Preventing Serious Accidents with the Human Performance Philosophy

Human performance as a facet of organizational structure comes from the Institute for Nuclear Power Operations (INPO)—a consortium of America's nuclear power production facilities that studied safety performance and worker behavior at its facilities for 15 years.

As a result of its study, INPO developed a program to improve safety, performance, and efficiency and devised the following set of key human performance principles.

1. People are fallible—even the best workers make mistakes.
2. Error-likely situations are predictable, manageable, and preventable.
3. Individual behavior is influenced by organizational processes and values.
4. People achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers, and subordinates.
5. Understanding the reasons why mistakes occur and applying lessons learned from past events can prevent accidents.

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The Accident Pyramid

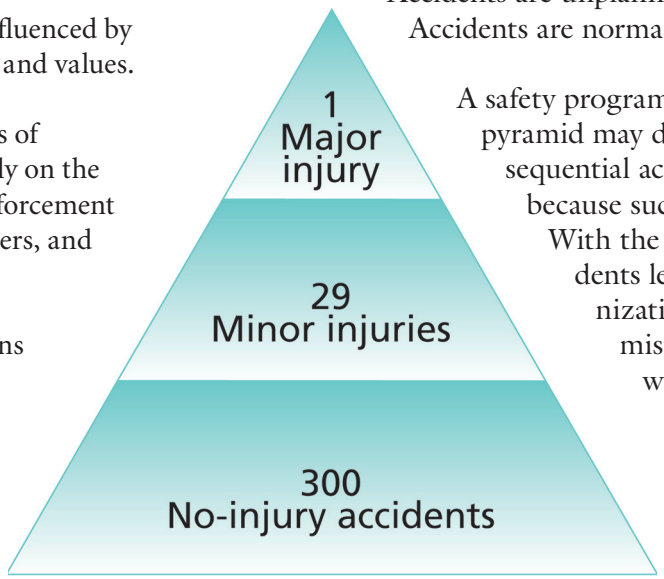
H. W. Heinrich's accident pyramid illustrates a commonly held belief that safety conforms to the law of averages and leads one to conclude that minimizing the number of no-injury accidents will reduce the probability of more severe accidents. The underlying assumption of Heinrich's theory is based on probability. Therefore, the number of accidents is inversely proportional to the severity of those accidents.

Heinrich did not provide empirical data to support his pyramid. He simply used a commonly held notion—some day our unsafe behavior will catch up to us.

Reevaluating the Meaning of Inconsequential Accidents

Accidents are unplanned, unintentional events. Accidents are normal.

A safety program that follows Heinrich's pyramid may drive reporting of inconsequential accidents underground because such a program is punitive. With the belief that little accidents lead to big accidents, organizations strive to eliminate all mistakes by punishing those who make them. Instead of eliminating mistakes, these efforts merely teach us not to talk about our



Developed in 1931, Heinrich's accident pyramid applies the law of averages to safety. Generally accepted for approximately 70 years, the pyramid illustrates Heinrich's theory of accident cause: unsafe acts lead to minor injuries and, over time, to major injury. The accident pyramid proposes that for every 300 unsafe acts (no-injury accidents) there are 29 minor injuries and 1 major injury.

mistakes. It is futile to try to punish accidents out of any system.

A New Perspective on Inconsequential Errors

In reality, near misses are probably the best data that we receive on the reliability of safety systems. Accidents without consequence are a good thing. They tell us that our safety systems are working and show us precisely where we need to reinforce our systems against human error; in other words, never move a barrier that has dents in it. We don't get that type of actionable information from commonly used lagging indicators such as total recordable case and days away, restricted, or transferred rates, which essentially tabulate numbers for the accident pyramid.

A Change in Focus from Errors to Defenses

Contrary to Heinrich's law of averages, any mistake can lead to a severe injury or other disastrous consequence. Hazard assessments reveal that the severity of accidents is relative to the risk and severity of the hazards involved in the activity and not how often that activity is performed.

What keeps people from getting hurt isn't reducing the number of mistakes. On the contrary, it is increasing the number of defenses against the consequences of mistakes. Defenses are the protections we build into our work based upon recognized hazards and risk assessment. Rumble strips, an example of a robust defense, along the highway do not stop the driver from making an error. Rumble strips do allow the driver to realize that he has made a mistake and that he now has the ability to control the consequence of this mistake. The driver can continue to pull off the road, can correct for the error, or can crash the car.

Knowing what defenses to build and where to place them makes us recognize that mistakes are predictable and preventable and that we can keep mistakes from becoming significant accidents. We know this because we make inconsequential mistakes all the time and we can predict what the consequences might have been under different circumstances. Therefore, near misses aren't omens of doom; they are essential to building and maintaining defenses against mistakes. In other words, they help us put the right defenses in the right places.

Learning from the Accidents Sphere

A new perspective on accidents, consequences, and defenses challenges us to revisit Heinrich's theory. The accidents sphere doesn't illustrate the law of averages. It shows us what data we should seek in order to effectively build and maintain defenses within a safety system.

The sphere shows that we must discover as many mistakes and near misses as we can to fully understand the conditions that our safety systems must overcome. Quite the opposite of trying to drive these base numbers down, we must find new ways to identify, investigate, track, and trend mistakes and near misses.

The next time you or a colleague makes a mistake, don't curse under your breath or ask how could you be so stupid? Appreciate what kept the mistake from becoming an accident, consider if that defense is robust and reliable, and learn how the mistake can help you better understand the safety systems that you work within. NW

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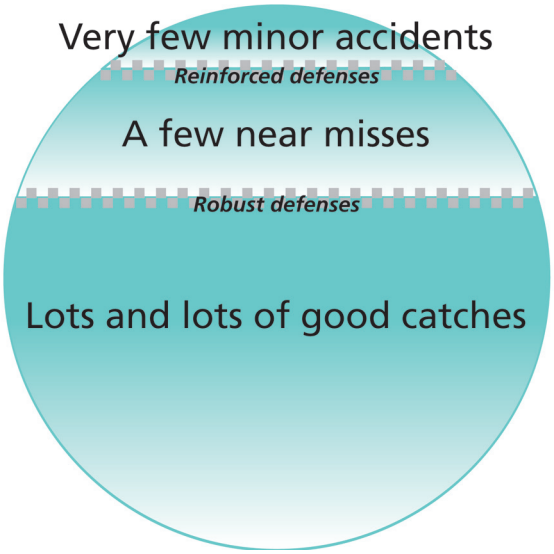

The accidents sphere reframes the accident pyramid to show that we must seek out information about close calls, near misses, and minor accidents in order to build and reinforce barriers against the consequences of inevitable human error. Robust defenses are layered and diverse, for example, administrative and engineering controls. Reinforced defenses, a higher level of defense than robust defenses, are both redundant and robust.