approvers during the rule application require an hourly operator, a frontline supervisor, and a unit supervisor to approve the change in most cases.

These procedure deviations have the appearance of change that is managed, but the hazard reviews are being performed by the same group desiring the change. This is no different than selecting prisoners to guard other prisoners with no oversight. What could possibly go wrong!

As Professional Engineers, we realize how much time, effort, and resources go into designing, evaluating, and constructing a process unit. These years of time and resources invested are erased in a few minutes by a few frontline employees. The wise men rule evaluation process of change, having been accepted as normal operations. In some ways, this could be classified as institutionalized normalization of deviance (NOD).

No proper reviews, such as a management of change (MOC), what-if, or HAZOP, are performed. This can leave many unknown hazards lying latent that can lead to catastrophic or deadly consequences. Make no mistake; these are not proceduralized managed changes. Like many things performed in the field, the operators perform the work, then catch the paperwork up later.

We are not talking about the slow NOD bleed that occurs over time, such as depicted in the retelling of the Bhopal disaster. This is specifically process start-up, process shutdown, abnormal operations, emergency procedures, and maintenance procedures. Nor are we addressing human error that is skill-based, or simple mistakes. This is a conscious decision that is an openly accepted method in many companies that allow local operations and maintenance personnel to alter a procedure with little or no hazard versus consequence review.

The author calls this minimalized evaluation process "imperceptivity." This is the condition of acting without insight or perception of all of the hazards and consequences from implementing a "Three Wise Men" change.

Why do we place so much confidence in the "Three Wise Men Rule"? Could it be from centuries of

acceptance? The Latin phrase “omne trium perfectum” (everything that comes in threes is perfect) simplifies the idea of the rule of three.

Imagine a scenario in which there are four people that board a private plane. The pilot, a doctor, a lawyer, and an engineer. The pilot has a heart attack while in flight, leaving the autopilot engaged. None of the passengers have ever flown a plane in their lives and know nothing about piloting a plane.

The doctor cannot save the pilot, and now between the three of them, they must land the plane or face imminent death. The lawyer says, “Whether we live or die, the private charter company will be sued.” The doctor says, “If we survive the crash, I can treat our injuries. The engineer says, “If I had a book on landing the plane or a procedure, I think I could get us to ground and land the plane. They search the plane and can not find anything that even resembles a book on the controls of the plane. Unfortunately, in this fictional story, the plane crashes, and they all perish.

The point of this story is that even though there were three highly intelligent people on the plane, they still did not know what they didn’t know. They did, in this case, understand the consequences but maybe did not think about the hazards. All three were in a hurry to get to their destination. All three agreed to fly on a private plane with no backup (co-pilot). None of them had any experience flying a plane in an emergency. None of them knew where the radio controls were. Even if they had, their efforts would have most likely been in vain. None of them insisted on knowing where the owner’s manual was located or what to do in an emergency.

How does this correlate to this course? In real life, we often have too much confidence in our own abilities. Operators that are shutting down a unit or maintenance men that are working on a piece of equipment are highly experienced. Their supervision is normally experienced as well as the unit leader. However, as in the case of the lawyer, doctor, and engineer, they do not know everything. Even with all the experience and knowledge they possessed, none of them could fly the plane well enough to land it.

In chemical, refining, manufacturing, and maintenance work, everything that is operated or maintained has procedures. If not followed, there are often serious consequences. However, immediate confidence is gained when we allow change to be managed through an authorized and approved process. A process that permits steps to be skipped, step sequences to change, omit steps with little or no oversight and approval.

Professional Engineers know that we must have the applicable knowledge in the room to make changes “on the fly,” so to speak. Otherwise, we end up crashing like our fictional characters in the plane. How often have we been conditioned to think that if we spend more time planning our work, it will eliminate errors when implementation occurs? Having the right people in the room when making changes on the fly is of paramount importance.

Imperceptivity can occur with other institutionalized change management bypass procedures known as variances or waivers. A variance is a formal action that permits employees to deviate from the requirements of a standard under specified conditions. A variance does not provide an outright exemption from the entire standard and is usually based on foregoing specific portions of a standard, time and situation restricted.

A waiver is relinquishing a right or claim established in a standard or best practice. Similar to a variance, a waiver usually implies a wholesale waiver of the entire standard. In industry, a waiver may be that a specialty contractor has an OSHA Recordable Incident Rate (ORIR) of 1.5. A company procurement and safety standard may not allow any contractor to work on the premises of your facility with an ORIR of 1.0 or above.

A waiver may also be written to allow a crude oil purchase above a TAN (total acid number) of 0.50 at a refiner. The TAN is an indicator of how corrosive a particular crude oil can be. This can affect corrosion rates of design in process equipment and piping. Waiving this could produce accelerated corrosion rates and cause a refiner to not make a turnaround cycle ending date, and require a shutdown much sooner than anticipated.

Any of these institutionalized changes (Three Wise Men, Variance, Waiver) can have both beneficial and detrimental impacts on your organization. The difference is how well the change is managed.

The last type of unmanaged change is no process at all: when there is no formal approval to make changes, but they are made on the fly anyway. Arbitrary changes, omissions, skipped steps, or out-of-sequence steps may not be allowed at your facility. Unmanaged change is generally not allowed at most companies. However, it is interesting during an investigation when a company realizes that they do allow changes through variances, waivers, and wise men rules that fail to adequately define the hazards and consequences of the change.

The author worked many years at a well-respected, industry safety leading, and statistically above-average refining and chemical company. We will refer to this company as Tiger Refining and Chemical Company. The company pushed process safety and encouraged everyone to be safe and environmentally conscious. However, they grew rapidly, tripling in size over a decade through mergers and acquisitions.

Experts will tell you that culture lags behind—when you acquire an asset and its personnel, there is a lag in the adoption of the new company's philosophies and culture. This company was no different. Assigned to one of the largest petroleum manufacturing plants in North America with over 2500 employees, the transition took years.

In the middle of this transition, you find what the author refers to as "easter eggs." These eggs are latent cultural habits that are not overtly known or revealed until something goes wrong. One of these easter eggs was the ability for frontline level hourly operations and their supervisors to omit, skip steps, and perform steps out of order. These changes even included changing engineered recommended hold points on items such as unit cleaning times or refractory drying times. If this seems frightening to you, then you can imagine how management felt when a few minor incidents revealed this flawed process. The plant in question had suffered a major incident over a decade prior that killed over a dozen people. So, there was a very real reason for concern.

How does this relate to this course? In one incident, refractory drying times were reduced on a heater. When the equipment was started, hot spots appeared, and the unit had to be shut down so the equipment could have refractory repairs made.

Another incident in a different refinery involved the improper bypassing of flame scanners on a new boiler, which was a part of the safety instrumented system, resulting in blowing the boiler up. This delayed the full production of the new unit due to steam availability for several weeks.

The last was changing a procedure with a lack of understanding of hazards associated with the change, resulting in an anhydrous ammonia cylinder exploding. Steps were skipped in a management of change (MOC), subjugating the proper hazard review. To add insult, the minimum hazard review that was performed only had the unit personnel that desired the change involved. The cylinder exploded and nearly killed a nearby approaching operator.

All of these instances were made possible due to poor reviews enabled by a simple "Three Wise Men" review process. Many details were omitted in these examples to protect the identity of the

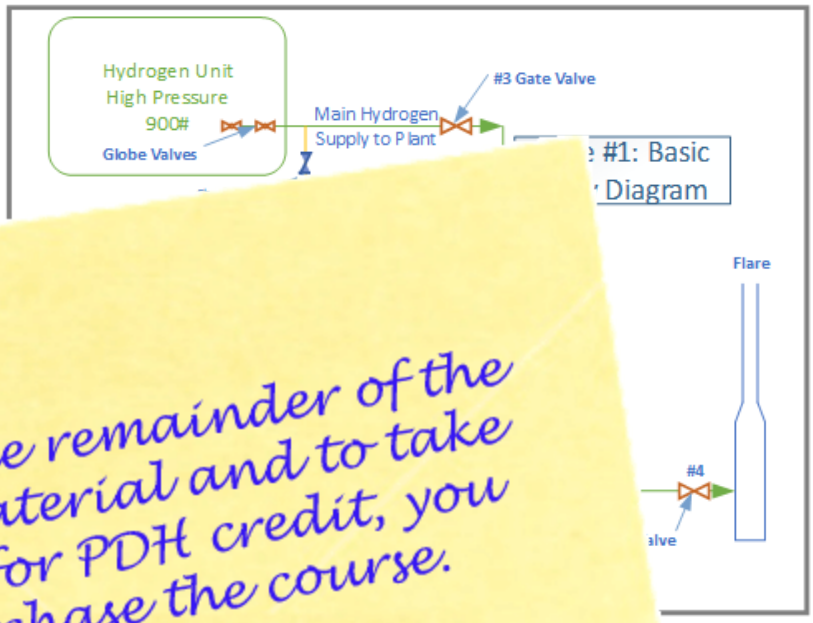
companies and individuals involved. However, this culture and process was part of the prior owners, now being adopted in the newly formed company.

How do we prevent this type of incident? We must understand what we are allowing into our process reviews. In this course, we will review portions of cases that demonstrate how variances, waivers, and Three Wise Men Rule (TWMRs) incidents can occur. We will review some recent major incidents from the Chemical Safety Board (CSB), Occupations Safety and Health Administration (OSHA), and the author's personal experiences.

The goal is to provide you, the Professional Engineer, with the knowledge you need to evaluate your tools and what is missing in these reviews. This review will benefit all engineers in all fields. Every field of engineering deals with standards, procedures, and specification changes. These lessons for learning will ensure you are among the elite in Professional Engineering that is in responsible charge of evaluating the efficacy and legitimacy of these processes.

Case Study #1, Missing Blind

Incidents almost always have more than one root cause that aligns with others to produce the holes that allow a catastrophic event to occur. This example depicts the case of having no formal process like the Three Wise Men Rule (TWMR).



Operators from multiple units were tasked with depressuring a high-pressure hydrogen line that supplied 900# (900-psi) hydrogen to the entire plant. Each unit had different pressure requirements for hydrogen and utilized pressur
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for the main hydrogen supply line
compressor must be offline. This was a huge error
What this meant is that 900# hydrogen could be present in the header if the line was not properly blocked in and blinded.

At the hydrotreating unit, the operators inadvertently left off the check valve when hooking up the 90# nitrogen hose. This was hole number three. A pressure gauge was installed at the flare to measure the pressure from the main hydrogen supply line to the flare. Operators were trying to drop the pressure in the line below 120# close to 90# the nitrogen pressure, indicating that the hydrogen line was depressured. This depressuring usually took 4-6 hours.

The next morning at shift change, an operator from the hydrotreating unit checked the pressure at