



## TEACHING HSE IN ENGINEERING COLLEGES: A STEP AHEAD TOWARDS IMPROVING PRODUCTIVITY

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### ABSTRACT

*HSE is a comprehensive development for industrial safety, which can be defined as Health, Safety and Environment in which the best safety criteria is the prime consideration. In the last two decades many organisations recognise that the HSE can help their existence in the market place by protecting their employees and then improving their productivity. In the Arab world in general the HSE has not been considered as an important subject in education and is not given a priority in industry. Therefore the main objective of this research paper is to introduce the HSE philosophy to engineering colleges or universities as a step towards implementation it in industry in the future. This paper presents a survey of teaching HSE in Saudi universities. The survey consists of a questionnaire that designed to find the right means of adopting the HSE philosophy in education. Then a proposed syllabus for HSE in engineering colleges and what are the roles of educational institutes in increasing awareness of HSE in industry will be presented. Finally a general discussion and conclusions will be drawn.*

**Keywords:** Health, Safety and Environment, HSE Syllabus

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## 1. INTRODUCTION

In the last two decades the term of HSE has been adopted as a result of the increase of use of the new technology in all kinds of establishment, institutions, factories etc., whether educational, health industrial, commercial etc. In many third world countries, the term HSE is understood to be only safety or only fire safety and the only auditing carried out on industries by civil defence force is the fire safety.

Accidents cost money to any organisation and could have an indirect or a long term damages as a result of:

1. Damage the machinery or buildings.
2. Delay in the production or business.
3. Losing worker experience partially or totally.
4. Damage to the health of the work force.
5. Compensation to the injured worker or public.
6. Organisations losing part of there reputation.
7. Damage to the Environment
8. Legal expenses.

The philosophy of HSE can be summarised as: **to ensure** a safe design is achieved and thus minimise the possibility of injury to personnel from consequences of an accident event, **to reduce** the possibility of accident and any event occurring that might affect the life or health of the workers immediately or on the long term, and **to minimise** the damage caused to the plants, equipment, structures, and environment, should any accident occur and to try to minimise the damage caused. This philosophy has been adopted and implemented in western world in all organisations in which humans are involved, but obviously HSE is more vital for the industrial firms. Therefore HSE should be in the forefront of any manager's and engineer's thinking and a priority in the organisation's strategy. Not only because of the humanitarian reasons but also because of the financial benefits. It is the manager's and engineer's responsibility to see that he does everything within his power to provide a safe and healthy working environment for his workforce. The factors that motivate safe practices at the job site are generally identified as follows [Bamber 1995]:

- Humanitarian concerns.
- Economic costs and benefits
- Legal and regulatory considerations.

Understanding sources of accidents has become a major area of research in the field of operation management. Therefore this research paper develops a step by step company and employee responsibilities in order to minimise the losses in human and financial resources.

## 2. IN SAUDI ARABIA

Kingdom of Saudi Arabia is one of the Gulf States that has shown an interest in industrial safety. This interest has been articulated by the ministerial act no (2139) dated 4th Shaba'an 1403, in which it defines the safety as number of rules and regulations that deal with safety prevention from fire. This act was a unique safety law and management philosophy because it includes "safety and security" under one umbrella which is called Safety Management. This unique philosophy has been adopted in Saudi Arabia despite the conflict between safety and security. This act emphasises that the aims of safety regulations are: *protection* worker, properties, belongings, and information *from* conspiracy accidents, fire, theft, forging, and earthquake *which lead to* injuries and death, financial losses, information losses, and delay in production *against* machine and human errors, and confederate. But in spite of this act, there is no clear HSE regulation neither in KSA nor in any of the Gulf States.

## 3. LINE MANAGEMENT AND ENGINEERS ROLE

The roles or the responsibilities of line management and engineers are not only to govern the workers, but also to protect the workers and the organisation properties. Next sections summarise the company and the employees responsibilities [Jassim 2001, Mohammed Ali et al 2001].

### 3.1. The company responsibilities

- To put the HSE as a priority in the company strategy.
- To set HSE standards and code for the company
- To set a budget for training on health, safety and environment issues.
- To be responsible for the health, safety and environment issues inside the company.
- To be responsible not to pollute the environment.
- To adequate training the employee HSE regulations.
- Engineers and Management at all levels must enforce attendance at appropriate training sessions
- Supervisors are responsible for having their employees attend required training.
- Ensuring that plant, workshop, storage etc used by employee at work is so arranged, designed, made and maintained that it is safe for the employee to use.

- Developing procedures for dealing with emergencies that may rise while employees are at work.
- Providing the employees with information to their employees and students on the specific hazards associated with their activities and the safety procedures to be followed.
- During each employee's performance evaluation, the supervisor needs to consider the individual's adherence to prescribed safety responsibilities.
- Creating a database system to help the line the person responsible for HSE (HSE officer or the factory engineer ) to generate internal reports on frequency on HSE or any accidents might occur (in days lost), contributing factors (events, sources demographics) and costs (treatment and worker compensation). This report can be submitted to the top management and answer questions such as: What factors contribute to these accidents? Does my company have an effective HSE programs?... etc.
- Disciplinary/Dismissal action up to and including termination may be appropriate for failure to comply with or follow required HSE procedures/policies.
- HSE surveys or inspections by outside activities including regulatory agencies will be brought promptly to the attention of the offices indicated below to ensure proper coordination:

### **3.2. Employees responsibilities**

The employee should take all the following practicable steps:

- Ensuring that your actions do not put yourself or others at risk.
- Knowing the emergency procedures if an emergency arises.
- Using all protective gear, devices, equipment and materials.
- Knowledge of hazardous substances and the preventive methods.
- It is the responsibility of every employee to report unsafe conditions to their supervisor or the supervisor having responsibility for the area. Unsafe conditions not promptly corrected will be reported in writing using the attached form which must also be sent to the appropriate supervisor

## **4. ENGINEERS KNOWLEDGE IN HSE**

A survey has been conducted in small and medium sizes of technical education, and industrial sectors in order to evaluate the standard of HSE in those institutions.

The questionnaire questions of the survey were as follows:

- What is the nature of your business?
- Do you consider your staff safety is one of main factor in your business strategy? How
- Do you have HSE regulations procedures in place?
- Do you have HSE review system of the regulations?
- Do you have a system of auditing?
- Have you conducted any training of HSE to your staff and keep them inform about the hazards or hazardous substances and the preventive methods?
- Do you provide your staff with protective gears, devices, equipment and materials? What are they?
- Have you conducted any medical check up for your employees, such as hearing test, eyes test, etc.
- Do you have an accident registered records?
- Do you have HSE officer or HSE committee?

More than 200 questionnaire were distributed among small size companies (<60 employees) and medium size companies ( 60 – 200 employees) 110 questionnaires were received and the graphs are drawn accordingly.

## Results

Results show that some of the small and medium industries have no clue of the HSE meaning and some of them have safety polices, but no health or environmental policies. In general even on the level of safety the results as shown in Table (1) were rather shocking for the following reasons

- Most of the organisations were hesitant to fill in the questioner and some were reluctant for various excuses.
- Lack of understanding the meaning of HSE or even industrial safety. A large number consider the HSE or industrial safety (IS) as a preventive measures from fire only.
- Lack of information about the HSE.
- Contradiction in the answers which make the percentage of error about  $\pm 25$ .

In order to analyse the results, we have classified the questioners into four sections, Preventive procedures (1), Training (2), HSE Officer and Auditing (3), Accident Registry (4).

**Table 1** Survey results

	Technical Education		Industrial	
	Yes	No	Yes	No
(1)	66%	34%	20%	80%
(2)	0%	100%	35%	65%
(3)	15%	85%	30%	70%
(4)	12%	88%	40%	60%

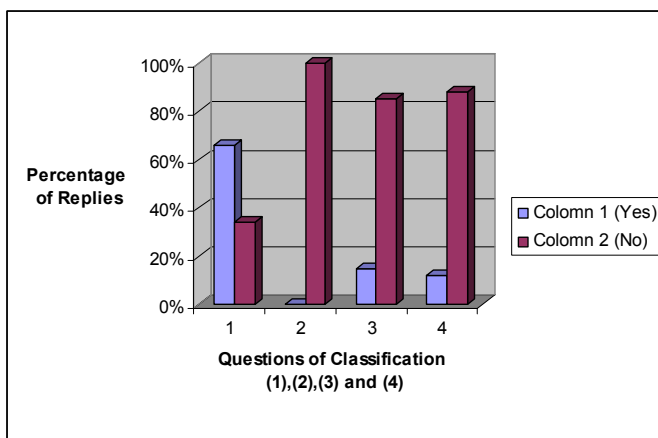


Figure (1) Technical Education sector results

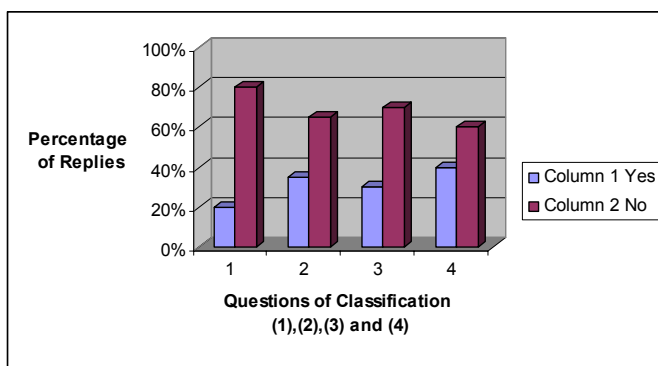


Figure (2) Industrial sector results

The above results show the need to have some people specially in industries to be trained for HSE so that they will be able to set policies, implement, audit, train and write reports about HSE within their organisation. The most suitable person to take on this task is the engineer of the company who should be educated and being trained for HSE in his engineering college for that purpose.

## **5. THE PROPOSED HSE COURSE FOR ENGINEERING COLLEGES**

Engineering student who will be the future engineer should be able to identify, minimise and eliminate the sources of risk and danger that could cause accidents and could endanger the health or life of human present inside or outside the organisation. HSE syllabus should enable the students to identify the risk of the following items:

- Machinery and equipment
- Electrical wiring and equipment
- Heating, cooling and ventilation systems.
- Piping and pressurised piping.
- Transportation, lifting machinery both inside and outside buildings.
- Building.
- Chemicals and fumes.
- Fire.
- Protective equipment.
- Hazardous material (explosion, oxidation, irritative, flammable, toxic, poisonous, ... etc).
- Any source that cause physical harm such as noise, vibration etc.
- Kinds of pollution produced.
- Waste management.
- Pollution Control

Also should increase the student skills in the followings,

- Occupational health i.e. Hygiene of restaurants, dealing with heavy weights, effect of hours office work ... etc.
- HSE standards and codes.
- Writing HSE reports.

The students after finishing this course should be able to:

- 1- Realise the importance of HSE.
- 2- Have the full knowledge of HSE and its implementations.
- 3- Have the full skill to identify the needs of HSE i.e. put HSE standards and code, audit, write reports (accident and full reports ).
- 4- Be able to solve problems associated with HSE.
- 5- Should be able to train other staff.
- 6- Be able to participate in any HSE planning for the company.

## **6. DISCUSSION**

One factor that can set an industry apart from its competitors especially in the world with the implementation of the GAT, in the private or public sectors is its employees. Then the HSE standards that can have a significant impact on the organisation productivity as a results of their employees productivity, level of reputation and survival. Although is known accidents will never be entirely eliminated, but can be isolated or minimized. Nevertheless accident prevention could be regarded as a necessity measured by money, reduce suffering, work atmosphere and quality of life. Accident elimination on any organization should be in the forefront of any manager's and engineer's thinking for preventing or reducing accidents. Engineers of any organization should be aware of the HSE practice in order to be able to adopt it in their organization and should bear in mind that [Health and Safety Regulations USA 2001].

- HSE is everyone's responsibility.
- Mandatory training is a key component of many safety efforts.
- All employees are expected to carryout their assignments in a way that prevents injury to themselves and others.
- Engineers as a technical people must be alert to recognising and resolving potential safety and environmental hazards so that risks for employees, volunteers and visitors are identified and reduced or eliminated.
- Engineers in Colleges should be taught and trained how to implement the HSE regulations within the company.
- Every individual must know the potential hazards associated with their duties and follow all applicable HSE practices and procedures.



## **7. CONCLUSIONS**

HSE aim is to provide safe and healthy working environment by determine the hazard and then take all the practicable steps to eliminate, isolate or minimise the harm of hazard. In any organization the technical person is the engineer who can identify the danger and the hazard from the different processes within the company and should have the Knowledge, Skills and Ability to manage the HSE effectively. Especially in the small and medium size company where the companies are unable to employ HSE or safety engineer because of financial reasons.

The carried out survey in this study shows, there is a lack of knowledge and understanding the importance of HSE towards improving the work environment and the productivity of the company. This lack of knowledge was noticed with managers and engineers, therefore KSA companies need to adopt and implement HSE philosophy in order to reduce accident events that might endanger the health and life of workforce and the environment.

The main conclusion of this study is that engineers should be taught and trained for HSE during their engineering course at the universities or colleges. Also governments should interfere to set role, regulation and codes for HSE and develop a restrict auditing system in line with GAT requirements.

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