TECHNICAL FACULTY "MIHAJLO PUPIN" ZRENJANIN,
UNIVERSITY OF NOVI SAD,
REPUBLIC OF SERBIA

CONFERENCE AGENDA

Venue:
Technical Faculty "Mihajlo Pupin" Zrenjanin,
October, 3-4th, 2024.

Thursday, 03.10.2024.	
15.00 - 17.00h	Registration
19.00h	Welcoming coctail
Friday, 04.10.2024.	
9.00 – 10.00h	***Registration***
10.00 – 10.30h **36**	***OPENING of the*** ***XIV International conference on Industrial Engeenering and Environement Protection*** Ph.D Milan Nikolić, Dean of the TF "Mihajlo Pupin" Ph.D Jasna Tolmač, President of the Organizing Committee
PLENARY SESSION	
10.30 -11.30h **35**	**Chairs**: Slavica Prvulović, Jasna Tolmač
	EXAMINATION OF THE SAMPLE PROPERTIES MADE BY THE ADDITIVE Mirko Karakašić
	EVALUATING MICROPOLLUTANTS IN THE DANUBE RIVER: ASSESSING CONCENTRATIONS AND ENVIRONMENTAL IMPACT Marija Perović
11.30 - 12.00h	***Coffee break***
12.00 - 13.00h	***ORAL/POSTER PRESENTATION***
SESSION 1 (**Chairs**: Ljiljana Radovanović, Borivoj Novaković)	
12.00 - 13.00h **36**	**Mechanical Engineering**
	Energetics and Process Technique
	Designing and Maintenance
	Oil and gas engineering
	Engineering Management

SESSION 2 (**Chairs**: Višnja Mihajlović, Jovana Čugalj)	
12.00-13.00h	**Health and Environmental Protection**
<u>35</u>	**Environmental Management and Occupational Safety**
13.00 - 14.00h	***Lunch break***
14.00 - 14.30h	***Conclusions of the conference and closing ceremony***

ORAL/POSTER PRESENTATION

Session 1. Mechanical Engineering		
FREE VIBRATION ANALYSYS OF A BEAM RESTING ON WINKLER ELASTIC FOUNDATION THROUGH THE SUMUDU TRANSFORM METHOD FLUID	Svetlana Lilkova-Markova, Dimitar Lolov	University of Architecture, Civil Engineering and Geodesy, Faculty of Hydraulic Engineering, Sofia, Bulgaria
DEVELOPMENT OF A MODEL FOR ASSESSING VIBRATION RISK LEVELS IN HYDROPOWER PLANT TECHNICAL SYSTEMS	Slobodan Juric, Slavica Prvulovic, Jasna Tolmac, Uros Sarenac, Ljubisa Josimovic, Milos Josimovic	High school "CEPS-Center for Business Studies" Kiseljak, Bosnia and Herzegovina
ARTIFICIAL INTELLIGENCE IN FUNCTION OF IMPROVING PRODUCT FUNCTIONALITIES	Rade Dragović, Milada Novaković, Zoran Bakić, Marija Matotek Anđelić, Igor Kostovski, Valentina Mladenović	Institute for standards and technology, Belgrade, Serbia, Technical College of Applied Sciences, Zrenjanin, Serbia, Ministry of Economy, Belgrade, Serbia, University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia
THE ROLE OF COOLANT IN THE ENERGY BALANCE OF INTERNAL COMBUSTION ENGINES	Juraj Marković, Hrvoje Glavaš, Mirko Karakašić, Eleonora Desnica	Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Osijek, Croatia, University of Slavonski Brod, Mechanical Enfineering Faculty, Slavonski Brod, Croatia, University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia
EXAMINATION OF THE SAMPLE PROPERTIES MADE BY THE ADDITIVE	Mirko Karakašić	University of Slavonski Brod, Mechanical Engineering Faculty, Slavonski Brod, Croatia
PRODUCT DEVELOPMENT OF AN INDUSTRIAL CONTROL SYSTEM FOR ROTOR WITH A FOCUS ON DESIGN FEATURES	Jure Marijić, Ivan Grgić, Marko Vilić, Mirko Karakašić, Željko Ivandić	University of Slavonski Brod, Mechanical Engineering Faculty in Slavonski Brod, Slavonski Brod, Croatia
THE ROLE OF CERIUM AND PRASEODIUM AS RARE-EARTH ELEMENTS IN FILLER METAL FOR BRAZING DIAMOND – AN OVERVIEW	Zoran Karastojković, Jasmina Pekez, Radiša Perić	Society for Ethics and Evaluation in the Arts and Sciences, 11000 Belgrade, Serbia, Technical Faculty, University of Novi Sad, 22000 Zrenjanin, Serbia “Perić&Perić“d.o.o., Dunavska 114-116, 12000 Požarevac, Serbia

MECHANICAL CENTRIFUGATION AND PYROLISIS AS A COMBINED PROCESS FOR EFFICIENT MANAGEMENT OF OIL REFINERY SLUDGE	Srđan Kovačević, Nikolina Tošić, David Mitrinović, Marko Muhadinović, Galina Ilinykin, Natalia Sliusar	University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia Institute for the Development of Water Resources "Jaroslav Černi", Belgrade, Serbia Lafarge BFC Srbija, d.o.o. Perm National Research Polytechnic University, Environmental Protection Department, Perm, Russia
THE INFLUENCE OF THE LAYER HEIGHT ON THE HARDNESS OF THE TPU PLASTIC SPECIMEN MADE BY 3D PRINTING	Dušan Jovanić, Eleonora Desnica, Dušan Malić	Technical College of Applied Sciences, Zrenjanin, Serbia Univesity of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia
EVALUATION OF THE TECHNOLOGICAL EFFECTS OF CELLULAR MANUFACTURING FOR A GROUP OF PRODUCTS	Dejan Lukic, Mijodrag Milosevic, Ahmet Cekic, Maida Cohodar Husic, Djerzija Begic-Hajdarevic, Dejan Bozic	University of Novi Sad, Faculty of Technical Sciences, DPE, Novi Sad, Serbia University of Sarajevo, Faculty of Mechanical Engineering, Sarajevo, BiH
THE MECHANICAL PROPERTIES OF A CIRCULAR CROSS-SECTION COLUMN MADE OF COMPOSITE MATERIAL PRODUCED USING A NEW MIXED PLASTIC RECYCLING TECHNOLOGY	Ljubica Lazić Vulićević, Danijela M. Jašin, Aleksandar Rajić, Valentina Mladenović, Ivan Palinkaš	Technical College of Applied Sciences, Zrenjanin, Serbia University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia
STRESS ANALYSIS OF CRANE SHACKLE USING FEM	Srđan Samardžic, Spasoje Trifković, Miroslav Milutinović	University of East Sarajevo, Faculty of Mechanical Engineering, Republic of Srpska, Bosnia and Herzegovina
BIOMIMETIC APPLICATIONS IN FLUID MECHANICS: FROM NATURE-INSPIRED DESIGNS TO TECHNOLOGICAL ADVANCEMENTS	Murat Ispir, Muharrem Hilmi Aksoy	Konya Technical University, Faculty of Engineering and Natural Science, Konya, Türkiye

THE DEVIATION BETWEEN INJECTED MOLDED PLASTIC PART AND FDM MANUFACTURED PART	Ivan Matin, Branko Štrbac, Miloš Ranisavljev, Miodrag Hadžistević, Đorđe Vukelić	University of Novi Sad, Faculty of Technical Sciences, Department of Production Engineering, Novi Sad, Serbia
ALGEBRAIC DIAMETER PROPORTION EXPRESSIONS DERIVED AND EXAMINED FOR EQUAL FLOW DISTRIBUTION BY MANIFOLD NOZZLE COUPLE	Eyüb Canli	Mechanical Engineering Department, Technology Faculty, Selcuk University, Konya, Türkiye
OPTIMAL LQR CONTROL OF A PENDULUM BASED OVERHEAD CRANE USING THE WHALE OPTIMIZATION ALGORITHM	Abdullah Çakan	Konya Technical University, Faculty of Engineering and Natural Sciences, Department of Mechanical Engineering, Konya, Turkey
ANALYSIS OF THE SYSTEM FOR ACTIVE VIBRATION REDUCTION DURING WHEEL LOADER MOVEMENT	Jovan Pavlović, Dragoslav Janošević, Vesna Jovanović	University of Niš, Faculty of Mechanical Engineering, Niš, Serbia
THE DIGITAL FACTORY–PRESENT AND FUTURE	Stanko P. Stankov	University of Niš, Faculty of Electronic Engineering, Niš, Serbia
A SUPERVISORY CONTROL OF WATER SUPPLY SYSTEM	Stanko P. Stankov	University of Niš, Faculty of Electronic Engineering, Niš, Serbia
THE EXAMINATION OF OPERATIONAL CONDITION THROUGH THE VOLUMETRIC EFFICIENCY OF AN AXIAL PISTON PUMP	Borivoj Novaković, Luka Đorđević, Ljiljana Radovanović, Mihalj Bakator, Milan Marković, Stefan Ugrinov, Mića Đurđev	University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia
AUTOMATED DECISION SUPPORT SYSTEMS	Sondra Preascilla Ioana Vacarescu, Nicolae Paraschiv, Flavius-Maxim Petcuț	Petroleum-Gas University of Ploiesti, Romania Continental Automotive Romania Aurel Vlaicu University of Arad, Romania

DEVELOPMENT OF SUPPORT VECTOR MACHINE MODEL FOR CHIP FORM CLASSIFICATION IN TURNING OF POM-C	Miloš Madić, Milan Trifunović, Marko Kovačević	University of Niš, Faculty of Mechanical Engineering in Niš, Niš, Serbia Independent researcher, University of Niš, Niš, Serbia
DEVELOPMENT OF A MODEL FOR ASSESSING VIBRATION RISK LEVELS IN HYDROPOWER PLANT TECHNICAL SYSTEMS	Slobodan Juric, Slavica Prvulovic, Jasna Tolmac, Uros Sarenac, Ljubisa Josimovic, Milos Josimovic	University of Architecture, Civil Engineering and Geodesy, Faculty of Hydraulic Engineering, Sofia, Bulgaria
Session 1. Energetics and Process Technique		
RISK ANALYSIS USING THE INTEGRATED FTA AND FMEA MODEL ON THE EXAMPLE OF A BIOGAS PLANT	Jovana Radnović, Vesna Makitan	University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia
LOCALIZED STATES OF BASIC ELEMENTARY CHARGES IN ULTRATHIN CRYSTALLINE FILM-STRUCTURES	Nikola R. Vojnović, Dušan I. Ilić, Jovan P. Šetrajčić	University of Novi Sad, Faculty of Technical Sciences, Trg D.Obradovića 6, 21.000 Novi Sad, Vojvodina – Serbia Academy of Sciences and Arts of the Republic of Srpska, Bana dr T.Lazarevića 1, 78.000 Banja Luka, Republic of Srpska, B&H
APPLICATION OF STATISTICAL METHODS IN ORDER TO DETERMINE THE LEVEL OF ENERGY EFFICIENCY	Čugalj Jovana, Pekez Jasmina, Stojanov Jelena	University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia
ANALYSIS OF A RESIDENTIAL PHOTOVOLTAIC SYSTEM	Anca-Adriana Petcuț-Lasc, Valentina-Emilia Bălaș, Flavius-Maxim Petcuț	Aurel Vlaicu University of Arad, Romania Petroleum-Gas University of Ploiesti, Romania
Session 1. Designing and Maintenance		
PRELIMINARY STUDY ON DRIVER POSTURE THROUGH NEW METHOD OF ANALYSIS	Anca SABAU, Mihaela POPA, Gabriela STOIA, Timotei Bogdan BACOȘ, Adrian Eugen CIOABLĂ	Faculty of Mechanical Engineering, University Politehnica Timisoara, Timisoara, Romania

PROJECT MANAGEMENT AND MAINTENANCE OPTIMIZATION IN INDUSTRIAL TECHNICAL SYSTEMS	Peko Lakatuš	University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia
Session 1. Oil and gas engineering		
OPTIMIZATION OF OIL PRODUCTION ON THE EXAMPLE OF LIBYA	Branislava Radišić, Snežana Komatina, Slavica Prvulović, Snežana Filip, Dragana Kovač	University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Republic of Serbia
POSSIBILITIES OF PURIFICATION OF OIL CONTAMINATED WATER USING PERLITE	Danijela Jašin, Milana Drašković, Milada Novaković	Technical College of Applied Studies, Zrenjanin, Serbia
ANALYSIS OF TEMPERATURE DROP AND HEAT LOSSES OF CRUDE OIL ALONG THE MAIN OIL PIPELINE	Jasna Tolmač, Slavica Prvulović, Saša Jovanović, Uroš Šarenac, Branislava Radišič	University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin University of Pristina, Faculty of Technical Sciences, Kosovska Mitrovica, 38220, Kosovo
Session 1. Engineering Management		
THE IMPORTANCE OF BUSINESS INCUBATORS FOR THE IMPLEMENTATION OF ENERGY MANAGEMENT	Vladimir Milošev, Rade Dragović, Igor Kostovski	University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia
SUSTAINABLE SUPPLY CHAIN MANAGEMENT IN THE CONTEXT OF NATURAL RESOURCE CONSERVATION	Stefan Ugrinov, Sanja Stanisavljev, Mihalj Bakator, Edit Terek Stojanović, Mila Kavalić, Verica Gluvakov	University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia
ARTIFICIAL INTELLIGENCE – AN ESSENTIAL FACTOR IN CORPORATE STRATEGIC COMMUNICATION	Zlatko Lacković, Milan Ivanović, Krešimir Lacković	Panon – think tank, Osijek, Croatia 2 Sveučilište Sjever - Koprivnica, Croatia
THE APPLICATION OF INDUSTRY 4.0 AMONG ENTREPRENEURS IN THE REPUBLIC OF SERBIA	Bojan Stankov, Sanja Stanisavljev, Mila Kavalić, Verica Gluvakov, Snežana Mirković	Hemofarm a.d. Hemofarm A.D., Beogradski put bb, 26300 Vršac, Srbija, Technical Faculty “Mihajlo Pupin”, Zrenjanin, University of Novi Sad, Zrenjanin, Serbia, 5BB TRADE doo, Zrenjanin, Serbia

GREEN BEHAVIOR OF EMPLOYEES	Dragana Kovač, Edit Terek Stojanović, Mila Kavalić, Maja Gaborov, Melita Ćoćkalo-Hronjec	University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia High school „Laza Kostic", Novi Sad, Republic of Serbia
COMMISSIONING AND QUALIFICATION OF A PHARMACEUTICAL FACILITY	Ilija Tabašević, Dragan D. Milanović, Mirjana Misita	Hemofarm, Vršac, Serbia University of Belgrade, Faculty of Mechanical Engineering, Beograd, Serbia
CIRCULAR ECONOMY IN THE CONSTRUCTION SECTOR: THE SITUATION IN CROATIA	Držislav Vidaković, Marijana Hadzima-Nyarko, Laura Šoja	Josip Juraj Strossmayer University of Osijek, Faculty of Civil Engineering and Architecture Osijek, Osijek, Croatia Josip Juraj Strossmayer University of Osijek, Faculty of Economics and Business, Osijek, Croatia
INTRODUCING ISO 22301 INTO AN ESTABLISHED INTEGRATED MANAGEMENT SYSTEM (IMS)	Marija Perović, Marija Todorović	Jaroslav Černi Water Institute, Belgrade, Serbia
Session 2. Health and Environmental Protection		
VALIDATION OF SOME AIR POLLUTANT DISTRIBUTION MODELS	Stevo K. Jaćimovski, Dane Subošić, Jovan P. Šetrajčić	University of Criminalistic and Police Studies, Zemun – Belgrade, Serbia Academy of Sciences and Arts of the Republic of Srpska, Banja Luka, B&H
EXPERIMENTAL STUDY OF FIRE HAZARDS FROM SMALL-SCALE METHANE FIRES	Milan Protić, Nikola Mišić, Ana Vukadinović, Jasmina Radosavljević, Miomir Raos	University of Niš, Faculty of Occupational Safety, Niš, Serbia
INTEGRATION OF CIRCULAR ECONOMY AND INDUSTRIAL ECOLOGY: PATHWAYS TO SUSTAINABLE INDUSTRIAL DEVELOPMENT	Vesna Drakulović, Višnja Mihajlović, Bogdana Vujić, Mića Đurđev, Milan Marković	Univesity of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia
METHODOLOGY OF DETERMINATION OF FIRE HAZARD ZONES IN THE HIGH-BAY WAREHOUSES	Goran Bošković, Višnja Mihajlović, Nikola Karanović, Natalija Nikolić, Zoran Čepić	Faculty of Mechanical and Civil Engineering in Kraljevo, University of Kragujevac, Kraljevo, Serbia Technical Faculty "Mihajlo Pupin", University of Novi Sad, Zrenjanin, Serbia University of Aveiro, Portugal Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia

GIS AND REMOTE SENSING IN FOREST FIRE ANALYSIS IN SERBIA	Natalija Nikolić, Jovana Čugalj, Vesna Drakulović	Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia Technical Faculty "Mihajlo Pupin" Zrenjanin, University of Novi Sad, Serbia
PTE DISTRIBUTION FACTOR AS AN INDICATOR OF URBAN SOIL POLLUTION	Aleksandra Mihailović, Jordana Ninkov, Selena Samardžić, Savka Adamović Robert Lakatoš, Sofija M. Forkapić, Tomas Nemeš	University of Novi Sad, Faculty of Technical Sciences, Trg Dositeja Obradovića 6, Novi Sad, Serbia, Institute of Field and Vegetable Crops, National Institute of the Republic of Serbia, Maksima Gorkog 30, Novi Sad, University of Novi Sad, Serbia Faculty of Sciences, Novi Sad, Serbia
Assessing the Potential of Photovoltaics on Austrian Railway Noise Barriers: Advancing Renewable Energy Communities and Sustainable Energy Solutions	Milijana Keseric, Momir Tabakovic	University of Applied Sciences Wiener Neustadt, Wieselburg, Austria University of Applied Science Technikum Wien, Vienna, Austria
GREENWASHING: TRICK OR THREAT	Gordana Rendulić Davidović , Milena Damnjanović, Nikola Radosavljević	University of Kragujevac, Faculty of Technical Sciences Čačak, Serbia
PREDICTION OF LANDFILL FIRE AND ENVIRONMENTAL IMPACT HAZARD ZONES: CASE STUDY OF THE SANITARY LANDFILL IN PIROT	Lidija Milošević, Emina Mihajlović, Amelija Đorđević, Jelena Malenović	University of Niš, Faculty of Occupational safety in Niš, Niš
DISTRIBUTION OF PCB CONGENERS IN ENVIRONMENTAL MEDIA	Nada Markovic, Nebojsa Ralevic	Directorate for Inspection Affairs, Podgorica, Montenegro University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

ASSESMENT OF WATERBORNE TRANSPORT SECTOR IMPACT ON EUROPE AIR QUALITY WITH SHERPA MODEL	Madalina Zot, Francisc Popescu	University Politehnica Timisoara, Timisoara, Romania
NAVIGATING TOWARDS ZERO-EMISSION DISTRICT HEATING: THE DANISH GOOD PRACTICE EXAMPLE FROM ESBJERG	Borivoj Lj. Stepanov, Zoran M. Čepić, Đorđije D. Doder	University of Novi Sad, Faculty of Technical Sciences, Department of Energy and Process Engineering, Novi Sad, Serbia University of Novi Sad, Faculty of Technical Sciences, Department of Environmental Engineering and Safety at work, Novi Sad, Serbia
IMPACT OF FUEL CONSUMPTION ON CO2 EMISSIONS IN ROAD TRANSPORT IN EUROPEAN COUNTRIES	Ermina Ćosović, Ivan Mihajlović, Vesna Spasojević Brkić	University of Belgrade, Faculty of Mechanical Engineering, Belgrade, Serbia
EVALUATING MICROPOLLUTANTS IN THE DANUBE RIVER: ASSESSING CONCENTRATIONS AND ENVIRONMENTAL IMPACT	Marija Perović	Jaroslav Černi Water Institute, Belgrade, Serbia
APPLICATION OF THE MACHINE LEARNING IN SURFACE WATER QUALITY ASSESSMENT	Jelena Antović, Katarina Batalović, Ivana Mihajlović	University of Priština, Faculty of Technical Sciences, Knjaza Milosa 7, Kosovska Mitrovica 38220 VINČA Institute of Nuclear Sciences—National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovica Alasa 12–14, Belgrade11000, Serbia University of Novi Sad, Faculty of Technical Sciences, Department of Environmental Engineering and Occupational Safety and Health, Trg Dositeja Obradovića 6, Novi Sad 21000, Serbia

COMPARATIVE STUDY OF SODA LAKES AND PANS CHEMICAL PROPERTIES IN SERBIA AND HUNGARY	Nevena Živančev, Srđan Kovačević, Ivana Mihajlović	University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
THE NECESSITY OF ROOFTOP GREENHOUSES FOR IMPROVING URBAN AIR QUALITY AND TEMPERATURE REGULATION	Mihaela POPA, Valentina-Emilia BĂLAȘ	Petroleum-Gas University of Ploiesti, Romania Aurel Vlaicu University of Arad, Romania Academy of Romanian Scientists
AQUAPONICS AS AN INNOVATIVE TECHNOLOGY FOR SUSTAINABILITY AND ENVIRONMENTAL PROTECTION: CHALLENGES AND INDUSTRIAL SOLUTIONS	Daniel Alexuță, Marius M. Bălaș	Aurel Vlaicu University of Arad, Romania Petroleum-Gas University of Ploiesti, Romania
ASSESSING THE LANDSCAPE OF HAZARDOUS CHEMICALS MANAGEMENT	Dunja Istrat, Jelena Ćulibrk, Maja Petrović	University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
NEOLIBERALISM AND CLIMATE CHANGE: TOWARDS A SUSTAINABLE ECONOMY THROUGH THE GREEN NEW DEAL	Edi Daruši	Tehnički fakultet “Mihajlo Pupin”, Zrenjanin, Serbia
EXTENDING THE APPLICATION OF VR/AR TECHNOLOGY TO IMPROVE SAFETY TRAINING IN THE CRUDE OIL INDUSTRY	Adrijana Babić, Zoran Čepić	University of Novi Sad, Faculty of Technical Sciences, Department of Environmental Engineering and Occupational Safety and Health, Trg D. Obradovića 6, Novi Sad, Serbia

NEITHER ANTHROPOCENE NOR CAPITALOCENE - A PATH TOWARD AN ANTI-CAPITALIST ECOLOGY	Dejan Mihailović, Alexis Toribio Dantas	Tecnológico de Monterrey, Ciudad México, México Rio de Janeiro State University, Rio de Janeiro, Brasil
AQUAPONICS AS AN INNOVATIVE TECHNOLOGY FOR SUSTAINABILITY AND ENVIRONMENTAL PROTECTION: CHALLENGES AND INDUSTRIAL SOLUTIONS	Daniel Alexuță, Marius M. Bălaș	Aurel Vlaicu University of Arad, Romania Petroleum-Gas University of Ploiesti, Romania
Session 2. Environmental Management and Occupational Safety		
EU GREEN TRANSITION DOES NOT HAVE A PLANETARY APPROACH	Milan Ivanović	Panon, think tank for strategic studies, Osijek, Croatia
PSYCHOSOCIAL RISKS AND STRESS IN THE WORKPLACE	Dijana Vašaš Kuručev, Milica Bogdanov, Jasmina Poštin, Sanja Stankov, Milan Nikolić	University “Union – Nikola Tesla”, Beograd, “Faculty of Management”, Sremski Karlovci, Serbia University of Belgrade, Faculty of Philosophy, Belgrade, Serbia University of Novi Sad, Technical Faculty "Mihajlo Pupin," Zrenjanin, Serbia
THE IMPACT OF TRAINING AND EDUCATION ON REDUCING WORKPLACE INJURIES	Milica Bogdanov, Dijana Vašaš Kuručev, Jasmina Poštin, Sanja Stankov, Milan Nikolić	University of Belgrade, Faculty of Philosophy, Belgrade, Serbia University “Union – Nikola Tesla”, Beograd, “Faculty of Management”, Sremski Karlovci, Serbia University of Novi Sad, Technical Faculty "Mihajlo Pupin," Zrenjanin, Serbia

GREEN TECHNOLOGIES AND THEIR ROLE IN URBAN SUSTAINABILITY INITIATIVES	Mihalj Bakator, Luka Đorđević, Borivoj Novaković, Velibor Premčevski, Stefan Ugrinov	University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia
SUSTAINABILITY AS A CORE COMPONENT OF QUALITY STANDARDS IN MODERN BUSINESSES	Dragan Ćoćkalo, Mihalj Bakator, Milan Nikolić, Sanja Stanisavljev, Verica Gluvakov	University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia
ANALYSIS OF RISK ASSESSMENT CONDUCTED IN THE GARMENT INDUSTRY IN NORTH MACEDONIA	Monika Lutovska, Vladimir Mijakovski	Insititution Faculty of Technical Sciences, “Mother Teresa” University, Skopje, MK Faculty of Technical Sciences, University „St. Kliment Ohridski”, Bitola, MK)
INTEGRATING LEAN PRINCIPLES WITH ENVIRONMENTAL SUSTAINABILITY FOR ENHANCED ECOLOGICAL PERFORMANCE	Jasmina Naerac, Nemanja Sremčev, Danijela Ćirić Lalić	University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

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XIV International Conference on

INDUSTRIAL ENGINEERING AND ENVIRONMENTAL PROTECTION

IIZS 2024

Dear author,

We are pleased to inform you that your paper has been accepted by the Scientific Committee and will be published in the Proceedings of the XIV International Conference on Industrial Engineering and Environmental Protection (IIZS 2024). The Conference event will be held on **October 3-4, 2024.** at the **Technical Faculty "Mihajlo Pupin" Zrenjanin, Serbia.**

Paper Status	**Accepted**
Paper title	INTRODUCING ISO 22301 INTO AN ESTABLISHED INTEGRATED MANAGEMENT SYSTEM (IMS)
Author(s)	Marija Perović, Marija Todorović

All information about Conference, including templates for **Poster** and **PowerPoint presentations,** can be found at this link: http://www.tfzr.uns.ac.rs/iizs/signup.php

We would like to express our sincere gratitude for your contribution. Please do not hesitate to contact us should you require any clarification.

Best Regards,

Asst. prof. Jasna Tolmač, Chairman of the Organizing Committee
University of Novi Sad
Technical Faculty "Mihajlo Pupin"
Zrenjanin, Serbia
e-mail: iizs@tfzr.rs

Jasna Tolmač

Signature

IMPORTANT NOTES:

Full registration payment is required to be made in order to finally confirm your paper. Deadline to register and make full payments is October 01, 2024.

Please fulfill the Payment details form.

Please register on Conference website:
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UNIVERSITY OF NOVI SAD
Technical Faculty "Mihajlo Pupin"
Zrenjanin, Republic of Serbia

IIZS
Conference

PROCEEDINGS

of the XIV International Conference on

Industrial Engineering and Environmental Protection IIZS 2024

Zrenjanin, Serbia, October 3-4, 2024.

University of Novi Sad
Technical Faculty “Mihajlo Pupin”
Zrenjanin, Republic of Serbia

PROCEEDINGS

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Industrial Engineering and Environmental Protection IIZS 2024

Zrenjanin, October 3-4, 2024.

IN COOPERATION WITH PARTNERS:

	UNIVERSITY POLITEHNICA TIMISOARA, FACULTY OF ENGINEERING, HUNEDOARA, ROMANIA	
	UNIVERSITY «St. KLIMENT OHRIDSKI«, TECHNICAL FACULTY, BITOLA, MACEDONIA	
	„AUREL VLAICU" UNIVERSITY OF ARAD, FACULTY OF ENGINEERING, ARAD, ROMANIA	
	UNIVERSITY OF EAST SARAJEVO, FACULTY OF MECHANICAL ENGINEERING EAST SARAJEVO, REPUBLIC OF SRPSKA, B&H	
	UNIVERSITY OF GIRESUN, FACULTY OF ENGINEERING, GIRESUN, TURKEY	

Proceedings of the XIV International Conference - Industrial Engineering and Environmental Protection (IIZS 2024)

Conference organizer:

Technical Faculty “Mihajlo Pupin”, Zrenjanin, University of Novi Sad, Republic of Serbia

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INTRODUCTION

Department of mechanical engineering and Department of environmental protection of Technical Faculty "Mihajlo Pupin", Zrenjanin, has organized the XIV International Conference Industrial Engineering and Environmental Protection – IIZS 2024.

The topics of scientific conference «IIZS 2024», cover the fields of Industrial Engineering and Environmental protection: Mechanical Engineering, Energetics and process technique, Designing and maintenance, Oil and gas engineering, Health and environmental protection, Environmental management, Occupational safety and Engineering management.

The main goals of the conference are: fostering innovation and expanding knowledge for engineers in industry and environmental protection; supporting researchers in presenting their current research results; establishing new contacts with premier national and international institutions and universities; popularizing the Faculty and its leadership role in our society and immediate environment, to attract a high-quality young individuals to study at our Faculty; cooperating with other organizations, public companies, and industry; initiating the collection of ideas for solving specific practical problems; interconnecting and establishing business contacts; introducing professional and business organizations to the results of scientific and technical research; and presenting scientific knowledge and exchanging experiences in industrial engineering.

We would like to express our gratitude to the partners of the IX International Conference "IIZS 2024" – Aurel Vlaicu University of Arad, Faculty of Engineering, Arad, Romania; University St. Kliment Ohridski, Technical Faculty, Bitola, Macedonia; University Politehnica Timisoara, Faculty of Engineering, Hunedoara, Romania; University of East Sarajevo, Faculty of Mechanical Engineering, East Sarajevo, B&H, Republic of Srpska; and University of Giresun, Faculty of Engineering, Giresun, Turkey – for their support in organizing this event. We are also grateful to all the authors who have contributed their papers to the scientific meeting "IIZS 2024".

We would like to extend our special thanks to the Ministry of Education, Science and Technological Development, Republic of Serbia, and the management of Technical Faculty “Mihajlo Pupin”, University of Novi Sad, for supporting the organization of the Conference "IIZS 2024".

The IIZS Conference has become a traditional annual meeting for researchers from around the world. We are open to and grateful for any useful suggestions that could help make the next, XV International Conference on Industrial Engineering and Environmental Protection even better, both organizationally and programmatically.

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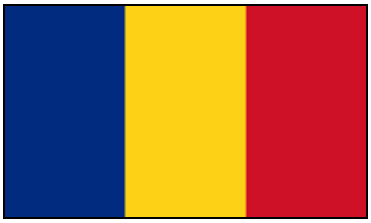

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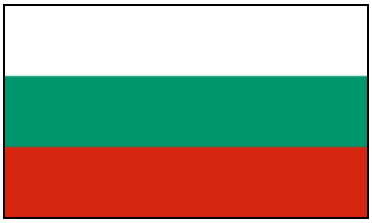

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INTRODUCING ISO 22301 INTO AN ESTABLISHED INTEGRATED MANAGEMENT SYSTEM (IMS)

Research paper

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[1] Jaroslav Černi Water Institute, Belgrade, Serbia

Abstract: Presented research highlights the critical role of standardization in enhancing efficiency, productivity, and compliance in Industrial Engineering and Environmental Protection. Standardization optimizes processes, ensuring consistent quality, interoperability, and cost reduction, while also facilitating regulatory compliance. The advantages of an Integrated Management System (IMS), which combines frameworks such as ISO 9001, ISO 14001, and ISO 45001, are reflected in streamlining processes, aligning organizational objectives, and enhancing risk management, leading to improved performance and compliance. Furthermore, the manuscript discusses the integration of the international standard for Business Continuity Management (BCM), ISO 22301 into an existing IMS, supported by a comparative analysis to ensure a smooth incorporation into already established management system. Results detail the methodology, challenges, and benefits of this integration, emphasizing how the process can be streamlined due to the pre-existing IMS, thereby reducing the effort required. The study also offers valuable insights into strengthening organizational resilience, highlighting key overlaps and differences between standards, and providing practical tools to help organizations anticipate and achieve desired outcomes with minimized effort.
Key words: Integrated Management System, Business Continuity Management, organizational resilience, risk management

INTRODUCTION

Enhancing Efficiency and Compliance Through Standardization

Standardization is crucial for companies, particularly in the field of Industrial Engineering and Environmental Protection (Fig. 1). In the area of Industrial Engineering, it enhances efficiency and productivity. Standardization optimizes processes by establishing consistent methods and practices. This reduces variability, minimizes errors, and enhances productivity. Consistent procedures allow for smoother workflow, better resource management, and improved operational efficiency. Standards ensure that products and services meet defined quality benchmarks. This fosters customer trust and satisfaction, as consistent quality is maintained. Standardization also simplifies quality control processes, enabling easier identification and correction of deviations. In industrial engineering, interoperability between systems and components is vital. Standards ensure that different parts and systems can work together seamlessly, reducing the need for custom solutions and facilitating easier integration of new technologies [1,2]. By adhering to standardized practices, companies can reduce costs associated with custom designs, trial-and-error approaches, and inefficient processes. Standardization also enables bulk purchasing of standardized materials and components, further driving down costs. Many industries have stringent regulatory requirements. Standardization helps companies ensure compliance with relevant laws and regulations, avoiding legal issues and potential penalties. It also facilitates easier updates to comply with new regulations [1-5].
In the area of Environmental Protection Environmental standards, such as ISO 14001, guide companies in adopting sustainable practices [1]. This includes efficient use of resources, waste reduction, and minimizing environmental impact [1]. Standardization in environmental management ensures that companies contribute positively to environmental sustainability. Standards provide frameworks for monitoring and controlling pollution levels. This includes setting limits for emissions, waste management practices, and pollution prevention strategies. Adhering to these standards helps companies mitigate their environmental

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footprint. Environmental standards help companies identify and manage environmental risks. This includes potential impacts on air, water, and soil quality. Effective risk management protects the company from environmental incidents that could result in costly cleanups, legal liabilities, and damage to reputation. Companies that follow environmental standards demonstrate their commitment to corporate social responsibility. This enhances their reputation among stakeholders, including customers, investors, and the community. A strong reputation for environmental responsibility can also provide a competitive advantage. Standardization encourages continuous improvement and innovation. Companies are motivated to develop new technologies and processes that meet or exceed environmental standards. This leads to advancements in cleaner production methods, energy efficiency, and overall environmental performance.

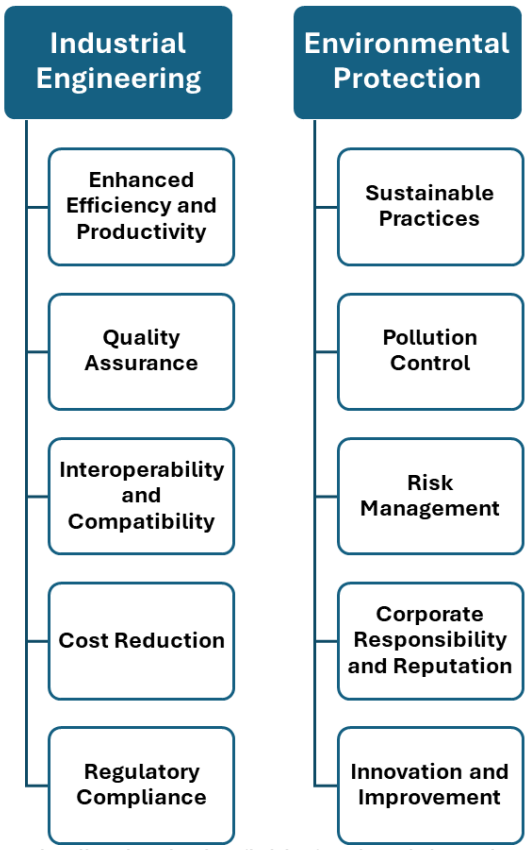

Fig. 1. *The advantages of standardization in the field of Industrial Engineering and Environmental Protection*

The advantages of the Integrated Management System

IMS seamlessly combines various management frameworks, such as quality (ISO 9001), environmental (ISO 14001), and occupational health and safety (ISO 45001), into a unified structure [4,5]. This integrated approach ensures that all aspects of an organization are harmoniously aligned and managed, removing redundancies and streamlining processes. By reducing administrative burdens and saving time and resources, IMS enables organizations to focus more effectively on their core activities. The alignment of management objectives and policies through IMS fosters consistency across the organization, helping to achieve strategic goals and ensuring that every department works towards common objectives. This integrated framework also facilitates compliance with multiple regulatory requirements, thereby minimizing the risk of non-compliance and its associated legal and financial repercussions. IMS takes a comprehensive approach to risk management, identifying, assessing, and managing risks across various functions. This forward-looking approach enhances organizational resilience and reduces the likelihood of disruptions. Additionally, by

consolidating data from different management areas, IMS provides a complete overview of organizational performance, supporting informed and strategic decision-making. The continuous improvement of culture promoted by IMS ensures that organizations consistently enhance their performance, quality, and sustainability [4,5]. Demonstrating high standards through IMS builds trust among stakeholders, including customers, employees, regulators, and investors—leading to increased business opportunities and a stronger reputation. Furthermore, IMS optimizes resource utilization across the organization, reducing waste and boosting overall productivity. Integrated audits of multiple management systems are more efficient and less disruptive compared to separate audits, streamlining the auditing process and offering a more thorough evaluation of compliance and performance.

The framework established by ISO 9001 helps organizations consistently deliver quality products and services, emphasizing customer satisfaction, continuous improvement, and process management. Through a systematic approach, ISO 14001 manages environmental responsibilities, aiming to minimize environmental impact and ensure regulatory compliance. The focus of ISO 45001 is on maintaining a safe and healthy work environment by identifying hazards, managing risks, and adhering to occupational health and safety regulations. Meanwhile, ISO 22301 enhances organizational resilience by developing strategies to maintain and recover critical operations during and after disruptions. To facilitate the integration of ISO 22301 into an existing IMS that includes ISO 9001, ISO 14001, and ISO 45001, a comparative analysis was conducted to identify key differences and ensure smooth incorporation.

MATERIAL AND METHODS

ISO 22301 is specifically focused on Business Continuity Management (BCM) to ensure that an organization can continue operating and recover effectively in the event of disruption. It concentrates on the development, implementation, and maintenance of a business continuity plan to protect against and respond to potential disruptions.
The Annex SL framework, which is a common structure adopted by ISO for management system standards, helps to align the structure and language of different ISO standards, making it easier to integrate them into an IMS. The Annex SL framework helps to standardize the structure and terminology of various ISO standards, making it easier to integrate them into an IMS. However, while IMS provides a unified approach to managing multiple standards, the specific requirements of each standard, including ISO 22301, will still need to be addressed individually within the IMS framework. In essence, Annex SL facilitates integration but does not eliminate the need to meet the distinct requirements of each individual standard within the IMS.
It outlines a common structure starting with understanding the organization's context and stakeholder needs, defining the scope, and establishing leadership and policy. Planning involves addressing risks, setting objectives, and planning changes. Support covers resources, competence, awareness, communication, and documented information. Operations are managed through planning and control of processes. Performance evaluation includes monitoring, internal audits, and management reviews. Lastly, improvement focuses on addressing nonconformities and continual enhancement of the system. Each standard applies this framework to its specific focus—quality, environmental, occupational health and safety, or business continuity—ensuring consistency while addressing distinct requirements.
The methodology of the conducted research was based on comparing the requirements of the standards according to the clauses of Annex SL, resulting in a detailed listing of the differences in these requirements. As a result, the necessary time for implementing ISO 22301 into an Integrated Management System is significantly reduced.

RESULTS AND DISCUSSION

The alignment of standard clauses across four major ISO standards: ISO 9001, ISO 45001, ISO 14001, and ISO 22301 is outlined in Table 1. Each standard follows a similar structure, with clauses covering scope, normative references, terms and definitions, and the context of the organization. For example, Clause 4 in all standards addresses the context of the organization, but with specific focuses related to quality, occupational health and safety, environmental management, and business continuity, respectively. Additionally, while the core structure remains consistent, ISO 22301 introduces unique elements in Clause 8, such as business impact analysis, continuity strategies, business continuity plans and procedures and evaluation of business continuity capabilities, reflecting its specialized focus on organizational resilience. This structured approach facilitates easier integration of ISO 22301 into existing management systems, significantly reducing the time required for implementation by utilizing commonalities and clearly identifying areas of divergence. Table 1 provides an overview of the examined standard requirements.

In addition to highlighting the structural similarities across ISO 9001, ISO 45001, ISO 14001, and ISO 22301, Table 1 reveals how these standards address specific organizational needs through their unique clauses. For instance, while all four standards emphasize leadership and commitment under Clause 5, ISO 45001 includes an additional focus on the consultation and participation of workers, reflecting its priority on occupational health and safety.

Furthermore, Clause 6, which covers planning, is tailored to each standard's specific objectives. For example, ISO 22301 incorporates planning for business continuity objectives, emphasizing the importance of preparing for potential disruptions. This clause also introduces the planning of changes specifically related to the business continuity management system, which is not present in the other standards.

Clause 8, focused on operation, diverges significantly among the standards, particularly with ISO 22301. While ISO 9001, ISO 45001, and ISO 14001 emphasize operational planning and control, ISO 22301 expands this to include business impact analysis, continuity strategies, business continuity plans and procedures and the evaluation of business continuity documentation. These elements are crucial for ensuring that organizations are not only operationally efficient but also resilient in the face of disruptions.

This detailed comparison underscores the tailored approach of each ISO standard to its specific focus area, while also demonstrating the potential for seamless integration within an organization's existing management system. By understanding these nuances, organizations can more effectively implement ISO 22301 alongside other standards, ensuring comprehensive management that addresses both operational excellence and continuity.

ISO 22301 introduces several unique requirements that set it apart from other management standards within an Integrated Management System. Central to ISO 22301 is the development of a comprehensive Business Continuity Management Policy, which establishes the framework for managing continuity. It requires conducting a Business Impact Analysis (BIA) to identify critical functions and assess the potential impact of disruptions. Risk assessment and treatment are essential, involving the identification and mitigation of risks to ensure continuous operations. The standard emphasizes setting clear business continuity objectives and developing strategies and solutions to maintain critical functions during disruptions. Detailed business continuity plans and procedures must be documented, regularly tested, and exercised. Effective communication and awareness programs are necessary to ensure that all stakeholders understand their roles. Performance evaluation and continual improvement are integral, requiring regular monitoring, reviews, and updates to the BCM system. Additionally, ISO 22301 mandates coordinated incident response and recovery processes to minimize operational impact during and after disruptions. These specific requirements focus on ensuring organizational resilience and continuity, distinguishing ISO 22301 from other standards like ISO 9001, ISO 14001, and ISO 45001.

Table 1 *The cross-section of requirements of different standards: ISO 9001, ISO 14001; ISO 45001; ISO 22301*

ISO 9001		**ISO 45001**		**ISO 14001**		**ISO 22301**	
Standard Clause		Standard Clause		Standard Clause		Standard Clause	
1	Scope	1	Scope	1	Scope	1	Scope
2	Normative references	2	Normative references	2	Normative references	2	Normative references
3	Terms and definitions	3	Terms and definitions	3	Terms and definitions	3	Terms and definitions
4	Context of the organization	4	Context of the organization	4	Context of the organization	4	Context of the organization
4.1	Understanding the organization and its context	4.1	Understanding the organization and its context	4.1	Understanding the organization and its context	4.1	Understanding the organization and its context
4.2	Understanding the needs and expectations of interested parties	4.2	Understanding the needs and expectations of interested parties	4.2	Understanding the needs and expectations of interested parties	4.2	Understanding the needs and expectations of interested parties
4.3	Determining the scope of the quality management system	4.3	Determining the scope of the OH&S management system	4.3	Determining the scope of the environmental management system	4.3	Determining the scope of the business continuity management system
4.4	Quality management system and its processes	4.4	OH&S management system	4.4	Environmental management system	4.4	Business continuity management system
5	Leadership	5	Leadership	5	Leadership	5	Leadership
5.1	Leadership and commitment	5.1	Leadership and commitment	5.1	Leadership and commitment	5.1	Leadership and commitment
5.2	Policy	5.2	OH&S policy	5.2	Environmental policy	5.2	Policy
5.3	Organization roles, responsibilities and authorities	5.3	Organization roles, responsibilities and authorities	5.3	Organization roles, responsibilities and authorities	5.3	Roles, responsibilities and authorities
		5.4	Consultation and participation of workers		/		/
6	Planning	6	Planning	6	Planning	6	Planning
6.1	Actions to address risks and opportunities	6.1	Actions to address risks and opportunities	6.1	Actions to address risks and opportunities	6.1	Actions to address risks and opportunities
6.2	Quality objectives and planning to achieve them	6.2	OH&S objectives and planning to achieve them	6.2	Environmental objectives and planning to achieve them	6.2	Business continuity objectives and planning to achieve them
6.3	Planning of changes		/		/	6.3	Planning changes to the business continuity management system
7	Support	7	Support	7	Support	7	Support
7.1	Resources	7.1	Resources	7.1	Resources	7.1	Resources
7.2	Competence	7.2	Competence	7.2	Competence	7.2	Competence
7.3	Awareness	7.3	Awareness	7.3	Awareness	7.3	Awareness
7.4	Communication	7.4	Communication	7.4	Communication	7.4	Communication
7.5	Documented information	7.5	Documented information	7.5	Documented information	7.5	Documented information
8	Operation	8	Operation	8	Operation	8	Operation
8.1	Operational planning and control	8.1	Operational planning and control	8.1	Operational planning and control	8.1	Operational planning and control
8.2	Requirements for products and services	8.2	Emergency preparedness and response	8.2	Emergency preparedness and response	8.2	Bussiness impact analysis and risk assessment
8.3	Design and development of products and services		/		/	8.3	Bussiness continuity strategies and solutions
8.4	Control of externally provided processes, products and services		/		/	8.4	Bussiness continuity plans and procedures
8.5	Production and service provision		/		/	8.5	Exercise programme
8.6	Release of products and services		/		/	8.6	Evaluation of business continuity documentation and capabilities

ISO 9001		ISO 45001		ISO 14001		ISO 22301	
Standard Clause		Standard Clause		Standard Clause		Standard Clause	
8.7	Control of nonconforming outputs		/		/		/
9	Performance evaluation	9	Performance evaluation	9	Performance evaluation	9	Performance evaluation
9.1	Monitoring, measurement, analysis and evaluation	9.1	Monitoring, measurement, analysis and evaluation	9.1	Monitoring, measurement, analysis and evaluation	9.1	Monitoring, measurement, analysis and evaluation
9.2	Internal audit	9.2	Internal audit	9.2	Internal audit	9.2	Internal audit
9.3	Management review	9.3	Management review	9.3	Management review	9.3	Management review
10	Improvement	10	Improvement	10	Improvement	10	Improvement
10.	General	10	General	10.1	General	10.1	Nonconformity and corrective action
10.	Nonconformity and corrective action	10	Incident, nonconformity and corrective action	10.2	Nonconformity and corrective action	10.2	Continual improvement
10.	Continual improvement	10	Continual improvement	10.3	Continual improvement		/

CONCLUSION

Standardization in Industrial Engineering and Environmental Protection is vital for ensuring efficiency, quality, compliance, and sustainability. It enables companies to operate more effectively, reduce costs, manage risks, and fulfill their environmental responsibilities. Ultimately, standardization supports long-term success and resilience in an increasingly competitive and environmentally conscious market. IMS integrates multiple management systems into a single framework, focusing on streamlining operations and eliminating redundancies across various management areas.

While ISO 22301 offers a targeted framework for business continuity, IMS provides a broader, more holistic approach to managing various aspects of organizational performance. IMS integrates multiple management standards into a unified system, enabling organizations to streamline their processes and achieve greater efficiency across different domains, such as quality, environmental management, and occupational health and safety. The IMS framework utilizes common elements from various standards to create a cohesive management approach, facilitating easier compliance and more effective oversight.

Both approaches are complementary but serve distinct functions. ISO 22301 focuses specifically on maintaining business operations during disruptions, ensuring that organizations are prepared to handle and recover from incidents with minimal operational impact. In contrast, IMS provides a comprehensive management structure that integrates various standards, addressing a broader range of organizational needs. Together, these approaches enable organizations to not only safeguard their continuity in the face of challenges but also enhance overall management practices, driving operational excellence and resilience across all aspects of their operations.

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