

Improvement of the enterprise based on model of OSH management system

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ABSTRACT

Purpose: The article examines the concept and the way to meeting the requirements implemented health and safety management system in industrial enterprise like Coking Plant. Based on analysis proposed improvements, which would aim to improve working conditions in the company.

Design/methodology/approach: The proposed improvements are designed for specificity of work, production scale and nature of possible threats in the analyzed enterprise.

Findings: The analysis showed that health and safety management system is implemented with PN-N 18001. Due to the large number of possible threats that may arise during the processing of coke reported a slight decrease in accidents at work and occupational diseases. It is therefore necessary to implement improvements to the already functioning occupational health and safety management system in the enterprise.

Research limitations/implications: The proposed changes to decrease accidents at work, which in will turn enhance the safety of the selected company.

Practical implications: Implementation of the improvements will increase the awareness of staff in relation to existing threats. Improvements that were proposed did not require large financial outlays and changes in the organization and working time positions. However, in big companies such as Coking Plant, even the smallest step towards improving safety at work is important and desirable.

Originality/value: Continuously improving the health and safety management system to improve working conditions.

Keywords: Safety and health management; Improvement the safety; PN-N-18001 standard; Model of safety and health management system

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1. Introduction

Competitiveness and market share of any company focused on development is currently being determined by any method of improving the company. Businesses through the current market situation are forced to seek new sources of competitive advantage [1]. For this reason, companies should not narrow its field of action

for implementation of new technical and organizational solutions. It is recommended to take care of the highest quality products, improve conditions for cooperation, or to offer an attractive price. Another important factor in achieving success on the background of the business is also the full potential of skills, creativity and commitment of employees at all levels. However, the fulfillment of all these actions is to implement solutions to ensure high standards of safety. High level of security has become an important

criterion that distinguishes the company from the competition [2, 3]. It turns out that providing a safe working environment is also cost effective for businesses, not just for their employees.

It should be noted that product quality, especially on productivity have a significant impact conditions. Employers should consider all management functions, to know and deploy quality and environment management systems, and then integrate them with the health and safety management system [4, 5].

Occupational health and safety management system (OSH management system) shows the way to improve the organization in terms of ensuring safety, which should be the basis of its business. PN-N 18001 regulates the scope of activities necessary to implement a properly functioning system of health and safety management. The starting point in the PN-N 18001 is a health and safety management system model which determines the direction and sequence of actions within the system [6, 7].

2. Model of health and safety management system and the Deming cycle

Model of health and safety management system not only organizes range and sequence of basic operations and development company, but also indicates the repeatability of these measures thus stressing that improvement is a long-term [8].

Both the Deming cycle and health and safety management system model from the standard PN-N 18001 are built with the same successive actions. Figure 1 shows the model OSH management system and the Deming cycle.

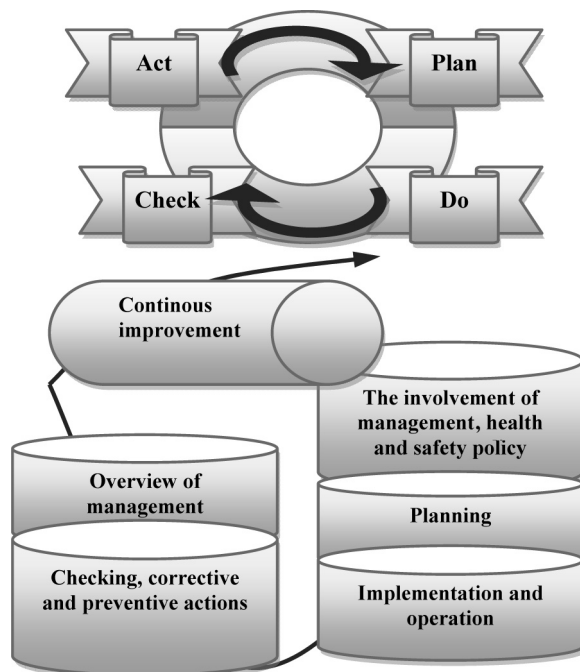


Fig. 1. Comparison of model Occupational Health and Safety management system and the Deming cycle [9, 10]

Occupational health and safety management system from the PN-N 18001 was created by the process of continuous improvement with regard to the stages contained in the Deming cycle. Turned out to be an effective concept and so far irreplaceable in terms of management, which proves create a model OSH system management on the basis of Deming cycle [8].

The first stage appearing in both the Deming cycle, as well as a model system with the PN-N 18001 standard is the stage of planning, which includes the definition of objectives and action plans within the organization. Adopted the findings can be made based on preliminary surveys which relate to existing procedures. Preliminary surveys are intended to facilitate the verification of the order scheduling the most urgent measures of health and safety [11, 12].

The next stage in this model is the implementation and operation, the equivalent of the “Do” from the cycle of Deming. Step “Do” covers a number of important measures for the smooth implementation and effective functioning of the health and safety management system.

The concept of implementation and operation were included of the following tasks [13]:

- identify the organizational structure, responsibilities and powers,
- provide the necessary resources that will be used for the implementation and operation of the system,
- establish the necessary competence and training and awareness building and motivating employees of the plant.

Further analysis it shows a further similarity of both concepts. The next step contained in the model of health and safety management system is to control and corrective and preventive actions. This step is necessary to develop a monitoring system for all activities that can have a significant impact on safety. The controls implemented and operating system takes place by means of monitoring and audits carried out. Overview of health and safety management system is carried out by management and includes [14]:

- results of audits,
- the extent to which objectives have been achieved and the tasks were implemented,
- date, relating to changing conditions.

Based on the results of the audits shall be determined to what extent, achieved its objectives and tasks have been completed. By analyzing and drawing conclusions from the audit can take corrective action that will improve system. As a result of such proceeding, “full circle” and returns back to the planning of activities, including time management system improvement. A similar situation occurs in the Deming cycle. The next steps are to check and improve a system in place. When you perform these steps, check the effects of the work and improve those aspects that do not meet the company's expectations. In this way, the cycle begins again, as any corrective action you need to plan and deploy [10, 14, 15].

3. Deming cycle in OSH management system in the selected enterprise

Health and safety management system in enterprises, which are extended in terms of infrastructure and threats should be

considered as a basis for continuous improvement of all activities, in particular measures to improve safety.

This article analyzed the implementation of efforts to improve the working conditions in Coking Plant. The company operates by the long time and has many years experience in the industry. Coking Plant produces coke and employs 1,700 people. Against the background of Polish enterprises coke industry stands out above all the high level of applied technology. Following the introduction of coke dry quenching technology began to produce dry coke with very low moisture content. Coking Plant as one of the few in the world is engaged in production of dry coke, which is due to these advantages is the fuel environmentally friendly. All the new technologies introduced in Coking Plant protect in the greatest extent air, water courses and soil.

In the management of Coking Plant have been implemented and are constantly maintained integrated management systems. In 1995, implemented a quality management system according to ISO 9001:1994. After adjusting the system to the new edition of ISO 9001:2000 was introduced mutually reinforcing another two systems, environmental management and health and safety. Thanks to this function Coking Plant integrated quality management system according to ISO 9001:2008, environmental management system according to ISO 14001:2004 and occupational health and safety management system PN-N18001: 2004 [16].

The first step to improve the safety was to determine the mission, which expresses both the commitment and expectations of the analyzed enterprise after the implementation of OSH management system. Figure 2 shows the mission of Coking Plant regarding health and safety.



Fig. 2. Subject mission of Coking Plant for OSH management system [16]

Mission of the analyzed enterprise presented the future direction of development structure of OSH management system in a selected company.

Table 1 shows analysis of the OSH management system functioning in the Coking Plant in terms of achieving some requirements of the PN-N 18001 regarding phases of Deming cycle.

In the case of Coking Plant develop system procedures and policies of the system was the first step to prepare the structure of OSH management system. Planned objectives included in the policy system is determine the direction for further action within the system.

After determining the scope of duties and responsibilities of all employees in Coking Plant identified financial, technological needs and range topics training.

The purpose of the designation of the effectiveness of actions implemented in the analyzed enterprise all organizational units of the company are controlled. All elements of the health and safety recognized by Coke Plant as the most important factors affecting the working conditions are monitored. In the case of the monitoring is executed also the *Schedule working environment* by the Main OSH Specialist. When developing this schedule are taken into account guidelines, decisions and external owned laws. The tasks of the managers of organizational units include:

- timely notification of measurement demand measurement,
- perform monthly inspections of working conditions,
- realization the orders issued by regulatory bodies.

The final task of monitoring is to provide reports and statistics on accidents and occupational diseases based on your measurements and data analysis. The faculties of enterprise are equipped with measuring devices and warning systems against risks, such as *Early fire detection system*, which also requires monitoring. For this purpose are realised periodic checks of technical condition this system by the Works Fire Brigade personnel. Periodic checks the technical condition of are subjected to the gas detectors in accordance with their instructions. Results of surveys are recorded in the appropriate documentation. Review is performed by an authorized officer. With reports of audits conducted in the organizational units of Coking Plant is possible, not only assess compliance OSH management system with the standard PN-N-18001, but also we could assess the effectiveness and efficiency of the system in the audited areas.

Effectively functioning system of managing occupational health and safety can be achieved while maintaining the principle of continuous improvement. Continuous improvement involves taking actions that are designed to improve safety at the workplace and to improve the system. Properly planned corrective actions can effectively eliminate the cause of the incompatibilities in the system and prevent a recurrence of these discrepancies. In addition to the actions that eliminate the cause of the incompatibilities in Coking Plant is planned and carried out tasks aimed at removing the causes of potential non-compliance in the system. Procedure in case of preventive action is also described in the procedure of corrective and preventive actions. By the obtained information on potential threats to possible customize the form of preventive measures to actual needs of the enterprise. Analyzed for potential incompatibilities are all organizational units located in the Coking Plant.

Implementation and certification of OSH management system in the selected enterprise was the first step to improve safety standards. Because of the specificities and scope of activity of the enterprise, the safety management should be of particular importance to leadership.

Table 1.

Characterization of Coking Plant in terms of implementation of some activities under the OSH management system in relation to the cycle phases Deming [16]

Phases Deming cycle	Component the OSH system	Realization of task in Coking Plant
PLAN	<i>the objectives of health and safety policy</i>	<ul style="list-style-type: none"> to operate in accordance with the laws and rules governing health and safety, continuous improvement and upgrading the skills of employees, striving for continuous improvement of safety conditions on the positions through the implementation of modern technical, technological and organizational solutions, ensuring resources and means to achieve the objectives of safety policy
	<i>structure, permissions</i>	main role in implementing and maintaining the health and safety management system as a representative fully Plenipotentiary management for Integrated Management Systems, appointed by the CEO
DO	<i>trainings</i>	<p>the thematic scope of trainings are:</p> <ul style="list-style-type: none"> amendments and changes in legislation regarding health and safety, types of hazards in the workplace, tutorials regarding the applicable safety rules in the Coking Plant
	<i>responding to accidents and serious breakdowns</i>	in the Coking Plant is prepared for this aggregate <i>List of major accidents</i> , after which it is redistributed across the enterprise.
CHECK	<i>monitoring</i>	measurement of conditions set at <i>Working environment measurements schedule</i> , comparing the results of risk assessment with the base state, examination and analysis of accidents and occupational diseases.
	<i>audit</i>	scheduling of internal audits by the Plenipotentiary, then conducting audits and preparing audit reports
ACT	<i>corrective actions</i>	after the occurrence of non-compliance The main OSH Specialist shall determine the reasons for its creation. Then the Heads of <u>organizational units plan and implement corrective actions</u>
	<i>preventive actions</i>	The Main OSH Specialist analyzes the organizational units of Coking Plant in terms of non-compliance, and then gives orders the managers in terms implement of preventive measures.

4. Assessment of compliance with the requirements of the PN - N 18001 of OSH management system in Coking Plant

The process of analyzing the state of health and safety after introduction the OSH management system is one of many management tasks in the enterprise conducted under the Labour Code. Assess the condition of the working conditions should be before and after the introduction of technological change, organizational and modernization.

The Coking Plant performed a comprehensive assessment of working conditions. Making the evaluation of working conditions is preceded by a monthly review of the safety of all departments. In 2010 conducted verification of factory working conditions did not show major deficiencies, and their condition was considered good.

In accordance with adopted policy of continuous improvement the OSH system has been made a series of modernization and renovation, and also introduced new solutions that aim to improve safety for workers. With the beginning of June 2010 in Coking Plant was imposed on all employees obligation use personal protection measures in the form of protective helmets and dust goggles. State District Inspector of Labour and National Provincial Sanitary Inspector has issued in 2010, only one decision which heard the occupational disease of an employee who is employed in the Maintenance Department.

After analyzing the number of accidents due to the profession turned out that the least accident occurred at the work of employees in the Electricity faculty and OSH Faculty at work. The largest number of accidents occur at work of employees in the Coke production department and the Coal derivatives production department. In Figure 3 are shown the various departments of accidents in Coking Plant in 2009 and 2010 year.

The analysis of the accident protocols demonstrated that the most common causes of accidents at work in the Coking Plant are:

- inappropriate technical solution or design defects in the material component,
- incorrect performance of the material factor,
- incorrect operation of the material factor,
- abnormal organization of work,
- wrong job organization,
- inappropriate employee behavior.

**Accidents on the faculties of Coking Plant
in the years 2009-2010**

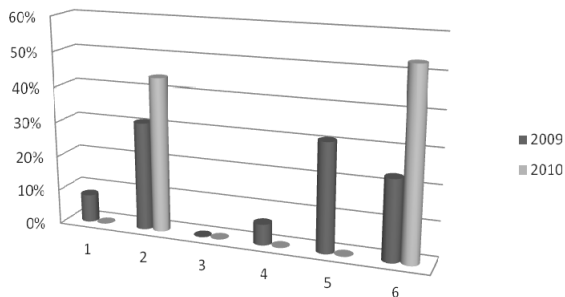


Fig. 3. Accidents at work in the Coking Plant in 2009 and 2010 in various departments: 1 – Quality Control Department, 2 – Maintenance of traffic Faculty, 3 – OSH Faculty, 4 – Electricity Faculty, 5 – Coal derivatives production department, 6 – Coke production department [16]

Within the Coking Plant there is a significant number of points of first aid, they work for persons trained in first aid. All points are located in places easily accessible to workers and to carry out a rescue. Accessible and ubiquitous:

- list of emergency phone numbers,
- list of people trained in first aid,
- washbasins with water.

Evaluation of OSH System operating in the Coking Plant with requirements PN-N-18001 was based mainly on the analysis of system documentation and information obtained during interviews conducted during visits to the company.

Table 2 shows the evaluation of OSH system functioning in the Coking Plant. Requirements PN-N 18001 in Table 2 were selected because of the available quantity of obtained information.

The occupational health and safety management system implemented and maintained in Coking Plant in formal terms should be evaluated very well. System documentation meets all the requirements of the PN-N 18001 while maintaining a prescribed hierarchy, and at the same time is structured in a friendly manner finding needed information. Due to the fact that environmental management systems, safety and quality are closely linked and complement each other, some of the chapters of the Book of Integrated Management Systems describe aspects that can be applied to all three management systems. All the chapters in the Book of Integrated Management Systems are assigned to reference the particular sections of the PN-N 18001. With this form, you can easily read the information, which apply only to OSH management system.

A lot of the information to evaluate the system functioning in the Coking Plant have provided the interviews conducted during visits to the company. Of the obtained on this basis the information indicates that a functioning OSH system could bring even better results if they increase the level of employee involvement in documenting the observed discrepancies.

In the Coking Plant collecting information on existing events potentially accident take place through the collection, recording and analyzing the forms titled as - "Notification the potential accident events " The information obtained in this way will serve OSH Committee to determine the form and scope of prevention activities to improve working conditions, where there were discrepancies. Unfortunately, employees are reluctant to fill out forms, and they only saying direct observations to his superiors. Assuming that the cause of this low involvement of employees in filling out forms is their fear of the responsibility for their insights, you can make some solutions that could improve the performance of this aspect of the system occupational health and safety management system.

5. Proposals for improving the OSH management system in the enterprise

Analysis of the OSH management system in a Coking Plant demonstrated that effective improvement of safety at the workplace as well as the smooth functioning of the health and safety management system largely depends on the involvement of employees in the implementation of their tasks. Absence of appropriate knowledge about the consequences of ignoring potential accident events led to a situation where the effects of a systematic approach to safety did not meet previously established expectations.

To change this situation, are proposed two solutions that can help to reduce the number of accidents at work. Table 2 shows that two proposals for changes attitudes of employees regarding documenting their observations on the forms. The first relates to plan and conduct training for employees working in positions for the reporting of incidents potentially accident. The majority of non-compliance and accidents results from not knowledge potential accident events, which preceded a serious accident. The potential accident events may lead to serious accidents. This is very important, whether potentially accident took place once a week or once every 3 months. Frequent repetition situation of this type creates circumstances conducive to accidents. Realizing this problem, workers can contribute to a gradual change in approach to reporting potential accident events. For this reason, the subject area of training should be broadened to include issues related to potential accident events.

Table 3 shows an example of a training program for the identification of potential accident events that may happen in the workplace.

The first point in the training program is to present employees purposes of training. It should be emphasized, that the aim of training is to acquire by the employees basic knowledge about the potential accident events and the principles to report them to his superiors. The next step in implementing the training program will define the notion of potential accident events. The trainer

should try to find out how employees understand this concept. In the order to understand the concept of potential accident events can be helpful pictures and short videos showing inappropriate behavior at work, which can lead to accidents.

Particular emphasis should be given to clarify the purpose and principles of reporting of potential accident events. The trainer should constantly convince employees that each completed form to indicate that not everything is working well in the workplace approaching the company to provide them with safe working conditions. It is important that employees recognize the need for assistance on their part for the purpose of improving conditions in the work. It is not appropriate that staff treat to fill the form as an

additional burden and responsibility. The structure of the form consists of several fields in which to place a fairly detailed information. The form should include information concerning the location, cause and circumstances of the incident. Construction of a multi-faceted form does not encourage employees to its fill, but the design of structurally less complex form could, however, mean that it does not fulfill its role. The degree of detail of data placed on the form is important to determining the types and scope of preventive measures aimed at eliminating the conditions that favor an accident at work. Presentation of these facts to workers aims to explain them, which aspects guided by the design of the application form.

Table 2.
Evaluation OHS Management System functioning in the Coking Plant [16]

The requirement of the PN-N 18001	Is the requirement of the standard met?	Alternative ways fulfill requirements	Arguments for the opinion of the requirement
Establishment of the OHS policy	☑		establishment of OSH policy, which is freely available on the website of Coking Plant
Planning objectives and activities of OSH	☑		Set out timetable for achieving goals. Shall be the annual action plans. The general objectives are contained in the OHS policies
Providing effective solutions to ensure participation of workers in the implementation of OSH system	☑	1. Training of employees in terms the reporting of incidents potentially accidental 2. Appoint the leader of the working group	Employees reluctantly write reports about the observed non-compliance. They inform superiors of the situation only verbally
Develop procedures for access and identification of legal requirement	☑		Information concerning the amendment or establishment of new legislation are checked through web browsing and review the source press
Establishment the organizational structure, responsibilities and powers of employees	☑		The organizational structure with division of responsibilities and powers is set out in the Book of Integrated Management System
Development documentation system OSH	☑		Documentation of OSH management system is complete, transparent and understandable to people outside the business environment
Carrying out hazard identification and risk assessment at work stations	☑		For the hazard identification and risk assessment are used in the Coking Plant program Risk Score, a procedure was written in the form of procedure B1 - "Hazard identification and risk assessment"
Develop and establish a procedure for checking the OSH system	☑		Under the verification the OSH system on Coking Plant developed internal audit schedule, schedule of measurements of environmental conditions of work and then verify data collected using statistical methods

Table 3.
The training program about topic related to potential accident events in the workplace

SUBJECT OF TRAINING:	
" POTENTIAL ACCIDENT EVENTS IN THE WORK ENVIRONMENT"	
Duration:	<i>one day</i>
Type of training:	<i>workshop</i>
Materials for training:	<i>multimedia presentation, materials for the exercises movies, which are warning against ignoring potentially accidental events</i>
Purpose of training:	<i>acquire knowledge and skills to reporting of potential accident events</i>
<p>Program of training:</p> <ol style="list-style-type: none"> 1. Present to employees purposes of training. 2. Event potentially accident - the definition 3. Purpose and principles reporting the event potentially accident 4. The role of detailed data on the circumstances of the incident in further proceedings 5. Practical work - filling in the form "Application for improving working conditions." 	
Summary, closing of the workshop	

In the last section of the training program the employees will be challenged to fill in a form that can be titled-*"Application for improving working conditions"*. The name of the form shows the main purpose his filled. Potential accident events can describe in words, or play a video showing this type of event, which will encourage employees to self-learn.

Conducting such training once a year should change the attitude of staff for filling out forms, which result in improvement of the occupational health and safety management system. If the training does not change the situation to a level satisfactory must be developed a new solutions.

An alternative solution could be the delimitation of a leader for each group of workers of individual organizational units of Coking Plant. The leader of the working group should have basic knowledge about which of the events are recognized in the Coking Plant as potential accident events. The leader of the working group must be a person, who has the ability to identify events potentially accidental, is communicative and has a lot of trust among employees performing the same job. The primary responsibility of a leader would be to filling out forms on behalf of workers from the working group. The task for leader is learn as many details as described events from the worker.

Leaders of the working group can be nominated by their head of organizational unit or be elected by their co-workers. Due to the fact that the leader of the working group will be in addition to his work had additional responsibilities, you should offer him in return for the results of his work in this area monetary bonus once a year or a subsidy to holiday leave. The premium amount will depend on the degree of improvement of working conditions in the sector organizational unit of Coking Plant.

Figure 4 presents way proceeding with potential accident events notifications in schematic form.

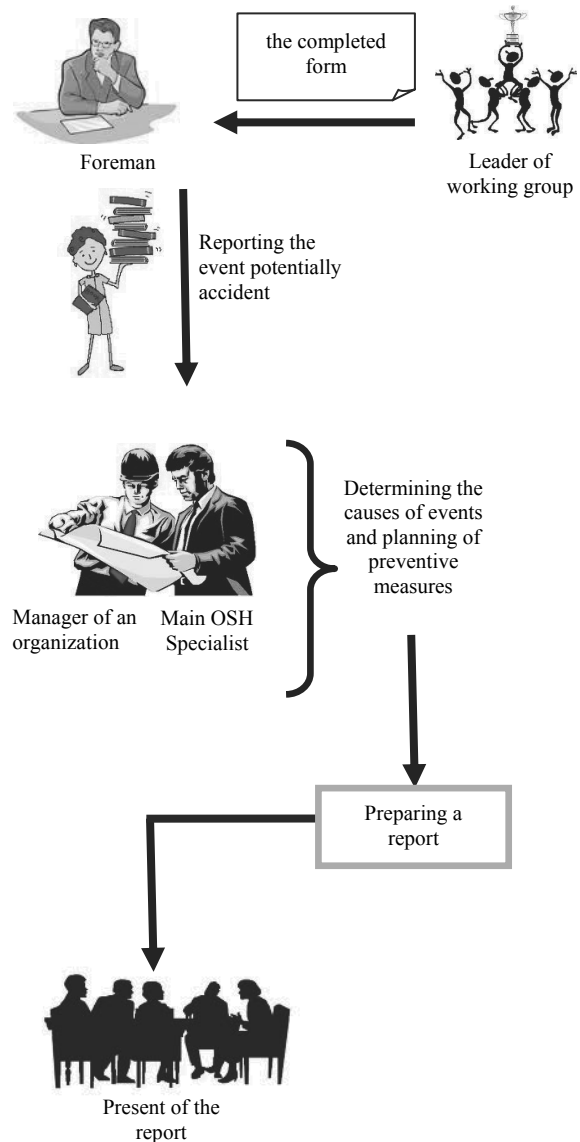


Fig. 4. Scheme proceeding with event potentially accident

Reporting the incident allows fill the form by the leader, which then goes to the foreman. Notification potential accident event is recorded. Manager of an organization in which the event occurred shall consult with Main OSH Specialist. They determine causes of the event and preventive measures to be applied to prevent the occurrence of similar casualties. The Report of the action taken regarding reported incident is the responsibility the Main OSH Specialist.

The diagram in Figure 4 differs only one element of the organization chart of actions already implemented in the Coking Plant, so the introduction of a minor change is not labor intensive

and not carries a huge cost. Promotion of staff for the leadership of their employees group is for him distinction, which in turn should be a strong motivation to work. Amendments to the existing procedure will differ only in that the filling in the forms will be only one person of the following groups of staff positions. Other workers also took part in the improvement of working conditions, but can not be held directly accountable for their observations. Implementation of training requires more time and effort, but with proper organization can bring tangible benefits.

6. Conclusions

Effectively functioning system of OSH management can be achieved only with maintaining the principle of continuous improvement. Conditions in the workplace is evolving along with the decision to the interference of all employees in the area of potential accident events. Coking Plant has decided to involve all employees in improving the system by reporting their observations in respect their workstations. Employees was rather sceptical approaching the issue. Therefore, are carried out the monthly inspections of workplaces in order to detect discrepancies that could cause an accident. Treatments of this type determine further action to improve work conditions and enable proper functioning of the OSH management system.

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