

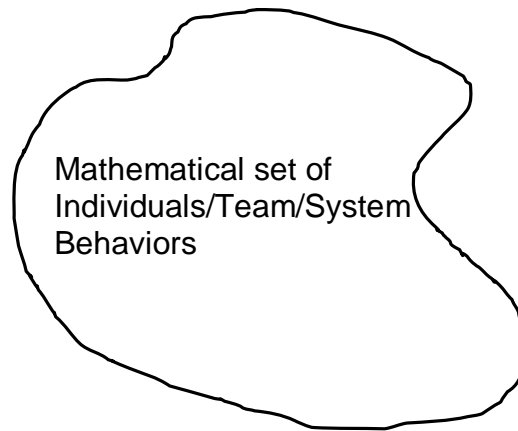
A Math Primer on Behavioral Safety

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This technical article is designed to demonstrate in the simplest of terms that the efforts to improve safety by displacing unsafe behaviors with safe behaviors are supported by math fundamentals. While the document has not been formally peer reviewed and/or published, the material has been presented in multiple public formats with zero exceptions taken by the audience on any occasion. Total audience count has exceeded 1000 participants. If something is completely amiss, please feel free to take note and forward me your concerns.

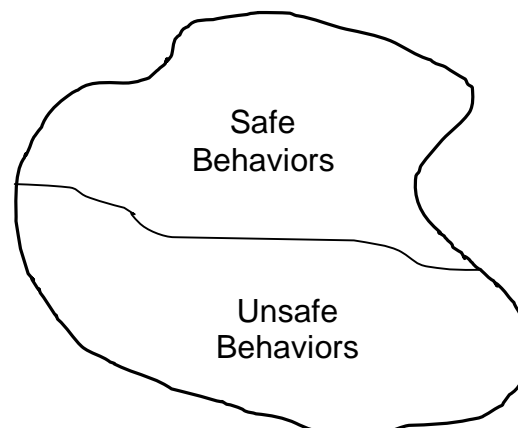
Safety is a mathematical fact. Figure "A" below represents a mathematical set of behaviors. It may be a set of individual behaviors, or a set of team behaviors, or a set of system behaviors. It may also fairly represent a combination of individual, team, and/or system behaviors.

Figure "A"



We can take the mathematical set of behaviors defined in Figure "A" and subdivide the set into two distinct sets of behaviors defined as safe behaviors and unsafe behaviors (see Figure "B" below).

Figure "B"



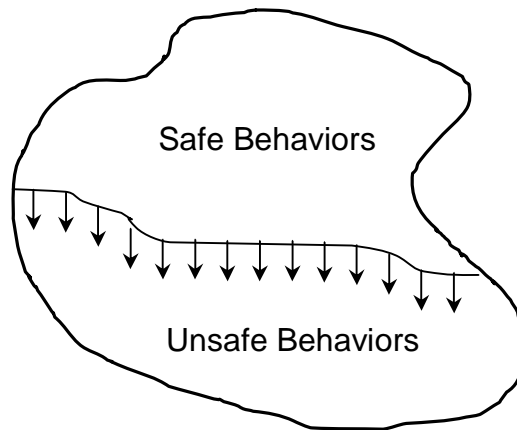
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You will note that the line between safe behaviors and unsafe behaviors is a very thin line. This is by design recognizing that behaviors can be one or the other, but they cannot be both; and the line between them is very thin. If one tries to thicken up the line (or turn the line gray) then one is likely trying to justify an unsafe behavior.

Why do accidents happen? Many studies have demonstrated that accidents happen as a result of unsafe individual behaviors, and/or unsafe team behaviors, and/or unsafe system behaviors. Accidents usually happen as a result of some combination of unsafe individual, team, and system behaviors.

How do we reduce accidents? We simply displace unsafe behaviors with safe behaviors as noted in Figure "C" below. When we promote safe behaviors and displace unsafe behaviors, we then mathematically statistically reduce the chance of an accident unfolding and/or the potential outcome of the event.

Figure "C"



"Getting to Zero" is all about displacing unsafe behaviors with safe behaviors. The more safe behaviors we promote within our organizations and industry, along with displacing unsafe behaviors, then the greater our chance of success in hurting fewer people. Many in industry may debate the viability of displacing all unsafe behaviors (i.e., can we really get to zero) and/or question at what point does one reach the point of diminishing returns. These are the same questions we as an industry (Oil & Gas) have been questioning for the last 30 years. In the meantime, industry safety statistics have continued to drop because we have accepted the fact that we as an industry have yet to reach that point of diminishing returns.

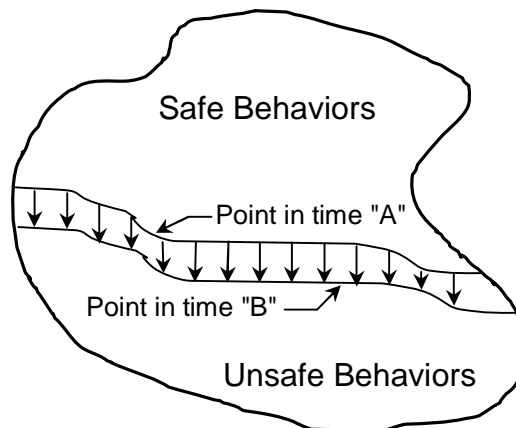
ExxonMobil Development Company has addressed the issue of whether getting to zero is feasible by simply stating in the Company's Safety Credo "We the Management and Employees of ExxonMobil Development Company will relentlessly pursue our ultimate objective of an injury and illness free workplace" until we achieve our vision of...

"Nobody Gets Hurt"

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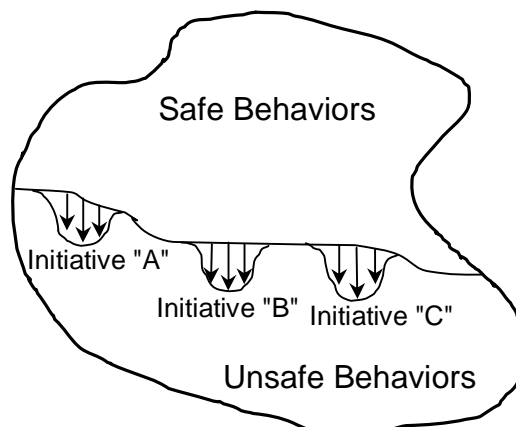
How do we improve safety performance? Generally there are two ways to improve safety performance. The first method, depicted in Figure "D", below is best described as working every aspect of safety at every minute of the day, every day of the week, every week of the month, etc. When we use this method, safety performance gradually improves over time and we all come to the realization that we are much more effective over time than what we give ourselves credit for at any point in time. This is not a bad approach, and some will say it reflects industry's progress over time.

Figure "D"



The second method, as depicted in Figure "E" below, is best described as working special safety initiatives. When we use this method, safety performance improves as well, but some of the energy extended is wasted as a result of the special initiatives not taking hold (or in some instances out right failing). The second method does have some significant benefits in that when an initiative is successful, it is "felt" by the organization which in itself perpetuates additional successes.

Figure "E"

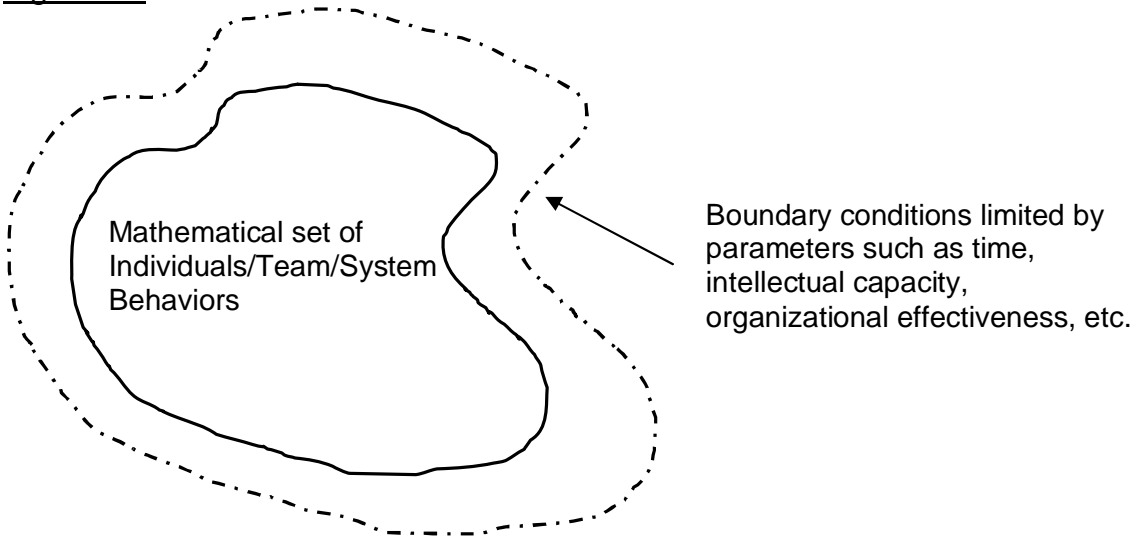


What is our job as safety professionals/SHE Managers? It is simply to promote safe behaviors, without wasting resources, by effectively applying lessons learned.

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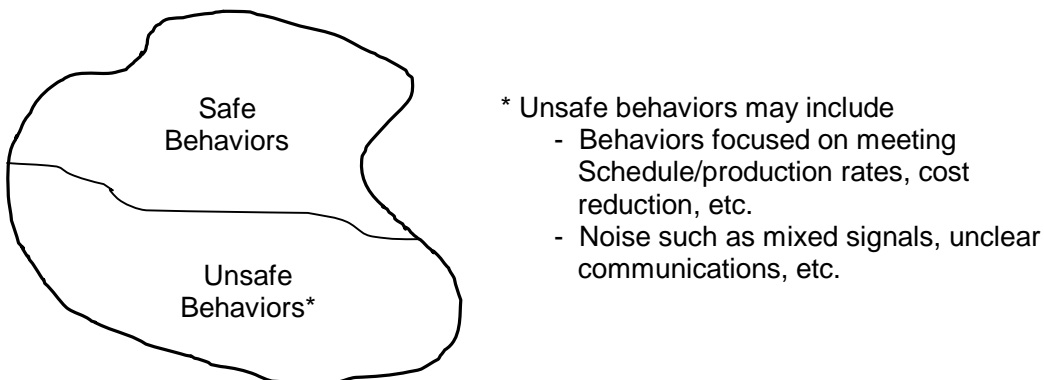
Is it really as easy as promoting safe behaviors? No, it is not as simple as simply promoting safe behaviors because of several factors. You recall that in Figure "A" we noted that safety was a mathematical fact, and that our behaviors (and the behaviors of teams and systems) could be represented by a mathematical set. Reality is that this set of behaviors is limited by boundaries defined by time and intellectual capacity. Although we like to think we can work our way to an optimal level of safety by working smarter and harder, the reality is that at some point in time we will simply run out of physical time and/or smarts to continue progress; see Figure "F" below.

Figure "F"



Once you reach the boundary levels established by time and individual/team/ system capacity you cannot improve safety by simply increasing safe behaviors because of the external demands beyond safety... safety is not the only thing we do. As noted in Figure "G" below, these external demands include behaviors focused on meeting schedule/ production rates, cost reduction/management, business controls, etc.. These are not necessarily bad or unsafe behaviors; they are a business necessity.

Figure "G"

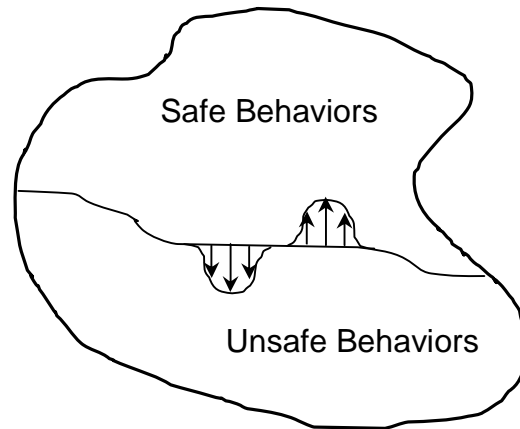


Unsafe behaviors may also include noise such as mixed signals. An example of a mixed signal is where we tell a work crew that we need to work safe, follow rules, watch out for each other, etc., and at the same time communicate that we must get the

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job done today. Quite often we reach a point where our safety performance has leveled out despite our continuing attempts to promote individual/team/system safe behaviors. What is happening, at least from a mathematical perspective, is depicted in Figure "H" below.

Figure "H"



So where does this lead us to? When we reach a point where our safety performance has leveled out despite our continuing attempts to promote individual/ team/system safe behaviors, we should consider focusing on two issues, reducing noise and finding more time for safety. The idea of reducing noise is easy to get one's arms around. We all understand that quite often noise has a negative connotation, but remember what is noise to one person is rock and roll (or country western or classical music) to another individual. Eliminating noise opens up an opportunity to increase safe behaviors, but identifying the source of noise is not always easy.

Finding more time for safety usually requires spending less time on working what others have already defined as important business parameters. This is not easy because business reality says we need to spend time managing cost, schedule, production rates, etc. We may find ourselves in a situation where we cannot get better in safety without first getting better at managing cost, schedule, production rates etc..

Is there a reasonable path forward? Absolutely! While we don't know the magic formula for safety we do know there are behaviors we can promote that will inherently lead us to a higher level of performance (e.g. fewer people getting hurt). First and foremost is to continue promoting safe behaviors. Safety in the simplest of terms is all about promoting planning, communication, team work, efficient processes, and effective controls; and those things we do to promote safety also benefit cost, schedule, production rates, etc. Along with promoting safe behaviors we should focus on eliminating noise and creating ways for the organization to spend more time on safety. Next to the people that we have in our organizations, time is the most valuable resource we have.

Safety is a journey and the destination is **"Nobody Gets Hurt"**. Please send comments on this article to info@bsms-inc.com who will forward them to the author.