

Health and Safety Assessment in Cement Industry: A Pareto-Based Approach

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Abstract :- The present study investigates health and safety conditions within the manufacturing industry, with a specific focus on industrial workers in Braşov County during the years 2017 and 2018. The analysis utilizes data on work-related accidents, processed using Pareto Analysis. In line with the 80/20 rule, the study concentrates on identifying the 20% of accident causes responsible for 80% of the total incidents. This targeted approach enables a more effective allocation of resources toward mitigating the most critical risk factors. The study also proposes corrective actions aimed at reducing workplace accidents based on the analysis of specific operational stages. Results from the 2018 data demonstrate significant improvement compared to 2017, highlighting enhanced performance in occupational health and safety practices. Ultimately, this contributes to better Quality Assurance in industrial manufacturing operations.

1. Introduction

According to data provided by the European Union, despite certain limitations due to incomplete or inconsistent reporting, it was observed that in a particular year of the previous decade, approximately 5 million individuals out of 120 million across the 15 Member States experienced occupational accidents that resulted in temporary incapacity for work exceeding three days. Each year, around 6,000 such incidents lead to fatalities among workers [1–6]. Every workplace accident brings about physical and psychological distress, financial loss, loss of time, and affects not only the injured individual but also their families, peers, and the workplace as a whole. Additionally, such incidents disrupt operations due to mandatory investigations and the need to implement contingency measures to maintain business continuity.

On a global scale, research conducted by the International Labour Organization (ILO) indicates that the direct economic burden of workplace injuries and occupational diseases amounts to roughly 1% of the Gross National Product (GNP). Furthermore, total economic losses, including indirect costs, are estimated to range between 2% and 4% of GNP in developed nations [1, 7–10].

Everyone seeks maximum safety at minimal cost. An especially effective means of achieving this objective is the optimization of occupational health and safety (OHS) management, with a strong emphasis on the economic efficiency of organizing OHS activities at both the microeconomic and macroeconomic levels.

Time management plays a critical role in assessing the productivity of the workforce. Regular training sessions for employees often result in the disruption of standard work schedules, thereby impacting their regular tasks. For such training periods to translate into long-term economic benefits, they must be effective, ensuring continuous workflow without interruptions caused by insufficient procedural knowledge or workplace injuries.

In this context, a proposed solution—potentially suitable for legislative adoption—is the digital transformation of all OHS-related operations. This includes a focus on online education and assessment to verify the assimilation of safety knowledge by employees.

The creation of a digital platform to enhance OHS operations through digitalization aligns with the objectives outlined in the EU eGovernment Action Plan 2016–2020 – *Accelerating the Digital Transformation of Government*. As outlined

in Communication No. 179/2016 to the European Parliament, Council, European Economic and Social Committee, and Committee of the Regions, eGovernment facilitates administrative functions, improves public service delivery, and enhances the internal operational efficiency of the public sector. Furthermore, digital public services reduce the bureaucratic load on businesses and citizens, making their interactions with government bodies faster, more efficient, more convenient, more transparent, and ultimately, more cost-effective. The integration of digital technology into public sector reform also promises wider socio-economic advantages for society at large [11].

According to both statistical data and the following case study, workplace accidents are frequently caused by inadequate training of employees. This underlines the pressing need to enhance and streamline the entire employee training process. Clearly, the effectiveness of such training is integral to the broader optimization of the employer's operations, directly influencing not only employee well-being but also productivity and the quality of the production output.

2. Main Direction to reduce the accidents

The reduction in the number of occupational accidents in 2018 (252 reported incidents) compared to 2017 (260 incidents) may also be attributed to the implementation and utilization of the features provided by the online employee training platform. In light of the aforementioned considerations, particularly regarding the effectiveness of the employer's operations in achieving enhanced outcomes—both in terms of economic efficiency and in retaining, motivating, and developing workers' professional competencies—the following benefits offered by a digital platform for the comprehensive management of occupational health and safety (OHS) highlight its necessity:

a) Reducing training expenses by eliminating costs associated with employee travel and the time investment required from both the designated trainer and the worker, who must pause production activities to attend in-person sessions.

b) Improving the efficiency of worker training by incorporating mandatory knowledge assessments through electronically stored records. The platform can help prevent superficial compliance, such as merely signing a training attendance form without truly engaging with the content—an issue that increases the risk of workplace accidents. Such incidents not only endanger the health and lives of workers but also result in economic losses for the employer, including:

- Higher contributions to occupational injury and illness insurance funds,
- Production delays due to absence and replacement of injured personnel,
- Failure to meet contractual deadlines,
- Compromised product quality or loss of new business opportunities,
- Negative audit outcomes from prospective partners,
- And the creation of a climate of insecurity among workers.

c) Providing employees with the ability to report safety concerns in real time, thus preventing the application of unsafe practices or technical solutions that could endanger health or damage equipment.

d) Enabling individualized learning by allowing workers to study at their own pace and effectively absorb training materials. The platform can track:

- Time spent reviewing content,
- Response times and accuracy in assessment quizzes,
- Failures.

All of which can offer insights into both the worker's ability to comprehend safety protocols and the clarity or complexity of the training materials, allowing for targeted improvements. These capabilities directly support the goal of an effective and impactful training process, as mentioned in point (b).

e) Offering employers a practical and cost-effective solution for monitoring lone workers. This feature eliminates the need for a dedicated supervisor by enabling automated oversight via the platform. It ensures prompt emergency response, should the worker fail to respond to scheduled check-ins, thereby enhancing both safety and operational continuity.

3. Case Study

The Pareto analysis is named after the engineer, sociologist, philosopher and economist Vilfredo Federico Damaso Pareto, who has formulated the 80/20 principle of unbalanced distributions that postulates that 80% of the effects are generated by 20% of the causes [12- 14].

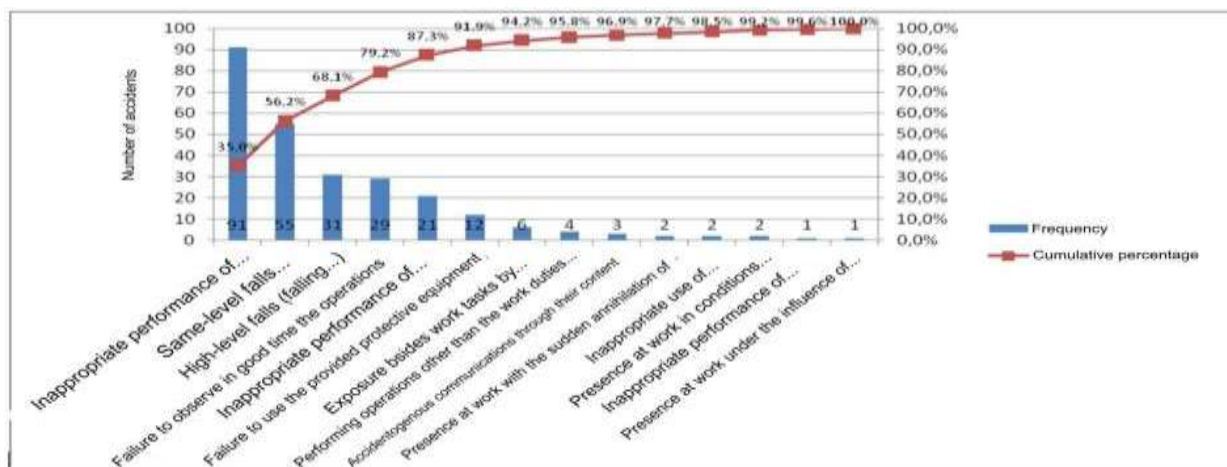
By carrying out the research with the Pareto analysis, there is performed a rigorous and pragmatic activity, very effective for multiple activities. With this analysis, the main categories of causes are identified; the contribution of each of them to the analyzed problem is identified, thus specifying the area in which the effort for optimizing the results should be focused. The Pareto chart is used in this study because there are measurable parameters, having records of each occurrence of parameters (the number of work accidents in Brasov County between 2017 and 2018). In Table 1 are listed the causes and number of work- related accidents caused by contractors for 2017.

Table 1. Causes and number of work accidents caused by contractors in Brasov for the

years 2017-2018

No.	Cause of the accident	Number of accidents/ Year	
		2017	2018
1	Inappropriate performance of orders, maneuvers	91	86
2	Same-level falls (loss of balance, slipping, tripping, locking in	55	57
3	High-level falls (falling down, loss of balance, slipping, locking in, spontaneous reactions inappropriate in case of danger)	31	27
4	Failure to use protective equipment	12	20
5	Failure to observe in good time the operations indispensable to occupational safety	29	19
6	Inappropriate placement, consolidation, fixation	21	19
7	Exposure besides work tasks by moving / staying in hazardous areas	6	12
8	Presence at work with abrupt annihilation of functional ability	2	5
9	Inappropriately performing assembly	1	2
10	Inappropriate use of protective equipment	2	2
11	Performing operations other than the work duties such as turning on transportation means, installations, machinery, gears	4	1
12	Accidental communications through their content	3	1
13	Presence at work under the influence of emotional states	1	1
14	Presence at work in inappropriate conditions due to other causes	2	1
	TOTAL	260	253

Fig. 1. The Pareto chart illustrates the causes and number of work accidents caused by the contractors in Brasov County, corresponding to 2017



4. Conclusion

Upon examining the data presented in this study, the following key conclusions can be identified:

- Occupational accidents, as indicated by the statistical data and case analysis, are predominantly attributable to inadequate training of contractors, highlighting the urgent need to enhance and streamline the worker training process across all stages. Improving the effectiveness of employee instruction will significantly contribute to minimizing accident rates stemming from insufficient training.
- The Pareto diagram has been employed in this research due to the availability of quantifiable variables, supported by documented records for each incident (i.e., the number of work-related accidents in Braşov County during 2017 and 2018).
- The primary causes of workplace accidents (top 1 to 3), which resulted in the highest number of injuries, remained unchanged in their rankings across both years—2017 and 2018.
- The reduction in workplace incidents, from 260 in 2017 to 253 in 2018, could be further improved by integrating online platforms into the worker training framework, thereby enhancing accessibility, consistency, and knowledge retention.

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