7TH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL AND MATERIAL FLOW MANAGEMENT

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University of Belgrade, Technical Faculty in Bor, Serbia

Trier University of Applied Sciences, Environmetal Campus in Birkenfeld, Germany

University of Zenica, Faculty of Mechanical Enginering, Zenica, Bosnia and Herzegovina

BOOK OF PROCEEDINGS

November 3-5, 2017

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Book of Proceedings of 7th International Symposium on Environmental and Material Flow Management – EMFM17

Publisher: University of Belgrade, Technical Faculty in Bor

In front of the publisher: Prof. dr Nada Štrbac, Dean of Technical Faculty in Bor

Editor-in-Chief: Prof. dr ŽivanŽivković, Technical Faculty in Bor
Prof. dr Ivan Mihajlović, Technical Faculty in Bor

Technical Editor: Prof.dr Đorđe Nikolić, Technical Faculty in Bor

ISBN: 978-86-6305-071-6

Published in 100 copies

Bor – December 2017

7TH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL AND MATERIAL FLOW MANAGEMENT

WHY ARE COMPANIES IMPLEMENTING ISO 14001 – EXAMPLE FROM CROATIA

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Abstract: Due to changes in word economy and bigger impact of environment protection need either from market or institution side, companies are deciding to implement different environment management systems. Many companies worldwide have taken even further steps to be certified in accordance to ISO 14001 international standard. The number of certified companies has been growing significantly in the recent years. Most companies are passing rigorous standard compliances but their reasons for doing this are still not clear. They all have different motives for implementation of ISO 14001 and they see different benefits coming as certification result.

Paper investigates statistical data on ISO 14001 implementation in Europe and Croatia during recent years. As a case study certification in one Croatia company will be examined. We will explore reasons and potential benefits of ISO 14001 implementation in this company and if the implementation of the standard has made effect on the environment and company's competitiveness. Based on research conclusions will be given as well as recommendations for the further research about this environment management system and its influence in Croatia.

Keywords: *ISO 14001, environment management systems, benefits, drawbacks, competitiveness*

1 Introduction

Changes in worldwide economy and global market have made companies to think and act faster, adapt to ongoing changes and look for activities which will make the better, faster, nicer and cheaper to customers – more competitive. Pressures from market is not coming only for business side but from environment as well. Economy crisis followed with issues of use of natural resources and ecology initiated several environment management systems which are companies implementing to create and maintain competitiveness. At the same time companies need to be in line with different environmental regulation to continue with their business. Companies tend to implement different management systems and standards to support their entrances to international markets [1]. One of those management systems is ISO 14001 which was introduced in 1996.

Paper aim is to investigate ISO 14001 implementation in Europe and Croatia. In the first part, we will give basic information about the ISO 14001 series of standards and its history. Benefits and drawbacks of implementation will be presented in the second part of the paper. Next, will give statistical insight about companies which implement this standard, their sectors in the word and in the Croatia. In the fourth part, we will present one example of Croatia company which has implemented ISO 14001 and discuss about effects of implementation. Finally, conclusions will be presented and recommendations for further research about this topic will be given.

2 Environment management systems

Corporations worldwide have been adopting environmental protection programs which were mandated by different national agencies and governments from early 1970-ties. During 1980-ties corporations started with attempts to be ahead of costly and quickly changing different environmental regulations and started adopting processes which were intended to reduce sources of pollution rather than controlling them. Because of those activities, companies started with integrating their environment management activities into more inclusive systems. Different associations, international organizations, and government noticed potential advantages of creating and setting standards – environment management systems (EMS) - which companies could use as guiding principles.

When company implements EMS, it is expected to initiate company's responsiveness to environment issues. EMS is framework for integration of corporate environment protection programs and policies. Practice of implementing EMS is growing rapidly not only in multinational companies but also in national and local companies [2]. EMS usually identifies of company's environmental targets on whose base companies develop their environmental policies. Companies within EMS must identify their impacts on environment and relevant regulations brought by government (local or national). Operational and management control together with different procedures (measurement and monitoring) and programs for impact on environment should be set up. This process is accompanied with employees training and education, documentation and audits (internal and external). EMS can and should be integral *part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy* [3]. Although there are several EMS standards present worldwide, three are most important: Eco Management and Audit Scheme (EMAS), BS 7750 and ISO 14001 Standard. All three-mentioned standard are complements to international and national legal regulations. BS 7750 is British standard while EMAS is like ISO 14001 regarding its requirements and components. Main difference is that EMAS in applicable only at site level while ISO 14001 is applicable to different levels – factory, company [4] and that standard has different aims [2]. Both standards are indicators for company's environmental obligation and are a way of developing company's competitiveness.

2.2 ISO 14001 standard

Although there have been many different EMS programs over the years, ISO 14001 is first attempt to create international EMS standard [5]. International standard ISO 14001 was presented for the first time in 1996 and it was an answer to growing need and pressure on companies in relation to their environment. This EMS was supposed to give legality in having ISO certificate on one side and to improve company's environmental performance on the other side [6]. Standard requires structure and set of procedures like typical EMS. It is important to make one strong point and that is main difference between EMS and ISO 14001. Company's own EMS can be completely customized according to the organization's needs but on the other side for company to be certified with ISO 140001 it must be audited by third party company and company should follow all elements of standard. EMS can be defined as an aspect of an organization's environmental policy [7] and has part in defining how companies manage their possible impacts on environment [8]. ISO 14001 is available to all companies (private and public) whichwant to be certified and invest in that process but there is a starting learning curve which should be made in every company [9]. Standard is set of guidelines with which company (whole organization or single site) can set its environmental policy, identify different environmental

aspects of its business, define environmental goals, adopt program to reach environmental goals, measure effectiveness, correct problems and assess its management system to promote continuous improvement [10]. Since this standard is derived from ISO 9001, companies with implemented ISO 9001 will be more inclined toward ISO 14001 certification [11] due to their defined quality management structure and review settings, internal audits, business procedures and procedures how to conduct corrective activities. Standard is voluntary on one side but on the other side it has opportunity for global impact on environmental policy making and is founded upon the idea that EMS can improve performance of the company [12].

Implementation of ISO 14001 proves the activities of organization (private or public) in reducing their potential impact on the human wellbeing and environment while at the same time diminishing potential environmental damage during all stages of their products/services life cycles in accordance to the circular economy[13]. Main goal of the circular economy is reducing landfills, waste and emissions with re-use, recycling, and remanufacturing of materials and at the same time it looks upon different stakeholders [14]. Process of implementing ISO 14001 is based on Plan Check Do Review Improve cycle [11]. In the first phase company makes first actions to be compliant with ISO 14001. Second phase looks over verification and correction of errors in company. In the third phase, company's top management makes overall assessment of complete company's process. Last phase officially never ends since company is constantly trying to find was of further development of their EMS (See Figure 1).

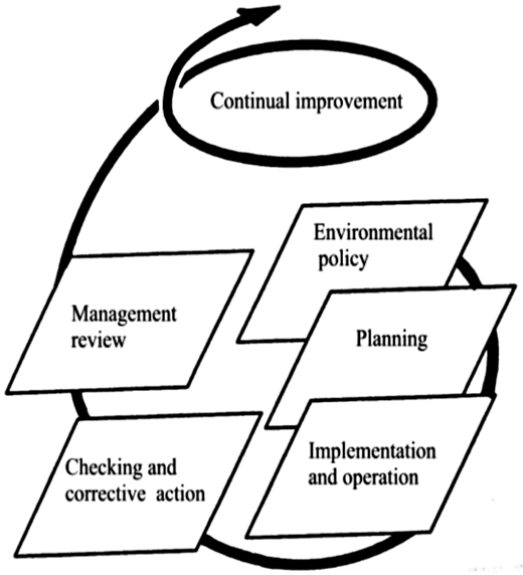

Figure 1. ISO 14001 model (Source: ISO, 2017)

As presented process of implementation and certification in accordance to ISO 14001 ends with company receiving standard and then goes further with continuous improvement. But the question is why companies decide to implement this standard. Whitelaw [15] identified several reasons: (1) gaining and/or retaining market share through green corporate image; (2) reducing insurance risk; (3)

reducing cost; (4) attracting more ethical investments; (5) reducing potential prosecution risks. It is important to state that order of reason according to their importance is not always the same. It is up to the companies to decide which tool will they use to answer one or more identified reasons. All reasons can be placed in one sentence - companies need to control and reduce their impacts on the environment.

During years, ISO 14001 has been changing and there were two revisions of the standard – one in 2004 and latest coming in 2015. Main elements of ISO 14001 are organized in five steps: (1) Environmental policy, (2) Planning; (3) Implementation and operation; (4) Checking and corrective action and (5) Management review [16].

2.2 Benefits and drawbacks

As every process, procedure and activity company can implement into their business, implementation of ISO 14001 standard has benefits and drawbacks for companies.Most of studies about ISO 14001 have been focused on economic benefits and drawbacks implementation can bring to companies. Benefits which ISO 14001 implementation can bring to companies have been extensively studied and examined in academic literature. Tari [17] made analyze of conducted studies and identified 14 different benefits implementations of ISO 14401 is bringing to companies. Some of them include environment protection, profitability, efficiency, improved image, improved customer satisfaction and improvements in employee results. First three mentioned benefits are mainly considered in research since they are presenting the most important standard is bringing to most companies. Grandić [12] stated that companies which implement ISO 14001 have further benefits such as reduction in waste management costs, energy and material consumptions saving. Standard is perfectly designed for proactive executives who understand how EMS can bring return on investment.

One of the studies divided ISO 14001 benefits to external and internal [18]. In internal benefits author placed: organizational, financial and people benefits and in the external: commercial, environmental benefits and supplier relations. Several other researches made different classification of potential benefits for companies implementing ISO 14001 (See Table 1).

Table 1. ISO 140001 benefits classification

Authors	**Benefits classification**
Zeng, Tian and Shi [19]	Internal operations, corporate management, marketing effects, supplier relations
Link and Naveh [20]	Environmental performance, business performance
Gavronski, Ferrer and Palva [21]	Productivity benefits, financial benefits, market benefits, societal benefits.
Poksinska, Dahlgaard and Eklund [22]	Internal performance benefits, external marketing benefits, relations benefits.

Based on Table 1 and all previous research results it is possible to conclude that the implementation of ISO 14001 standard can have significant impact on company's business. It is important to state that some of studies didn't find positive correlation between company's business performance and implementation of ISO 14001 [20].

Despite all previously stated benefits of implementation of ISO 14001, recently there have been studies which are focused on potential drawbacks connected with ISO 14001 adoption. Boiral [23] stated several drawbacks which arise during ISO 14001 implementation and they include risk of bureaucracy during preparation for certification and cost of standard implementation while Heras-

Saizabitoria and Boiral [24] stated limited potential of assessing the improvements and lack of focus and confidence in third-party audits. Potential standard implementation drawbacks can be seen in following categories: (1) inappropriate or excessive documentation; (2) lack of follow-up and system continuity; (3) search for commercial certification; (4) insufficient resources; and (5) externalization of the implementation process [25]. Probably the most important ISO 14001 drawback and criticism referrers to company's potential capacity of reducing negative environmental influences and thus influencing standard assurance as company's environmental behavior.

2.3 Standard statistics

Based on ISO 2016 survey [26] there is a significant growth in number of certificates worldwide. In 2016 there was more than 346.000 certificates implemented in 201 countries (See Figure 1). Although certification in accordance to ISO 140001 is not obligatory in many circumstances, the number of ISO 14001 certificates available through ISO survey 2016 can be a good representation to evaluate the dissemination of this standard [27]. It is also important to state that the increasing number of ISO 14001 standards can be considered as confirmation of previously stated benefits companies have after certification.

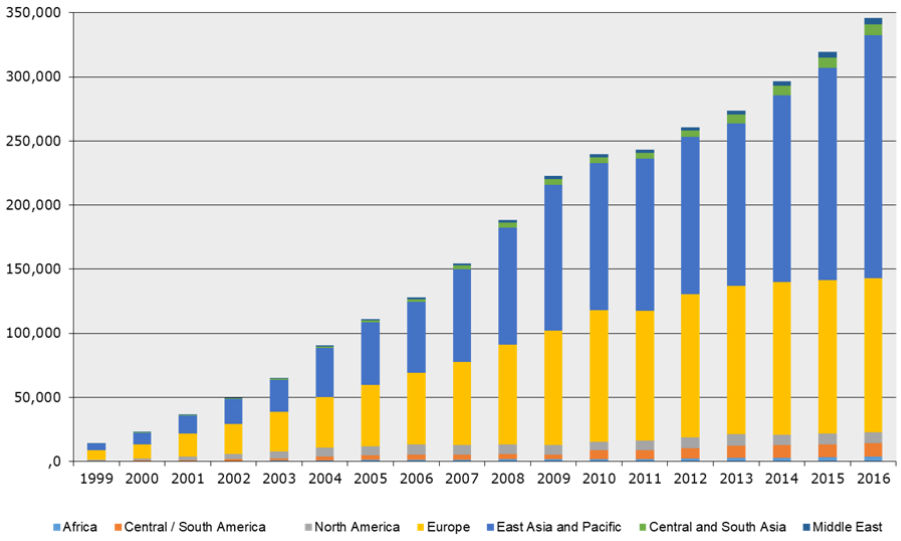

Figure 2. Total number of ISO 14001 certificated worldwide (Source: ISO Survey 2016)

Areas with the most ISO 14001 certificates are East Asia and Pacific (189.505) and Europe (120.595). Average yearly growth in number of certificates is more than 10% and in 2016 there was 17% more certificates in relation to previous year. Country with highest number of certificates is China (137.230) followed by Japan (27.372), Italy (26.655), United Kingdom (16.761), Spain (13.771) and Germany (9.444).

ISO 14001 is implemented in 39 sectors (according to European Accreditation classification code) and five sectors with most ISO 14011 certificates in 2016 were construction, basic and fabricated

metal, electrical and optical production, wholesale and retail trade and other transport equipment (See Figure 3).

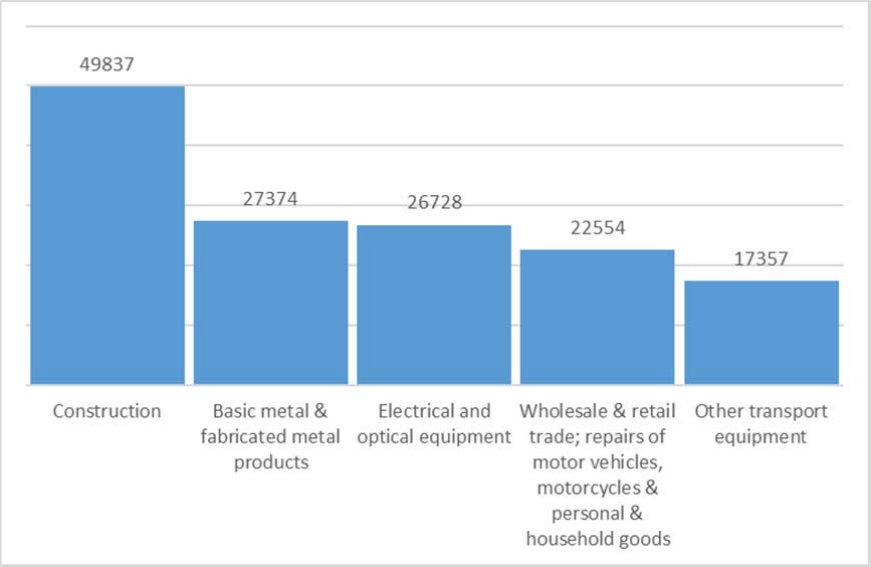

Figure 3. Top five industrial sectors for ISO 14001 certificates 2016 (Source: ISO Survey 2016)

Those five sectors accumulate 45.7% of total ISO 14001 certificates worldwide. During last three years first four sectors have not changed and only fifth sector on the top-five list was changing so in 2014 fifth sector was machinery and equipment and in 2015 rubber and plastic products. Both sectors are still important and they are sixth and eight according to number of ISO 14001 certificates in 2016. This gives good insight for which industrial sectors worldwide ISO 14001 certification is bringing benefits for their businesses.

3 ISO 14001 in Croatia

ISO standard 14001 is present in Croatia from the 1997 when the first companies were certified. By 1999 there was 8 companies with ISO 14001 certificate (See Figure 4).

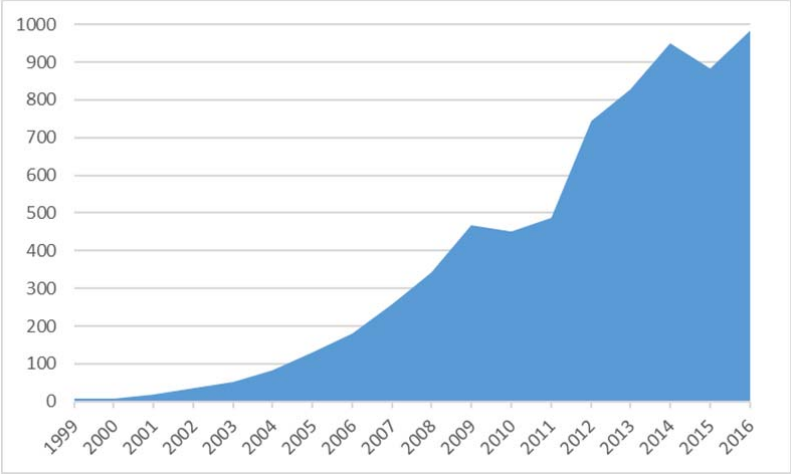

Figure 4. ISO 14001 certificates in Croatia from 1999 to 2016 (Source: ISO Survey 2016)

During period from 1999 to 2016 the number of certificates was growing and in 2016 there was 984 certificates. This number was growing during examined period except during 2015 when the number fallen for almost 10%. In 2016 growth was recorded again with the highest number of certificates. ISO 14001 can be found in 37 different industrial sectors in Croatia (See Figure 5).

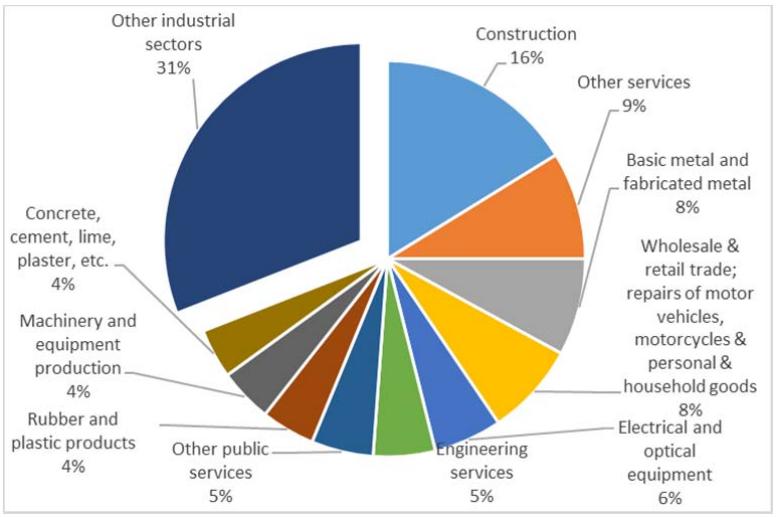

Figure 5. Sectors with ISO 14001 certificates (Source: ISO Survey 2016)

Construction sector in Croatia has the most ISO 14001 certificates and it is followed with other services sector and basic metal and fabricated metal sector. This division between sectors in Croatia is following division of ISO 14001 across sectors worldwide and is showing importance of having ISO 14001 for certain sectors and their businesses.

Main reasons why Croatian companies implement ISO 14001 is not different in relation to world examples and they include following: (1) better performance of the company, (2) improving public image of the company; (3) compliance with regulation; (4) employee involvement [28]. Companies

implement ISO 14001 as a tool for building waste management organization to reduce, re-use and recycle waste on their level. Standard is also important for waste management in municipalities, cities, countries and whole country since it can help in raising awareness about waste and consequently whole environment. In the following part of the paper an example from Croatia will be presented.

3.1 Example from Croatia

Croatian company has a long tradition of production of chemical and cosmetics products. During its existence company has invested in organization and production as well in implementation of ISO 9001 standard. Company is situated in urban part of the city and due to its production, there has been several complaints from the people living nearby regarding possible influence on the environment. In 2004 company started a project of implementation of ISO 14001 standard and first action was to introduce company's policy of environment protection management within company and to present it to all other stakeholders. Company started with assessing status and determining environmental aspects of the company (See Figure 6).

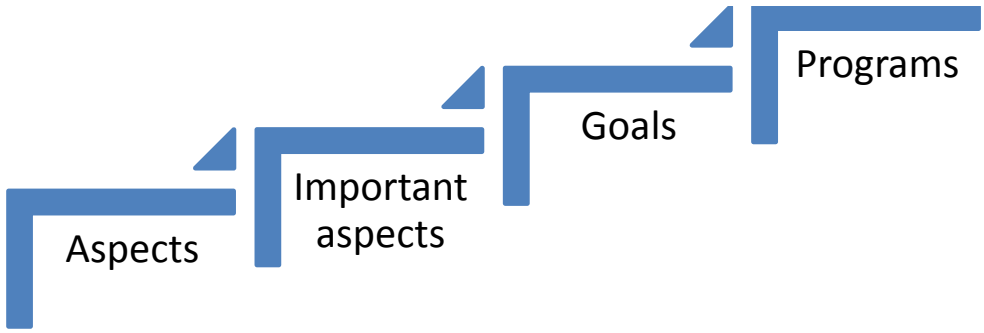

Figure 6. Process from aspects to goals and programs of environment protection

Based on assessment company has determined its environmental aspects which are based on following criteria: legal requirements, local requirements, administration and self-government, environmental protection policy of the company, public influence, technical and technological, financially objectively possible pollution reduction activities.

Company has identified several significant aspects of the environment (13) through crystallization of goals and different programs (23) within which different tasks were assigned (42) for realization. Company has assigned environment protection programs to different employees, set deadlines for realization of programs and financial resources which are analyzed every six months. ISO 14001 shares common management systems principles with ISO 9001 quality standards, and since company has ISO 9001 since 2000 it was much easier during implementation process for the employees to understand process and importance of the certification. Whole ISO 14001 environmental management system is elaborated within integrated system specific elements (13) which are required by ISO 14001 standard.

During process company's environment management system and its functionality were checked and assessed. Different corrective actions are carried out and their results are presented in regular reports (semi-annual, yearly). Twice per year board of director's representative for ISO 14001 presents achieved results which can be environmentally and financially measured. Company presents their

results in reports on their web pages in which they inform stakeholders about what has been achieved. As a part of all activities two programs are worthy of mentioning:

1. Re-use of PET granulate - company is producing their own packaging from PET granules. Because of production of bottles, company has approx. 2% of waste (residue after color or mold changes, inadequate quality bottles) – i.e. 60 tons of material. Based on ISO 14001 procedures company is inspecting waste and almost 40% is put back into production and 60% is sold to certified waste collector. With this procedure company is saving almost 40.000 EUR/year.
2. Collecting of used printer cartridges – due to the legal regulation in Croatia every company should pay certain amount for used printer cartridges (as part of electronic waste management). Company introduced, as part of ISO 14001, procedure for collecting used cartridges and giving the to another company which is using them in process of preparation for re-use of cartridges. In return company is receiving receipt which means that they don't need to pay fee for electronic waste. This is representing way of saving money and protecting environment.

Through ISO 14001 environment management has become important parameter in planning company's environment impact and in today's economy this is not easy to achieve. Because of ISO 14001 implementation company has achieved following results:

1. Environment protection and thinking about it became significant part of company.
2. Company clearly recognized its significant aspects of environment.
3. Company defined goals and aligned them with the national legislation.
4. Company follows systematically program and its realization.
5. Better management of different natural resources was established and through that company achieved significant financial savings.
6. Company enabled better control of costs and activities related to environmental protection.
7. Company improved production technology to reduce environmental pollution.

Above mentioned results helped in improving company's public image as environment friendly company and this is one of the several benefits company received with ISO 14001 certification. It is important to state that besides external benefits for the company, ISO brought change of thinking inside company with employees starting to think about how they can contribute. Several activities brought savings in used resources which led to saving in financial resources thus enabling company to be more competitive on the market.

4 Conclusion

In today's global market condition companies need to look upon every aspect of their business and environment is becoming more important for companies for being more competitive in their business and to take care about environment in which they work.

Although there are several different EMS standards available to companies, ISO 14001 is standard which has gained popularity and is accepted all over the world. During time ISO 14001 has been changing in accordance with changes in world business. Latest version of ISO 14001:2015 standard emphasizes sustainable development and the achievement of the balance between the environment, society and the economy. Key improvements of standard include strategy alignment, increased governance, efficient communication, enhanced environmental protection and environmental problem monitoring during lifecycle of products and services.

Implementation of ISO 14001 brings external and internal benefits to companies which adopt standard and those benefits include among others environment protection, profitability, efficiency, improved image, improved customer satisfaction and improvements in employee results. On the other side, there are drawbacks of ISO 14001 and they include lack of follow-up and system continuity and company's potential capacity of reducing negative environmental influences.

Presented case showed benefits of ISO 14001 for Croatian company which managed to better use resources needed for production and in the same time to save financial resources which were then used for other purposes. Besides this saving company increased its image in local and national environment and is aligned with different national environmental regulation.

Based on literature review, increased number of standards worldwide and benefits found in observed Croatian example further research is proposed:

- examine potential influence of ISO 14001 standard implementation on company's competitiveness on local and domestic markets,
- examine if Croatian companies that have implemented ISO 14001 have reduced their negative impact on environment or not.

References

1. I.M.B. Freitas, M. Iizuka, Research Policy, 41 (2012).
2. D. Morrow, D. Rondinelli, European Management Journal, 20 (2002) 2.
3. ISO, ISO 14001 Section 3.6
4. G. Sulzer, Proc. of ASQ's 53rd Annual Quality Congress Milwaukee, USA, 1999.
5. N. Darnall, Business & Society, 45 (2006) 3.
6. R.J. Jiang, P. Basal, Journal of Management Studies, 40 (2003) 4.
7. T. Tibor, I. Feldman I., Electronic Green Journal, 1 (1996) 6.
8. C. Coglianese, J. Nash, J. Howard-Grenville, J., Law and Policy, 30 (2008) 1.
9. M. Delmas, Production and Operations Management 10 (2001) 3.
10. G.H. Weaver, Strategic Environmental Management: Using TQEM and ISO 14000 for Competitive Advantage, Wiley, New York, 1996, p. 320
11. C.J. Corbet, D.A. Kirsch, Production and Operations Management 10 (2001) 3.
12. D. Grandić, Eurasian Journal of Business and Management, 5 (2017) 1.
13. A.E. Di Noia, G.M. Nicoletti, StudiaOeconomicaPosnaniensia, 4 (2016) 10.
14. A. Erceg, B. Činčurak Erceg, A. Božić, Proc. of 6th International Scientific Symposium Economy of Eastern Croatia – Vision and Growth, May 25-27, Osijek, Croatia, 2017.
15. K. Whitelaw, ISO 14001 Environmental Systems Handbook, Elsevier Butterworth-Heinemann Ltd, Oxford, 2004, p. 237.

16. R. Welford, in Corporate Environmental Management, Earthscan Publications Ltd, London, 1998, p. 256.
17. J.J. Tarri, J.F. Molina-Azorin, I. Heras, Journal of Industrial Engineering and Management, 5 (2012) 2.
18. R. Hillary, Journal of Cleaner Production, 12 (2004) 9.
19. S. Zeng, P. Tian, J. Shi, Managerial Auditing Journal, 20 (2005) 4.
20. S. Link, E. Naveh, E. IEEE Transactions on Engineering Management, 53 (2006) 4.
21. I. Gavronski, G. Ferrer, E. Paiva, Journal of Cleaner Production, 16 (2008).
22. B. Poksinska, J. Dahlgaard, J. Eklund, International Journal of Quality & Reliability Management, 20 (2003) 5.
23. O. Boiral, Long Range Planning, 44(2011) 3.
24. I. Heras-Saizarbitoria, O. Boiral, International Journal of Management Reviews, 15 (2013) 1.
25. V.F. Vilchez, European Research on Management and Business Economics 23 (2017).
26. ISO, ISO Survey 2016.
27. A. Terlaak, A.A. King, Journal of Economics Behavior & Organization, 18 (2006) 60.
28. M. Bešker, J. Čiček, M. Drljača, Proc. of 17th International Symposium on Quality - Quality Makes a Difference, March 16-18, Zadar, Croatia, 2016.

CONTENTS

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