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Utilizing Worker Expertise and Maximizing the Brain Reward Centers

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Introduction

People are experts when it comes to the work they do; unfortunately their expertise is not utilized as frequently as it could be. More opportunities need to be provided that allow people to participate in the design of their work including: accident investigations, job planning, and process improvements. Many employers use some form of job hazard analysis process to identify and document hazards and controls, but the front line worker is rarely involved. This presentation will show the core principles supporting employee involvement, provide examples where workers had brilliant ideas but no one listened, and provide examples where workers were given the opportunity to use their expertise to improve occupational safety.

According to Abraham Maslow's Hierarch of Needs model, one essential human need is to be innovative and solve problems. Advances in brain science have proven, through functional magnetic resonance imaging (fMRI) studies, the brain reward pathway is activated when people are recognized for their intellectual contributions. As people contribute their expertise to improve occupational safety more frequently they will feel a sense of gratification. In addition, safety professionals will have more time to spend on strategic planning of emerging occupational safety issues.

One effect of the current global recession is that SH&E professionals are asked to do more with less. Therefore, to be successful it is essential that SH&E professionals incorporate worker expertise in job planning. This will be illustrated in the presentation through an example where a worker had the answer to a difficult decision on appropriate personal protective equipment for a job but no one asked the worker for his idea during the job planning phase. Fortunately the worker was eventually consulted and his recommendation for the appropriate personal protective equipment for the job was implemented before work began.

The goal of this presentation is to expand the awareness and knowledge of SH&E professionals on the benefits and opportunities for leveraging brain science. This will include an overview of the components of the brain reward pathway and the biological mechanisms that make workers feel a sense of gratification when they contribute their ideas toward improving occupational safety. On-the-job examples where it is hypothesized that the brain reward pathway was activated in workers will be provided.

Finally, the presentation will include a model illustrating the importance of empowering workers to participate in occupational safety programs. SH&E professionals can use this model to maintain a robust safety and health program with limited resources. The model will also help SH&E professionals prepare for challenges in the SH&E fields by showing them how to allocate more time for strategic planning of emerging issues.

Many recent best selling business books such as *Wikinomics*, *Crowdsourcing*, and *Sway*, illustrate how the benefit of harnessing the collective knowledge of employees is a key to company success. Companies like Google and Pixar have mastered the ability to capture employee knowledge in terms of technology. Why should occupational safety be any different? Workers know how to improve safety in their workplace. SH&E professionals can harness this collective safety knowledge just as top companies do with technology, and workers will feel grateful for contributing.

Workers are the Experts

Workers are the experts when it comes to the work they do. However, that expertise is not solicited or utilized as often or as efficiently as it can be. Companies that go above and beyond when it comes to occupational safety compliance have implemented Voluntary Protection Programs (VPP) and many have achieved STAR status, the highest VPP achievement. A critical requirement of this status is worker involvement. Companies create safety committees and post slogans like the one shown in Figure 1, to show that they have fulfilled this VPP requirement.

Figure 1. This is a typical VPP slogan.

Companies take credit for their workers being the experts, but are workers asked to share their expertise during accident investigations? Are workers asked to participate in job planning? The answer to these questions most of the time is, "no."

Below is a description of an accident involving a journeymen machinist who cut his thumb. The initial investigation did not capture the machinist's thoughts about the accident and only focused on the facts of the event. The follow up investigation began with interviewing the machinist and captured the context of the event. Anyone can speculate which investigation provided more details that led to useful lessons learned.

The machinist was preparing to insert an end mill into a horizontal boring mill, see Figures 2 and 3. As the machinist retrieved the end mill from a tool holder, the end mill made contact with a drill chuck. As the drill chuck and the end mill collided, the machinist's left hand slid up the end mill, cutting his left thumb.

Figure 2. This is a tool holder with the drill chuck lying horizontally and out of place.

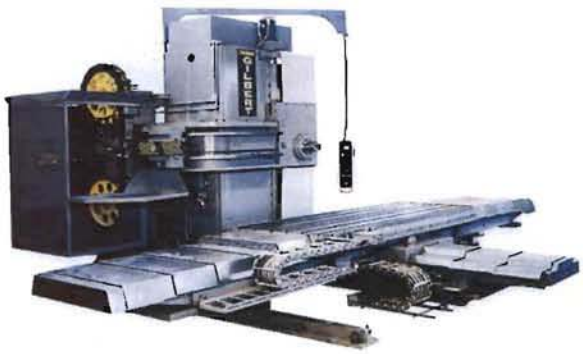

Figure 3. This is a picture of a horizontal boring mill

The initial accident investigation was conducted by an Issues Management Coordinator (IMC) who gathered data over the phone from multiple third parties. The IMC's report stated that the machinist cut their thumb on a rotating boring mill and the machinist was not wearing gloves. The IMC developed the following corrective action for the initial report: Machinists should wear gloves when working with sharp, rotating tools. This is a prime example of why occupational safety cannot be conducted from behind a desk. The machinist never put the end mill into the boring mill so the end mill was not rotating.

As the safety professional assigned to the machine shop, I conducted an event analysis using Human Performance Improvement (HPI) techniques. HPI is a proactive process of preventing unwanted outcomes triggered by human error. An HPI event analysis cannot be conducted without interviewing the injured worker, because the goal of the analysis is to have the worker provide as much detail as possible. Below is the dialog of the HPI event analysis:

Safety Professional: Tell me what happened?
Machinist: I was retrieving an end mill and cut my thumb.
Safety Professional: Tell me more?
Machinist: Come over here to the tool holder and let me show you.
Safety Professional: If you owned this shop how would you have prevented this event?
Machinist: That is easy. I would buy more tool holders to reduce the clutter.

The accident investigation conducted by the IMC was all based on facts. HPI event analysis is focused on obtaining context as well as facts. To obtain context the investigator must talk to the employee who was involved in the event. Facts without context do not tell the whole story. Context does not justify employee behavior it helps explain it, which can be critical when developing corrective actions.

In this case the machinist knew exactly how to correct the event from happening again. When the shop supervisor heard that machinists in the shop needed additional tool holders he ordered them immediately. If the HPI event analysis was not conducted for this case and the machinist was not consulted for his ideas, the shop supervisor would have spent the next couple of weeks trying to convince the IMC why it is not safe for machinists to wear gloves while machining; and nothing would have been learned from this event. Instead, the machinist was pleased that the shop supervisor listened to him and purchased additional tool holders.

Workers Know Safety

In many instances workers know how perform tasks safely, but they are not given the chance or the credit to demonstrate their safety knowledge during job planning. The following scenario demonstrates this point. All contents of a beryllium machine shop, including all the light fixtures and electrical conduits, were to be removed before the shop was decontaminated and restored to light lab space. The project manager planned the job very well and her top priority was worker safety. However, she sought out subject matter experts (SME) and did not consult with workers on the job when she was faced with a challenging safety dilemma.

For example, she held a meeting with an electrical safety officer and the beryllium SME when she discovered that the personal protective ensemble established for the project was not compatible with electrical safety personal protective equipment. The meeting did not include the master electrician on the job who had 33 years of experience with this particular shop. After a 30-minute discussion, the project manager and the two SMEs finally asked the experienced electrician if he had any ideas on how to solve the PPE dilemma. The electrician had the perfect answer. He said, "I am going to lock out and tag out the main electrical feed leading into the beryllium shop and we will not have to be concerned with electrical PPE while we are removing the light fixtures and electrical conduits from the shop."

When asked why he did not bring this idea up before, the electrician stated, "I was not involved in the job planning." Workers, especially workers with extensive experience, must be involved in job planning. In their book, *Wikinomics*, Don Tapscott and Anthony Williams write: "whoever figures out how to harness the collective genius of its workforce is going to blow away the competition." Similarly in occupational safety, the organizations who integrate worker expertise in job planning will be the organizations that drive down injury rates.

Worker Ingenuity

Many workforces are a collection of geniuses. There are pockets of ingenuity, which is the power of creative imagination, in every workplace. The following is an example of ingenuity by a young worker. A machinist apprentice recognized a tripping hazard in the welding area of a machine shop, as shown in Figure 4. The apprentice took the initiative to correct the hazard on his own with minimal supplies and effort, as shown in Figure 5.

Figure 4. Welding cables stretched across the floor, causing a tripping hazard.

Figure 5. Welding cables placed in a concrete grove, covered by a stainless steel plate.

This apprentice received recognition from his supervisor and even the safety department for this safety improvement.

The fourth principle of human performance improvement states that people achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers, and subordinates. The recognition the apprentice received for eliminating the tripping hazard inspired him to improve environmental safety and health in other areas of the shop.

When the apprentice heard that aerosol cans were considered hazardous waste and it cost approximately $250 to dispose of each can, he presented a new idea. He recommended that machine shops purchase WD-40 in one-gallon, recyclable containers, and purchase re-usable plastic spray bottles for secondary containers. A one-gallon container of WD-40 contains the same volume as ten aerosol cans. This idea saved cost up front and eliminated a waste stream at the end. Figure 6 shows this new application of WD-40 use.

Figure 6. Aerosol cans replaced by one gallon container and secondary containers.

The apprentice did not receive a monetary award for his WD-40 idea; instead, he was rewarded by being recognized by his peers and supervisors and by seeing his idea implemented in other machine shops. This type of non-monetary reward can be very gratifying. Recent fMRI research illustrates how this gratification results from the activation of the brain's reward pathway.

Brain Reward Pathway

In the 1940's Abraham Maslow developed his Hierarchy of Needs model that consists of five stages of needs that are essential for humans to feel content. The five stages are arranged in a pyramid, see Figure 7. All the needs of the lower stage must be satisfied before a person can move to the next stage of well being. The goal is to reach the top level, self-actualization. Athletes refer to this level as "Being in the Zone." When the machinist apprentice eliminated the tripping hazard he was within the Esteem stage and he moved into the Self-actualization stage when he saw his new application of WD-40 idea being used in all the machining shops.

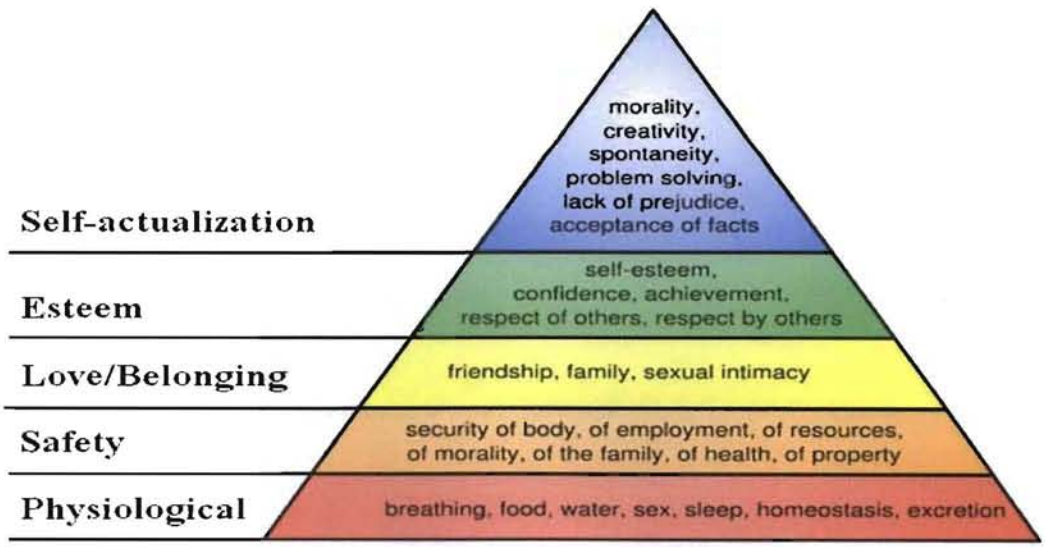

Figure 7. This is an illustration of Maslow's Hierarchy of Needs model.

When workers reach the Self-actualization stage the entire organization benefits. First line supervisors and safety professionals need to encourage workers to identify hazards in the work place and improve occupational safety. Not only will a worker move into the Self-actualization stage but their brain reward pathway will be activated.

In his book, *How We Decide*, Johah Lehrer writes that dopamine is released in the brains of workers when they are praised for their ideas and when they do a good job. Dopamine is a neurotransmitter in the brain that is released when the brain reward pathway is activated. Dopamine triggers areas in the brain responsible for that "feel good" sensation like after eating a piece of chocolate to cure a sweet tooth. Dan Ariely writes in his book, *Predictably Irrational,* individuals who play video games are rewarded up to 84 times an hour. In other words, the brain's reward pathway is activated this many times an hour and bursts of dopamine are being released.

One does not have to be an expert on the brain to understand how the brain reward pathway operates. In simple terms, the brain's reward pathway connects a region of the central midbrain, the ventral tagmental area (VTA), to the nucleus accumbens and the cortex. When areas in the brain light up signals from other brain areas inform the VTA to produce dopamine. Dopamine then travels along the mesolimibic pathway to the nucleus accumbens. The nucleus accumbens is involved in reward and sensation of pleasure. In the final stage of the process, the nucleus accumbens communicates with the prefrontal cortex, which is responsible for reasoning and planning. The prefrontal cortex weaves these pleasurable feelings into memories, reinforcing the behavior by motivating the individual to perform a particular activity again.

An fMRI is capable of taking pictures of brain areas that light up when an individual performs a particular activity. While in the fMRI, subjects perform different tasks, causing increased metabolic activity in the brain responsible for that task. This technique is being used extensively in marketing research and a new field called Neuro Marketing has developed. In his book, *Buyology*, Martin Lindstom describes a cigarette study where smokers are asked to read cigarette warning labels while they are in an fMRI unit. The study showed that brain areas lit up most when smokers read the most dangerous warning labels, suggesting that smokers preferred the more dangerous cigarettes, because they created a better and longer sensation.

Several extensive reviews of the literature on the brain reward pathway and fMRI did not reveal any studies that were directly related to occupational safety. However, several on-the-job examples described below, illustrate how activating the brain reward pathway promoted safety behaviors in the workplace. The combination of brain research and occupational safety is a novel concept and conducting research studies on these two topics could prove that activating the brain reward system can lead to improved occupational safety. The Mind Research Network in Albuquerque, NM, is focused on using fMRI technology and its emergence as an integral element in neuroscience investigation. In addition, Los Alamos National Laboratory is working on a prototype of a portable fMRI unit. With the assistance of these two organizations, conducting research studies focused on the brain reward system and occupational safety will be feasible. In the mean, time two examples of where it is hypothesized that a safety professional activated the brain reward systems of workers are described below.

One morning a safety professional was gathering respirators and cartridges for a larger crew who were going to be working in a beryllium contamination area for several weeks. When the crew arrived, the safety professional handed them respirators and demonstrated how to don the respirator and do a fit check. The safety professional asked an iron worker for his employee number so he could write it on a clean, plastic bag that would be used to store his respirator when

it was not in use. (Note, employee numbers at this company are six digits long and start with a one or a two. A worker with an employee number that starts with a zero has over 25 years of experience).

When asked for his employee number, the iron worker said in a grumpy voice," It's 007..." The safety professional interrupted him after the third digit. The safety professional thought to himself, "This man has been here over 35 years; no wonder he is so grumpy." Then the safety professional said, "007!! I am very happy you are on this job. You bring a lot of valuable experience to this job. I know you will work very diligently and will not spread contamination." The iron worker said, "That is not the typical greeting I receive." Most people say, 'when are you going to retire old man?'" Not only did this senior iron worker come to the job site each morning with a smile on his face, but he was a leader and encouraged other employees to work diligently and not spread contamination. Every safety professional enjoys working with employees who are good role models.

Did the safety professional activate the iron worker's brain reward system with the positive comments? It cannot be proved without a fMRI brain scan, but the resulting behavior demonstrated by the iron worker would suggest he took the comments positively. It is hypothesized that the safety professional did activate this worker's brain reward system and he was able to move this worker from the Esteem stage to the Self-actualization stage, see Figure 7 above. Several days into the job the iron worker suggested a change in a work task that saved time and resources on the project.

Several months later the same safety professional noticed a group of workers who were repairing some concrete stairs, which needed to be repaired for nine months. It was not the workers fault that it had taken so long for the stairs to be repaired; they only follow their work orders. The safety professional walked up to the workers and said "Wow!! Look at these stairs. They are perfect now. Thank you." The foreman told the safety professional, "You are the only person that has thanked us since we have been on this job." The safety professional replied, "Everyone who passes by here should be thanking you guys because we do not have to seek an alternate route anymore." When the safety professional left, all five workers had a smile on their face with a look that said, "Thanks for the appreciation."

Positive comments and appreciation can really have an impact on workers. However, the comments must be genuine. Workers will pick up on insincere comments quickly. The concrete foreman asked the safety professional if their barriers were in the appropriate place. It seems that when safety professionals are interested in an employee's work the employee wants to do a good job and work safely.

Safety professionals greatly benefit by taking an interest in the work employees do and letting employees know they are experts on the jobs they do. In today's recession where companies are slashing budgets, safety professionals need employees to be their extra eyes in the field. Everyone knows that the first line supervisor is responsible for the safety of their employees but often time this burden is placed on safety professionals and safety professionals spend the majority of their time being retroactive instead of proactive. Katherine Hart, Ed.D, CSP, developed a model that suggest how an experienced safety professional should spend their time. This model, called ESH Consultant Roles, is shown in Figure 8.

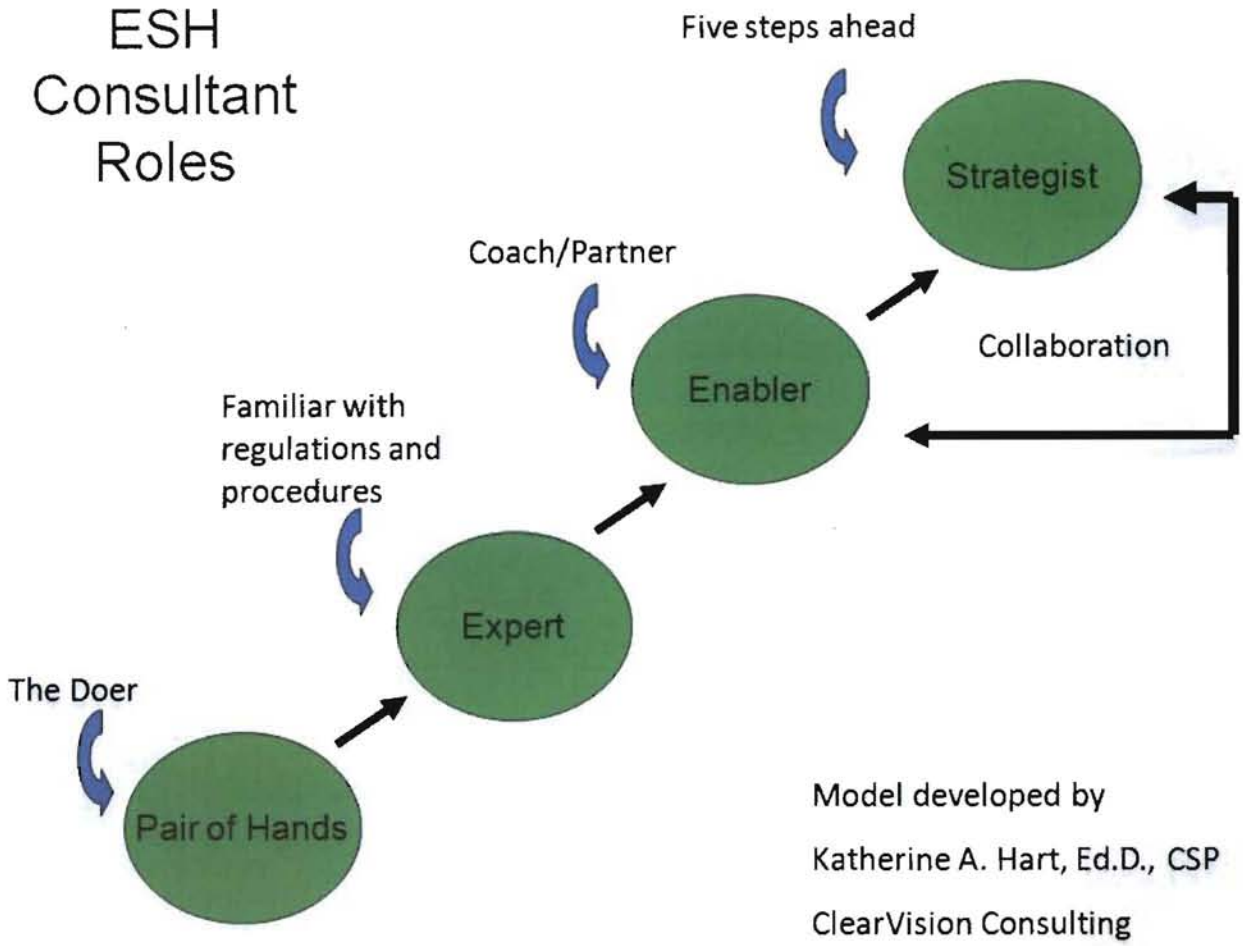

Figure 8. This is a diagram of the ESH Consultant Roles model.

This model is made up of four roles, Pair of Hands, Expert, Enabler, and Strategist. Safety professionals begin their careers spending a large percentage of their time being a Pair of Hands and working on programs that have already been established by the organization. As safety professionals become more knowledgeable and versed in regulatory compliance, they operate as Experts and work with employees and managers to ensure work is conducted in a compliance manner. Mid-career safety professionals should be Enablers for first line managers and workers and encourage them to take on safety responsibilities, such as conducting safety inspections of work areas, holding pre-job briefs, and leading safety tailgate meetings. However, many safety professionals spend their time in the Pair of Hands and Expert role and rarely have the time to enable other employees in the company to help with these roles. Ultimately mid-career and senior safety professionals should advanced to strategists spending most of their time collaborating with senior management teams to solve institutional safety problems and strategically preparing for emerging issues, such as implementing new standards.

At least 60 - 75 percent of a mid-career or senior safety professional's time should be spent in the Enabler and Strategist roles and the remainder of their time in the Pair of Hands and Expert roles. In talking with seasoned safety professionals the exact opposite is true. The typically spend 75 percent of their time in the Pair of Hands and Expert roles. Empowering workers to take on more responsibility in occupational safety would make it possible safety professionals to spend more of their time in the collaborative roles.

Conclusion

Examples in the presentation have illustrated that workers are the experts when it comes to their own work. Most workers can tell another person about the most hazardous components of their job without even thinking. Workers even keep an eye out for safety hazards and will correct them on their own. This behavior must be recognized and praised. The machinist apprentice referred to in this presentation is a star employee and found opportunities to improve occupational safety. He is the exception. The other employees referred to in this presentation had to be asked or be motivated before they offered their ideas for safety improvement. However, in all cases the workers had very clever safety ideas.

The author has seen many instances in the workplace where the worker knew exactly why an accident happened and had the perfect solution to prevent the accident from happening again. Too many instances have been missed where a worker was not involved with job planning and a mishap occurred. Workers are the experts and they enjoy being consulted on their expertise. The more workers get involved with their own occupational safety the more time safety professionals will have to spend on emerging issues. As a result workers will continue to move up the stages of Maslow's Hierarchy of Needs and will want to contribute more to the success of the organization.

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