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Safety tour: a tool towards zero accidents

Abstract

People are the most valuable resource in any company; therefore, it is essential to maintain a workplace free of accidents. Several guidelines establish the requirement to keep the work environment safe; however, gaps in procedures often lead to incidents and accidents. Gemba walks help eliminate waste from processes in this context, the waste refers to unsafe conditions. When conducted with a safety focus, Gemba walks can be transformed into a Safety Tour, which becomes a powerful tool to address these gaps because it involves visiting the actual workplace. The use of a checklist structured by areas will bring consistency and systematization to the visits. This article presents the fusion of a Gemba Walk and a checklist to minimize blind spots in safety systems. Additionally, near-miss reports play a key role in eliminating detected risks before they escalate into accidents.

Keywords: safety, Gemba walk, zero accidents, check list, near miss report

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Juan Carlos Ortiz Lara
Sintenovo S.A. de C.V. Calle 13 Este n° 3 62578 Civac, Jiutepec State of Morelos, Mexico

Correspondence: Juan Carlos Ortiz Lara, Sintenovo S.A. de C.V. Calle 13 Este n° 3 62578 Civac, Jiutepec Estado de Morelos, México, Tel +527773206162

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Introduction

Around the world, companies strive to achieve zero accidents because people are the most valuable resource. However, there seems to be a gap in safety systems, as numerous accidents have been documented. For example, in India, a chemist died after inhaling methanol mixed with other reagents from a chemical centrifuge without using the required safety equipment.[1] Also several years ago, an accident occurred in a chemistry laboratory involving the use of butyllithium; unfortunately, the person involved did not survive.[2] Another incident took place in a chemical plant due to the failure of earthing equipment, which led to an explosion.[3] Fires in chemical plants are also a frequent source of accidents.[4]

These examples, described in the literature, lead us to ask: Could these accidents have been avoided? In this article, it´s propose an alternative that can be implemented in laboratories, workshops, or any company to minimize the occurrence of accidents. To reach this goal, it is essential to establish a strong safety culture, as accident prevention begins with self-awareness. In this context, He et al.[5] identify thirty-two elements that define safety culture, such as the economic benefits of safety, the role of safety management systems, emergency response capabilities, and the consistent implementation of safety protocols. Building on this concept, a new tool was developed to help maintain an accident-free factory. The approach presented here was applied in a chemical plant.

Guidelines associated to safety

The ISO 450001 Occupational health and safety management systems is the most important guideline that established the minimal requirements for occupational health and safety.[6] this guideline gives the bases for the companies generates safety places and avoid accidents and sicknesses for their collaborators. This guideline uses the methodology PDCA (plan, do, check, act). Which is de Deming cycle[7]and is the base of continuing improvement. Basically, this guideline helps the companies to build a prevention culture and take care of the personness. In this context Torres et al published an example of applications of the ISO guidelines in the health system.[8]

In Mexico the Federal Labor law regulates workplace safety, in addition the Ministry of the Labor and social Welfare stablishes specific guidelines on this topic. There are some guidelines that apply to the chemical industry as an example it can mention the: building and facilities (NOM-001-STPS-2008),[9] prevention and protections against fires (NOM-002-STPS-2010),[10] safety systems and devices in machinery (NOM-004-STPS-1999),[11] handling, transport and storage of hazardous substances (NOM-0058-STPS-1998),[12] work at height (NOM-009-STPS-2011),[13]pressure vessels and boilers (NOM-020-STPS-2011),[14] static electricity (NOM-022-STPS-2015),[15] welding and cutting (NOM-027-STPS-2008),[16] maintenance of electrical installations (NOM-029-STP-2011),[17] working in confined spaces (NOM-033-STP-2015).[18] In addition to these guidelines the Environment Health and Safety system also is also implemented in most companies, this system includes health safety and environment requirements that help to prevent accidents. This system led to the inclusion of policy, planning, evaluation, improving actions and promotion of the maintenance of the physical, mental and social well-being of the employees in the workplaces.[19] In these rules it is include also audits (internal, external), management of deviation, systems to avoid accidents, evaluation as Hazard and operability risk analysis, etc., safe practices in the laboratory, analysis of incidents and the establishment of corrective and preventive actions.[20]

Work areas in a manufacturing plant of intermediates and pharmaceutical ingredients

A manufacturing plant for the synthesis of intermediates and pharmaceutical ingredients is divided into several areas. The first area is the reactor zone, where all raw materials are loaded into the reactor and reaction conditions are established (e.g., heating, cooling). The next area is the centrifugation zone. After a reaction, the product usually precipitates or crystallizes, forming a suspension (solid in liquid). Since the liquid contains impurities, it must be removed using a centrifuge. The following step is the elimination of residual solvent, which is carried out in a vacuum dryer. Finally, the product is milled and analyzed.

If it is a final product, it proceeds to packaging; if it is an intermediate, it returns to the synthesis chain after analysis. Figure 1 illustrates the synthesis cycle. Each of these areas includes a technical zone and a clean zone for finished products. Additionally, the warehouse and the farm tank are part of the plant. These areas have inherent risks documented in the safety system (e.g., fire, spills, runaways of reactions, falls, etc,). Cleaning procedures must also be considered because they involve flammable solvents used to clean

equipment after manufacturing.[21] As it´s shown, there are several areas that must be visited, each with its own risk for example, risk of fire, electrostatic discharges, leaks, spilled, falls, etc. Therefore, it is essential to identify every improvement opportunity to prevent accidents. It is worth to mention that in all these areas it was implemented contingency systems against the accidents but there was a missing part that it will necessarily cover.

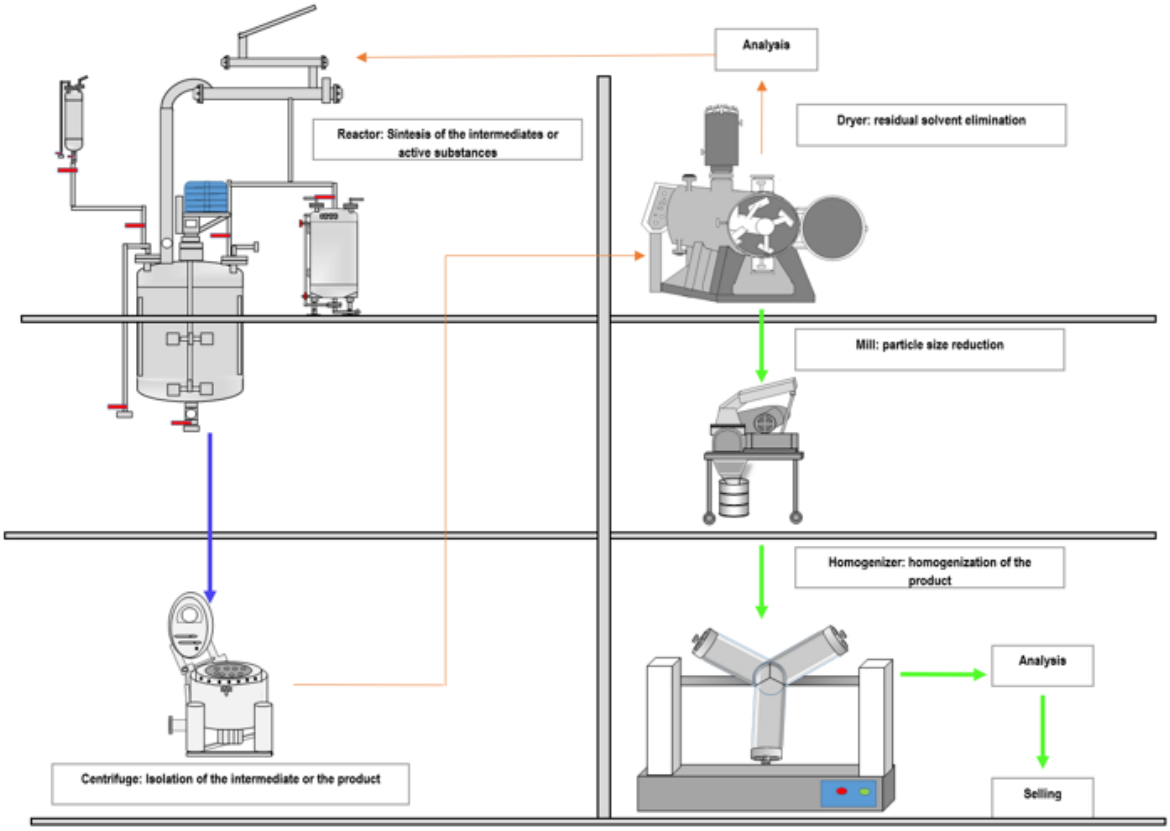

Figure 1 Equipment train for manufacturing active substances.

Lean six sigma in safety

There are several tools that can be part of a safety system, such as Hazard and Operability analysis, technical instructions, contingency plans, and standard operating procedures. These procedures are usually written in an office environment, and often there are discrepancies between what is documented and the actual conditions in the work area. These gaps are precisely the cause of many accidents and incidents. In this context, Lean tools offer an alternative to improve these systems because they reflect the reality of operations and eliminate waste which, in this case, translates into reducing risk. The Lean philosophy and its impact on safety have been reported for several years. For instance, Boutmir et al.[22] compiled various applications of Lean tools to enhance safety in different settings. In their work, 13 reports were reviewed, covering the use of different tools. Among the tools reported were 5S, Kaizen, visual management, statistical analysis, and Gemba walks which have been used to improve activities in hospitals.[23]

Tours around the plant (Gemba walks)

Accidents in work areas are caused by several factors, including unsafe behavior, unsafe acts, hazardous working conditions, inadequate safety performance, poor housekeeping, low tool maintenance, supervisory failures, and other unsafe practices.[24] All these risks can be minimized through safety tours across the plant covering laboratories, offices, warehouses, and any other company areas. The main objective is to visit the work area and observe what is happening. These visits, commonly referred to as *safety tours*, aim to identify improvement opportunities by detecting unsafe activities or conditions and fostering safety awareness among employees. The findings from these tours must be reported with the goal of eliminating hazards. Over time, safety tours have evolved to include a checklist to standardize the activity, with the goal of creating an accident-free workplace.

Basics of gemba walk

Definition of a Gemba walk is as follow, a Gemba walk is a technique used to observe and understand how work is being performed. Gemba is taken from the Japanese word *gembutsu*, meaning real thing or real place and a Gemba walk has the following elements: observation (watching people perform work in-person); location (observing people at the actual location where works is performed), teaming (interacting with people performing the work). Gemba walks provide an update close, detailed view of behaviors in action an area powerful tool for identifying process improvement opportunities.[25] The concept of Gemba is crucial in the Toyota production System and was established by Taiichi Ohno. The Gemba concept was so important that Sochiro Honda, founder of Honda Motor Company, did not have a president's office.[26] By his side, Womack stated that during the Gemba walk it is

necessary to define what is necessary improve? What is the value that will be provide for the customers?[27] In our case the value is improving safety, and the clients are our coworkers.

The Gemba Walk is an excellent tool for improving processes[28] because many standard operating procedures have been written in the office when procedures are created, and sometimes the data collected may not be accurate and parameters may not reflect real conditions. The Gemba Walk encourages the team to go and see for themselves. Visiting the workplace helps detect issues, identify unsafe situations, and gain a better understanding of the processes. A Gemba Walk consists of visiting the area where value is created such as a production line, a warehouse, a laboratory or a maintenance workshop. The objective is to observe what is really happening in the process, detect improvement opportunities, and eliminate risks. Listening to feedback from people working in the field is critical to understanding the heart of the process. In other words, the Gemba Walk is about connecting with reality and identifying actions that make the workplace safer and more efficient.

What are the benefits of Gemba Walks?

Better decisions because real data will be evaluated.

Improved quality by minimizing waste

Increased efficiency, which also improves the profitability of the process.

Eliminate risk of incidents

Promote safety and quality culture

Develop relationship in the team

Gemba walk with a safety scope: Although safety systems are implemented in many companies, there is still significant room for improvement. But what happens when a Gemba Walk is carried out with a safety focus? The answer is the Gemba Safety Tour. Just like its precursor, the Gemba Safety Tour can be a valuable source of information to strengthen the safety system and help maintain an accident-free workplace. Based on the principle of Go and See, the Gemba Safety Tour focuses on detecting unsafe activities and conditions, such as: lack of use of safety equipment, wet floors, damaged stairs, misplaced tools, scattered residues, and obstructed corridors. Safety tour was used by several companies around the world some examples has been reported by Tervene,[29] Proaction[30] and Aren.[31]

A concrete example identified during several tours was the misuse of safety glasses. It was observed that many employees were not wearing them correctly. After two weeks of monitoring, it was discovered that the model was not ergonomic, causing discomfort for the personnel. The model was replaced with an ergonomic version, and compliance with the use of this protective equipment improved significantly.

Safety gemba checklist: As Atul Gawande proposes in his book The Checklist Manifesto,[32] the use of a checklist can help prevent mistakes. No matter how skilled professionals are, fatigue can lead to errors and sometimes these errors can be critical. Moreover, the use of checklists has recently been reported in the context of laboratory safety.[33] Up to this point, we have combined the concepts of Gemba Walk and safety. But what happens if we integrate a checklist into this approach to create a new tool? The result is the Safety Gemba Checklist.

Now that the idea has been generated, the next step is: what should be checked during the Safety Gemba Checklist? To define the sites, areas, and details to be reviewed, it is essential to establish a multidisciplinary team, because each area will be analyzed from different perspectives. For example, a production colleague will not notice the same issues as a maintenance colleague, and the same applies to quality or health and safety specialists. To build the first checklist, it is necessary to have many different eyes in the same place to identify diverse risks and opportunities. All areas of the plant warehouse, workshop, or offices must be visited by the entire team, mapping all potential sources of incidents. With this objective in mind, the first draft of the checklist will be created. All areas should be reviewed using this checklist, and observations must be recorded and plotted to identify trends. Based on data interpretation, corrective actions will be implemented.

Examples of items to check include:

Condition of stairs

Cleanliness of corridors

Missing screws in equipment

Recurrent spills on the floor

Blocked exits and emergency equipment (e.g., fire extinguishers)

Presence of toxic odors

Tools in the wrong places

Accumulated residues

Lack of use of protection equipment

Poorly grounded equipment (hoses, pumps, lines, equipment)

Pipeline corrosions

Unsafety acts

Unlabeled equipment (pipeline)

Spills

Weird noises (motors, pumps)

Saturated places with materials

Solvent / gas leaks

Misused safety equipment (uniform, coats, shoes, glasses, gloves, respiratory equipment, etc.)

Reagents loading and discharges

Implementation of the safety tour

At the beginning of the implementation, only a notebook was used. As a result, data collection was inconsistent sometimes recorded, sometimes not. Moreover, during the tours, the focus was often lost because visit to the workplace lacked structure, making the process highly variable. Using a specific checklist ensures that all areas of the workplace are reviewed systematically, generating valuable data to evaluate improvement opportunities. This structured approach reduces variability, maintains focus, and provides actionable insights to strengthen the safety system. One initial drawback was the time required to complete the checklist. At the beginning of the exercise, it took approximately three hours to carry out the tour. However, with practice and process improvements, the duration was reduced to an average of 30 to 40 minutes. As a result of these efforts, the company has now achieved almost 550 days without accidents, reporting only near misses for which corrective and preventive actions have

been established. This milestone demonstrates the effectiveness of structured safety tours.

Near miss incident report

A near miss is a minor incident or unsafe condition that could potentially lead to an accident.[34] It can be seen as a symptom of a potential problem; therefore, these situations must be addressed before they escalate into accidents. To illustrate this, imagine water frequently accumulating on the floor. Up to this point, no accidents have occurred, but people could slip and get injured. For this reason, it is essential to report all these small incidents to prevent major problems. In this context, the Safety Tour is an excellent tool because the person conducting the workplace visit will observe these details and report them. As a result, corrective and preventive actions can be implemented. This activity, carried out daily, minimizes unsafe acts and reduces the likelihood of accidents, ultimately helping the company in the way of zero accidents. The most important part of the checklist is analyzing the data. As mentioned earlier, it is essential to implement corrective and preventive actions. In addition, sharing lessons learned is crucial to raise awareness throughout the company. Admittedly, this is a challenging task, but it is necessary because people deserve a safe workplace. Effective communication ensures that everyone understands the risks, the actions taken, and the role they play in preventing future incidents. The figure 2 shows the flow diagram of the safety tour.

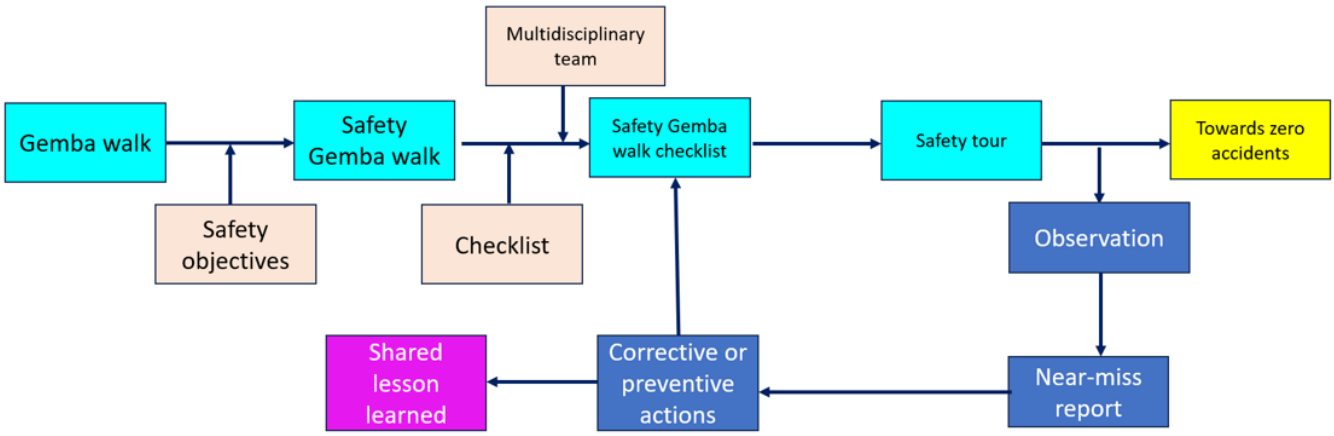

Figure 2 Flow diagram of the safety tour.

Conclusion

Safety in the workplace is one of the main objectives of any company because people are the most important resource. To move toward zero accidents, it is necessary to develop new methodologies to achieve this goal. In this context, the Gemba Walk is an excellent tool to "go and see" the real process and propose effective actions to address deficiencies particularly those related to safety. One of its greatest strengths is its flexibility to adapt to the company's needs. Including a tailored checklist for each work area ensures that all potential issues are observed and addressed. The proposal presented here has generated excellent results in a chemical plant avoiding accidents during almost 550 days. The inclusion of a checklist to monitor the entire workplace is crucial to achieving zero accidents. Within our plant, we are evaluating all processes that may pose potential issues, such as pyrophoric reagent loading, hazardous material handling, and solvent transfer operations, among others. Also, we are implementing the value stream map in chemical processes to eliminate all the wastes, including the waste related to the unsafe operations. In general, there are some interesting perspectives, imagine a professional with expertise in biology, pharmacy, chemistry, or similar fields combining that knowledge with Lean Six Sigma methodology. The result could be a wealth of new tools to solve problems effectively and enhance safety systems.

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Conflicts of interest

The author declares no conflicts of interest.

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