Behavioral-Based Safety — The Final Step Toward Safe Operation

Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working environment for everyone.

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Comments are welcome. If you have questions about this topic or other safety issues, please contact safetyfirst@aist.org. Please include your full name, company name, mailing address and email in all correspondence.

In the late 1960s, Badische Stahlwerke GmbH (BSW) started to produce reinforcement steel in Kehl, Germany, with an installed capacity of 300,000 metric tons per year. Nowadays, BSW produces more than 2.3 million metric tons per year with virtually the same basic conditions. Many mini-mills have very similar equipment and material flow, but what has made BSW such an efficient mini-mill has been its educated and well-trained work force, routinely good care for equipment, and high productivity leading to low-cost production.

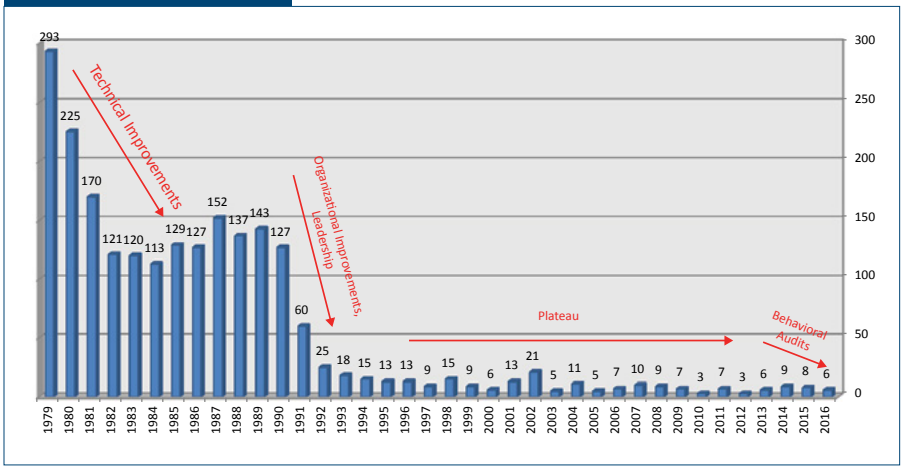
People

BSW started at a very early stage to take care of its personnel. Driven by tough German safety regulations, the management recognized that health and safety lead to well-motivated employees and a long commitment to the company.

In the mid-1970s, the German government published the Health and Safety at Work Law, which had an immediate effect on efforts to create a safe working environment. But in the end it was the change in the minds of general management in the early 1990s that made the big step forward. Safety became a personal responsibility of each director and manager. Together with the STOP (Safety Training Observation Program) program developed by DuPont, BSW improved the working environment by introducing a large number of technical innovations into the normal routine.

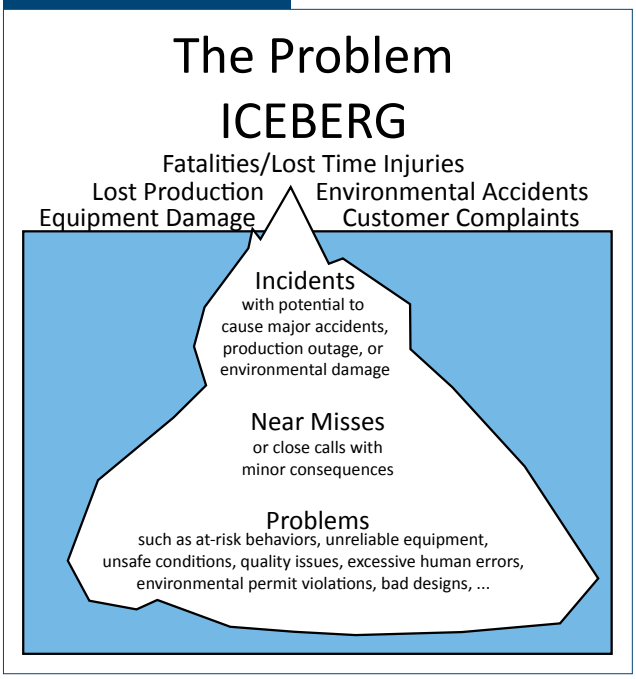
Despite an immediate effect on accident statistics (Fig. 1), a significant number of incidents still occur every year, which indicates that there is still a danger of possible severe accidents. This made BSW feel that something more had to be done to minimize this potential.

Figure 1



Number of reported accidents by year (more than 3 calendar days lost) at Badische Stahlwerke GmbH (BSW), 1979–2016.

Figure 2



The Problem Iceberg. Source: www.quiz.biz

Safety Culture

For decades, BSW's supervision strategy was dominated by values such as:

- Production first.
- Everybody is responsible for themselves.
- Safety costs money and wastes time.

But today the environment has changed:

- The expectations and attitude of employees has changed with Generation Y.
- Increase in competition and the drive to be faster, superior, go further, etc.
- New legal obligations and responsibilities.

So BSW had to change its mindset about health and safety first. The goal was for all BSW directors, managers and supervisors to talk about safety in order to find out what happens under the "water surface" of the "problem iceberg" (Fig. 2).

With the help of an external consultant, BSW started the process of behavioral-based audits. BSW eliminated the previously used checklists and tick-boxes and scaled down to three steps:

1. Observe an employee at work.
2. Discuss with him/her the results of the observations (good behavior and/or opportunities for improvement).
3. Ask him/her about ideas to improve safety in their working environment.

The lead auditor is joined by a supervisor of the audited area and a safety adviser. This group had to conduct and record this kind of audit at a minimum of 12 times a year. More than 80 executives were trained to conduct safety audits and BSW gets more than 300 audit reports each year. Over the years, such behavioral-based audits were gradually embedded in the normal day-to-day routine so that every walk through a production area nowadays can be counted as an audit.

The results from the audit are either handled directly inside the audited department or, if a recurring incident is detected, it will be managed by the safety department together with the designated experts. An overview of the performed audits and the results are presented in a weekly morning meeting together with the shift representatives.

However, due to the 24/7 nature of steel mill operations, there are still a large number of unsafe acts and unsafe behaviors that occur at nights and on weekends that go unreported. This was the next challenge to solve.

Acting Instead of Reacting

The main hazards in a mini-mill operation are:

- Molten metal.
- Reactions/explosions.
- Hot surfaces.
- High-speed wire processing.
- Overhead crane and vehicle movement.

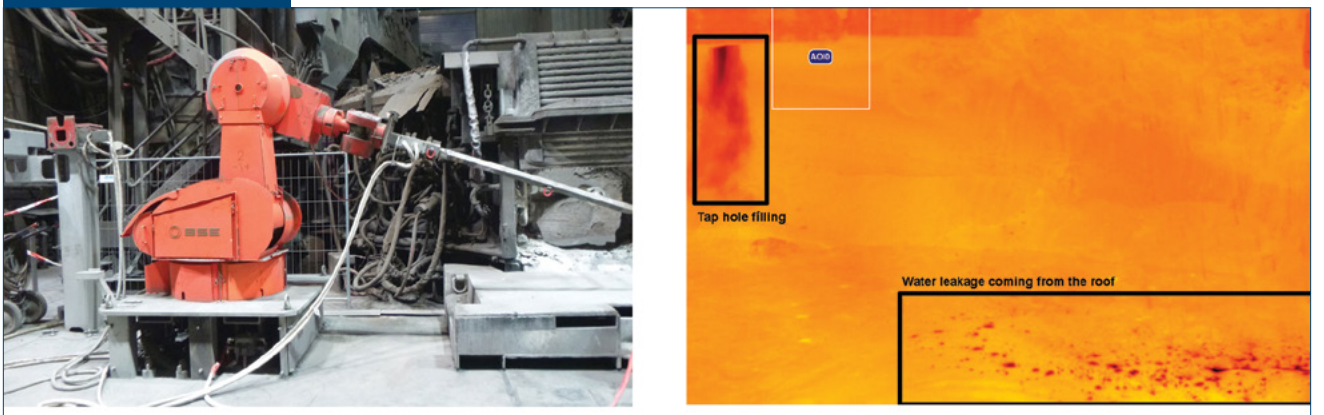
Other common hazards include:

- Slips, trips and falls.
- Manual handling of tools and equipment.
- Health issues (e.g., skeletal injuries, heat exposure).

BSW has managed to reduce the risk of accidents over the past few years by using the "T.O.P." Principle:

T = Technical Improvements — For example, to get people to a safe distance from hazards, in 2012 BSW developed the MultiROB for temperature measurement, sampling and camera control of refractory. This technical improvement also included camera-controlled processes, such as scanning for leakages (Fig. 3).

Figure 3



The MultiROB machine (a) allows for temperature measurement, sampling and camera control of refractory at a safe distance, eliminating safety hazards associated with activities such as scanning for leakages (b).

O = Organizational Measures — Setting clear safety standards, described and fixed in standard operating procedures (e.g., safe ways in production areas).

P = Person-Related Measures — Person-related measures can include:

- Personal protective equipment.
- Toolbox talks and instructions.
- Training (e.g., on health issues like ergonomics).

The Way Forward

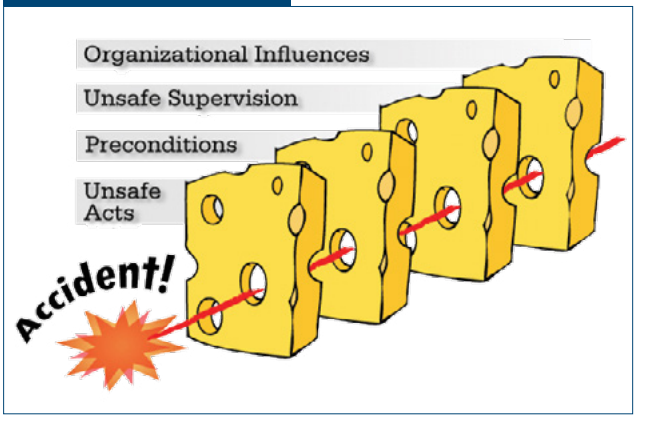
Using the T.O.P. Principle means that one must always look for a technical improvement before using organizational or — at the very end — person-related safety measures. BSW uses this clear hierarchy for safety improvement and always aims for a technical solution first.

But still, more than 80% of all accidents happen because people behave in an unsafe manner, either by error or by violation of safety guidelines. The "Swiss Cheese Model" (Fig. 4) shows that a company has to learn from each reported near miss, unsafe act or unsafe condition in order to prevent accidents.

BSW and its employees follow three basic principles to detect every occurrence of one "slice of the cheese:"

1. Never walk past an unsafe act or unsafe conditions without reaction.
2. Never think "someone else will react." Always care about others like colleagues, contractors and other third parties.
3. Report all incidents, including near misses, unsafe acts/conditions, and accidents and damages to property.

Figure 4



The "Swiss Cheese Model."

By applying this vital part of its safety philosophy, BSW has the opportunity to prevent accidents and learn from every event. Only continuous improvement makes a business successful — this counts for production, environmental protection, and especially for health and safety. ✦