

Impact of Economic Incentives on Costs and Benefits of Occupational Health and Safety

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The most common type of economic incentive used in the field of health and safety is experience rating of insurance premiums. The impact of this incentive on occupational health and safety (OHS) costs in the company was analysed by comparing insurance costs with other OHS costs associated with inadequate working conditions, such as accident costs borne by a company. Accident costs were estimated on the basis of research carried out in 10 companies. Insurance costs and their adjustments according to the health and safety level in a company were calculated according to an experience rating model developed in the Central Institute for Labour Protection.

OHS costs	OHS cost-benefit analysis	experience rating
	costs of accidents	

1. INTRODUCTION

The costs of occupational health and safety (OHS) in a company include both costs resulting from inadequate working conditions and costs of prevention (Figure 1).

OHS costs resulting from inadequate working conditions can be divided as follows:

- insurance cost driven by the overall actuarial risk of the company, which can be influenced by employers through changes in working conditions,

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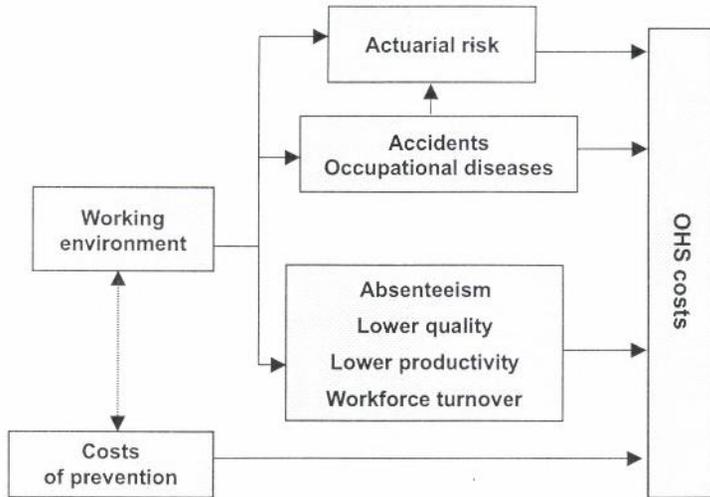


Figure 1. Main sources of occupational health and safety (OHS) costs.

- cost of occupational accidents and incidents,
- cost of occupational diseases,
- costs associated with absenteeism,
- costs resulting from lower productivity and quality.

Prevention costs are connected with the necessity to assure the employees' safety and health protection to a degree at least adequate to the requirements of the legal regulations in force.

It is assumed that if the safety level is economically optimal (Andreoni, 1986), the sum of prevention costs (curve P in Figure 2) and costs resulting from inadequate working conditions (curve N in Figure 2) reaches the minimum value. The increment in costs resulting from inadequate conditions, which is reached by including the insurance cost (curve U in Figure 2), induces growth of the economically optimal safety level.

Experience rating (insurance premium differentiation by looking at the level of OHS in the company) is a basic economic incentive used in numerous countries to focus the employers' interests on upgrading their working conditions (Bailey, 1994). The influence of this incentive on the costs and benefits of OHS will be analysed through a comparison of insurance costs and other components of costs resulting from inadequate working conditions.

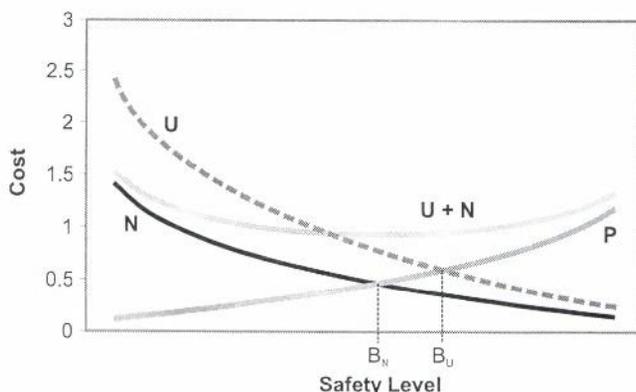


Figure 2. Costs of prevention and costs resulting from inadequate conditions of the working environment. Notes. U—insurance cost; N—costs resulting from inadequate conditions of the working environment; P—costs of prevention; B_N , B_U —optimal safety levels.

2. INSURANCE COST

2.1. Experience Rating Model

In the model worked out at the Central Institute for Labour Protection, the insurance premium is differentiated at the level of a given branch of economical activity and at the level of the company (Rzepecki, 1993; Rzepecki & Schulz, 1993). The premium size depends on the OHS level in the company, described by a risk category, which is determined on the basis of the following four indicators:

- total accident frequency rate,
- fatal and serious accidents frequency rate,
- occupational diseases rate,
- rate of employees exposed to harmful and noxious working conditions.

A specific category (C_1 to C_4) is attributed to each indicator (R_1 to R_4). The risk category determined for a specific company is the arithmetic average of the categories corresponding to specific indicators:

$$C_p = (C_1 + C_2 + C_3 + C_4)/4$$

where

C_1 — risk category determined on the basis of the total accident frequency rate (R_1) from the following equation: $C_1 = 1 + R_1/2.5$,

C_2 — risk category determined on the basis of the fatal and serious accidents frequency rate (R_2) from the following equation:

$$C_2 = 1 + R_2/0.06,$$

C_3 — risk category determined on the basis of the occupational diseases rate (R_3) from the following equation: $C_3 = 1 + R_3/0.25$,

C_4 — risk category determined on the basis of the rate of employees exposed to harmful and noxious working conditions (R_4) from the following equation: $C_4 = 1 + R_4/40$.

The following was assumed in the model:

- the highest risk category is category 25,
- a change in the risk category determined for a specific company by two categories carries a 5% change in the premium.

In compliance with the Act on the social insurance system of October 13, 1998 (Ustawa, 1998), the rate of an accident insurance premium should be from 0.4 to 8.12% of the contributory basis for premium calculation.

2.2. Insurance Cost and the Health and Safety Performance of a Company

The insurance premium, determined according to the presented model, may significantly influence the economical performance of a company. Figure 3 presents the share of the premium in the net profit for companies with different relations of remuneration to the net profit, according to the agreed premium rate.

The share of the premium in the net profit may be varied as it is determined by the OHS level in the company. In the case of companies with a high-risk category and low profit, the premium may constitute a significant share of the profit.

A cost-benefit analysis of OHS should include the part of the insurance premium that may be influenced by the company through changes in working conditions. The size of the premium, set at the level of the branch, may be changed through changes in the total accident rate, fatal and serious accident rate, occupational diseases rate, and the rate of employees working in harmful conditions.

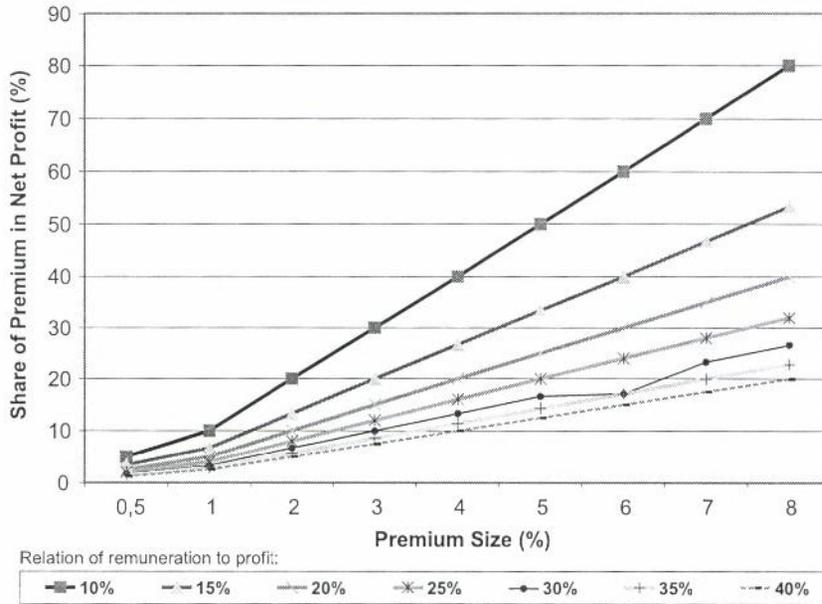
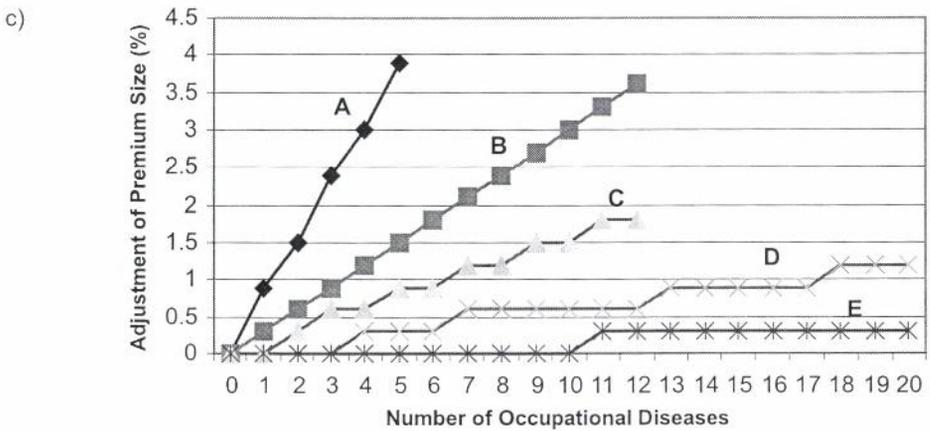
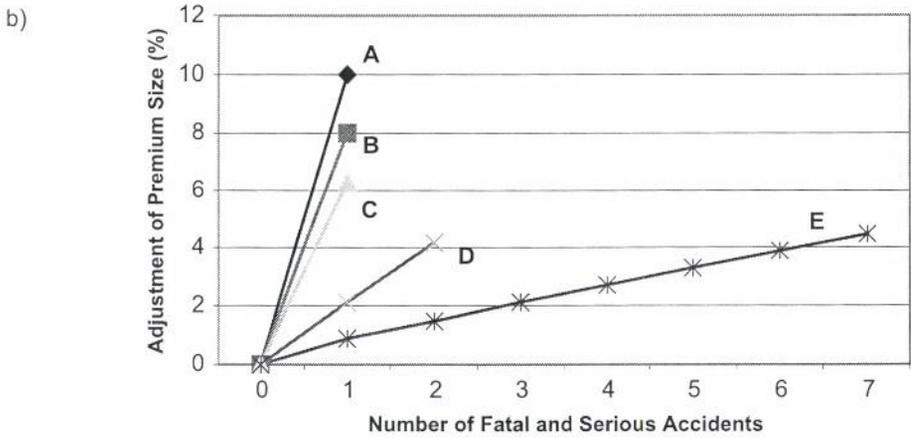
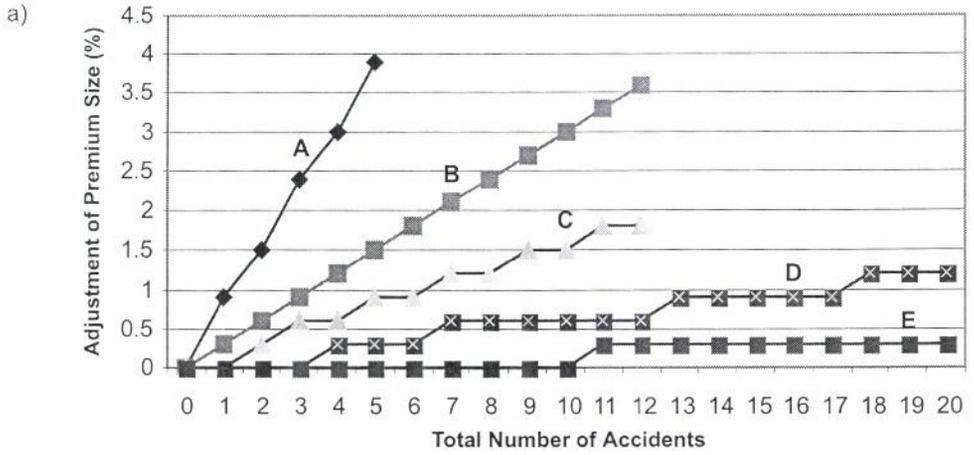


Figure 3. Insurance cost share in the net profit of the company.

Changes in the cost of insurance, calculated for companies of different sizes according to the presented experience rating model, are presented in Figure 4 (a, b, c, d). It was assumed that these companies belong to a branch whose size of the premium has been set at 6%. This assumption does not significantly influence the generality of this analysis. However, in the case of a premium set at a lower level, its changes induced by changes in working conditions would be lower.

Figure 4 shows that the most significant changes in the size of the premium are induced by changes in the number of fatal and serious accidents and occupational diseases. In small and medium-sized companies employing up to 300 people, one fatal or serious accident or one case of occupational disease may result in the increment in the premium rate to a maximum level. In order to change the size of the premium by changing the number of employees exposed to harmful and noxious working conditions, especially in large companies, it necessary to introduce changes improving working conditions for a significant number of employees. Changes introduced at specific workstations, which influence working conditions of a limited number of employees, will not influence the premium rate.



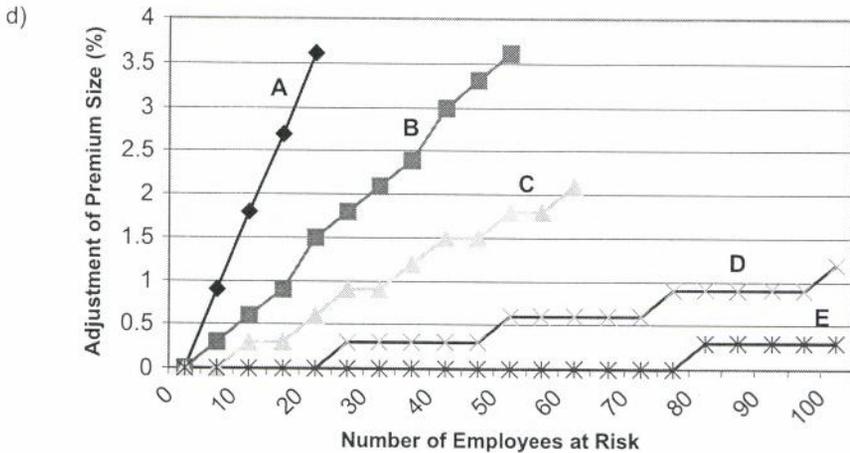


Figure 4. Changes of the insurance premium according to (a) the total number of accidents, (b) the number of fatal and serious accidents, (c) the number of occupational diseases, (d) the number of employees exposed to harmful and noxious working conditions in companies employing respectively A—20 employees, B—50 employees, C—100 employees, D—300 employees, E—1,000 employees.

3. THE COST OF AN OCCUPATIONAL ACCIDENT IN A COMPANY

Occupational accidents influence the increment in the premium (Figure 4a, b) and they mean costs for the company as well. The method of calculating costs resulting from occupational accidents at the company level, developed at the Central Institute for Labour Protection, includes the following costs components (Pawłowska & Rzepecki, 1997):

- lost working time,
- current liabilities connected with the accident,
- lost fixed and current assets,
- lost revenues.

When determining lost working time, we must take into account time lost by the injured person, both on the day of the accident and during the entire absence, time lost by other people (e.g., those administering first aid, assisting or accompanying the injured person on the way to the doctor's or home, looking on, etc.), time spent on replacing the injured person, and time spent on investigating the accident.

Current liabilities connected with the accident include payment of single compensation, compensation benefits, compensation benefits for occupational rehabilitation, additional liabilities connected with a transfer to other work, and so forth. Current liabilities also include costs incurred because of the need to rent machines, contract out of the production and repairs, the cost of transporting the injured person, and the cost of the medical treatment outside the company.

Losses in fixed and current assets cover lost raw materials, intermediate and finished goods, or damaged equipment (machinery, tools, vehicles). Breaks in work, lower work productivity, and lower quality caused by an accident lead to lost revenues. The total cost of an accident borne by the company can be calculated by adding individual costs.

Safety cost analyses conducted in companies seldom cover all of the important cost items of occupational accidents. In many cases, the cost of accidents is not calculated at all. To collect data on costs of occupational accidents in various economic branches, research was carried out in 10 companies of different sizes and belonging to different economic branches (Rzepecki, 1999). The calculated costs of occupational accidents in the companies studied are presented in Figure 5.

On the basis of the results of the survey, it was assumed that the average cost of one injury accident in the company was 4,200 zlotys. Following this assumption, the percentage shares of the costs of occupa-

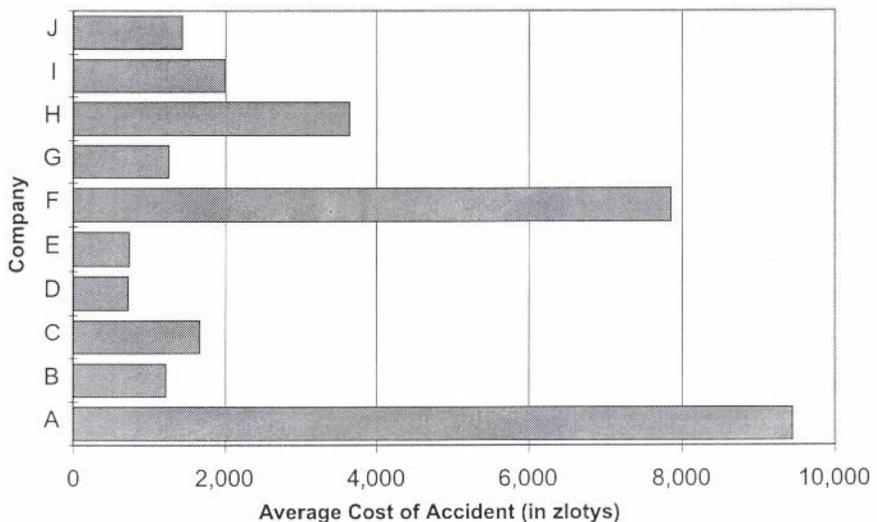


Figure 5. The average cost of an occupational accident in various companies (Rzepecki, 1999).

tional accidents in remuneration costs (calculated on the basis of the average gross salary) were estimated for companies employing respectively 20, 50, 100, and 1,000 people (Figure 6). For comparison, changes in the size of the premium following the change in the number of accidents in those companies are also shown (dashed lines).

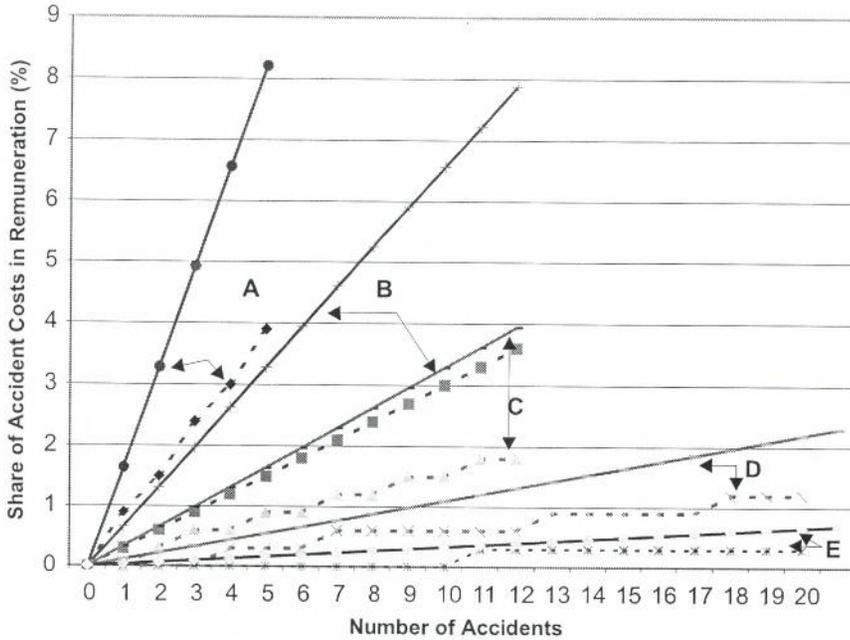


Figure 6. The share of the costs of occupational accidents (excluding fatal and serious accidents) in remuneration costs and changes of the premium rate according to the number of occupational accidents in companies employing respectively A—20 employees, B—50 employees, C—100 employees, D—300 employees, E—1,000 employees

The results of the research confirm the theory of “occupational accidents’ costs iceberg” that the costs of accidents borne by the company are bigger than the costs of insurance against occupational accidents and diseases (Andreoni, 1986; Brody, Letourneau, & Poirier, 1990; Davis & Teadsale, 1994; Heinrich, 1959; Simonds & Grimaldi, 1956; Health and Safety Executive, 1993). However, according to the presented model, in the case of fatal and serious accidents, especially in the case of companies belonging to low-risk branches, the increment in the premium should make the insurance cost exceed the accident cost borne by the company.

An economic analysis of OHS should include, together with injury accidents, costs of non-injury accidents. It appears from the numerous surveys (Heinrich, 1959; Rzepecki, 1999; Simonds & Grimaldi, 1956; Health and Safety Executive, 1993) that the number of non-injury accidents is significantly higher than the number of injury accidents. The costs of non-injury accidents usually exceed the costs of injury accidents, too. According to the results of the research (Rzepecki, 1999), the costs of non-injury accidents are 4 to 10 times higher. Taking the aforementioned into account, it may be said that the total costs of both injury and non-injury accidents borne by the company are usually a few times higher than the cost of insurance. That is why omitting accident costs in the economic analysis and taking into account the premium cost only, always results in invalid conclusions concerning the optimal level of expenditure on prevention.

4. THE COST OF OCCUPATIONAL DISEASES

The occupational diseases result especially in the premium increase. The cost of employee's absence during the period previous to the absence is borne by the insurer. The company may bear the costs connected with lower effectiveness and quality of work performed by the employee, which are difficult to estimate. It may be assumed that they are small enough, in comparison to the insurance costs, to be omitted in the analysis.

5. COSTS ASSOCIATED WITH ABSENTEEISM AND LOWER WORK PRODUCTIVITY AND QUALITY

Inadequate working conditions may induce higher absenteeism and lower work productivity and quality. However, it is difficult to estimate the incurred cost resulting from those negative processes. It may be expected that if many employees work in conditions other than ergonomically optimal, both the size of the premium and the costs of absenteeism will increase. Costs connected with absenteeism borne by the company may be significant. The share of these costs in remuneration costs, depending on the length of the absence, is shown in Figure 7.

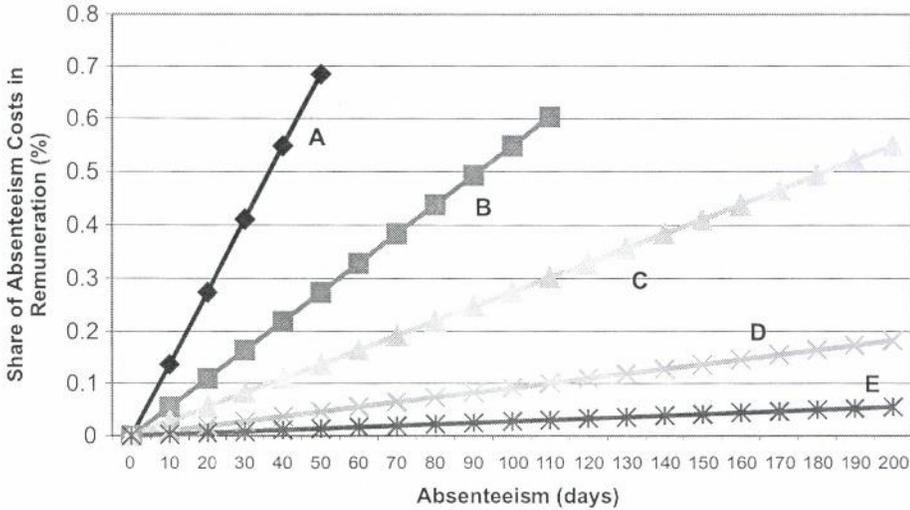


Figure 7. The share of costs connected with absenteeism in remuneration costs according to absenteeism.

6. CONCLUSION

Cost items that can be influenced by the company are taken into account in the OHS cost-benefit analysis carried out in order to define the optimal level of expenditure on prevention in a company and supporting decision processes in OHS management. A premium set at a fixed level may be considered the company's fixed cost.

If there is no economic incentive to improve working conditions, the costs of the occupational accidents borne by the company are a major component of the costs connected with inadequate working conditions. However, these costs are not calculated at all or some of the particular components of these costs are calculated in the majority of the companies. This usually leads to invalid conclusions concerning economic aspects of OHS, treated mainly as the source of additional costs.

Experience rating as an economic incentive for the improvement of working conditions should make companies focus on the economic aspects of OHS. It is also the first and the clearest sign that investment in safety may be profitable. It is expected that the introduction of this incentive will encourage a significant number of companies to continuously analyse costs and benefits of OHS. To be complete and usable for decision processes, these analyses should include all the important components of OHS costs.

Experience rating will induce significant changes in cost-benefit analyses. On the basis of an analysis of the changes, carried out for the presented model, it may be concluded it will result in

1. an at least twofold increment in costs connected with injury accidents and a significant increment in costs connected with fatal and serious accidents,
2. the company being charged with costs connected with occupational diseases of employees, which it does not currently feel,
3. a reduction in OHS costs induced by investments improving working conditions for employees; in the long run, such investments will result in benefits from a lower number of occupational diseases.

Those changes should support increased expenditure on prevention activities and greater benefits from an improvement in safety reached by an efficient implementation of these activities.

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