Surviving Chaos

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Why do some survive, while others don’t?

This is the question posed by adventurer and National Geographic discoverer Laurence Gonzales in his book Deep Survival (1). I highly recommend this book to every business executive and technical decision maker in our industry.

First, it excels as a rippling good read on extreme survival, replete with tales of shipwrecked survivors in shark-infested waters and airplane crash survivors in high mountains and Amazonian jungles, all presented in high-definition prose. It also has very much to do with our world of cereal foods. Stay with me on this.

In his chapter “The Sand Pile Effect,” Gonzales chronicles how small missteps, false assumptions, and miscalculations conspire with unforeseen circumstances to turn a routine and diligently planned climb up a “beginner” mountain, Oregon’s Mt. Hood, into a multi-fatality tragedy.

Gonzales equates such events to physical “systems.” Each incremental safety measure adopted by the climbers served to increase the potential energy of the system. The energy level mounted until it reached a critical point where small, unforeseen (chaotic) natural events conspired to shift the system’s energy from potential into kinetic energy with disastrous consequences. What ensued could apply equally well to food plants, regulatory bodies, agriculture, and national economies.

What were some of the unanticipated factors that led to disaster? They included small shifts in weather and timing, stress, faulty logic, and, finally, the laws of statistics. It was this accumulation of small, unanticipated factors that shifted the system from stasis to critical to disaster. Would greater attention to detail have prevented this tragedy? Stay with me, we’re getting there.

Countries, economies, agricultures, companies, universities, and research projects all represent systems that require high levels of organization to function. It is a very human impulse to want to squeeze “error” out of our systems, and civilization could not have organized itself without increasing degrees of control on human behavior and the environment.

In our own world of cereal foods, we try to impose stringent controls on everything from DNA profiling to packaging specifications to personal hygiene to help guarantee a safe, reliable, consistent, nutritious, and credible food supply. In companies and societies, we pile policies, protocols, and accreditations upon mounds of laws and regulations to help guarantee desirable outcomes. Is too much control a recipe for disaster?

The sand pile in Gonzales’ book is a reference to the Bak-Tang-Wiesenfeld model of criticality in physical systems. The model explains how a system such as a pile of sand (i.e., think HACCP program, production protocol, or corporate governance system) can self-organize into bigger and bigger structures as grains of sand (i.e., laws, regulations, directives) accumulate. Eventually, however, a critical point is reached whereby a single additional grain of sand causes collapse. It’s not the grain’s (i.e., food inspector, line operator, etc.) fault per se—it is the system that has gone critical. Any number of unforeseen factors (perturbations in the air, the angle of impact, etc.) can swing the outcome one way or another.

Here is a question for all of us scientists, product developers, food safety experts, and corporate executives to ponder: does more control over our respective systems grant us extra margins of safety or does it push us toward criticality?

In our highly organized and controlled food system, a major outbreak of E. coli or melamine-contaminated flour unleashed by a single, <1% probability human error in judgment can have enormous and far-ranging impacts on our society, generating enormous and far-ranging impacts on our society, generating lawsuits, devastated brand equity, and loss of consumer confidence.

Gonzales offers an interesting conundrum: when systemic risk is high, people are more careful and flexible to changing circumstances. When systemic risk is reduced, people take more risks. For example, contrary to expectations, the introduction of antilock brakes in cars increased rather than decreased accident rates, as drivers believed that antilock brakes relieved them of the need for risk aversion. The European Union recently applied a counter-intuitive principle to so-called “shared space” traffic zones, whereby all traffic controls and signage are removed in order to increase safety.

And here is my final point—we, in the food industry, constantly face risk, be it food safety, contamination, source and supply, consumer and regulatory trends…whatever. All human and other natural systems are naturally chaotic. By layering additional levels of control via protocols, audits, and regulations, we may actually increase the risks and consequences of systemic failure. A functioning HAACP program may offer a perfect excuse for overlooking low-probability failure rates—failure rates are statistical probabilities that compound.

Referring kayaking, Gonzales observes that, day-to-day, no river is ever the same. Each day at the office, lab, or production facility presents an entirely new set of unanticipated circumstances. A workable security system for chaotic systems should be flexible enough to accommodate changed circumstances.

It’s counter-intuitive, I know, but in matters of cereal industry survival, we may actually accomplish more by relying upon less.

Reference