THE ROLE OF SAFETY COURSE FOR WORKPLACE SAFETY SYSTEMS IN AUTOMOTIVE TECHNICIAN TRAINING

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Abstract

This article describes briefly about various stages in automotive technology education in workplace safety and the influence of the safety course. The purpose of the automotive technology education program is to create awareness about work, workplace, employee safety, resource and how to increase energy efficiency while minimizing waste and environmental pollution. It has been argued that the effects of safety training extend to safety-related processes during service and maintenance at works in auto repair shops. Development of modern automotive technology and technology for the production process, after the sales service, maintenance and quality service are vital for sustainable competition. This study aims at providing workers occupational safety and to help people involved in the automotive repair shops in reducing their chances of work accidents; it is purposed at for managers and operators; and identifies some of the safety problems for common vehicle operations in automotive repair shops and prepares the trainees in solving them.

Key words: occupational safety, workplace, automotive repair shop

OTOMOTİV TEKNİKERİ EĞİTİMİNDE İŞ GÜVENLİĞİ DERSİNİN İŞYERİ GÜVENLİK SİSTEMİ İÇİNDEKİ ROLÜ

Özet

Bu çalışmada otomotiv teknikeri eğitiminde iş güvenliği dersinin işyeri güvenlik sistemi içindeki farklı aşamaları kısaca açıklanmaktadır. Otomotiv teknolojisi programının amacı; iş, işyeri, çalışanların emniyeti ve kaynaklar hakkında farkındalık yaratmak iken aynı zamanda atıkları ve çevre kirliliğini azaltırken enerji verimliliğinin nasıl artırılacağının öğretilmesi amaçlanmaktadır. Oto tamirci işyerlerinde servis ve bakım esnasında güvenlik ilişkili işlemlerde iş güvenliği dersinin etkilerinin yaygınlaşması tartışılma konusudur. Modern otomotiv teknolojisinin ve imalat işlem teknolojisindeki gelişmeler, satış sonrası servis, bakım ve servis kalitesi sürdürülebilir rekabet için hayati önem taşımaktadır. Bu çalışma otomotiv tamircilerindeki işyeri çalışanlarını mesleki güvenlik açısından bilgi sağlayacak ve iş kazası risklerini azaltacaktır. Aynı zamanda yönetici ve taşıt sürücülerinin eğitilmeleri sonucunda yaygın güvenlik problemlerinin azaltılabileceğine dikkat çekmektedir.

Anahtar Kelimeler: mesleki güvenlik, işyeri, otomotiv tamircileri

1. Introduction

Today air pollution is one of the most important problems and constitutes most of the environmental pollution. Atmospheric pollution is becoming more serious and petroleum deposits on the earth are becoming less and these are the two serious problems that the world faces in 21st century. According to Environmental Protection Agency (EPA) data, 44% of hydrocarbon emitted that lower air quality in atmosphere results from the transportation sector. The automotive manufacturers should ensure that the environmental regulations of all the countries are met. The majority of emission is caused by various chemical compounds that are either hazardous or poisonous because of combustion reaction. Examples are unleaded petrol (eradicating harmful lead additives), detergent additives (that have increased fuel economy and increased engine lifetime), oxygenated fuels (that improve fuel efficiency) and catalytic converters (to reduce carbon monoxide, volatile organic compounds and NO_X emissions) (Bata et al., 1994; Bauer, 2004; Cetin, 2006). Therefore, hazards of

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combustion process type and exhaust emissions need to be identified in order to provide safe workshop conditions for workers or students.

In the 1980s, the science in safety and human factors as a theoretical and practical technical change was observed in the management and organization concepts. Work injuries continued to be a major issue for employers economically and all companies had to implement some sort of suitable safety programs for their working environment. There were several accepted definitions in the open literature for the human factors. The UK has one of the world's best records for workers' health and safety. Nevertheless, in the year 2003/2004 (April to April), there were 235 fatal injuries to workers, almost the same as during the previous year and the fatal injury rate to employees was the same in 2003/2004 as in 1999/2000, and that for the self-employed in 2003/2004 was the same as a decade earlier. This is due to the involvement of various elements of human and organizational factors and the presence of different interaction levels within the working environment which can influence safety performance. Behavioral approaches to safety management are commonly implemented within organizations in order to improve safety and reliability. There were four main interaction levels that were taken into consideration: workers themselves and workers and supervisors; workers with equipment and machinery; workers with top management; and workers with the overall surrounding environment. These interventions were based upon the principle that modification and change of safety behaviors could facilitate improvements in safety and reduce accidents. These activities brought changes, partly through lessons from major disasters and approaches to regulation, and partly effected an international ''revival'' in the industry of an integrated strategy of benefits and to achieve business success by preventing loss of human lives in occupational accidents. This 'innovation' was to a large extent based on maintained beliefs such as ''all injuries can be prevented; safety must be equal to quality, costs, and productivity; safety is a line organization responsibility more safety is business.'' It is evident that the success or failure of any safety process depends mainly on human factors. It is better to define and distinguish the difference between the following two terminologies: human factor and human error. New emerging trends included new arguments for more holistic approaches to safety, health, environment sensitivity, and quality management in industry that were extended to include safety in traffic, work, and home time in the same framework. The safety work programs that were implemented successfully reduced the occupational accidents and injuries in many companies to a very low level. We assume that efficient safety programs such as, vocational education and vocational training, strict quality controls, legislation, and regulation at the workplace will affect safe behavior not only at the workplace but also in other areas (Abu-Khader 2004; Lund and Hovden 2003; Cox and Jones 2006; Fıtzgerald 2005; Hale 2000).

2. Vehicle repair shops and the importance of workplace safety training in automotive sector in Turkey

Turkey, a rapidly developing country, is located between Europe and Asia and this geographic situation gives the Turkish automotive industry an important strategic advantage. Today, there are 19 automobile industries in Turkey, of which 5 are automobile producers and 14 are commercial vehicle producers. Most of the companies have foreign collaboration and target to serve both domestic and international markets. The automotive industry is one of the four largest exporters and of the leading investor industries of the Turkish economy. It is an economically strategic sector in terms of its significant contribution to the national production and development, direct and indirect employment and level of technology in Turkey. It employs more than 500,000 people with related subsectors and attracts foreign investors. Therefore, an automotive sector employee's safety and training are very important. However, domestically, there are many small- or middle-scale companies and, in practice, these companies do not give adequate importance to occupational safety and compared with the western countries, the number of fatal injuries and incidence rates is high in Turkey (Society of Turkish Automotive Industry, 2009). Workplace safety training in automotive program, described to help with automotive repair shop safety, identifies typical hazards in most repair shops and offers recommended guidelines. By practicing the recommended guidelines in this course, technicians in auto repair facilities can avoid workplace injuries, as they are exposed to numerous potential injuries and hazards every workday. In addition, this course also helps them in understanding many government regulations in accordance with garages, auto repair shops, and service stations (Ministry of Labour and Social Security, 2009).

The automotive program graduates are working in vehicle production plants and vehicle maintenance sectors; also, a majority of graduates could find employment in a wide range of industries. As a consequence, the vocational schools in automotive program should place more emphasis on developing students' transferable

skills. Nowadays, in Turkey, vocational higher training programs are more popular and apprenticeships are less common. The experts in the industry recommend that the applicants first obtain formal training through high school or a vocational higher school in Turkey. Most of them train students to receive their technician's certification for work in the service or car plant that merely introduces the student to the industry, giving them a better understanding of automotive technology suitable for a consumer. Some vocational higher schools could add specific courses to improve students' skills. In national education policy, the curriculum of these schools is updated to keep pace with the advancements in technology and the changes in equipment. These repair shops or dealerships provide great hands-on-experience with the supervision and aid of an experienced repairer who provides instruction and tips to the student (The Turkish Council of Higher Education, 2002, Turkish Industrialist' and Businessmen's Association, 2001). Today, the work of automotive service has evolved from mechanical repair to a high technology job. Many important instruments and hand tools are used by technicians in repair shops or at dealer shops. The expensive test tools, such as power tools, engine analyzers, emissions analyzers and diagnostic tools are provided by employers. Many entry-level technicians are able to acquire tools, thanks to arrangements that tool manufacturers have with the training program centers. Technicians gain experience over time and become an office manager or a foreman, or a service manager or a supervisor in dealer auto repair shops and car factories. Technicians who interact positively with customers might become automotive repair service trouble estimators. Some of them may open their own service station or workplace.

After complete combustion, harmless CO_2 and H_2O are released and without combustion reaction, inert N_2 comes out of exhaust pipes. Because of engine configurations, wrong engine adjustments and engine subsystems, unfortunately a complete combustion is not possible with spark ignition engines. As a result of incomplete combustion, a high ratio of harmful emissions such as CO, HC, NO_X and particulate matter (PM) come into atmosphere. CO is produced in large quantities by gasoline engines, especially in idle speed, the inhalation of which, with a volumetric concentration of 0.3%, can result in death within 30 minutes. HC is formed as a result of incomplete combustion or evaporated fuel from the fuel tank. Some hydrocarbons are considered to be carcinogenic. Normally, nitrogen is an inert gas; however, it reacts with combustion process in high compression ratio and high temperature and forms NO_2. NO_2 is a reddish brown, smelling and poisonous gas that comes into air. It affects inhalation systems greatly. So, workers need fresh indoor air in their workplace (Bauer, 1996; Borat et al., 1996; Bauer, 2004; Klingebiel et al., 2005).

3. Courses and methods of workplace safety training in automotive program

Chemical combustion courses have been introduced in the first and third semesters in the two-year program. In automotive technology, the main objective of the training is combustion theory which mainly deals with combustion phenomena in power equipment. In this course, chemical thermodynamics and combustion physical chemistry in combustion process are described in detail and the ignition, flame propagation and combustion product compositions of liquid, solid and gaseous fuel, respectively, are also covered. This training activity may be used to bring awareness of car emission issues such as the environmental impact of different types of emission and the differences in hybrid engines or gasoline versus diesel engines. Scientific literacy is approached by doing exercises and practical activities in workshops classroom. It will be useful for people in their future work to improve combustion equipments, raise energy utilization ratio, analyze the mechanism and formation of harmful emission, prevent abnormal combustion phenomena, and control and reduce harmful emission. An elaborate course guide that includes all these information is useful for teachers and students. This methodology has been included in the fourth semester in the two-year automotive technician degree. The two-year training program of workplace safety for the workers educates trainees of safety from fire, traffic, electricity, poisoning, fall to the ground in shops and first aid. A process is regarded as safe when workers follow the recommended safety rules in a relatively normal situation, and adjust their behavior because of knowledge and consciousness of safety aspects of the situation in order to avoid accidents. They are related to behavior that reduces the consequences of a crisis such as an accident or a fire. Table 1 shows the details of the automotive program, Occupational Safety Course.

Table 1. Occupational safety course: issues and respective chapters

	Issues	Area in chapters (%)
	1. Overview accident	5
	2. Ergonomic approach, worker health and occupational safety easier	10
	3. Security policies, laws and rules	5
	4. Electrical systems safety in shops	5
	5. Safety of pressure tanks and protection against explosions	10
	6. Protection against fire and explosions and prevention methods	10
	7. Hazardous chemicals and safety signs	10
	8. Environmental protection: emissions and waste of water vapor	5
	9. Personal protective equipment selection	5
	10. First aid measures	5
3.1.	11. Occupational accidents and diseases	10
	12. Work accidents, accident causes and accident chain	10
	13. Effects on the human psychology of security measures	5
	14. Occupational health and safety legal method	5

Training on caution and safety signs in automotive repair shops

This chapter describes harmful chemicals, the danger, warning and caution signs and they means. Safety signs can provide an initial warning to staff as to dangers. In 1908 the Automobile Association in West London set the first warning signs. The program aims at having more effective teaching methods to improve the awareness of labeling and the safe handling of chemical substances. The Occupational Safety Course has pictograms of safety instructions, linked with key words such as danger, warning and caution; these always indicate an immediate or potential hazard to the students. Each year, millions of people are injured in the workplace and safety signs are largely associated with legal requirements rather than providing any practical purpose. Actually, safety signs play a real practical role in preventing injury and ensuring staffs are aware of the dangers and hazards awaiting them at given points in the workplaces. Safety signs are often seen as part of the bureaucratic process rather than a practically important safety tool. The employees would lack essential direction in times of crisis, and employers might find themselves in significant legal difficulties if any accidents were to arise as a result. The clear safety signs can help advice staff of the pending dangers and ultimately instill caution when it is required most. Also safety signs are great importance in workplaces which come into close contact with the general public. This helps keep the employer out of trouble as well as acting as a safeguard for the worker, into dangerous employment environments. Safe signs might not seem interesting, but they really are essential in the fight against danger and risk in the workplace. By ensuring workplace is sufficiently well signed, they can help protect the staff and costumers to the shop particularly, against the imminent dangers that could otherwise go unnoticed, leading to less industrial accidents and helping to reduce the risk to employees. Not only through living up to legal requirements, the positioning of safety signs in the workplace but also the critical importance in ensuring a healthy and safe workforce for increased productivity without the misfortune and staff injury and legal proceedings. As an employee, safety signs are the first port of call in response to any injury, be it to staff, and they can also help create a safer environment for workers where danger meets everyday life (Newton, 2007; Cheatham et al, 2003). It can be seen that auto repair shop safety helps identify typical hazards in most repair shops and offers recommended guidelines. By practicing these guidelines, technicians in auto repair facilities can avoid workplace injuries, as they are exposed to numerous potential injuries and hazards every workday. Fig.1 shows precautionary signs: danger, warning and caution; the signs include not only a symbol but also a short educational descriptive caption. As a signal words;

Danger; indicates immediately hazardous situation that will result in death or serious injury if not avoided; use only in extreme situations.
Warning; indicates a potentially hazardous situation that may result in death or serious injury if not avoided.
Caution; indicates a potentially hazardous situation that may result in minor or moderate injury.

Fig.1. Danger, warning and caution safety signs.

3.2. Training on wastes in automotive repair shops

This chapter is designed to give the students an overview of shop safety, welding and brazing, wheel components, frames, suspension systems, manual and power steering, brake systems, basic electrical circuits and batteries, and maintenance and diagnostics. In the first week of the course, students are introduced to safe workshop practices, such as hazardous materials in the shop, fire prevention, emergency procedures and disposal of hazardous materials. Students learn to identify various types of plastics, their characteristics and locations, and the procedures to follow while repairing or refinishing various types of plastics. During this course, students learn appropriate safety procedures to prevent workplace injury when using solvents and get to identify various types of solvents and their functions. Students learn to identify a repair order/estimate sheet, how to remove all vehicle interior and exterior components and how to work safely around vehicles' various operating systems and identify major causes of accidents in the workplace; recognize unsafe conditions and the use of personal protective equipment. During term two, students apply their knowledge of safe workshop practices and perform safe lifting and jacking procedures. Fire safety and safe operation and maintenance of service equipment are stressed. Special emphasis is placed on the practice of personal safety and health. Basic safety measures, procedures to follow in case of an accident, and the role of workplace safety are also emphasized.

3.3. Safety standards in the workplace

Safety standards in the workplace are of growing concern. Personal injuries, time loss, costs for compensation and negative impact on productivity are reasons why the industry needs to improve its track record. Professional auto services take training periodically; it includes workplace and worker safety; occupational health and safety programs; equipment maintenance; consultation services; training on first aid, dangerous equipments and goods; accident investigation; and much more for the automotive industry. These programs are tailored specifically to the needs of the automotive industry and can be hosted for multiple employers. Managing for safety is about reducing risks and not eliminating them. The work accidents that might happen are anticipated and steps are taken to try and make sure they are avoided. All employees, contractors, maintenance personnel and visiting drivers must understand their responsibilities in the health and safety system. Employers must include safety responsibilities in job descriptions and in training, raise safety issues in day-to-day contact with employees, and display safety notices and risk assessment results. By law, employers have a general duty to ensure that the health and safety of their employees and workers in automotive repair shops are protected. Employees also have a duty to look after their own health and safety, and that of anyone who might be affected by their work. The law requires that health and safety risks at work are controlled as far as is 'practicable'. The law also requires that every employer, when choosing equipment, must take into account the working conditions and risks to the health and safety of people using the work equipment. By law, employers have to make sure that work equipment is in good working order.

3. 4. Communication in work and workplace

In the third semester of the course, the subject is Quality and Behavior in Service, and this is with regard to communication with colleagues, other workers and consumers. The foundation of all workplace relationships lies in the fact that most professionals spend at least a third of their time at work, thus being an effective communicator becomes a core competency that everyone should work to acquire. Developing good communication and workplace relationships can often, however, be difficult to achieve. Good communication is essential for maintaining a safe workplace and helps ensure that safety information can be spread through the organization and be put into use as effectively as possible. Effective communication in the workplace is vital to improving personal productivity and attaining a high quality of life at work. The communication rules help improve worker and customer relationships and worker and co-worker relationships and raise workplace quality (Davis, 2008). Remember that not only the physical aspect of a workplace is vulnerable to accident but also is some of the company's most valuable property, that is, its information. From telephone directories and training materials, to budgets and product research, to employee and customer profiles, more and more people see stealing this information as an easy way to take advantage of businesses. This comprehensive program is supported by all levels of employees and addresses physical security, hiring and firing practices, and employee vulnerabilities. Work with upper management to encourage them to evaluate your workplace and help start a workplace violence prevention program where you work.

3. 5. Safety of the workplace after work

According to this study, although the employees are trained according to the safety management guide for business and industry, human error is the single largest cause of workplace emergencies. This can result from poor training, misconduct, poor maintenance, excessive tiredness, dirty indoor air, substance abuse, and carelessness. Whether you are at work or not, accident prevention is everybody's business. If you do not work, volunteer to lead a group to work with the management to make sure that your work environment is safe. Good locks are the first line of defense to ensure the physical security of any workplace. Check for fixing high security locks, such as electronic access control units on all doors, and on closets that have private information or hazardous materials, outside doors, basements, and so on. Verify that any electronic access control unit in use has secure key bypass utilizing patented control of duplication of keys. Any access control unit is only as good as its mechanical override devices. This includes workplace vehicles in shops and carelessly parked vehicles which can create a risk of injury. Check the identity of strangers who are in your shops or office, and find out whom they are visiting and if you can help them find that person and don't forget to request identification from service or utility workers as well. Install motion-sensitive as well as constant outside lights. Do not discuss your vacation plans and those of your co-workers to people visiting or calling your workplace. The workplace should be protected with proper lighting and some interior lights can be left on even after the business is closed.

3. 6. Environmental sensitivity in work and workplace

A good shop response plan helps a company in protecting not only its employees but also its community and environment. The environmental response plans are a dynamic measure and to be environment sensitive, the plan must include everyone in the workplace. In the workplace, it is critical that the environment plan is practiced by all employees, which include waste evacuation and wastes' effect on environment. An environmentally friendly shop is not hard to achieve, as the training course offers ten practical tips for a sustainable workplace as part of its drive toward carbon accounting. Recycling efforts are often undermined by workers unknowingly, while they attempt to cut paper and oil usage in shops. Recycling boxes need to be labeled clearly so cross contamination does not happen, with paper, metal, and plastic getting mixed up. It is almost shop culture to have your own waste boxes, but there is no point in surprising workers with a change of direction without explaining it first. Reducing the heating thermostat by one or two degrees can make a massive difference to the office environment; employers are under a legal obligation to provide a "reasonable" temperature in the workplace. One single computer left on all day produces 1,500 pounds of CO_2 in a year and workers must down their computers and test equipments at the end of the workday so it becomes the company's culture to do so. Fuel saving measures can be extended to worker transport needs too. For example, for car users, the company can introduce a car-sharing scheme, do a deal for supplying electric cars or provide shuttle buses to local transport links.

4. Results

Each year, thousands of auto repair shop workers suffer from injury, illness or even death in the job because of work accidents. Worse is it is the employer's willful or unwitting negligence of safety and health standards that is too often the cause. In this study, a wide definition of the Occupational Safety Course was adopted. The course of safety at workplace and its environment has been discussed and compared with automotive workshop worker expressions for Turkish higher education program targets, based on both practical cases and studies of the sector opinion. The general approach to educational modeling was to identify safety systems and environmentally sensitive effects from the perspective of the car repair shops. One aspect is that an educational model should be sustainable and refined enough not to be trivial, but simple enough to bring forward only the essential characteristics of the real workplace system. In case for sustainable, the main advantages of the model appeared. Educational activities arranged information about safety features and environmental sensitive, giving an overview of different items that normally belong to different areas to worker. It was found that formal organizational functions were common, but also that informal and less clear organizational structures played an important role in occupational safety and environmental sensitivity. The methodology supports consistent analysis of the training material available, and can integrate it into a common format to make it work in the shops. This situation is an essential subject for a behavioral concept of increases quality and safety, which can be useful for the analysis of systems that also understand to formal safety functions to worker. The concept and the investigation approach were easy for students to understand, in all the trained groups and also in classroom exercises. The results of the study are as given below:

This course gives an introduction to students about the principles of work safety and health regulations in auto repair shops. They learn to identify safety signs, symbols, and equipment.

Health and safety regulations must include vehicle repair shops without limitation.

Increased focus on employer awareness of workplace health and safety legislation in regard to work and workplace; vehicle safety practice to include maintenance process.

Existing laws should be used to support workplace vehicle safety laws and it should be possible to integrate the chain of responsibility and combine workplace vehicle safety with safety policies.

Integration of vehicle safety compliance laws to provide a safer work environment.

Further studies of workplace vehicle safety should be undertaken based on improved data to develop accurate and appropriate accident prevention strategies for workplace and work.

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