

INVESTIGATING OCCUPATIONAL DISEASES IN THE METALLURGICAL INDUSTRY

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The paper presents the trends in the evolution of occupational diseases in Romania in comparison to the EU and the US, as incidence of occupational diseases, their interrelationship with the exposure to occupational risk factors in the working environment, the dynamic changes over time of the traditional structure and of the hierarchy framework of employees' check-up regarding the risk factors. The analysis covers the period 2010 - 2015 and was made in quantitative terms (statistical data) and qualitative terms (study concerning the causal factors of the employee's work environment). The data are presented as absolute figures and the average annual incidence rates are presented per 100 000 people employed in this industry.

Key words: metallurgical industry, diseases, injuries, illnesses, risks

INTRODUCTION

The human body is a complex system of motility habits and skills and thus work efficiency is dependent on the physical and psychological state of the human resource [1]. Metallurgical industry [2] is one of the most demanding industries, in terms of working conditions with increased risk factors, being vital to us to know the evolution of occupational diseases in order to prevent the risk of injury and to make the employees' work more efficient [3]. It is an essential ring in the European Union (EU) industrial supply chain, as it produces components and finished goods used in other production sectors. Therefore, this paper aims to identify the trajectory of the metallurgical industry in terms of occupational diseases, for the period 2010 – 2015. In Romania, the metallurgical industry is privatized 100 %, and the share of foreign capital is about 80 %. In 2010, the Romanian metallurgical industry achieved a benefit of about 562 million Euros (0,93 % of the EU total) with a labour productivity of approximately 14 800 Euro / employee (i.e. 25 % of the EU average).

In 2013, it provided jobs for around 10 % of the EU - 27 industrial workforce. In 2015, there was a decrease in jobs, since in 2010 the metallurgical sector covered approximately 11 % of the total number of jobs in the EU. The metallurgical industry provided 12 % of all jobs in the industrial sector [4].

OCCUPATIONAL DISEASES IN ROMANIA BETWEEN 2010 AND 2015

According to the National Institute of Statistics of Romania, the incidence of occupational diseases per type of activity shows that, in 2015, the most cases of diseases were reported in the construction industry (38,70 % of the total reported cases), the metalliferous ore extraction (12,54 %), and the manufacture of motor vehicles for road transport, trailers and semi-trailers (12,40 %) [5, 6]. In 2015, there were 335 cases of musculoskeletal disorders, 246 cases of silicosis, and 61 cases of bronchial asthma. Occupational diseases caused by musculoskeletal disorders top the list in Romania as they do worldwide [6]. The evolution of the

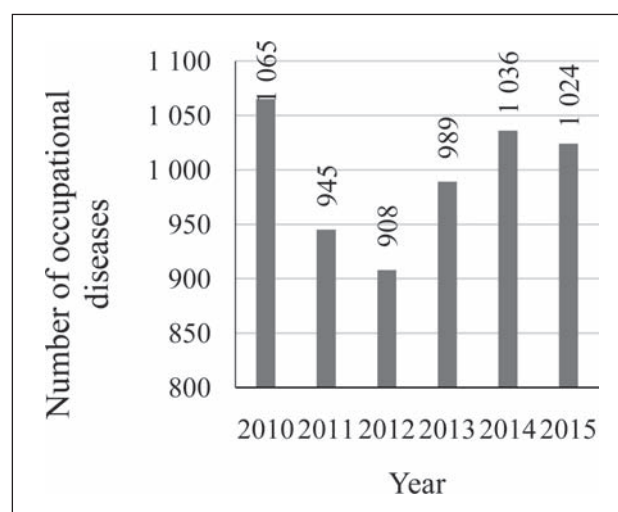


Figure 1 The evolution of the number of new occupational diseases reported in Romania between 2010 and 2015

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number of new reported cases of occupational diseases in Romania for the period 2010 - 2015 is shown in Figure 1, in which only the new cases reported are considered, without the cases reported in other years, for which the disease has recurred or worsened itself. It can be noticed that professional morbidity vary widely in recent years, the highest level being recorded in 2010, with approximately 27 % more occupational illnesses than in 2015 [4, 5].

The evolution of the number of occupational diseases reported in the metallurgical industry in Romania is shown in Figure 2.

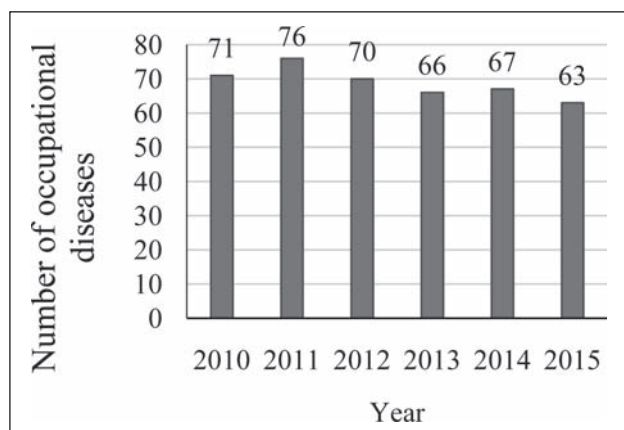


Figure 2 The evolution of the number of new occupational diseases in Romania in the metallurgical industry between 2010 and 2015

In 2014, the metallurgical industry in Romania recorded 67 new reported cases and it ranked fifth, according to individual branches of industry, representing 6,5 % of the total reported cases [4, 5]. The construction industry came first with 370 new reported cases, representing 35,70 % of the total cases in Romania.

The evolution of the number of new cases is in decline, with a decrease of approximately 17 % in 2015, as compared to 2011. The most numerous new cases in the metallurgical industry were recorded in 2010, i.e. 101 new reported cases, representing 7,21 % of the total number of cases reported in Romania [4].

The total incidence index is an indicator that is used to identify the condition and efficiency of the sector analyzed. The incidence index (1) is defined as the total

number of declared cases of diseases at national level (N_{TAD}) divided by the total number of employees (N_T) per 100 000 workers:

$$I_i = \frac{N_{TAD}}{N_T} * 100000 \quad (1)$$

The incidence index for the metallurgical industry (2) is defined as the total number of declared cases of diseases in the metallurgical industry (N_{MIAD}) divided by the total number of employees (N_T) per 100 000 workers:

$$I_{imi} = \frac{N_{MIAD}}{N_T} * 100000 \quad (2)$$

Table 1 shows an overview of the occupational morbidity in Romania, emphasizing the data related to the metallurgical industry. The data show that the number of new cases of illnesses in the metallurgical industry is between 6,15 % and 8,04 % out of the total number of new cases reported in Romania.

Since 2011, there has been a decrease in the number of new cases due to the new technology that reduces the effort and the harmful conditions of work and NOD decreases the most in 2015 with 18 %. In Romania, the incidence index was 21,53 %000 in 2015, with 4,8 % lower than the previous year.

OCCUPATIONAL DISEASES IN THE EUROPEAN UNION

In Europe, musculoskeletal disorders are the most common health problems related to work, affecting millions of workers. In the European Union, 25 % of workers suffer from backaches and 23 % report muscular pains [4, 7, 8]. In the metallurgical industry, most workers suffer from bronchial asthma and silicosis, i.e. approximately 62 %. The situation in the EU metallurgical industry is shown in Table 2. The metallurgical industry represents 26 % of the total production value and 11 % of GDP (Gross domestic product) [4, 7, 8]. The incidence rate of occupational diseases has a downward trajectory, registering in 2015 a value of 22,43 %000, due to a great concern within the EU for developing the 2020 Strategy for the development of sustainable job places.

Table 1 Occupational morbidity in the metallurgical industry in Romania between 2010 and 2015

Dimension / Value		2010	2011	2012	2013	2014	2015
NOD	Value	1 065	945	908	989	1 036	1 024
NODMI	Value	71	76	70	66	67	63
	Percentage / % of NOD	6,67	8,04	7,70	6,67	6,46	6,15
I_i / %000		22,30	19,63	18,76	21,07	21,79	21,53
I_{imi} / %000		1,48	1,57	1,44	1,40	1,40	1,33
Number of employees in the metallurgical industry		64 203	59 213	61 259	35 757	32 050	32 123
Total number of employees in Romania		4 774 000	4 812 000	4 840 322	4 693 585	4 753 821	4 754 896

Legend: NOD - The number of new occupational diseases reported in Romania, NODMI - The number of new cases of occupational diseases reported in the metallurgical industry, I_i - the total incidence index in Romania, I_{imi} - the incidence index in the metallurgical industry

Table 2 **The occupational diseases in the EU metallurgical industry between 2012 and 2015 [4]**

Dimension	2012	2013	2014	2015
NODMI	14 340	13 231	12 300	12 180
I_i / %000	24,34	23,47	22,61	22,43
I_{imi} / %000	2,48	2,21	2,11	2,08

OCCUPATIONAL DISEASES IN THE UNITED STATES

In the United States (US) [7], on an industrial level, it is estimated that approximately 1,2 million people who worked in 2014 / 2015 suffered from an illness caused or aggravated by the work place, and 35 % of those were reported cases. The situation of the occupational diseases in the metallurgical industry in the US is shown in Table 3. In the US, about 70 % of the new cases of occupational diseases, for the year 2014 / 2015, were musculoskeletal or stress disorders, depression, or anxiety.

Table 3 **The occupational diseases in the US metallurgical industry between 2012 and 2015 [7]**

Dimension	2012	2013	2014	2015
NODMI	4 010	3 860	3 765	3 761
I_i / %000	19,87	19,21	18,87	18,86
I_{imi} / %000	2,31	1,98	1,88	1,86

RESULTS AND LIMITATIONS

Comparing the situation of EU-28, US, and Romania for 2012 and 2015, in term of the incidence index in the metallurgical industry, I_{imi} , it is observed that in 2015, the EU value drops by 16 %, in US falls by 9 %, and in Romania decreases by 7 % (Figure 3).

Considering the situation shown above, the primary hierarchical framework for controlling the employees' exposure include the following: anticipation, recognizing risks, controlling risks education, and the legislation in force (Figure 4).

On an efficiency scale of the methods (noted from + to -), the engineering techniques are gaining value, being in antithesis with the employees' equipment which should bring additional safety. The data analysis presented in the previous sections leads to several results, such as:

- in 2015, there was a decrease in the metallurgical industry by 7,3 % in the US and by 15,1 % in the EU - 28, in comparison to 2012, due to the inclusion of new objectives in the 2020 Strategy;
- the decrease in the incidence of occupational morbidity is due to improved working conditions (due to technological developments and the legislation in force);
- from the perspective of the limitation, the decrease in the incidence of occupational morbidity may also imply that some of the cases are not even reported.

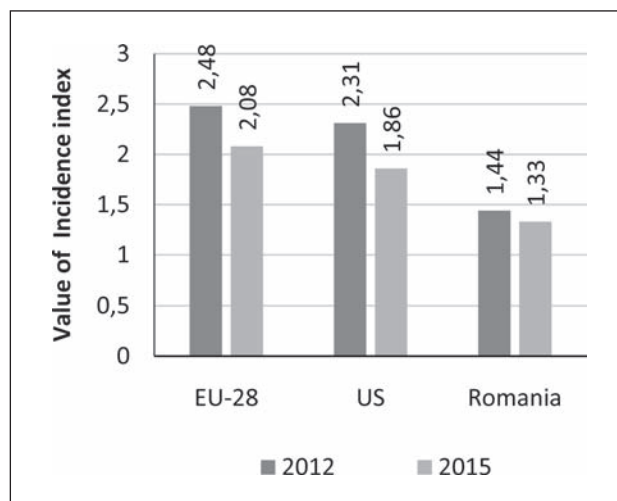


Figure 3 The evolution of the incidence index in the metallurgical industry between 2012 and 2015 in EU-28, US and Romania

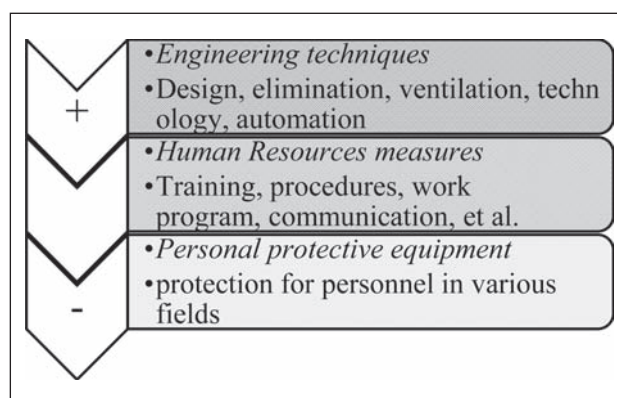


Figure 4 The preliminary hierarchical framework for controlling the worker's exposure to danger sources

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Note: The responsible translator for the English language is Ioana Matiu, Sibiu, Romania