Behaviour Based Safety

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Abstract

The main goal was the development of a Behaviour Based Safety tool to improve safety at paint's company (TRSA). Aiming at the adoption of safety behaviours based on the analysis of the risks, this work covered the different workstations of the company, from the Factory to the Stores, through the Central Warehouse and administrative spaces.

The analysis and identification of hazards and their risks, in each of the sixteen different workstations of the company, allowed the development of sixteen different check lists. In order to structure and guide the safety visits passing from the raw materials until the store. Starting from the raw materials (raw materials warehouse and tare park and big bag change), through the different machines / units of manufacture (NewMixer, MasterMix, CowlesMixer, Cowles 5, Adesan), the associated washes, labeling of packages, quality control, research and filling areas. The filling is followed by the shipping area, the central warehouse of finished products, the administrative areas and the shops.

The target points of verification are focused on the safe behaviors to be adopted.

The checklists, which will be used in the safety visits, are as specific and concrete as possible. Only then, starting from the observation of a concrete workstation/ activity and sending a feedback of that same observation will be possible to raise employees awareness of how their individual behaviour affects not only their own safety, but also the safety of those around them and, inevitably, the surrounding environment.

With the implementation of these checklists it is intended not only to achieve this awareness, but, essentially, to guarantee a change of behaviour. This change will be positively reinforced so that the goals for behavioural change are achieved. Consequently, Tintas Robbialac, S.A, with an improved tool, which focuses on prevention will be even closer to the "zero accidents".

Keywords

BBS, prevention, *check-list*, behaviour change, safe behavior.

Introduction

Taking into account the effects of TRSA tools and initiatives already developed (and described below), the Behavior Based Safety approach works as a complementary tool that will amplify these same effects. It will allow a concrete and objective measurement of the behaviors.

Adopting the guidelines of the Cromology Group, TRSA implements not only the Group's values, but also a perspective of continuous improvement, in which safety plays a prominent role. TRSA thus has several commitments in the field of safety:

- Ensure that the activities / processes, products or services developed by the company in each of the areas of operation take into account the principles of quality management, environmental protection, including pollution prevention, injury prevention, health and safety sustainability and social responsibility;

- Identify and evaluate the company's activities that can lead to a risk to safety and health for its employees, establishing a plan based on risk prevention, combating them at source and controlling those that can not be avoided, minimizing their consequences, and always giving priority to collective protection measures over individual measures;

- Comply with the compliance obligations applicable in the different areas in which its activity fits, namely in terms of product, environmental aspects of activities, occupational safety and health in addition to other commitments / requirements that the company subscribes to;

- Ensure the commitment of continuous improvement in the performance of the company namely in the satisfaction of the clients, in the environmental protection and in the safety and health of the collaborators;

- Promote the motivation and participation of all employees of the company, committing them and making them responsible in the integrated system of quality, environment, safety and health at work, stimulating initiative, teamwork, professional training and development of technical skills;

- Recognize the importance of information and training of employees and other stakeholders to achieve the objectives expressed in this policy. [1]

All these commitments are taken with great seriousness since much of people's lives are spent in their workplace. And so it is undoubtedly important that the work environment is safe and healthy. Despite this, workers are often faced with a multitude of hazards in the workplace. Occupational safety seeks to assess risks to facilitate the prevention of accidents and occupational diseases, with a view to promoting and maintaining the physical, mental and social well-being of workers in all occupations.

With this in mind, it is intended to avoid work-related accidents - defined as unplanned occurrences during the work, which may result in bodily injury, loss, temporary or permanent reduction of work capacity, deaths, production or property damage. [2] [3]

To avoid these accidents and also the occupational diseases mentioned above, looking for a preventive environment, there are different tools that are based on a systematic

evaluation of the spaces, activities or tasks of the company. Quasi accidents are situations reported by any employee of the company as risk situations. They allow a preview of the accident seeking a preventive / corrective action and understanding of its possible causes. The safety visits, allow a systematic evaluation by following a checklist, looking for points to improve, and new strategies to achieve the safety objectives.

Being the focus of prevention, awareness and empowerment of all are an essential behavioral component and an integral part of this context. Taking this into account, we present Behavior Based Safety (BBS), a tool used to reinforce safe behaviors through observation and positive feedback.

In terms of the BBS approach, once the safe behaviors to be implemented in each activity have been identified, checklists are produced in order to record the observation of workers behavior. This observation must, on the one hand, allow feedback to be given to the worker, and on the other hand it should integrate a database for the analysis of the observations collected, which will allow to adjust the way forward in terms of prevention and confirm or define new goals / objectives in terms of safety at work, with the possible change of check lists.

Since it is intended to promote behavior change, it is important to understand how behavior can be explained according to the ABC model "Antecendent Behavior Consequence". "A" refers to the background and is defined as the stimulus or episode occurring before the behavior, stimulus or episode that can result in the behavior itself (goals to be achieved, training / training, rules). The "B" refers to the observed Behavior. The "C" refers to the Consequence, defined as the stimulus or the episode that occurs after the behavior. Depending on this consequence, if viewed as a positive reinforcement or rebuke, behavior in a future situation may be more or less frequent. Despite the importance of antecedents, it is the consequences that most influence our behavior. Following this model, we look for the antecedents but, mainly the consequences of the behavior that needs to be modified. In this way, we will be able to optimize the reduction of the risk behavior and, consequently, to maximize the safe behavior, reducing the frequency of the accidents. [5]

The number of accidents at work in the TRSA (Factory, Central Warehouse and stores) has been decreasing significantly in the last fourteen years. The most marked decrease is in the first years after TRSA integration in the Materis Group in 2004 (renamed Cromology in 2015). From 2004 to 2010, over a six-year period, the number of work-related accidents dropped from sixteen to zero and in 2012 there is even a historic moment of "zero accidents", which is repeated again in 2014. In the years which have followed, to date, this number ranges from zero to an accident, reflecting the investment that has been made, namely in terms of commitment and involvement of all in the safety issue.

Despite the belief that new technologies would eradicate work-related accidents and diseases, studies show the need for risk analysis, the definition of more stringent rules accompanied by the production of information and the promotion of training and awareness-raising activities in the field of prevention of diseases and accidents at work. [4] In fact, the rules

alone, if not accompanied by an awareness of their importance, will not fulfill its purpose. The human element is decisive in the change / prevention and the leaders will have to command this movement, involving all the workers in formative and / or informative actions, in a process of shared responsibility and of qualification for the identification of the risk and perception of the same. Prevention allows for anticipating and analyzing the risks associated with work in the short and long term, making it possible to reduce costs and increase productivity.

With this in mind, in recent years, TRSA has developed tools and initiatives that, by themselves, encourage the involvement of all, training and information for workers and a focus on the prevention of occupational accidents and diseases. We then explored the tools already mentioned, quasi-accidents and safety visits, now in the TRSA context.

The quasi-accidents are registered in the Factory, the Central Warehouse and the stores, by means of a form. All records are evaluated in relation to the pertinence of the presented situation, its risk and easiness of resolution. Thanks to this tool, workers have significantly improved their perception of risk, and this is a step taken in preventing accidents. Having established a monetary incentive, albeit symbolic, to assign workers who present the three most relevant quasi-accidents (according to the three criteria presented above) per quarter, the number of quasi-accidents reported has been increasing significantly, along with the objective (553 quasi-accidents in total: 153 in the Factory and Central Warehouse, 180 in the stores and 220 in the administrative areas).

The safety visits are based on the Behavior Based Safety (BBS) system, starting from the observation of a concrete activity and sending feedback of the same observation. To this end, check lists were developed, which are intended to be improved so that the observation becomes more concrete and specific. Only in this way will the BBS-based approach be improved and not only the desired behavioral change be achieved but also the choice to remain in the "zero accidents". In 2018, a total of 400 safety visits are planned, which translate into 21 visits per month in stores, 10 visits per month in the Factory and 2 visits per month in the Central Warehouse.

It should be noted that while safety visits seek to evidence risk behavior through the aforementioned careful observation (following a checklist), the quasi-accidents seek to identify flaws or defects in the conditions / facilities in which the tasks are performed. Thus, knowing that the causes of occupational accidents can have a human, material or organizational origin, with these tools and the other initiatives that TRSA uses, we have the spectrum covered with regard to prevention.

In view of the above, it is possible to establish a link between the low number of accidents and the prevention policy conducted by TRSA, which is based on an investment not only financial but essentially human and behavioral. The range of initiatives carried out by the company seeks to mobilize all workers, subcontractors and involved in the universe of the company for active prevention, enabling them to identify and perceive risk.

Continuous improvement method

Taking into account the potential impact of correcting / changing behavior, TRSA decided to focus on safety visits and improvement of existing checklists, thus working on the purpose of Behavior Based Safety (BBS). It is within this scope that the internship is integrated, in the search for continuous improvement.

The BBS as a complementary resource will expand the effects of the other tools and initiatives associated with the prevention of occupational accidents and will allow a concrete and objective measurement of the behaviors. A systematic inquiry is always made, taking into account the underlying motivation of the behavior in question, and may thus increase the frequency of safe behavior or decrease the frequency of risk behavior. It will involve a continuous effort that will, consequently, provide sustainable results. [5] [6] [7]

Methodology

- Intervention team:

The main obligations in this context are the participation in training for observers, with special relevance to their impartiality in visits. This same training encompasses not only a detailed explanation of the ABC model, the feedback, the goals and the importance of the example, but also the method and posture to adopt during the safety visits. It is also crucial that the observers understand all the terms and checks mentioned in the check lists.

- Check-lists:

Creating the check-lists was the main focus of the six months spent in the factory.

Accident or quasi-accident reports have identified the behaviors that put workers in this situation. The analysis of risks allowed and facilitated the identification of the hazards associated with a specific work station and the identification of the tasks that can originate or even promote risk behavior. In an entirely different register, the detailed observation of the tasks carried out by the workers at their work stations served as a validation for the items already identified by means of reports and risk analysis, adding new behaviors that, although involving a risk, did not result in serious injuries, and were not mentioned in the documentation analyzed before. On the other hand, since workers are the "work specialists they develop", when they are questioned about the way their work is done, we get a vision that often does not appear in any of the other mentioned documents, and that must be reflected in the check-lists. [7]

Taking into account all these information, sixteen different check lists were developed for sixteen different workstations of the company (factory, warehouse and stores). These check-lists are composed of lists of safe behaviors, as opposed to identified risk behaviors. The identified risk behaviours were rewritten in a positive action format. In addition to these behaviors, to the improved lists, were also added some preventive check-points associated with the facilities and conditions in which certain tasks are carried out, and not so much the behavior of the observed worker.

All points presented are observable/ measurable and are preventive measures that,

in a more or less direct way, contribute to the adoption of safe workplace behaviors that need to be reinforced. Regardless of the area in question, the checklists are essentially verification of the use of the required personal protective equipment, proper handling of raw materials / finished product and associated shelves, proper use of tools, equipment and vehicles, the conditions of the place of work and the behavior / attitude of the operator concerned.

A representative exemple is displayed in tables 1 and 2.

- Behavior observation and feedback:

As a rule, the observers go to the workplace that will be the subject of a safety visit and inform the observed worker that the visit is about to begin. The worker must carry out his duties as if the visit was not taking place. For about 15 minutes the tasks performed are observed, as well as the facilities and conditions under which the same tasks are done. All check-list points must be checked at this time. Potential comments and observations should be recorded on the checklist itself.

- Analysis of data collected and definition of new goals and objectives:

Once the risk behaviors have been identified, it is important to have a way to measure their evolution to/ adoption of safety behaviours. It is also pertinent to be able to do a graphical analysis of the results, to later facilitate the collective feedback. For this, it is recommended that a statistical treatment be made with the following calculations/ graphs (based on equation 1):

$$\%\ \boldsymbol{Achievements} = \frac{\boldsymbol{n^{\underline{o}}\ Conquered}}{\boldsymbol{n^{\underline{o}}\ Conquered + n^{\underline{o}}\ Not\ conquered}} \times \mathbf{100} \qquad (\mathbf{1})$$

- Percentage of preventive behaviors won total;
- Percentage of preventative behaviors achieved (by block of evaluation: EPI's, Body position, Working conditions, among others);
- Graph of percentage of preventive behaviors achieved vs. total Time;
- Graph of the percentage of preventive behaviors achieved (per block) vs. Time;
- Number of observations made / work zone.

- Communication to all workers:

It is important that all workers feel that their effort is not only being recognized as it is influencing the defined behavior change. Once the effort is recognized, everyone gets even more involved, and ideally, it creates an environment where people want to be targeted for safety visits. They feel responsible not only for their own attitude and behavior but also for the attitude and behavior of those with whom they work.

In the TRSA context, the above mentioned collective feedback can be given on a recurring basis: taking advantage of the "Minute of Safety" and occasionally discuss points to improve or to celebrate (symbolic) small and great achievements. This rich communication environment will facilitate motivation, which in turn is essential in this approach.

BBS- MasterMix

Observers:
Date:

1. Protective equipment:	Prevention	Conquered!	Not Conquered	Not observed	Quase Acidente
1.1. Helmet / Cap	– Use in areas where there is a danger of head injury.				
1.2. Gloggles / Visor	– Wear protective goggles during activities where operators are exposed to chemicals.				
1.3. Workwear / Slippers	– Wear appropriate safety clothing and shoes to protect your arms and legs. – Wear safety shoes inside the Factory.				
1.4. Footwear / Toe cap					
1.5. Hearing protection	– Use hearing protection in areas exposed to noise				
1.6. Gloves	– Wear suitable safety gloves when working with mechanical and / or chemical hazards *				
1.7. Mask	– Wear the proper mask during operations exposed to dust. *				
1.8. Conservation	– Keep the PPE in good condition (and when necessary, require replacement).				
Comments and % achievements **					

2. Raw material	Prevention	Conquered!	Not Conquered	Not observed	Near Accident
2.1.Grounding of storage racks	– Check that the equipotential bonding between the two storage racks is in good condition.				
2.2. Correct packaging, identification of the raw material and its associated risk, on the shelf	– Ensure that the storage compatibility rules of the MPs are met according to the attached table. – Check the proper packing of the MPs on the shelves: drums and vats in the appropriate holders and pallet bags in good condition. – Check that the MP (bagged / drums / vats) are placed on the shelves in order to allow immediate identification of the MP and associated risk. The identification tag should be forward and at the base of the pallet. – Check that all the containers used for MP weighing (buckets and barrels) are properly identified.				
2.3. The shelf is in good safety	– Check that the shelf is in good condition and has good safety conditions (fixing, stability and compliance with the maximum permissible loads). – Check that both the guards and the side supports are fixed to the floor.				
Comments and % achievements **					

3. Position of the body	Prevention	Conquered!	Not Conquered	Not observed	Near Accident
3.1. Position of the body during movement of loads	– Bend your knees when lifting loads. Lift the weight without twisting the body. – Ask for help when handling drums or heavy loads (or when you are not sure of the weight of the load). – Use the equipment aid whenever possible (stacker / pallet truck), including as a lifting platform. – Proper posture when pushing the manual pallet / scale carrier.				
3.2. Body parts are at a safe distance	– Take away the body of equipment / machinery, in particular moving parts, which can entrap, clamp, cut and / or burn. – Do not clean running machines.				
Comments and % achievements **					

4. Tools, equipment, vehicles	Prevention	Conquered!	Not Conquered	Not observed	Near Accident
4.1.Use of forklift trucks	– Check that the operator has the training necessary to drive the truck. – Drive with the seat belt. – Reduce speed and always keep the forks down. – Park the truck securely (with brakes, forks at the bottom, and without the key in the ignition). – Always check that the load is well conditioned (the base of the pallet must be stable in order to ensure safe handling). In the movement of full pallets, raise the pallet to a safe height. – When visibility is obstructed by the load, drive in reverse. – Always approach the approach of doors / intersections to alert presence. – Ensure that there is sufficient safety perimeter and visibility in the loading / unloading maneuver. – Observe pedestrian traffic lanes. – Respect the traffic rules.				

*see by reading the safety codes of the raw materials used and the existing signs, if it is necessary to use these PPE's

** %Achievements = Number Conquered / (Number Conquered + Number not conquered) × 100

Table 1- Check-list BBS- MasterMix (front)

4.2. Use of Equipment / Tools	– Work only with tools that are in good condition (check that the shank used has a retractable blade). If necessary, request new tools from your Chef. – Check that the ladders in use are in good condition, with adequate height and non-slip bases. – Check that the balance wheels are in good condition and lubricated. – Ensure that at the end of the task everything returns to its place. – Close all taps at the end of activities or in case of emergency.				
4.3. Use of machines	– Check that the instructions for use of the equipment are legible. – Check that the labels of the buttons are legible. – Check the correct use of the handle bags. – Check that the dedusting system is working. – At the beginning of the shift check the safety devices of the machines. – Do not remove the safety devices from the machinery. Metal nets shall be maintained throughout their manufacture. – In case of emergency, lock the machine immediately. – Check that the machine has an emergency button and that the operator knows the location of the emergency button.				
Comments and % achievements **					

5. Work conditions	Prevention	Conquered!	Not Conquered	Not observed	Near Accident
5.1. Storage and cleaning	– Check that the work area is kept clean and tidy. Check that no bags or packages are left on the floor. – Check that when only part of a bag is used, the remaining raw material is well conditioned. – Check that the position of the pallet during the introduction of the raw materials is adequate and there is no risk of tripping. – Check that the floors are dry and free of obstacles, avoiding slips or tripping. – Avoid spilling liquid on the floor. There should be a cleaning kit near the site. – Do the separation of waste and place them in the appropriate places. – Check for any damage on the pallet, replace it if present, or reinforce it by placing another pallet underneath.				
5.2. Workspace	– Remove PPE only at the end of the shift, during rest periods and meal breaks, and kept in a clean place. In the case of disposable PPE, it should be placed in a separate waste collection container. – Leave the workplace safe.				
5.3. Use of footpaths	– Walk along footpaths. – Pay attention to the movement of forklifts. – Check that the footpaths are properly marked and unequipped.				
Comments and % achievements **					

6. Behavior	Prevention	Conquered!	Not Conquered	Not observed	Near Accident
6.1. Visual focus	– Verify that eyes and attention are dedicated to running tasks.				
6.2. Communication	– Verify that verbal or non-verbal interaction does not affect safety.				
6.3. Pace of work	– Check that the working speed in progress is adequate;				
6.4. Safety Minute	– Be aware of and take advantage of the safety information provided in the minute and the Prevention measures encouraged by TRSA.				
Comments and % achievements **					

Final notes:

Table 2- Check-list BBS- MasterMix (back)

** % **Achievements =**

** %Achievements = Number Conquered / (Number Conquered + Number not conquered) × 100

Conclusion

The main focus of the work developed, as previously mentioned, were the sixteen checklists to structure and guide the safety visits.

The check-lists intend to reduce not only the number and severity of occupational accidents and occupational diseases, but also the risk associated with each specific task / area.

The check lists themselves would have a limited impact, if used alone. In order to maximize the results that the safety visits, but specially the check-lists can accomplish and, taking into account the motivation and involvement of TRSA's management in the safety dynamics, several actions were also formulated. These actions are complementary to the entire structure and procedures already carried out by the company.

So, the importance of a secure leadership as well as the involvement of all workers is strengthened. To achieve this, communication between management, the intervention team, workers in general, as well as the training / information specific to each of the parties involved must be reinforced. The use of different check lists, distinct for each of the jobs, will concretely improve the safe behaviors to be adopted or reinforced. Of these same checklists, the points not won are of special importance and it is essential to show that there are consequences associated with these undue behaviors. With regard to these behaviors, observers must collect as much information as possible so that the subsequent ABC analysis is facilitated. Equally important is to do a graphical analysis of the results collected through checklists, to facilitate not only the measurement of the impact of security visits, but also to define immediate actions, new goals to be achieved or even to change the check lists themselves. In this way it is also possible to return feedback to all involved, which is crucial as it makes it easier to hold everyone accountable, recognizing that each one's behavior influences the desired behavior change.

Finally, it seems relevant to me to praise the way everyone involved in the TRSA universe takes seriously, and as his, the company's first value: "Safety First." This same involvement, as already mentioned more than once, is a major key in the results / impact of the investment made, this time in behavioral safety.

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