The Role of Occupational Health and Safety in the Success of Fuel Station Projects

M. T. Kıraç
Istanbul University-Cerrahpaşa, Department of Civil Engineering, İstanbul, Turkey
mucahittalhakirac@gmail.com

O. H. Türkakın
Istanbul University-Cerrahpaşa, Department of Civil Engineering, İstanbul, Turkey
turkakin@iuc.edu.tr

S. Aslan
Muş Alparslan University, Department of Transportation Services, Muş, Turkey
se.aslan@alparslan.edu.tr

Abstract

Fuel station construction projects are shaped not only by structural elements but also by a broader range of success criteria including occupational health and safety management systems, environmentally friendly practices, sustainability, customer satisfaction, and company reputation. Considering that fuel companies aim for 'zero' workplace accidents, a workplace accident during project implementation will directly affect the project's success by causing environmental damage and resulting in losses for the client in terms of time, cost, and prestige. This study presents an analysis aimed at understanding the impact of occupational health and safety management systems on project success in fuel station projects.

Keywords: *Fuel station construction projects, occupational health and safety, project success.*

Introduction

Fuel station construction is more than just building a physical structure; it's a complex process involving safety, environmental sustainability, regulatory compliance, high-cost management, and numerous risks. These projects are among the most challenging and meticulously managed in the construction industry. Every fuel station must be built with precision to ensure the safety of its operation and minimize its environmental impact. One of the fundamental goals of project management is to achieve the defined project objectives on time, within budget, and to the required quality standards. These three elements form the "Iron Triangle," considered in the literature as the key parameters of project success. However, while these three dimensions (time, cost, quality) are objectively measurable, limiting success to only these factors can be misleading (Canbal, 2025). Fuel station construction projects are shaped not only by structural elements but also by a broader range of success criteria such as occupational health and safety management systems, environmentally friendly practices, sustainability, customer satisfaction, and company reputation. These elements link project success not only to financial and time-

measurable outcomes, but also to the company's prestige within the sector and its environmental responsibility. In this context, to evaluate the success of fuel station construction projects, not only the classic time-cost-quality equation but also the effectiveness of a crucial management system such as occupational health and safety must be considered. This is because in the construction of fuel stations, it is critical that the work is carried out safely and with sensitivity to environmental impacts. Throughout the project, the compliance of contractor firms with occupational health and safety standards, the prevention of work accidents, the reduction of environmental damage, and the efficient use of labor directly affect the success of the projects. Therefore, HSE (Occupational Health, Safety, and Environment) practices are not only related to project outcomes but are also directly related to the long-term success and reputation of the firms in the sector. This study will examine in detail the factors affecting the success of fuel station construction projects, as well as the role of HSE management systems in these projects.

Occupational Health and Safety

The World Health Organization and the International Labour Organization defined occupational health and safety in 1995 as: “The protection and improvement of the physical, social, and mental well-being of workers in all types of work; the prevention of health loss due to working conditions; protection from factors that negatively affect their health during work; placement and maintenance of work suitable to their physiological and psychological structure; in short, ensuring the suitability of the job to the worker and the worker to the job” (Ministry of Labour and Social Security, Health Surveillance in Working Life Guide, 2015). The concept of occupational health and safety aims to eliminate factors that pose a threat to human health from social, psychological, and physical perspectives, to understand potential risks, and to develop measures against these hazards. OHS (Occupational health and safety) rules and practices provide a safe working environment for employees while ensuring the systematic continuation of goods and services production. The effective and appropriate use of OHS requirements ensures the continuity of workplace activities without interruption. Therefore, occupational health and safety practices make the work environment safe, healthy and productive (Dinç, 2014).

An occupational accident is a series of unplanned events that, if they occur, can create harmful situations for those around them. Occupational accidents are events that cause harm to people, the environment, and machinery/equipment—in short, to living and non-living things. However, some argue that occupational accidents only harm individuals (Epik, 2006). In short, an occupational accident can be defined as the moment when control is lost. It is quite difficult to predict the consequences of an accident before it occurs. The first step in approaches aimed at preventing occupational accidents is to determine why the accidents occurred. To prevent occupational accidents, it is necessary to first investigate the causes of the accident and the developments that led to it. Scientific approaches to this are formed only as a result of examining the accidents that have occurred, in other words, the defined events that have taken place.

Over the years, many theories have been developed for the analysis of causes to prevent accidents. The most widely accepted theories developed for investigating the causes of accidents are: domino theory, accident/incident theory, systems theory, human factors theory, epidemiology theory, and combination theory. According to Heinrich, the occurrence of an accident can be expressed as an accident chain. In an accident chain, there are five stages in the sequence of events that lead to an accident. These stages are genetic and social environment, personal faults, unsafe actions and unsafe situations, the accident itself, and the resulting

damage (Sefer, 2019). Various risk assessments are carried out to prevent occupational accidents. Falconer et al. (1999) stated five steps for controlling and evaluating risks related to occupational health and safety:

- Identifying existing hazards in the environment
- Defining these existing hazards and understanding their characteristics
- Conducting a risk assessment for potential hazards
- Determining and implementing controls for these risks
- Observing and reviewing the effectiveness of the controls implemented for the risks.

Fuel Stations and Their General Characteristics

The term petroleum is used to describe various natural substances composed of plants, animals, and minerals. The term petroleum industry refers to the process of searching for, extracting, refining, and marketing petroleum (Yavuz, 2018). Petroleum primarily contains ethane, methane, and propane gases. Due to the structural diversity of petroleum, petroleum products have unique properties and characteristics (Biberci, 2019). Fuel types are obtained through the refining and chemical transformations of crude oil. Petroleum products, primarily gasoline, diesel, and LPG, are sold at fuel stations.

Fuel stations are generally areas where fuel is sold retail to vehicles traveling on the road. Generally speaking, gasoline, diesel, and LPG are used as fuel in Turkey, and these products are sold at fuel stations. In Turkey, there are two important regulations concerning fuel stations: the TS12820 standard titled "Fuel Stations - Safety Rules" and the "Regulation on Fire Protection of Buildings". The "Fuel Stations - Safety Rules" was published in the Official Gazette dated May 20, 2007, and numbered 26527. The "Regulation on Fire Protection of Buildings" was published in the Official Gazette dated December 19, 2007, and numbered 26735. The eighth section of the regulation lists the fire safety measures to be applied in fuel stations under the heading "Storage and Use of Hazardous Materials". Fuel stations that sell LPG must also comply with TS11939. Fuel stations require documents such as a Building Occupancy Permit (from the relevant municipality), a Class 2 GSM Operating License, a Certificate of Competence (TSE), and an Occupational Safety and Health Contract to complete construction and become operational.

Fuel stations are classified into hazard zones in terms of fire safety measures. These are (Kılıç, 2008):

- Zone 0; places where an explosive atmosphere may occur under normal operating conditions, where the probability of its occurrence is high, and where it lasts for a long time when it does occur (e.g., inside a tank).
- Zone 1; places where an explosive atmosphere may occur under normal operating conditions, and where there is a possibility of an explosive atmosphere occurring under abnormal operating conditions or accidentally, but if it does occur, it lasts for a short time.
- Zone 2; places where there is no possibility of an explosive atmosphere occurring under normal operating conditions, and where the probability of an explosive atmosphere occurring is very low even in cases of malfunction, accident, repair, or maintenance, and if it does occur, it lasts for a very short time.

Fuel Stations and HSE (Health, Safety, and Environment)

Occupational health and safety practices in the fuel industry are generally referred to as HSE (Occupational Safety, Health and Environment). The HSE management system is a structured control and evaluation mechanism for better management of work within the fuel industry. Unlike ISO 9001, ISO 14001, and OHSAS 18001, the HSE management system is not subject to certification. However, for companies operating in the fuel industry, the HSE management system is a matter of responsibility and prestige. The HSE culture, on the other hand, is a way of working, thinking, and living that aims to take precautions against existing or potential hazards in performing a job, and to create and maintain awareness regarding occupational safety and the environment.

Occupational health and safety is a necessary system for all jobs. In the fuel industry, HSE activities are given great importance. The reasons why companies operating in the fuel sector are sensitive to HSE (Health, Safety, and Environment) are as follows (Epik, 2006):

- Maintaining Company Quality
- Ensuring Company Standards
- Having an HSE Culture
- Maintaining Global Reputation
- Maintaining Company Culture in Every Country of Operation
- Competition

HSE management system is essentially a system aimed at protecting people and the environment. Although it is not subject to certification, it is a source of respect for fuel companies operating in the sector. In addition, the HSE management system is becoming indispensable in the field of competition day by day. The HSE management system should be prepared considering the applicable laws and regulations in the country. For the HSE method to be successful, employees must be well trained, lessons must be learned from mistakes, and an effective monitoring mechanism must be established. In addition, for the success of the HSSE management system, senior management levels must support every step of the system, set an example for employees and lead the HSE culture to become the company culture.

HSE policy is the company's stated views on the protection of human health, service quality and the environment, stating the principles and objectives of the work done (Epik, 2006). This policy is written and displayed publicly. After determining the HSE targets, an HSE program should be created that defines the responsibilities and authorities for the targets, covers the methods used and timelines. In addition, these programs should be reviewed at specified time intervals (Çavdar, 2019). Responsibility for the implementation of established HSE activities belongs to the senior management. The HSE officer authorized by the senior management must have the authority to stop the work carried out if the HSE requirements are not met.

Measurements should be taken regarding the success in achieving HSE objectives, planned/actual activities, and the success of corrective/preventive actions. These measurements reflect the effectiveness of the HSE management system. Performance measurement methods can be as follows (Epik, 2006):

- Field occupational health and safety tours
- Periodic field audits
- Inspections and periodic maintenance of machine/equipment protection devices

- Workplace environment measurements
- Comparison with similar organizations

A procedure should be established for auditing the HSE management system and its requirements, and the personnel who will conduct the audit should be determined. The effectiveness of the management system should be audited periodically, and the workplace should be audited both in a planned and unplanned manner. In addition, a scoring system can be established for auditing HSE performance in the workplace. If necessary, records of accidents and nonconformities should be kept, existing or potential hazards should be listed, and measures to be taken against these hazards should be determined with the responsible parties (Erdoğan, 2019). Corrective/preventive action forms should be opened, and it should be checked whether the deficiencies have been rectified within the recognized time limit. Senior management should review the HSE management system within a timeframe to be determined. These reviews should ensure the suitability, efficiency, and continuity of the HSE management system. During the review phase, previous events, actions taken in response to these events, lessons learned from these events, employee effectiveness, and legislative changes should be taken into consideration (Epik, 2006).

The employer, the fuel company, provides various trainings for its contractors in addition to audits. These trainings generally cover topics such as changing risk factors, developments in HSE (Health, Safety, Environment) processes, compliance with HSE management systems, and the employer company's compliance with HSE requirements. The training in compliance with HSE requirements aims to integrate the contractor's risk assessment, procedures, work permits, forms to be used in the work process, etc. With these trainings, the employer company aims to raise the contractor's HSE management and perception to a higher level. An example of HSE audit topics for an employer company, X fuel company, is shown in Table 1.

Table 1. HSE Audit Topics.

Audit Subject
Leadership and HSE Culture
HSE Policy and Strategic Objectives
Organization, Responsibilities, Standards and Documentation
Risk Management
Planning and Procedures
Implementation and Performance Monitoring
HSE Audit and Review of the HSE Management System
HSE Management

The HSE (Health, Safety, Environment, Environment) audit topics for fuel company X are grouped under 8 main headings. Table 1 presents these 8 main headings and indicates their weights within the total HSE score. Depending on the focus areas determined by the relevant employer company, various percentage weights can be assigned to the 8 main headings mentioned above when calculating the total HSE score.

Conclusion

Fuel stations are inherently very dangerous areas. Various health and safety risks arise during the operation of the station, including storage, fuel transfer, and delivery to the end customer. Controlling these risks during the operation process prevents potential loss of life and property. This study focuses on measuring employees' awareness of occupational health and safety and improving this awareness through implemented practices. As employees' awareness of HSE increases, their job satisfaction will also increase. Thus, workplace accidents, which can be a consequence of job dissatisfaction, will be kept to a minimum. Consequently, a project completed without workplace accidents will be considered successful by both the employer (fuel companies) and the contractor. Similarly, job dissatisfaction, one of the effects of workplace accidents on employees, will be prevented, and employee productivity will increase. This stems from the reciprocal influence between workplace accidents and job satisfaction. Therefore, it can be said that increasing employees' awareness of HSE will increase their perceived job satisfaction, thus reducing the likelihood of workplace accidents. It is evident that an HSE management system is a prerequisite for the success of projects, especially in the fuel sector. In conclusion, an effective HSE (Health, Safety, Environment) management system will facilitate the achievement of the defined project objectives and contribute to project success.

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