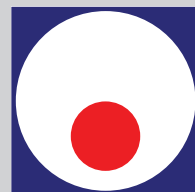




FACULTY OF MECHANICAL AND CIVIL ENGINEERING
IN KRALJEVO
UNIVERSITY OF KRAGUJEVAC



The Eighth Triennial
International Conference

HEAVY MACHINERY HM 2014

Proceedings

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24 - 26 June 2014



**FACULTY OF MECHANICAL AND CIVIL ENGINEERING KRALJEVO
UNIVERSITY OF KRAGUJEVAC
KRALJEVO – SERBIA**

THE EIGHTH INTERNATIONAL TRIENNIAL CONFERENCE

HEAVY MACHINERY HM 2014

PROCEEDINGS

Zlatibor, June 25 – June 28 2014.



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UNIVERSITY OF KRAGUJEVAC
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PREFACE

The Faculty of Mechanical Engineering Kraljevo has been traditionally organizing the international scientific conference devoted to heavy machinery every three years. The VIII International Scientific Conference HM 2014 is considering modern methods and new technologies in the fields of transport design in machinery, control energy, production technologies, urban engineering and civil engineering through thematic sessions for the purpose of sustainable competitiveness of economic systems. Modern technologies are exposed to fast changes at the global world level so that their timely application both in large industrial systems and in medium and small enterprises is of considerable importance for the entire development and technological progress of economy as a whole.

The VIII International Scientific Conference Heavy Machinery HM 2014 is a place for exchange of experiences and results accomplished in domestic and foreign science and practice, with the goal to indicate directions of further development of our industry on its way toward integration in European and world economic trends. Exchange of experiences between our and foreign scientific workers should contribute to extension of international scientific-technical collaboration, initiation of new international scientific-research projects and broader international collaboration among universities.

The papers which will be presented at this Conference have been classified into seven thematic fields:

- A. EARTH-MOVING AND TRANSPORTATION MACHINERY
- B. PRODUCTION TECHNOLOGIES
- C. CIVIL ENGINEERING AND MATERIALS
- D. AUTOMATIC CONTROL, ROBOTICS AND FLUID TECHNIQUE
- E. MACHINE DESIGN AND MECHANICS
- F. RAILWAY ENGINEERING
- G. URBAN ENGINEERING, THERMAL TECHNIQUE AND ENVIRONMENT PROTECTION

Within this Conference, the First International Students Symposium will be held. The aim is to open a scientific discussion on this actual problem in industry among young students.

The sponsorship by the Ministry of Science of the Republic of Serbia is the proper way to promote science and technology in the area of mechanical engineering in Serbia.

On behalf of the organizer, I would like to express our thanks to all organizations and institutions that have supported this Conference. I would also like to extend our thanks to all authors and participants from abroad and from our country for their contribution to the Conference. And last but not the least, dear guests and participants in the Conference, I wish you a good time in Kraljevo – Vrnjačka Banja and see you again at the Eight Conference, in three years.

Kraljevo – Zlatibor, June 2014

Conference Chairman,


Prof. Dr. Milomir Gašić, mech eng.

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Knowledge Innovation Trends on a Standardization Platform – in Parallel: Civil Engineering and Railway Engineering

Živadin Micić¹ PhD*, Slobodan Petrović, M.Sc.Eng.²

¹Faculty of Technical Science Cacak - University of Kragujevac, Cacak (Serbia)

²Business Technical College of Vocational Studies, Uzice (Serbia)

The paper presents multi-criteria research and statistical analyses of trends of separated segments per subfields of civil engineering and engineering of railway vehicles. A focus is given to trends in knowledge innovating at the beginning of the second decade of the XXI century. The goal is to provide and improve the resources for quality of knowledge, on the platform of SRPS and ISO standardization. This paper presents the important details (the results) of comparing the trends of knowledge, in the analyzed subfields/ fields classified according to the International Classification of Standards (ICS) or ICS1 = 45 (Railway Engineering) and ICS1 = 93 (Civil Engineering). The directions of further development are presented, and also possibilities of access to the sources of knowledge and obligations, as well as comparisons with the standardization of local (national) and international level, in the same and in all other fields of creative work (for ICS1 = 01 to 99).

Keywords: Knowledge trends, Civil engineering, Railway Engineering, Knowledge innovation, Standardisation

1. INTRODUCTION

According to International Classification for Standards - ICS, civil engineering is a field classified in 12 subfields (ICS2 = 93.xyz), [1], [2]:

- 1) 93.010 Civil engineering in general,
- 2) 93.020 Earthworks. Excavations. Foundation construction. Underground works,
- 3) 93.025 External water conveyance systems,
- 4) 93.030 External sewage systems,
- 5) 93.040 Bridge construction,
- 6) 93.060 Tunnel construction,
- 7) 93.080 Road engineering,
- 8) 93.100 Construction of railways,
- 9) 93.110 Construction of ropeway,
- 10) 93.120 Construction of airports,
- 11) 93.140 Construction of waterways, ports and dykes,
- 12) 93.160 Hydraulic construction.

According - ICS, railway engineering is classified in six sub-fields (ICS2 = 45.xy0), [1], [2]:

- 1) 45.020 Railway engineering in general,
- 2) 45.040 Materials and components for railway engineering,
- 3) 45.060 Railway rolling stock,
- 4) 45.080 Rails and railway components,
- 5) 45.100 Cableway equipment,
- 6) 45.120 Equipment for railway/cableway construction and maintenance.

Standardization and innovations are compatible concepts, based on the trends of knowledge. Standards are binding: at the same time they accelerate technological and organizational changes, improve innovation performances, promote innovative products and services, provide stable references for the development of new solutions and products, [3], [4], [5].

The pace of knowledge innovating and training in professional work is very intensive. Experts are often

faced, also in the fields of ICS = 45 and ICS = 93, with the problem to remain competitive, which imposes new, big challenges: Lifelong (continuous) education and maintenance of the knowledge level that is necessary for good quality performance of work. Much of this knowledge has been acquired or completely revised through practice. In this paper, a platform for knowledge innovating is consisted of ISO and SRPS standards, with the aim of knowledge modelling and management. 164 national standardization bodies from all over the world are members of ISO: industrialized countries, developing, countries in transition, [4]. Classification of Standards (ICS) includes 40 hierarchically organized fields of standardization. This paper analyzes the fields ICS1 = 45 and ICS1 = 93.

Standards facilitate and improve the methodology according to PDCA (Plan-Do-Check-Act):

- planning and systematic approach to solving problems,
- dissemination of technologies and best practices, inclusion of all the stakeholders in determining the rules for future research and development, transfer of knowledge and technologies, networking with other industries and main stakeholders in future research, access to new technologies, interoperability of its own with other compatible technologies,
- evaluations and comparison with the best ones, compatibility with other manufacturers,
- providing a platform for innovation, the use of research results [3-7], improvement of products quality, etc.

This paper presents the methodology and analysis of trends and comparisons of innovativeness intensity on the examples of standardization in two fields. The statistical analysis of the results is shown, obtained with our own Web applications [7], developed for the purpose of a comparative analysis and the valuation of

*Corresponding author: Faculty of Technical Science Cacak - University of Kragujevac, Svetog Save 65, 32 000 Čačak, Serbia; micic@kg.ac.rs

