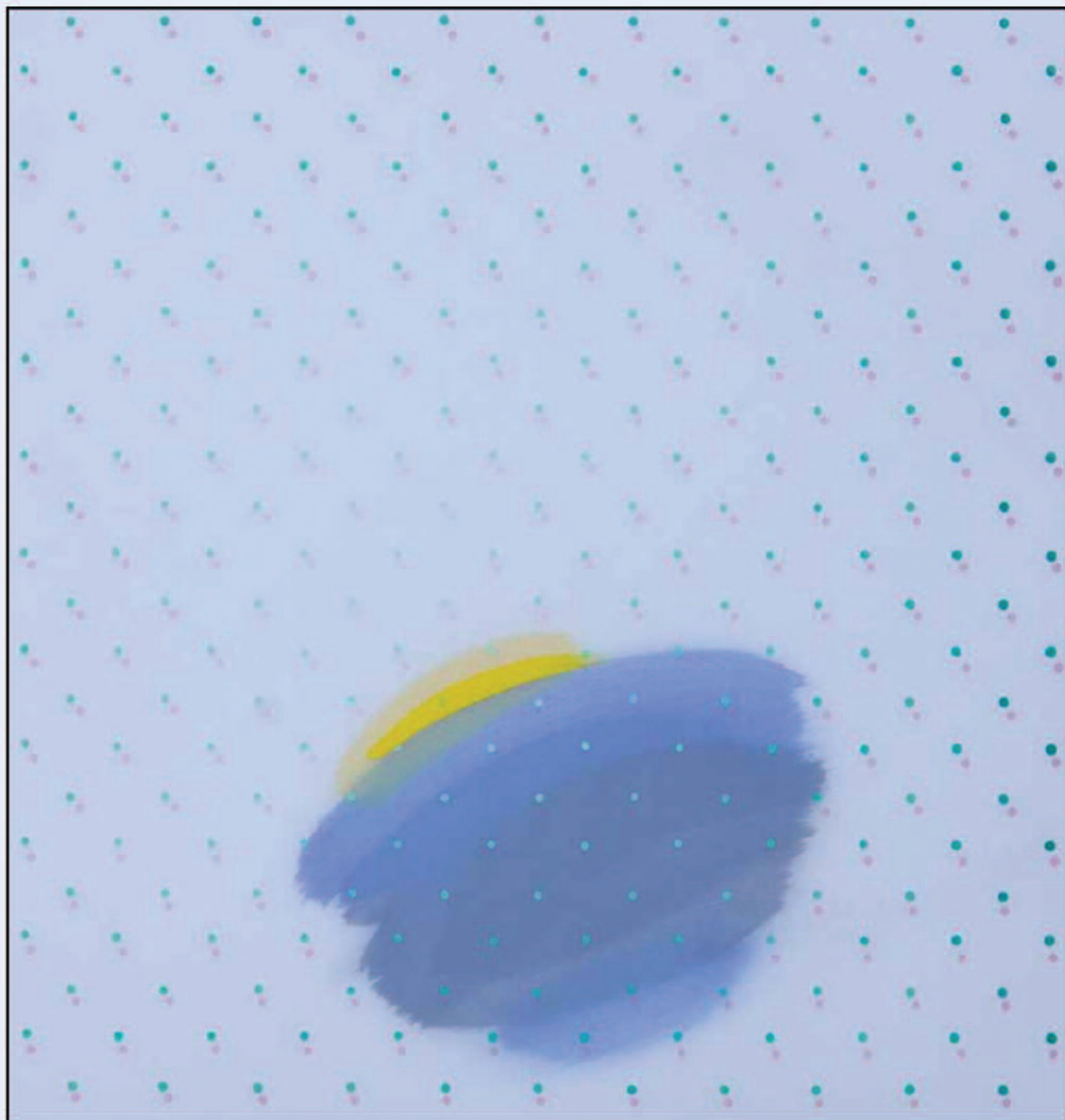


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SOUTH EAST EUROPEAN JOURNAL OF SUSTAINABLE DEVELOPMENT

Vol.2 (1/2018)



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SOUTH EAST EUROPEAN JOURNAL OF SUSTAINABLE DEVELOPMENT

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CONTENTS

FME(C)A METHODS AS A KEY FACTOR ON THE RELIABILITY AND SAFETY OF THE TECHNICAL SYSTEMS TOWARDS SUSTAINABLE DEVELOPMENT IN THE INDUSTRY SECTOR	9-16
Isein Ajdari	
THE ROLE OF TRANSPORTATION IN SUSTAINABLE DEVELOPMENT GOALS	17-20
Emel Hamza Sherif	
THE WAVE OF INFLUXES IN THE BALKANS IN THE LAST TWENTY YEARS	21-29
Avni Avdiu, Agron Kurtishi	
SYNTHESIS OF NANOCOMPOSITE SYSTEMS BY MECHANICAL ATTRITION	30-33
Altin Gjevori	
ANALYSIS OF AIR MICROORGANISMS IN THE MATURATION AND STORAGE STAGES OF WHITE CHEESE	34-37
Albana Uka, Alush Musaj	
DESIGN AND INSTALLATION OF WASTE WATER TREATMENT PLANT IN TOBACCO PROCESSING FACTORY-SIGNIFICANT STEP TOWARDS SUSTAINABLE DEVELOPMENT	38-44
Vladimir Mijakovski, Monika Lutovska	
THE APPROACH OF TEACHERS AND STUDENTS TO THE PHONOLOGICAL ASPECTS OF THE ITALIAN LANGUAGE AS A FOREIGN LANGUAGE	45-49
Anila Shehu	
ANALYSES OF IMPACTING FACTORS AND ISSUES IN THE USE OF ICT CAPABILITIES IN ENHANCING EDUCATION	50-55
Bekim Fetaji, Majlinda Fetaji, Mirlinda Ebibi, Samet Kera	

EDITOR'S MESSAGE

It has been almost 350 years since the founding of the first scientific journals, the *Philosophical Transactions* in England and the *Journal des Sçavans* in France. Now, there are many diverse publications in various scientific fields which have shown enormous development, both in terms of quantity and quality.

Over time, published scientific papers have heralded the development of societies and global welfare. New scientific findings, innovations and research methodologies have become the determinants of the advancement of humanity. Those publications have surpassed any ownership and crossed over the borders of the places where they were produced and emerged to build solid research in the interest of the advancement of the needs and interests of humankind.

In this spirit, as a result of our willingness to engage in contemporary scientific developments and debates, the academic staff of the Mother Teresa University, the youngest University in the Republic of Macedonia, decided to establish the International Scientific Journal "South East European Journal for Sustainable Development (SEEJSD)."

The editorial board of the Journal, constituted of researchers, experts and young scholars of various fields relevant to sustainable development, took the responsibility to consolidate and advance the content and quality of the Journal, to increase its scientific credibility and to align it in accordance with the requirements of the Science Citation Index (SCI).

The Journal will be published biannually and will include original peer-reviewed articles, book reviews and short essays, from various areas that have an impact on sustainable development. We believe that our Journal will contribute towards the enrichment of scientific thought and the affirmation of ideas in different fields from established and young researchers. We are also convinced that this scientific platform will affirm the new scientists and enthusiasts of our University to engage in international theoretical and empirical debates.

The editorial board of the Journal is well aware of the great challenges ahead. Undoubtedly, in order to produce a successful and effective Journal and make our contribution to the scientific community, a lot of hard work and commitment is required. I am certain that our board members, teaching and research in various universities and countries, will contribute greatly towards our goal with their experience and willingness to sustain the SEEJSD and its community. I take this opportunity to thank the members of the editorial board and welcome them to their important role.

Lastly, I would like to express my sincere hope that the "South East European Journal for Sustainable Development" will succeed in the realization of its mission to positively contribute to science, education and human development.

Editor in Chief,
Prof. Aziz Pollozhani, PhD



FME(C)A METHODS AS A KEY FACTOR ON THE RELIABILITY AND SAFETY OF THE TECHNICAL SYSTEMS TOWARDS SUSTAINABLE DEVELOPMENT IN THE INDUSTRY SECTOR

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ABSTRACT

The purpose of this paper is to provide suggestions for increasing the reliability and safety of the technical systems through a concrete case analysis of industrial technical systems using FME(C)A (FMEA/FMECA) methods and tools used as working methodologies. In this way, the efficiency and effectiveness of technical and technological systems towards sustainable development in the industry sector are increased.

The main objective of this paper is also the analysis of the failure mode (failure mode: the manner in which an item fails), causes and effects on the technical systems, and then the application of the FME(C)A methods. The Failure Modes and Effects Analysis (FMEA), and Failure Mode, Effects and Criticality Analysis (FMECA) procedure, is a tool that is performed on the technical systems. The FMECA extends FMEA by including a criticality analysis which is used to quantify failure effects and severity. The criticality for each item is obtained by summing the criticalities for each failure mode that have been identified for each item of the system. The reliability is the ability of an entity (e.g. technical system) to perform the required functions under stated conditions for a specified time. Safety is the ability of the entity to avoid, under given conditions, critical or catastrophic events, with consequences in the form of damage to the equipment, or other injuries or harms to human health.

The Risk Priority Number (RPN), as an important quantitative index, is used to analyse the risk associated with potential problems identified during the failure mode and effects analysis, and to rank the failure modes and effect in the criticality analysis of the technical systems.

Key words: Technical systems, FMEA/FMECA, failure mode; reliability and safety, Risk Priority Number (RPN).

1. INTRODUCTION

Failure mode and effects analysis (FMEA) is a risk assessment tool that mitigates potential failures in systems, processes, designs or services and has been used in a wide range of industries. Failure mode and effects analysis (FMEA) is initially developed as a formal design methodology in the 1960s by the aerospace industry (Bowles & Peláez, 1995) [2]. FMEA is an analysis technique for defining, identifying and eliminating known and/or potential failures, problems, errors and so on from the system, design, process and/or service before they reach the customer. When it is used for a criticality analysis, it is also referred to as failure mode, effects and criticality analysis (FMECA).

FMEA is an important technique that is used to identify and eliminate known or potential failures to enhance the reliability and safety of complex systems and is intended to provide information for making risk management decisions [1]. FMEAs can identify and address safety issues before a potential catastrophe. The purpose of FMEA is to prioritize the failure modes of the product or system in order to assign the limited resources to the most serious risk items. When potential failure modes are identified, corrective action can be taken to eliminate or continually reduce the potential for occurrence. The first step in FMEA is to identify all possible potential failure modes of the product or system by a session of systematic

brainstorming. After that, critical analysis is performed on these failure modes taking into account the risk factors: occurrence (O), severity (S) and detection (D).

For system FMEAs, the objective is to improve the design of the system, subsystem or component. System FMEA is the highest-level analysis of an entire system, made up of various subsystems. The focus is on system-related deficiencies, including system safety, system integration, interfaces or interactions between subsystems or with other systems. Interactions with the surrounding environment, human interaction, service, and other issues could cause the overall system not to work as intended, which include failure modes associated where a single component failure can result in complete failure of the entire system.

2 THE MAIN INDICATORS FOR DETERMINING THE FMCA METHOD

2.1 The Risk Priority Number (RPN)

The Risk Priority Number (RPN), is the critical indicator for determining proper corrective action on the failure modes. The RPN is calculated by multiplying the severity (1–10), occurrence (1–10) and detection ranking (1–10) levels resulting in a scale from 1 to 1000, as shown in Table 1.

$RPN = \text{Severity (S)} \times \text{Occurrence (O)} \times \text{Detection (D)}$.

Table 1. Scale for assessing the level of risk [IEC 60812:2006].

Severity (S)	Occurrence (O)	Detection (D).	The level of risk	
Irrelevant	Irrelevant	Very high	Value of assessment	RPN
Low	Low	High	Low	< 50
Medium	Medium	Medium	Medium	50 - 100
High	High	Low	High	100 - 200
Very high	Very high	Irrelevant	Critical	> 200

The smaller the RPN, the better, therefore, the larger, the worse. A Pareto analysis should be performed based on the RPNs once all the possible failure modes, effects and causes, have been determined. The high RPNs will assist you in providing a justification for corrective action on each failure mode.

2.1.1 Severity (S). Severity is an assessment of how serious the Effect of the potential Failure Mode is on the overall system or process, as shown in Table 2.

Table 2. Severity (S) ranking [IEC 60812:2006].

Severity	Criteria	Ranking
None	No discernible effect	1
Very minor	Fit and finish/squeak and rattle item does not conform.	2
	Defect noticed by discriminating customers (less than 25 %).	
Minor	Fit and finish/squeak and rattle item does not conform.	3
	Defect noticed by 50 % of customers.	
Very low	Fit and finish/squeak and rattle item does not conform.	4
	Defect noticed by most customers (greater than 75 %).	
Low	System/item operable but comfort/convenience item(s) operable at a reduced level of performance. Customer somewhat dissatisfied.	5
	System/item operable but comfort/convenience item(s) inoperable. Customer dissatisfied.	
Moderate	System/item operable but at a reduced level of performance. Customer very dissatisfied.	7
	System/item inoperable (loss of primary function).	
High	System/item inoperable (loss of primary function).	8
	Very high severity ranking when a potential failure mode affects safe system operation and/or involves noncompliance with government regulation with warning.	
Hazardous with warning	Very high severity ranking when a potential failure mode affects safe system operation and/or involves noncompliance with government regulation without warning.	10
	Very high severity ranking when a potential failure mode affects safe system operation and/or involves noncompliance with government regulation without warning.	

2.1.2 Occurrence (O). Occurrence is an assessment of the likelihood that a particular Cause will happen and result in the Failure Mode during the intended life of the system or process, as shown in Table 3.

Table 3. Occurrence (O) ranking [IEC 60812:2006].

Occurrence	Criteria	Ranking
Remote	Failure is irrelevant	1
Low	Relatively few failures	2
		3
Moderate	Occasional failures	4
		5
High	Repeated failures	7
		8
Very high	Failure is almost inevitable	9
		10

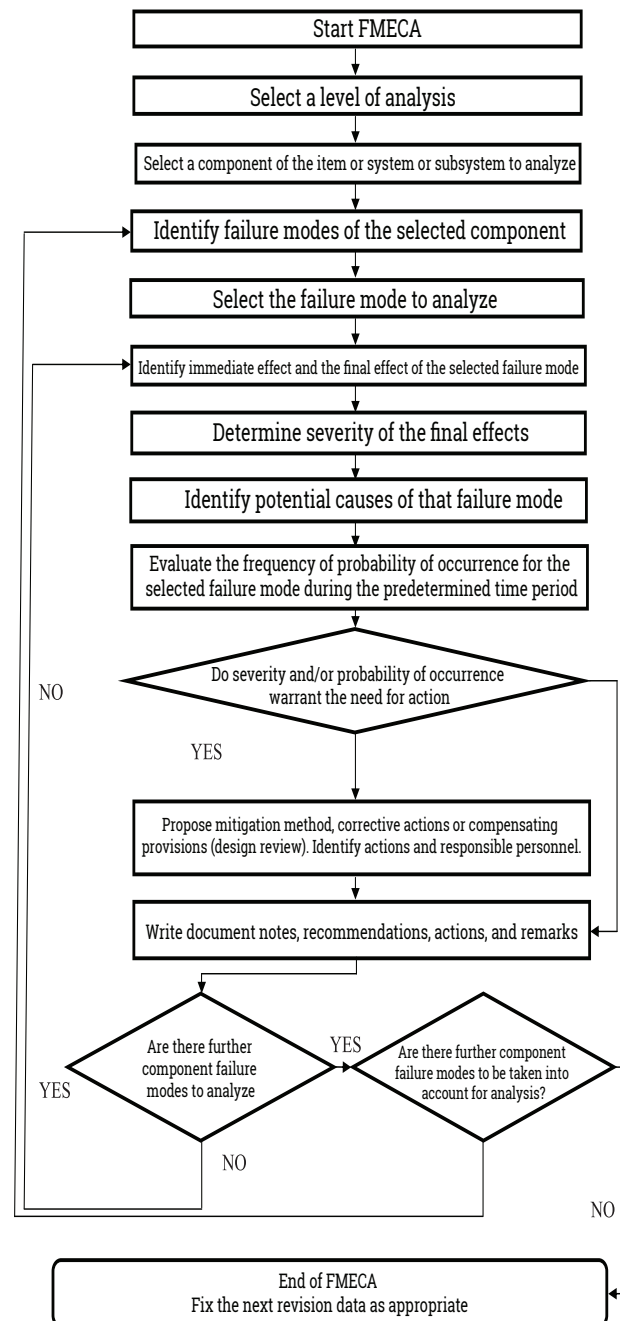
2.1.3 Detection (D). Detection is an assessment of the likelihood that the mechanisms provided to prevent the Cause of the Failure Mode from occurring will detect the Cause of the Failure Mode or the Failure Mode itself, as shown in Table 4.

Table 4. Detection (D) ranking [IEC 60812:2006].

Detection	Criteria	Ranking
Almost certain	It will almost certainly detect a potential cause/mechanism and subsequent failure	1
Very high	Very high chance it will detect a potential cause/mechanism and subsequent failure	2
High	High chance it will detect a potential cause/mechanism and subsequent failure mode	3
Moderately high	Moderately high chance it will detect a potential cause/mechanism and subsequent failure	4
Moderate	Moderate chance it will detect a potential cause/mechanism and subsequent failure	5
Low	Low chance it will detect a potential cause/mechanism and subsequent failure mode	6
Very low	Very low chance it will detect a potential cause/mechanism and subsequent failure	7
Remote	Remote chance it will detect a potential cause/mechanism and subsequent failure mode	8
Very remote	Very remote chance it will detect a potential cause/mechanism and subsequent failure	9
Absolutely uncertain	It will not and/or cannot detect a potential cause/mechanism and subsequent failure mode	10

2.2 FMECA flowchart (in compliance to IEC 60812:2006)

In Fig.1. it is displayed a more detailed form of the FMECA flow chart (in compliance to: IEC 60812:2006) and the steps following this method.

**Figure 1.** FMECA flowchart (in compliance to: IEC 60812:2006).

3 CASE STUDY: FMECA - FAILURE MODES AND EFFECTS ANALYSIS FOR ROTARY EXCAVATOR

3.1 Rotary excavator of surface mine - digger (rotor with baskets)

Fig. 2. shows a Rotary excavator of surface mine which is subject to analysis in this paper using the FMCEA method, appointed as a system. The excavator, as one of the heavy mining machinery, serves for digging coal or soil on the surface mine.



Figure 2. Rotary excavator of surface mine - digger (rotor with baskets), (source: www.elem.com.mk).

3.1.1 The main parts (subsystems) of the system-Rotary excavator. Fig. 2. shows the digger with the buckets, one of the most critical parts (assemblies) of excavators, and in this analysis, it is displayed as a subsystem of the system rotary excavator. In Table 5, for example, on the first column on the left in the first row the sub-system number 1 displays rotor with buckets-digger, while the column on the right displays the function of that subsystem.

The order and description for the all other parts of the system (subsystems) continues in Table 5.

Table 5. The main parts (subsystems) of the system-Rotary excavator

Si No	subsystems	function
1.	rotor with buckets-digger	digging coal or soil
2.	rotary torque drive	circular turning left and right on digger
3.	lifting and lowering device for the rotor (on the receiving tape)	lifting and lowering of the rotor (on the receiving tape)
4.	drive for left and right turn of the receiving tape	driving for left and right turns on the receiving tape
5.	Drive for circular motion left and right on the delay track	circular motion left and right on the delay track
6.	lifting and descent lifting unit	raising and lowering the delay tape
7.	drive for movement of the reception and the delay track	movement of the reception and the delay track
8.	mechanism of transport and caterpillars	transport of rotary excavator
9.	steel construction	bearing construction
10.	steel ropes	balance of construction
11.	rotating parts (rolls and drums)	movement of the tape

3.2 FMECA - FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS FOR ROTARY EXCAVATOR

In Table 6 it is displayed the FMCEA analysis of the system through its subsystems.

Table 6. FMECA - Failure Mode, Effects and Criticality Analysis for Rotary excavator.

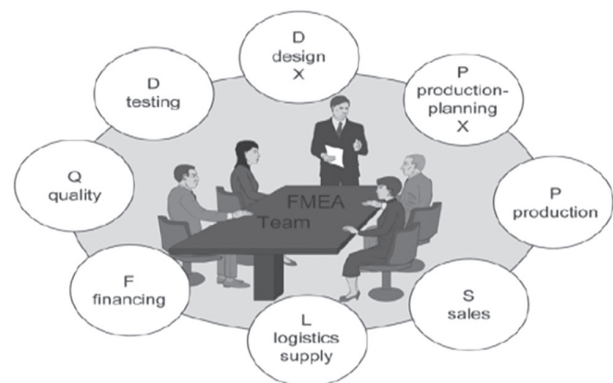
Si No	Part Description	Part Function	Failure Mode	Failure Causes	Immediate Effect	System Level Effect	D (Detection)	O (Occurrence)	S (Severity)	RPN	FMECA Analysis				
											Prevention/Correction Action				
											Correction Action	D	O	S	RPN
1.	digger (rotor)	digging coal or soil	vibration, cracks, breaking	drive, buckets, construction	difficulty digging or interruption	no rotation of the rotor	8	5	7	280	setup, welding, centering	4	3	4	48
2.	mechanism of transport	transport operations	vibration, cracks, breaking	drive, caterpillars, field of transport	no movement	interrupted transport	6	4	4	96	setup, detailed lubrication	4	3	3	36
3.	steel construction	steel construction of rubber band	bad lime, cracks, damage of steel ropes	breaking	interrupted function	breaking or tearing	9	2	9	162	tuning of steel ropes, welding	5	2	5	50
4.	conveyor belts	acceptance, transport and disposal of material	vibration, tearing, breaking	drive, construction, drums, rolls	Interrupting off the tape function	the transport track does not move	4	3	3	36	---	-	-	-	--
5.	hydraulics	lifting of the rotor, lubrication	leakage of oil, dry sliding surfaces	viscosity of oil and grease, seals	high temperature, fractures and deformities	dysfunction of the cylinder, aggregate or pump	8	4	7	224	change pumps of oil and fat	4	2	5	20

The columns in Table 6 shown, for example, the subsystem number - number 1, then subsystem Description - digger (rotor with baskets), subsystem Function - digging coal or soil, Failure Mode - Vibration, Cracks, breaking, Failure Causes - Drive, Buckets, construction, Immediate Effect - digging difficulty or interruption, System Level Effect - no rotation of the rotor, D (Detection) - with value 8, O (Occurrence) - with value 5, S (Severity) - with value 7, and RPN with the resulting value of the analysis 280 (red color), which it is not allowed according to the review in Table 1, and corrective measures are taken after which it is obtained a new permitted value RPN = 48 (green color) , etc., continuing for all other subsystems in Table 6.

3.2.1 The FMEA team

The team size ranges ideally between 4 – 6 members and consists of experts (a designer,

draftsman, testing engineer, planer, manufacturer, laboratory assistant, resource planner, testing planner, master craftsman, machine operator, further knowledge carriers etc.). Thus, merely a basic knowledge of FMEA is adequate for the team of experts, as shown in Fig. 3 [7].

**Figure 3.** The FMEA team

3.3 The bathtub curve

Technical systems are classified as repairable and nonrepairable systems. When you classify an item as unrepairable, we are only interested in the study of the item until the first failure happens, which means it will be rejected by the first failure, while for repairable systems and the occurrence of failure they are trained in proper conditions to help for their maintenance.

This curve is usually called a bathtub curve after its characteristic shape. The failure rate is often high in the initial phase. This can be explained by the fact that there may be undiscovered defects (known as "infant mortality") in the items, and these soon show up when the items are activated. When the item has survived the infant mortality period, the failure rate often stabilizes at a level where it remains for a certain amount of time until it starts to increase as the items begin to wear out.

From the shape of the bathtub curve, the lifetime of an item may be divided into three typical intervals: the burn-in period, the useful life period and the wear-out period. The useful life period is also called the chance failure period. Often the items are tested at the factory before they are distributed to the users, and thus much of the infant mortality will be removed before the items are delivered for use. For the majority of mechanical items the failure rate function will usually show a slightly increasing tendency in the useful life period (Fig. 4) [5].

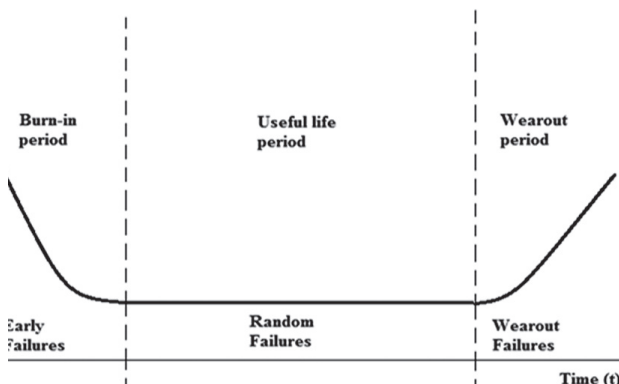


Figure 4. The bathtub curve.

The reciprocal value of the average time between the failures m is the frequency of the fault (intensity failure) or the fault index λ . It indicates the number of system failures in the unit of the time [6], equation 1.

$$\lambda = \frac{1}{m} \ln \left[\frac{1}{h} \right]$$

Reliability means the probability that an asset or item will perform its intended purpose functions for a specific period of time under stated conditions. It is usually expressed as a percentage and calculated using Mean Time Between Failures (MTBF). Mean Time Between Failures (MTBF), means the mean measured time between two system failures in the observed period of system exploitation, denoted by m (MTBF) and expressed in hours (h) [6], as shown in equation 2.

$$\lambda = \frac{1}{MTBF} \ln \left[\frac{1}{h} \right]$$

3.4 The optimal value of the systems effectiveness

Knowing the functional dependency between system efficiency and costs of exploitation, procurement and commissioning costs, the development and production costs allow us to define the optimal system efficiency and effectiveness [6];[8], as shown in Fig. 5 (The diagram shown is prepared using the programming language Matlab).

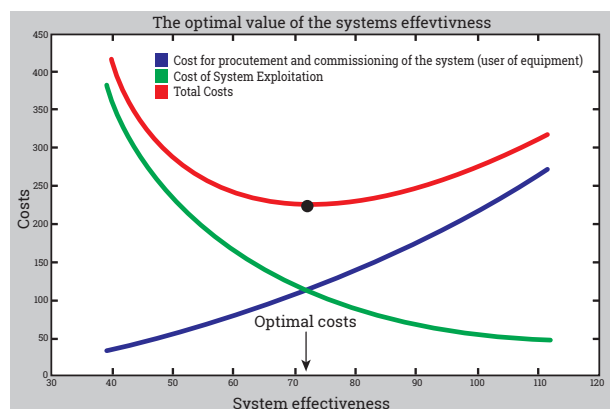


Figure 5. The optimal value of the systems effectiveness.

As shown in Fig. 5, we need to find the right level of effectiveness required to give us the optimum total cost. This graph illustrates the production or the use of cost, which represents operations and downtime cost versus effectiveness and System Exploitation cost.

4 CONCLUSIONS

In summary, FMEA/FMECA methods provide an easy tool to determine which risk has the greatest concern and therefore an action is needed to prevent a problem before it arises. We have successfully solved such a case in Table 6, using the FMECA analysis and its tools in the system, the rotary excavator (Figure 2) and the subsystem digger (rotor with buckets) in Table 5. Through correction, the value of RPN over the correction action of the digger (rotor with buckets) reduces the RPN from the critical value 280 to the permitted value RPN = 48.

Failure Mode Effects and Criticality Analysis (FMECA) is a risk assessment tool that mitigates potential failures in systems, processes, designs or services and has been used in a wide range of industries. It is used to identify and eliminate known or potential failures to enhance the reliability and safety of the systems and it is intended to provide information for making risk management decisions.

As can be seen from FMECA - Failure Mode, Effects and Criticality Analysis for rotary excavator (Table 6), the bathtub curve of the system (Figure 4), the optimal value of the systems effectiveness (Figure 5), according to the flow diagram of the FMECA (Figure 1) and from the overall analysis in this paper, we come to the general conclusion that the efficiency and effectiveness of the systems are improved by using the FME(C)A methods, and thus we achieve an increase in the reliability and safety of the technical systems towards sustainable development in the industry sector.

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Appendix A. Basic Terms and Definitions

Basic Terms	Definition	Source
Reliability (performance)	<p>The ability of an item to perform a required function under given conditions for a given time interval.</p> <p>NOTE 1 – It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval.</p> <p>NOTE 2 – Generally, reliability performance is quantified using appropriate measures. In some applications, these measures include an expression of reliability performance as a probability, which is also called reliability.</p>	IEV 191 -02-06
Corrective Action	<p>Action to eliminate the cause of a detected nonconformity (3.11) or in another undesirable situation.</p> <p>Note 1: There can be more than one cause for a nonconformity. Note 2: Corrective action is taken to prevent recurrence, whereas preventive action (3.18) is taken to prevent occurrence.</p>	[ISO 9000:2005, Item 3.6.5]
System	<p>A combination of interacting elements organized to achieve one or more stated purposes.</p> <p>NOTE 1 – A system may be considered as a product or as the services it provides.</p> <p>NOTE 2 – In practice, the interpretation of its meaning is frequently clarified by the use of an associative noun, e. g. aircraft system. Alternatively, the word "system" may be substituted simply by a context-dependent synonym, e.g., aircraft, though this may then obscure a system principles perspective.</p>	ISO/IEC 15288
Item	Any part, component, device, subsystem, functional unit, equipment or system, that can be individually considered. An item may consist of hardware, software or both, and may also in particular cases include people.	[IEC 60812:2006]
Failure	It is the termination of the ability of an item (a component/system) to perform a required function.	[IEC 60812:2006]
Failure mode	The manner in which an item fails.	[IEC 60812:2006]
Failure effect	The consequence of a failure mode in terms of operation, function or status of the item.	[IEC 60812:2006]
Hazard	A potential source (state of an item) of physical injury or damage to the health of people or damage to property or the environment.	[IEC 61882:2001]
Risk	It is a combination of the probability of occurrence of hazard/failure and its severity.	[IEC 61882:2001]
Risk Priority Number	The Risk Priority Number is a mathematical product of the numerical Severity, Occurrence and Detection ratings. $RPN = (S) \times (O) \times (D)$. This number is used to place priority on items that require additional quality planning.	[IEC 60812:2006]
Severity	Severity is an assessment of how serious the Effect of the potential Failure Mode is on the overall system or process.	[IEC 60812:2006]
Occurrence	Occurrence is an assessment of the likelihood that a particular Cause will happen and result in the Failure Mode during the intended life of the system or process.	[IEC 60812:2006]
Detection	Detection is an assessment of the likelihood that the mechanisms provided to prevent the Cause of the Failure Mode from occurring will detect the Cause of the Failure Mode or the Failure Mode itself.	[IEC 60812:2006]

THE ROLE OF TRANSPORTATION IN SUSTAINABLE DEVELOPMENT GOALS

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ABSTRACT

Sustainable development basically involves a process of improving well-being and the prosperity of people (communal and economic) and at the same time taking care for available resources (mostly ecological) by implying care for present and future generations. The sustainable development goals are a major step forward in integrating transport with other global goals. Sustainable development is very important in every pattern, especially in this century. Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development and institutional change are made consistent with future as well as present needs. Sustainable development at the transportation sector can be divided into three major sections: society, economy, and environment. Sustainable development in transportation requires balance to achieve the minimum expectations in these three sectors. Strategies like promoting public transportation, improving road management, pricing policies, vehicle technology improvement, using clean fuels, cultural enhancement, and transportation planning can be used to increase the role of transportation in sustainable development goals. This paper evaluates the role of transportation and the effect of using these strategies in sustainable development goals.

Keywords: Sustainable development goals, transportation strategies, environmental quality.

1 INTRODUCTION

In 2000, the United Nations established the Millennium Development Goals (MDGs), putting forth a vision of how to solve the world's biggest issues. In 2015, the MDGs are set to expire, and the global community is working hard to develop the next 15-year agreement to guide economic growth, ensure an environmentally sustainable development and end poverty. Negotiations are ongoing, as representatives from countries around the world and civil society develop a common set of goals with targets and indicators.

Development means meeting the needs of the present generation without comprising the ability of future generations to meet their own needs. Sustainable Development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development and institutional change are made

consistent with future as well as present needs." (UNICED 1978)

The basic definition of sustainability has been expanded to include three major points: society, economy and environment.

2 SUSTAINABLE DEVELOPMENT AND TRANSPORTATION

2.1 Sustainable transportation

Sustainable Transport is sometimes known as "Green Transport" and it is any form of transport that does not use or rely on dwindling natural resources. Instead, it relies on renewable or regenerated energy rather than fossil fuels that have a finite life expectancy. For this reason, it is said to have a low or a negative effect on the environment since it makes use of energy sources that are sustainable. Walking, cycling and sailing are excellent examples of sustainable transport. There are now around 750 million cars

in the world and predictions are that if the present trend continues, the number will double in the next 30 years. All but a very few are powered by petroleum-based fuel [5].

In 1900 there were just a few thousand cars in the world but as numbers increased, so did the demand for oil. Estimates suggest that during the 20th century about half of the world's accessible oil deposits were used up. It is only relatively recently that people began to be concerned about future oil supplies. A combination of political unrest in major oil producing areas like the Middle East, combined with the fact that reserves are running out in areas such as the US, has heightened this concern and had the combined effect of focusing the mind on seeking alternative energy sources, and pushing up prices.

Added to that, during the last few years people have simply become more environmentally conscious. Whereas before, in many people's eyes the resources of the world were simply there to be made use of, and there is now an almost universal appreciation of the fact that the world's resources will not last forever and that once they are gone they are gone for good. Sustainable development at the transportation sector can be divided into three major sections: society, economy, and environment. Fig.1. below shows the effects of sustainable development on environment, society and economy.



Figure 1. The effects of transportation on sustainable development.

2.1.1 Sustainable transport and society - Transport systems are a fundamental component of societies since they support complex economic and social interactions. **Mobility** is one of the most fundamental and

important characteristics of economic or social activities as it satisfies the basic need of going from one location to the other, a need shared by passengers, freight and information. Locations do not share the same level of mobility as most are in a different stage in their mobility transition towards motorized forms of transport. Mobility is thus a reliable indicator of development. Providing mobility is an industry that offers services to its customers, employs people and disburses wages, invests capital, generates income and provides taxation revenue. Mobility is therefore the recurring aspect where transportation has its most significant societal impacts.

2.1.2 Sustainable transport and economy - Transportation developments that have taken place since the beginning of the industrial revolution have been linked to growing economic opportunities. Economies that possess greater mobility are often those with better opportunities to develop than those with scarce mobility. Reduced mobility impedes development while greater mobility is a catalyst for development. At each stage of social development, a particular transport technology has been developed or adapted with an array of impacts. Five major waves of economic development where a specific transport technology created new economic, market and social opportunities can be suggested: **Seaports, rivers and canals, railways, roads, airways and information technologies.**

2.1.3 Sustainable transport and economy - The most important impacts of transportation on environment is related to: climate change, air quality, noise, pollution, the loss of wetlands, ocean pollution due to oil spill etc. The issue of transportation and the environment is paradoxical in nature since transportation conveys substantial socioeconomic benefits, but at the same time transportation is impacting environmental systems. From one side, transportation activities support increasing mobility demands for passengers and freight, while on the other, transport activities are associated with growing levels of **environmental externalities**. The growth of personal and freight mobility in recent decades have expanded the role of transportation as a source of emission of pollutants and their multiple impacts on the environment.

3 THE ROLE OF TRANSPORTATION IN THE SUSTAINABLE DEVELOPMENT GOALS

3.1 Sustainable development goals related to transportation

Sustainable Development Goals include one or more targets that address transport, both rural and urban. While some name transport directly, many of the targets incorporate transport by recognizing the importance of *access* in achieving advances in education, healthcare, and other critical needs.

Encouragingly, in the framework of Sustainable Development Goals, both cities and transport take prominent roles. This is a historic step, as transport had not been recognized in the previous MDGs. Of the seventeen goals recommended by the Open Working Group to the UN General Assembly, seven of them include specific targets that incorporate transport (including both rural and urban infrastructure, Table 1.). This elevation of transport recognizes it as a key tool in reducing emissions, improving equity, and reducing poverty. Another historic first is the inclusion of a goal on cities, recognizing the increasingly valuable part cities are playing in global development.

Table 1. Sustainable development goals related to Transportation

Sustainable Development Goals (related to transportation)	Transport Targets
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3	Ensure healthy lives and promote well-being for all at all ages
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12	Ensure sustainable consumption and production patterns
Goal 13	Take urgent action to combat climate change and its impacts

3.2 Transport strategies for having a sustainable transportation

For having a sustainable transportation, we need to build some transportation strategies for SD, and these strategies include promoting public transportation, demand management, operation management, pricing policies, vehicle technology improvement, using clean fuels, cultural enhancement, integrated land use and transportation planning.

Transportation strategies can be grouped in several categories based of their relation to the transportation system. Mainly, there are three group of transportation management strategies: Vehicle, Human, and Road.



Figure 2. The categories of transportation management strategies.

3.2.1 Vehicle category The first category would reduce adverse environmental effects of motor vehicle use through technological changes in vehicles and fuels. This will be achieved through using few strategies like:

- Improved efficiency of conventional vehicles (manufacturer innovation, responses to costumer demand)
- New vehicle technologies (hybrid cars, electric cars)
- New fuel (bio fuel, also called green fuel)
- Smart vehicle

3.2.2 Road category The second category of strategies involves improvements of urban and suburban ways, while the human is the third category of strategies for managing the transportation system. This can be achieved by using some of these strategies:

- Traffic flow improvement (Traffic signal timing, ramp metering, bottleneck removal, removing of black-spots – places where most of car accidents occur)

- ITS improvement (Smart highway, routing and scheduling enhancement, giving priority to public transport vehicles via special lanes)
- Regular maintenance. The preventive maintenance is better than the corrective one. And the regular maintenance of roadways will play a major role in road traffic safety.

3.2.3 Human category Several subcategories of human strategy group are in use. Modal substitution, telecommunication substitution, pricing, responses to Government regulation and incentives, and proper implementation of traffic rules strategies all can be thought of as forms of human strategy group. All these strategies have methods that help achieve the sustainable development in the field of transportation (see Table 2).

Table 2. Human category of strategies for sustainable development in transportation.

Human category of strategies for SD	
<i>Cultural Enhancement</i>	
Modal Substitution	Transit, Walking, Biking, Rail Substitute for Truck
Telecommunication Substitution	Telecommuting, Teleshopping, Teleconferencing
<i>Incentives/Disincentives</i>	
Pricing	Increasing Gas Tax, Checking Technical Examination
Proper Implementation of Traffic Rules	The most important one

4 CONCLUSIONS

Transport is a vital part of our everyday life. The prevailing 20th century view was to rely on fossil fuels for most of our transport needs and to ignore any consequences. In the 21st century we have woken up to the fact that there is a need for us to care for the world around us. Nonetheless, the SDGs have some room for improvement. Where the goals fall short is the lack of inclusion of cycling and walking - key parts of the sustainable transport mix. Both are low to no impact on the environment and have far reaching benefits.

Walking is the form most often used by people with lower income, including women and children who often lack access to a vehicle or money.

This paper has suggested some strategies for increasing the role of transportation in sustainable development such as promoting public transportation, demand management, improving road management, pricing policies, vehicle technology improvement, using clean fuels, cultural enhancement, applying incentives & disincentives, and transportation planning for sustainable transportation.

These strategies require more studies, and since each one of these categories has different effects on society, such as consumer responses to sustainability strategies, the result of these should be considered for the society, environment and economy. Also, the effects of these strategies should to be taken into account in sustainable development.

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THE WAVE OF INFLUXES IN THE BALKANS IN THE LAST TWENTY YEARS

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ABSTRACT

The phenomenon of migration is as early as the civilization itself. Nowadays, migration is a growing problem all over the world. It is a complex global problem that affects all countries. Migrants all around the world risk their lives on daily basis in attempting to find safety or a better life. In everyday life one often uses notions and terms related to the displaced, refugees, immigrants, asylum seekers, etc., which basically mark the persons abroad. However, uncertainty in understanding and distinguishing the aforementioned notions still prevails. Often in the media, war-fleeing people are not called refugees, but emigrants. For this reason, it should be insisted on clarifying the volume and the content of notions defining the status of migrants, refugees, and asylum seekers at the present time. Over the last twenty years in the Balkans, especially in and out of the lands inhabited by Albanians, there have always been many refugees, immigrants and asylum seekers, both Albanians and foreigners. These influxes in and across the borders occurred due to the various crises and wars in Kosovo, Macedonia, Syria and other countries of the East which caused large political, economic and social changes in regional and global dimensions.

Keywords: War, refugees, migration, asylum, Balkans, Macedonia, Middle East.

1 INTRODUCTION

We are all witnessing the most massive influxes that human history has ever known. There prevails a time which is constantly changing while one of the main factors of this global change is the migration itself. This paper aims to clarify the terminology of phenomena related to the abandonment of homeland, its causes, factors, influence and extent in the Balkan region.

2 THE NOTION OF MIGRATION

In the Webster's international dictionary, the notion of migration means the change of residence from one place to another due to the

influx of an individual, family or community from one country or region to another. The Latin word '*migrare*' means migration, displacement or influx. "An emigrant is a forerunner of change because it includes the experience of two societies; it is an instigator for both the society which did not offer him/her well-being and the society in which s/he is involved" (Jackson, A., 1986: 49).

The reasons why people are determined to change their habitations are complex and exposed to frequent changes. Therefore, the classification of migrations is a complex issue. Thus, migration represents the periodic migration from one

region to another due to nutrition and better living conditions, not only for humans but also for living creatures. In accordance with this, an *emigrant* is a person who migrates, respectively changes the place of living (Webster's International Dictionary, 1955: 1557). The emigrant is therefore the displaced person from his/her homeland to another country. S/he can also be called displaced from the homeland for social, economic, political, religious and other reasons. Migration is also related to the political elements, i.e., the expulsion of persecuted people for religion, race, or political reasons (Evans, G., et al., 1998: 242). There is also another category of people who are called *apartheids*, whose legal status is stateless, i.e., they do not have the status of citizenship. Both *asylum* and *asylum seeker* are terms that are often used for migration and emigrants. The word *asylum* derives from the Greek word *asylos* which means inoffensive, untouched, safe bunker, shelter, shelter for settling, shelter for keeping the persecutors and "freedom from persecution" (Boed, R., 1994: 2). Asylum is a form of international protection that is guaranteed to people escaping from persecution or any serious threat from their homeland. In short, asylum can be understood as an inevitable place where the persecuted finds shelter, namely the place that provides him/her security and protection from danger and persecution. In the theory of rightness there are two types of asylums, *territorial* and *extraterritorial*. The territorial asylum means the right of people to remain in the territory of the state that provides them shelter and the right to refuse extradition. The extraterritorial right, or diplomatic asylum, may be given in the space of diplomatic missions in states where some people are exposed to persecution or may be given on the state-owned asylum¹ ship. In the full sense, the international asylum system is located in the place where the gap between state sovereignty and universal human rights is met. It is based on sovereign rights of countries to guarantee asylum rather than the right of the refugees to gain it, so to a large extent, it depends on the country's

commitment to accept this form of protection (Lavenex, S., 1999: 12). "*People between states*" is the head of the chapter where a theorist of the rightness elaborated the rights of refugees (Louis, H., 1990: 50).

The *brain drain* term is widespread and often used as a synonym for educated immigrants, scholars, researchers and in general, educated intellectuals of various scientific fields. '*Brain Drain*' was first used in the British Academic Science Bulletin and talked about educated English immigrants who were oriented in immigrating to the United States (Emigration of Scientists from United Kingdom, 1962:32).

3 RATIONAL AND PURPOSE OF THE STUDY

People migrate for different reasons. Lots of researches prove the assumption that people migrate because through it, they believe and expect success and better life. Among the important elements for migration are health and social determinants of health, natural hazards and disasters, and social, educational, economic and environmental elements. All these can be classified into three categories: employment (economic), social protection (social), and protection policies (political or environmental).

Irregular migrations are not autonomous and random processes. Rather, they are dependent on wider economic, political, geographical and social conditions (De Genova, 2002:424).

Asylum practice is as old as mankind itself (Sinha, P., 1971:5). Since the early history of humanity, the right of asylum represents the way of defending the personality of man from desecration. *Asyilia* in antiquity was associated with a kind of code of conduct which came into force in cases of going abroad, where local polis rules were applicable. At international level, refugee protection began after World War I when the Russian Revolution of October, the fall of the Ottoman Empire, and the Austro-Hungarian Monarchy occurred, and new states were created. This triggered massive wave of people's influxes in Europe and Asia, and as a consequence it cited the awareness of international community for providing refugee

1 [The basic data on asylum history as a foreign protection instrument can be found in UNHCR documents (UNHCR 1993, Box 2.1 and UNHCR 2007, 3, 11-12), while for the definition of asylum,

protection and solving their problem. At the end of the Second World War, the consolidation of the international system of national states, the strengthening of the borders and the introduction of passports took place (Ngai, M., 2003: 75).

The first international refugee protection document was drafted within the framework of the Nations League in 1920 with the aim of providing international peace and security and advancing co-operation between states.

Regarding the massive influxes of Albanians throughout the world after World War II «there is no possibility to write about it based on scientific credibility without exploring precisely the secret documents of the former Yugoslavia, Albania, Britain, America, Italy, or even other countries where the activity of Albanian emigration was concentrated. There is no way to make a clear and scientific projection for the influxes of Kosovans without knowing in detail the complete files of some important events, ranging from Bujan and Prizren Assembly, weapons shares and consecutive illegal groups from the sixties backwards» (Kraja, M., 2009: 121-122).

4 THE FACTORS, THE DIVISION and THE IMPACT

Sensitive factors influence individuals to decide on the abandonment of their homeland. The main factors are: personal and family factors (better education or job position), demographic, economic, political and military disproportion, conflict, power and public service, environmental factors and transnational communication networks. Non-violent mobility is a power. Being able to move or remain calm on a voluntary basis for individuals and groups is a main source of advantage (Urry, J., 2009: 491).

One of the major migration divisions is based on the international legal status of the migrant. It may be legal and illegal, respectively with regular and irregular status (World Migration Report, 2013: 34). There are frequent cases when migrants are seen falsely as victims of political persecution, while essentially hiding the economic motives of migration. One of the most cited typologies is that of William Petersen who divided migrations into

five main groups: primitive, violent, imposed, free and massive. Each of these types is divided into two sub-categories: innovative, when migration is used to improve living conditions and conservative whose purpose is to prevent change and the preservation of life quality as it has been before (Petersen, W., 1969: 289-293). Based on the criteria of causes or motives, migrations are divided into economic or non-economic; based on the wish criteria into: voluntary and non-voluntary; based on the administrative boundary criteria: in foreign and domestic migration; based on organizational criteria: in organized and non-organized, or spontaneous and stihic migrations. Basically, contemporary economic migration is voluntary, but volunteering is always conditional (Wertheimer, B., 1999: 305). Based on the time criterion, migration can be: long-term, seasonal, casual, and final.

Migration represents a complex global problem that affects all countries; countries of origin, transit or destination, and also the creation of different ethnic composition and mutual cultures. Global migration leads to the mix of residents from many countries, affecting the creation of different ethnic composition.

5 GLOBALIZATION AND WORK

We live at a time when migrations change the world greatly. According to Tomlinson, migration is a part of the global economic development occurring in all countries of the world (Tomlinson, J., 1997:170). In the 21st century, migration became the main driving force and structural feature of countries. The majority of developed countries were transformed into societies with different multi-entity forms, while the ones that were not yet so, are moving rapidly in that direction.

On daily basis, migration takes place in the rural-urban direction, because people see their future in urban settlements where the population is more concentrated and where needs and offers for different services are presented. With globalization, the influx of population has become a factor that forms the world economy. From demographic statistics, it is seen that the census criterion is the nationality rather than state or place of birth. The main problem is usually the

inadequacy of the statistical basis that records the migration processes. For this reason, there is no possibility of distinguishing people who were born in or out of the migration country, but have not taken the citizenship of the country where they were born. In this way, the number of immigrants is constantly increasing, and it is estimated that today this number reaches around 214 million, i.e., around 3.1% of the world's population lives in places where they have not been born.²

In general, migration is the least marked demographic phenomenon. Migration, or the influx of population, is the main determinant of people's number in a place and the potential workload. Numerous studies have taken place to assess the impact of migration on the labor market. The data, even when available, are often incomparable, making it difficult to identify the impact of migration on the labor market. Not all emigrants are employed in the places where they migrate. Thus, the results vary not only from study to study, but also within the same study depending on the various econometric methods done over the same period of time. However, this impact is not to be ignored, and there is a need for additional research to achieve the most accurate results. According to Waldinger, the gap between rich and poor countries is such where the benefits of migration often exceed the expenditures (Waldinger, R., 2010: 42). The economic strength and adaptation of jobs to unskilled migrants are the main factors determining the number of emigrants who will attempt to enter European countries (Morehouse, B., 2011:3).

The worst category of immigrants are victims of trafficking inhuman beings, namely victims of forced prostitution, sex tourism, enslavement work, forced marriages and organ trafficking. Children are the most vulnerable group; in the last ten years, the phenomenon of migration of unaccompanied children prevails. These children are younger than 18, i.e. children who are outside their homeland, in the territory of another state without legal conditions of entry and stay, and

unaccompanied. The total number of foreign emigrants distributed around the world till 2009 was estimated at around 214 million. 48% of all foreign immigrants are women, most of whom now emigrate alone, without their families.³ According to the statistics, active emigrants working alongside their families are about 90% of worldwide emigrants. Refugees and asylum seekers make up 7 or 8 percent of immigrants. In 2009 it was estimated that 50 million people lived or worked in a non-native country without an adjusted status (Human Development Report 2009: 2).

It is important to note that the poorest sections of population are not those who decide on transnational emigration. According to Skeldon, mobility is the privilege of those who are relatively suffering and only the poorest are forced to remain in their country (Skeldon 2006: 21-22).

Global migration has also links to international terrorism, because foreigners have the potential to be destructive towards the country they emigrate.

6 EUROPE

Many international relationship theorists estimate that the 21st century will be a century of migrations, and in this regard, they emphasize the fact that at the beginning of this century there were much more foreign immigrants than ever before in history compared to the 20th century, which was defined as a century of internal migration of people as the bearers of the migration process. It was the period when refugees from the territories of SFRY and other crisis areas began the process of international migration (Cohen, R., et al., 1998: 186). The wave of migration that included Europe over the last few years, from the so-called Arab Spring, according to some theorists, is an indicator of the inefficiency of the migration policy by the European Union. Building walls at the borders of European states and suspending the Schengen Agreement are phenomena that undermine the proclaimed principles upon

2 *United Nations Department of Economic and Social Affairs, Population Division, Trends in International Migrant Stock: The 2008 Revision, <http://esa.un.org/migration>*

3 *International Labour Migration, A Rights-based Approach* 2010, p.1) *General Recommendation No. 26 on women migrant workers*, CEDAW, doc. UN, CEDAW/C/2009/WSTR.1/R, 5 decembre 2008, p. 8

which European integration, multiculturalism and the free movement of people, goods, and ideas are supported. What the European Union offered as a solution to the migration had no systematic solution, rather it dealt only with crisis management. The big wave of migration from the Middle East and Africa towards Europe started in 2011 and was intensified in 2014. In 2015-2016, it was so high, reaching up to 237 million. It was a serious growth rate compared to 1990, when the total number of emigrants around the world reached 154 million.⁴

According to some data, the reinforced border control diminishes the success of illegal migration and lessens the benefits of criminal organizations (Futo, J., 2005:35). It has been shown that the flows of illegal migration to the European Union are related to changes in border management surveillance. Irina Molodikova, a researcher on the issue of migrants from Eastern Europe, in her criticism goes so far that she calls Schengen as the New Iron Curtain in the asymmetric relationship between European countries (Molodikova, I., 2011:130). At the beginning of the third millennium Europe was seen as a continent of immigrants. The European Union is one of the top international destinations, with foreigners making up 6% of the total population of 500 million, while the problem of migration in Europe is increasingly taking xenophobic content. The most spectacular case that took mass media's attention was the case of the cameraman and journalist of Hungary's N1TV channel, Petra Lazslo - which took place in September 2015 - who kicked a Syrian refugee holding a child near Roske camp. In practice, the discrimination of immigrant minorities coming from different ethnic, cultural and social backgrounds takes place everywhere. That is why they are exposed to stereotypes and prejudices. A serious discrimination of immigrants is based on ethnic, religious, and racial background. All kinds of discrimination derive from intolerance and prejudice. Discrimination of immigrants is most common in these areas:

1. Politics (e.g., restriction of political activity, exclusion from the political decision-making process, prohibition of access to financial means);
2. Economic (e.g., in terms of access to the labor market, concentration in some economic sectors, difference in payment and income, different working conditions);
3. Social (e.g., access to education and health care, social rights, housing);
4. Juridical (e.g., fair access to procedures before the relevant bodies).

Surrounded by one of these differences or all, the discriminated migrant is often in a lower position compared to others. Discrimination in these areas is prohibited under international human rights law, more precisely on the basis of international conventions dealing with the abolition of all forms of discrimination [International Convention on the Elimination of All Forms of Racial Discrimination, Article 1].

The Dublin Regulation was adopted at EU level followed by the Dublin Convention, which was signed in Dublin in 1990, and entered into force in 1997. The Dublin Regulation is based on the concept of European security. Generally, beyond EU borders the safe country may be the first one to provide asylum.

The Common European Asylum System (CEAS) was designed in Tampere in 1999 and is based on the 1951 Geneva Convention and the 1967 New York Protocol. It aims to harmonize the judicial systems of member states on the basis of standards, that is to say, the treatment of asylum seekers becomes uniform throughout the EU territory, and there is greater solidarity between member states and cooperation with the third countries in these efforts.

The EU has established multidisciplinary ESPON institute that deals with rural-urban migration study, regional environment, ecology, cultural habits, communication technology and education. The 2008 European Migration Package confirmed the readiness of the European Union and the member states to implement sustainable and efficient public asylum and migration policies in the spirit of solidarity between member states

⁴ UN, *Key trends in international migration, Expert Group Meeting on The Post-2015 Era: Implication for the Global Research Agenda on Population Development*, New York, 10 April 2015

and in cooperation with the third countries in establishing a common European asylum system that would guarantee higher standards of protection. The EU's priorities for developing asylum policies over the period 2010-2014 were confirmed by the Stockholm Program from 2009. The European Asylum Support Office (EASO) was established in May 2010 with a purpose of improving and realizing in practice the equal right to asylum.

The Eurosur system became operational by the end of 2013, a week after the heavy accident in Lampedusa where hundreds of immigrants lost their lives. This EU external border surveillance system enables the exchange of data about border's condition between the Schengen and Frotch countries almost in real time, facilitating the coordination of actions in order to reduce the number of migrants entering illegally the EU, reducing deaths in maritime borders, rescuing migrants in the sea and increasing the EU's internal security by preventing cross-border crime.

7 THE SFRY DISINTEGRATION

The fall of the Berlin Wall in 1989 and the disintegration of former dictatorial socialist regimes marked the beginning of a new phase of European migration. Migrations in the Balkans reflect the complexity of the conditions that prevailed in this region and represent the fascinating view of their development. The development of a common European asylum policy, among others, was also influenced by the increasing number of asylum applications in the early 1990s. Thus, the number of asylum applications in 1992 reached nearly 700,000, mainly from the former Yugoslavia. Unlike economic migrants, the displaced persons violently had no choice except to seek refuge and protection by fleeing. Wars in the former Yugoslavia and poor economic outcomes during the long-term transition did not give hope for a better future. This led to conflicts and persecutions involving Slovenia, Croatia, Bosnia and Herzegovina, Serbia and Montenegro, Kosovo and Macedonia. Thousands of people from the former Yugoslavia became refugees inside and outside the territory

of Yugoslavia. The Bosnian war sparked a large wave of refugees inside and outside the SFRY territory. The war in Croatia between Croats and Serbs, especially in Sllavonia and Vukovar, caused the displacement of hundreds of thousands of Serbs, whom the Serbian government placed as settlers in Kosovo.

The war in Kosovo sparked the biggest wave of refugees. In Albania, there were approximately 435,000; 355,000 in Macedonia and 72,000 in Bosnia.

Between 1991 and 2004, 1.3 million citizens from the former Yugoslavia sought asylum in developed countries around the world, representing 15% of the worldwide forced migration. A large number of them were allowed to stay with asylum status just because of humanitarian reasons. Emigrations from the Balkan region recorded the highest figure in Germany with 532,000 in 1992, 394,000 in 1993, 74,000 in 1997, 60,000 in 1998, 88,000 in 1999 and 85,000 in 2003. Migration from the regions of the former Yugoslavia flooded also to other European countries, such as: Switzerland, Sweden, Norway, etc.

Albania is the country with the highest migration in the Balkans. Over the last twenty years, more than 700,000 people fled from this country and most of them migrated to Greece and Italy.

8 MIDDLE EAST REFUGEES

Although the number of refugees has declined lately, it is still impossible to find a long-term solution about this problem. Middle East riots, known as the Arab Spring, especially after the expansion of the so-called ISIS Islamic State in 2014 caused refugee waves to the Balkans as a transit country to European Union countries. Alongside the Arab countries, there were people from Eritrea, Nigeria, Sudan, Mali and other African countries in the waves of refugees.

„If I fall out of power, Europe will become hell. Millions of people want to reach Europe through Libya,»- said Colonel Muamer Gaddafi, Libya's president during his stay in Rome. He was terribly murdered a year later. In the meantime, the anti-dictatorial revolutions called the Arab Spring exploded in some Arab countries. In Tunis, Ben

Ali fell out of power; the dictator Hosni Mubarak fell out in Egypt; after the democratic elections Mohammed Morsi was chosen the president of the country, who was overthrown by the army of AbdelFetah Sisi; in Libya, after a short war Colonel Muammar Gaddafi was killed, while in Syria even after six years of war, dictator Bashar Assad remains in power. Unfortunately, Syria became a mass and global recruitment of terrorist fighters who, by misusing and misinterpreting Islam, expanded the territory even in Iraq, forming the so-called Islamic State ISIS. The dictator's violence on one side and the terrorist on the other side put the innocent population in the face of the Hamlet's dilemma: «to be or not to be». A great number of people left the country, thus becoming refugees. It is noteworthy that the vast majority of the media called these refugees as emigrants. One of the transit countries to Europe was the Republic of Macedonia. Macedonia as a member of the UN signed and ratified the Convention on the Status of Refugees of 1951 and the 1967 Protocol. It was therefore obliged to provide them with protection, security, and not returning them towards their territory. But the situation was different. The police arrested refugees and sent them to the Gazi Baba Reception Center, under bad conditions. The other center in Vizbeg near Skopje was as well under bad conditions. Often, the refugees organized a hunger strike due to these conditions. So, entering Macedonia was not simple. Refugees were stopped by police forces at the border and returned to Greece. Those who were able to penetrate though the borders, although wounded and bleeding, were mistreated by the hooligans. From Greece to the border with Serbia, refugees travelled on feet, because Macedonian law prohibited the transport of illegal immigrants. In addition, they travelled by bicycles which they bought very expensively and sold them cheaply. The vast majority of refugees confessed how they were attacked and robbed on Macedonia's roads by criminal gangs, without being protected by police. On May 25, 2015, legal amendments were made to allow the transport of people entering the Republic of Macedonia without permission. Every refugee entering Macedonia was given 72 hours to seek asylum or abandon Macedonia. On August 15, 2015, the Government of Macedonia declared the

crisis because of the large crowds of refugees. In Macedonia's railways, many refugees were jailed, heavily injured, and found death. According to the French journal Mediapart, all this contributed to the fact that refugees called Macedonia - Mafiadonia. The British Channel 4 informed that refugees were kidnapped in the village of Vaksica, Kumanovo, from which the kidnappers requested ransom. Just after this reportage, Macedonian police surrounded the village, but instead of arresting domestic criminal gangs, they arrested 128 refugees. The Macedonian police spokesman argued that the refugees declared to have come to Vaksice voluntarily. Thousands of people experienced Golgotha, suffered long-term consequences due to injuries, trauma, violence, loss of their families, hungriness, etc. Various scandals of Macedonian police towards refugees circulated over the Internet. But despite this gloomy picture, hundreds of citizens provided refugees with various forms of assistance, such as food, water, medicines, clothing and medical services. Through social networks, especially the Facebook group *Help the migrants in Macedonia*, a host support was organized. One of the most active organizations in assisting refugees was the 'Vllaznia' Association. Its head PhD Milazim Mustafa, senior official at the Government of Macedonia, who led the team to Tabanoc among others, said: "If we talk on percentage, over 80% of emigrants are from Syria. There are also from Iraq, Afghanistan and very few from Pakistan, Iran, Bangladesh and African countries, such as: Senegal, Sudan, and Nigeria. There have been times when children could be seen together with their parents, but along the way they had lost their contact. In other cases, parents managed to take the train while the children were left. It is not easy to host a wave of a great number of refugees, and at the same time meet the immediate requirements and needs. Many donors from both outside and inside the country were interested in helping and offering their assistance in different ways and forms. It is worth mentioning that a great support was received from the Albanian Diaspora, but also from other overseas organizations such as IHH from Turkey, France, Baraka City, and so forth (Peace magazine, X, no.102, XI-XII, 2015, pp.7-9).

9 KOSOVANS ESCAPE FROM THEIR LIBERATED HOMELAND

The year 2015 brought a huge wave of influx across the territory of Serbia. Alongside Syrian refugees, Albanian emigrants from Kosovo took their path towards Europe. They crossed the Serbian border near Subotica illegally and stood at the Hungarian border. Despised by the general economic and social situation, they aimed Europe. Serbian media reported with pomposity: *'Kosovans leave free and liberated Kosovo'*, *'Kosovans flee massively, Hungarians imprison them'*, *'Kosovans flee their land through Serbian territory'*, *'Only in three days 4,000 immigrants were imprisoned'*, *'From Kosovo to EU countries arrived 37,900 immigrants'*. In addition to these headlines, the media showed also images of crowded buses, chaos, screams, unhappy faces, tears and parents with children in their arms.

Kosovans hoped both in international community and national politicians. They were disappointed twice. Due to mismanagement nearly two decades after independence, Kosovo still remains isolated. It is the only country in the region where its citizens cannot move out of its territory without a visa, while the social situation continues to grow worse. This condition forced some Kosovans to seek out a Serbian citizenship. Also, this situation in Kosovo was just like the case of Albanians in Macedonia five years ago (2010). Just after the visa liberalization with EU countries, a misinformation was spread out that EU countries provide economic asylum for Macedonian citizens. Hundreds of Albanians, especially from the Kumanovo region, fled to the airports, taking paths towards the West. The vast majority of them were driven away only after a few months. The displacement of Kumanovo (Albanians and Macedonians) took place within the territory of Macedonia and Kosovo during the 2001 conflict between the Macedonian forces and the Albanian rebels.

10 CONCLUSIONS

In this paper, within a few lines we summed up many things. Usually in such cases, there is a lack of detailed elaboration for everything, so things are said to be overlooked. However, the

essence of the idea was to give some conceptual explanation of this problem and the panorama of this phenomenon in a very sensitive peninsula, where within a time span of more than two decades, the influx of populations of different regions took place. We wish that in the future this work would serve as an incentive for even more detailed scientific works.

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SYNTHESIS OF NANOCOMPOSITE SYSTEMS BY MECHANICAL ATTRITION

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ABSTRACT

It is of technological interest to investigate the evolution of the microstructure and the thermal stability of nanocomposite materials. This research has been focused on the synthesis of the nanocrystalline FeO by mechanical attrition by means of ball-milling, that uses a high transfer technique of the mechanical energy. A peculiar characteristic of the ball-milling technique is the possibility to prepare nanocrystalline systems characterized from an elevated metastability. It was found that not only the medium dimension of the nanograins, but also the thermodynamic state of the interfaces plays a crucial role on the physical property of the systems prepared by means of such technique.

Keywords: Nano-Fe, Ball-Mill, Grain Size, XRD, DSC.

INTRODUCTION

The structural and chemical evolution of an equimolar mixture of iron and magnetite subjected to high-energy ball milling in shaker-type equipment has been studied. Samples milled for different times have been analyzed by X-ray diffraction and Differential Scanning Calorimetry (DSC). The aim of this research work is to gain an insight into how the mechanical energy transfer from the device may affect the synthesis process and the features of the final products. Moreover, information on the relationship between structural characteristics and thermal stability of the milled samples has been obtained.

EXPERIMENTAL

An equimolar mixture of pure (at 99.99%) commercial Fe powder and commercial magnetite (Fe_3O_4) powder was milled using a SPEX8000 mixer/mill. In the Fe_3O_4 powder a hematite ($\alpha\text{-Fe}_2\text{O}_3$) fraction of about 10 mol% has been found. The SPEX vials were sealed in air and the powder/spheres mass ratio was of 1/10. Four different samples were milled for 2, 4, 8 and 16 hours, and they will be respectively indicated as 2h, 4h, 8h and 16h samples in the following text.

Subatmospheric pressure was found in the vials after the milling indicating that no gas exchange with the atmosphere had occurred. Structural and compositional analyses of the powders were carried out by X-ray Diffraction (XRD) using a Philips 7310 diffractometer with Cu K α radiation. The XRD spectra have been analysed by the Rietveld method including particle size and microstrain refinement [1]. Differential Scanning Calorimetry (DSC) measurements were performed up to 650°C (heating rate = 20 °C/min), using a TA Instruments 2010 DSC.

RESULTS AND DISCUSSION

The Rietveld analysis results are presented in Table 1.

a) Average grain size $\langle D \rangle_v$

Milling time	Fe	FeO	Fe_3O_4	Fe_2O_3
(h)	(nm)	(nm)	(nm)	(nm)
2	27	12	5.2	7.4
4	14	17	5.6	6.0
8	15	10	3.5	...
16	10	12

b) Microstrain $\langle \epsilon^2 \rangle^{1/2}$

Milling time	Fe	FeO	Fe ₃ O ₄	Fe ₂ O ₃
(h)				
2	1.0E-3*	2.3E-3	8.7E-3	6.3E-3
4	1.0E-3*	2.5E-2	8.4E-3	1.0E-3*
8	1.0E-3*	4.2E-4	1.0E-3*	...
16	1.0E-3*	1.3E-2

c) Molar per cent

Milling time	Fe	FeO	Fe ₃ O ₄	Fe ₂ O ₃
(h)	(% mol)	(% mol)	(% mol)	(% mol)
2	48	8	28	17
4	38	18	36	8
8	14	74	12	...
16	1	99

Table 1. Rietveld analysis results.

The XRD spectra of the Fe/Fe₃O₄ samples milled in the shaker apparatus are shown in Figure 1a. The average grain size $\langle D \rangle_V$ of Fe and Fe₃O₄ after 2h milling, as estimated by the Rietveld analysis, is ~22 nm and ~6 nm respectively. The milling process has been much more effective on Fe₃O₄ probably because of the higher mechanical hardness of oxides, compared to pure metals, resulting in a lower annihilation rate of defects during the initial stages of the grain refinement [2]. Four different phases are identified in the 2h spectrum corresponding to α -Fe, Fe₃O₄, α -Fe₂O₃ and (FeO) wüstite. This last phase, which, according to the Rietveld analysis, constituted about the 5 mol%, is unstable at room temperature since it is the result of the eutectoid reversible reaction:



taking place at 560°C. The presence of FeO indicates that the mechanical energy transferred by milling for only 2 hours was sufficient to start with the reaction (1).

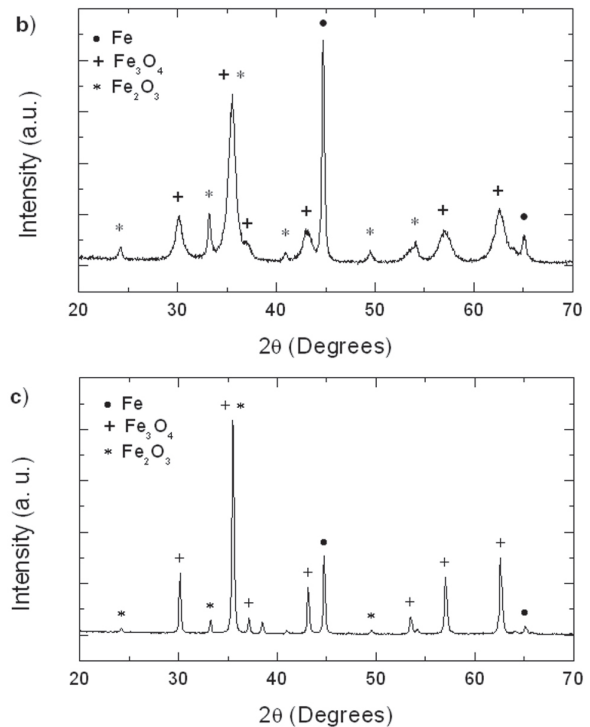
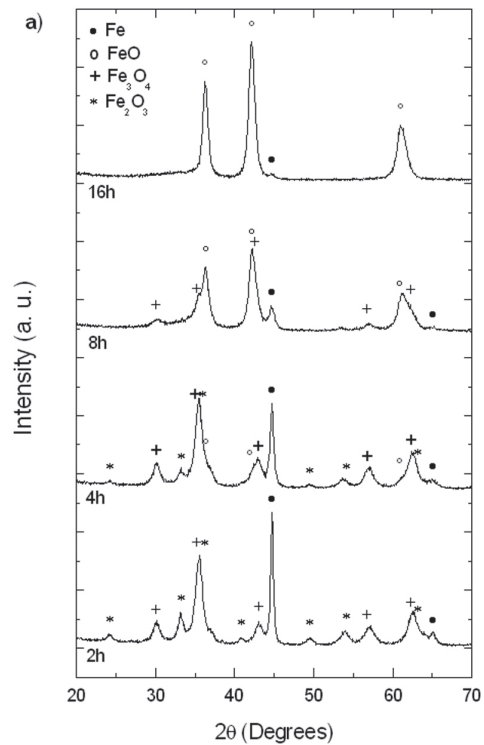


Figure 1. XRD spectra of: a) 2h, 4h, 8h, and 16h samples; b) 50h sample; c) 16h sample after 1 hour treatment at 400 °C in flowing Argon.

The amount of FeO gradually increases with the milling time and the 16h sample is constituted for 99 mol% of FeO, with a mean grain size of ~12 nm, and only a very small fraction of Fe (~1%) is detected. [3]. Moreover, α -Fe₂O₃, already present in

the un-milled mixture due to a partial oxidation of the commercial Fe_3O_4 powders, reduces by milling and disappears after 8 hours, probably transforming into the lowest ferrous oxides.

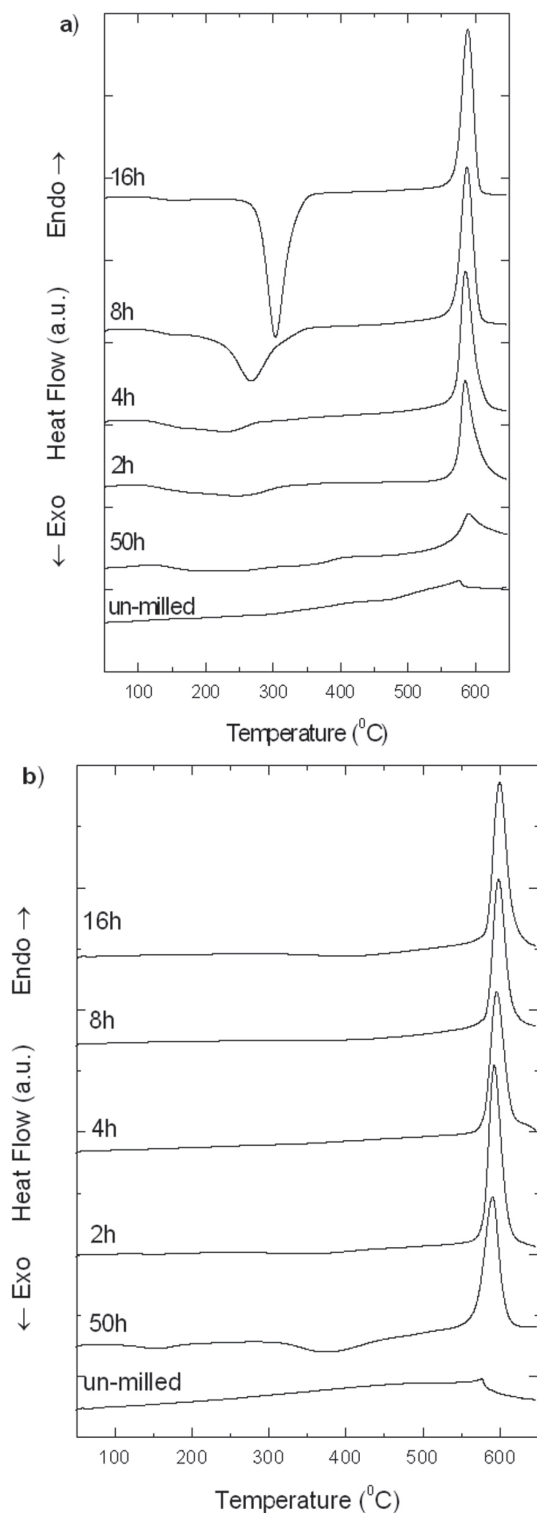


Figure 2. DSC measurements on un-milled, 50h, 2h, 4h, 8h and 16 h powders: a) first runs b) second runs after cooling at 5 °C/min. Curves of the un-milled sample are amplified by a factor 5.

Further information on the formation of the FeO phase were obtained by performing DSC experiments. The results of the first runs of measurement are displayed in Fig. 2a together with the curve relative to the un-milled mixture. In the un-milled sample only a small endothermic signal at 577°C, corresponding to the Curie point of Fe_3O_4 , is observed. In the samples milled by the SPEX, the exothermic process at temperatures ranging from 100 to 350°C and shifting to the right with hours of milling is connected with the thermally induced decomposition of FeO into Fe and Fe_3O_4 . This decomposition has been verified by XRD analysis on a 16h sample after being annealed for 1 hour at 400°C in flowing argon (Fig. 1c). The increase in the area of the exothermic peaks is in agreement with the XRD data, showing increase in the amount of FeO with the milling time, whereas the shift of the peak temperature suggests higher thermal stability of FeO. In the milled samples, an endothermic peak is present at ~585°C and it has been associated with the formation of FeO, namely to the direct reaction (1). It should be pointed out that the peak at 585°C is absent in the un-milled mixture and it does not appear even in successive DSC runs. However, the peak profiles in the milled samples are quite different. In fact, the peak of the 50h sample presents a pronounced tail on the high-temperature side. The same feature, even if in a reduced way, characterizes the 2h sample. With increasing the hours of milling in the shaker device, the peak becomes sharper and more symmetric whereas its area does not change substantially, more specifically ~120 J/g.

These results can be explained considering that in order for the reaction to take place, the diffusion processes between Fe and Fe_3O_4 must occur. Therefore, the two phases must be mixed on a scale length similar to or smaller than the diffusion length corresponding to the temperature and time scale of the DSC experiment. In the 8h and 16h samples, the reactants Fe and Fe_3O_4 mainly derive from the previous decomposition of FeO and are therefore expected to be mixed on a scale length favoring the rapid re-transformation into FeO. For the 2h and 4h samples, the mixing degree between the reactant phases is that achieved during the milling process. In these cases, the presence of

a tail on the right side of the peak indicates that higher temperatures, and i.e. greater diffusion lengths, are indeed necessary to induce the complete transformation of Fe and Fe_3O_4 into FeO. Second runs of DSC measurements (Fig. 2b) have been carried out on the same samples (Fig. 2a), after lowering the temperature at a cooling rate of $\sim 5^\circ\text{C}/\text{min}$ to allow the inverse reaction (1). The peaks at 585°C in the milled samples exhibit very similar profiles indicating that, after the thermal treatment carried out during the first run of measurement, the samples present a similar microstructure.

CONCLUSIONS

The effect of the mechanical milling through ball mill device on an equimolar mixture of Fe

and Fe_3O_4 powders has been studied. Using a SPEX8000 mill for 2, 4, 8 and 16 hours of milling, the progressive formation of FeO is observed. Moreover, the thermal stability of FeO increases with the milling time. The energy transfer rate of the mill has been demonstrated to be a fundamental parameter in the determination of the milling products and their properties.

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ANALYSIS OF AIR MICROORGANISMS IN THE MATURATION AND STORAGE STAGES OF WHITE CHEESE

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ABSTRACT

The main purpose of this paper is the research and analysis of air microorganisms in white cheese in two stages of production: maturation and storage. During the research stage, we get to know various factors that affect the air microflora of the product, and then adequate mechanisms that reduce the presence of harmful microorganisms in white cheese.

The method used in this paper is based on the phenomenon of "microbial precipitation," respectively the free fall of microorganisms in Petri dish, which contain nutrient media. This method includes the preparation of nutritional sites, setting of nutritional sites on Petri plates, opening of hosts for sampling, closing of dishes, incubation and reading of results. The analyzed samples are taken from two locations: Mitrovica and Fushë Kosovë, and include cheese locations such as dairy, market and shopping. To conclude that the air microflora in white cheese lies within or outside the permitted levels, this is verified by comparing results obtained with the levels provided by ISO standards. During the paper we will try to answer the following questions: "What are the main factors affecting the white cheese contamination? Which microorganisms of fungal contamination have been localized? How dangerous is the presence of these microorganisms in the concerned product? Which steps should be followed, namely, what are the recommendations to avoid contamination of white cheese by air microorganisms?"

As a result of recognizing and avoiding these contaminations, we will not only achieve the safety of the cheese, but also of all other products that are inseparable from our tables, and thus the health of the consumer in the near future will be much safer.

Keywords: White cheese, microflora of air, microbial precipitation, maturation, storage, ISO standards.

1 INTRODUCTION

White cheese is a concentrate of milk where the dry matter base consists mainly of protein, more precisely of casein and fat. The stages of production of the white cheese include: acceptance of milk, pasteurization, standardization, cast bacterial culture, milk coagulation in cheese, pressing, shaping, salting, packing, maturity, storage.

Also, cheese is a very suitable environment for the development of microorganisms that contaminate the product and at the same time possess a risk to the consumer. Air microorganisms commonly found to be contaminants of the cheese are *Escherichia Coli*, *Micrococcus*, *Streptococcus*, *Staphylococcus*, *Saccharomyces fragilis*, *Saccha-*

romyces lactis and so on. Each of the stages of production has a special sensitivity to these microorganisms and the infection from them affects both the leptic organ and the quality. Maturity is the stage where microbiological and biochemical processes are realized, accompanied by changes. Changes mainly affect lactose. Storage is the stage that we should be careful at two stages that are excessive water loss, infections and contamination of the cheese surface. So, these two phases are almost the most exposed phases of the environment that contains the air along with the microorganisms, and as a result, depending on the conditions we may have contamination. However, the cheese storage phase is the target point of the microorganisms depending on the conditions we provide. As such, the conservation phase in the market, in the dairy or in any other place will be attacked by contamination, therefore great care should be taken in the product of this phase, by not overlooking other phases as well.

2. MATERIALS AND METHODS

2.1 Materials

The materials that are needed to develop this research include nutrient medium, Petri Plates, analytical scales, aquatic baths and microscopy for microorganism examination.

2.2 Methodology and preparation

Sampling is done at different points in three different locations such as dairy, market, and shopping. Sampling is based on the migration of air mycophorus and it free falls directly into Petri dishes with a diameter of 9 mm, with a surface area of 60.79 cm², with a duration of 20 minutes exposure. This method is based on the phenomenon of "microbial precipitation", i.e. in the continuous fall of air microorganisms on the Petri dish with the respective nutrient medium. The sedimentation method is simple and very suitable for practical work. To determine the number of microorganisms present in the air and in and around the plants and to judge the quality, it is necessary to cultivate on a selective medium

by type of microorganisms. In the mediums where the microflora of the air is made, the plates get open and remain open for about 20 minutes in order to sediment (microbial rain). After they get closed, they are turned over and get incubated in the thermostat at 25-30°C. Reading the results was done after incubation time of 24 hours, 48 hours and after 5-7 days.

2.2.1 Preparation of feeding ground with PCA

The working tools and reagents are: Erlenmeyer flask, PCA and sterilized water. PCA, chemical composition (g / l): Glucose 1.0, 2.5 Yeast Extract, Agar 1.5.

We measured the PCA field and placed it in the Erlenmeyer flask, added a few agars to reinforce the soil, where the Erlenmeyer must be sterilized in the sterilizer. Then, the terrains after being homogenized were put into autoclaves for sterilization. For homogenization of the soil, we can place it in the water bath until the whole mass is homogenized and then placed in the autoclave for sterilization at 121°C for 15 minutes.

2.2.2 Prepare the nursing ground with CHAPEK

The working tools and reagents are: Erlenmeyer, CAPEK, sterilized water CAPEK, chemical composition (g / l): Sodium Nitrate 2.0, Magnesium Sulfate 0.5, Potassium Chloride 0.5, Sodium Sulphate 0.01, Potassium Di Phosphate 1.0, Sacharose 30.0, Agar 15.0. The CAPEK field has been measured, then placed in the Erlenmeyer, adding some agar to the ground reinforcement, then after being homogenized, they have been put into autoclaves for sterilization. After sterilization, the soil is poured into Petri plates and left until they are solidified. After the solidification, all dishes are well insulated until the places where the samples have been taken. The transportation of plates is made in refrigerators at a temperature of 7-8°C, allowed to be opened only at the place where the samples are taken and left to stand as described above. Then the samples taken are returned to the lab and incubated at 26°C for yeast and mold, while at 37°C for bacteria. All this chain of preparation can be seen in Figure 1.

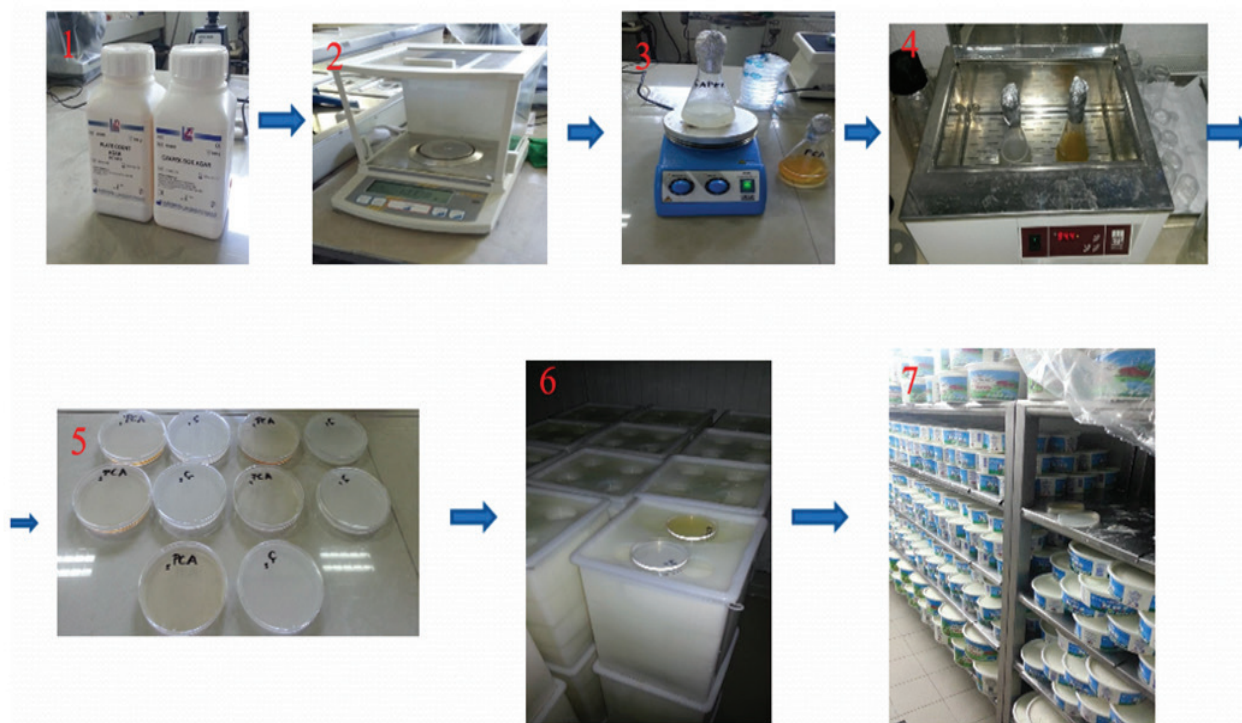


Figure 1. Chain of preparation.

3 RESULTS AND DISCUSSION



Figure 2. Results and diagrams of microorganisms at a) Dairy, b) Market and c) Shopping.

By analyzing the first table above (Fig. 2.a.), it can be seen that bacterial microflora has been quite clear where we can see that this sample did not have bacteria, whereas a very small number of mold ranged from 2 molds in sample 4 and 15 molds

in the first sample. Based on the second sample and from the table (Fig. 2.b.), it is seen that this bacterial microflora sample is more concentrated and it should be noted that in sample number 1 there is a greater spread of bacteria where in a

surface of 60.70 cm² there is a precipitation of 26 microorganisms, while in the other measurement samples there are fewer microorganisms. Here we have to mention that fungal microflora has been more widespread but always below the permitted standards, so it should be mentioned that the number 5 location was the most polluted from all other places (i.e. 163 in a surface of 60.70 cm²). The third sample (Fig. 2.c.) has a greater number of microbial distribution because in this place there has been the largest circulation of humans, so both bacterial microflora and fungal microflora have greater contamination than other samples, where in some places the plates have been unreadable by a large number of bacteria. After the growth and development of the molds we have also done microscopic examinations. During microbiological examinations, we have concentrated on colony growth, colony dye on both sides and colony diameter. In the dairy farm where we have sampled, and we monitor growth and development, the following molds have been identified: *Penicillium*-These organisms give separate mycelia. The cones are formed by filaments. The typical color in the food is blue and green. They are very common in soil, air, dust and many food products like cereals, fruits, etc. Some are also important in the production of antibiotics. *Alternaria* (Fig. 3.)-These molds alter many plant products and most of them also produce mycotoxins. Here, the mold that belongs to the fungi imperfect mildew appears and is very widespread in nature, too.



Figure 3. The appearance of *Alternaria*.

4 CONCLUSIONS AND RECOMMENDATIONS

Based on the results obtained from microbiological analyses and reviewed literature (ISO standards), we conclude and recommend the following: In general, in the dairy where white cheese is produced, the microflora of air has been at permissible levels. In the places where the cheese is marketed, the air microflora has been more contaminated and the hygienic-sanitary conditions where the cheese is marketed should be considered. During this research, the isolation of microorganisms of fungal contamination from molds is also done, according to the characteristics of climatic conditions suitable for their growth, both in moisture and dryness. These contaminations originated from normal microflora of air, surrounding environment, as well as from the movement of personnel and working tools, so there were many primary and secondary factors, both internal and external, as well as in the market the contamination is caused by consumers themselves.

The negative impact has undoubtedly failed to implement good working practices in the food safety, where the contamination of cheese and other products has great potential to pose a risk to the consumers.

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DESIGN AND INSTALLATION OF WASTE WATER TREATMENT PLANT IN TOBACCO PROCESSING FACTORY-SIGNIFICANT STEP TOWARDS SUSTAINABLE DEVELOPMENT

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ABSTRACT

This paper represents case-study from the designing, construction and installation of industrial Waste Water Treatment Plant (WWTP) in a tobacco processing factory in the Republic of Macedonia. The factory referred to in this article only processes recently harvested tobacco, creating a product that can be stored until it is needed for production of cigarettes, cigars and smokeless tobacco. This stemming and redrying facility is considered the "middle man" between tobacco farmers and manufacturers. The process itself results in little to no wastewater discharge from stemming and redrying operations. Components from the production wastewater are neutralized and biologically degraded, and after that they are homogenized by fecal waters from the sanitary nodes. The load of WWTP is calculated as 'population equivalent'. Population equivalent or unit per capita loading, (PE), in wastewater treatment is the number expressing the ratio of the sum of the pollution load produced during 24 hours by industrial facilities and services to the individual pollution load in household sewage produced by one person at the same time. The principle of operation and a short description of WWTP elements are also presented in the article. Following legal obligations regarding waste water treatment and the quality of waste water at the discharge from the industry, the installation of such facilities leads not only to environment protection but also contributes significantly to the sustainability of the environment protection and sustainable development of the country in general.

Keywords: Waste water treatment, environment protection, sustainability

1 INTRODUCTION

Wastewater is any water that has been affected in quality. It can be described as contaminated water or "sick water". Wastewater can originate from homes, industrial and factory waste, commercial or farming activities, surface runoff or storm water. Surface run off can include anything from harmful substances that wash off from roads, parking lots or rooftops. Wastewater is harmful to human health if not treated properly after being disposed into the environment. Sewage is usually treated at a wastewater treatment plant.

Wastewater begins from toilets, shower room, laundry room and kitchen sinks. Also, water used for washing and cleaning purposes such as for gardens, swimming pools, washing machine and storm water is included in wastewater but not specifically sewage water [1].

Wastewaters can be categorized as:

- Domestic wastewater: Used water discharged from the residential, commercial and industrial area of a city and collected through

the sewage system;

- Industrial wastewater: Generated from medium to large scale industries. Manufacturing industries produce a large volume of wastewaters.

A sustainable approach gives many benefits not only to the environment but also improves food security, health and a country's economy as a whole. A sustainable way to manage wastewater is to recycle and re-use water, for e.g. waste water can be used over and over again for a cooling plant, also recycled wastewater can be used for construction and concrete mixing.

Developing sustainable wastewater treatment requires consideration of the wastewater treatment systems in a broad sense taking into account not only cost and treatment energy performance but also recycling and social issues [2].

The wastewater treatment technique defines the loading of the wastewater treatment plant in relation to the number of the "population equivalent" (PE). This unit measure represents the degree of water pollution, which on average an adult person makes. Such waters, derived from production, are measured against pollution by "population equivalent". By the number of people, the number of "population equivalent" and the waters that are treated, the type of wastewater treatment plant is determined.

2 CHARACTERISTICS AND OPERATION CYCLE OF WASTEWATER TREATMENT PLANT

2.1 Reference treatment plant load and wastewater characteristics

The domestic wastewater of the tobacco factory 'Sokomak', with a maximum staff of 1,096 people (in three shifts), is treated in wastewater treatment plant, which is tasked to purify the sanitary wastewater. The sewer network is designed and built as a free flow system. The rainwater is discharged separately. The sewer receives only sanitary wastewater (toilets, showers, kitchen, and factory facilities) without additional storm water and drainage water, etc. The sewer receives also discharge of industrial wastewater to the

treatment plant with some hundred liters of condensed steam and comparable wastewater [3].

Wastewaters to be treated in the Tobacco Processing factory 'Sokomak' – Bitola include water released during the production and sanitary nodes in the factory (toilets, showers, kitchen etc.) [4]. Therefore, an approximate calculation of the mixed water released from production facilities is required. Water constituents from the production process are neutralized and biodegradable, so they are homogenized with fecal waters from the sanitary nodes.

The wastewater treatment plant (WWTP) is dimensioned according to the following load figures, which are based on experience with comparable plants:

- Number of employees: 1,200 people
- Reduction factor: 0.7
- Resulting plant load: approx. 840 PE
- Expected BOD5-load: up to 50 kg/d
- Sewer system: separated pipe system
- Average daily wastewater flow: up to 100 m3/d
- Assumed peak flow: 30 m3/h (shift change)
- Expected TSS-load: up to 50 kg/d
- Expected N-load: up to 10 kg/d
- Expected P-load: up to 3 kg/d

It is assumed that the quality of the raw wastewater resulting from living areas as well as from infrastructural facilities is in compliance with typical domestic sewage. If factory installations exist within the described project area, which are polluted with toxic components, deep or high pH-values or comparable ingredients, a pre-treatment must be performed before this polluted wastewater is discharged into the sewer network.

The wastewater treatment outgoing liquid should have the following parameters:

- BOD5-concentration: 10 mg/l
- CODcr-concentration: up to 70 mg/l
- Total nitrogen: 10-15 mg/l
- Ammon.N: 2 mg/l
- Total phosphorus: 1-2 mg/l
- Suspended solids (TSS): 25 mg/l
- pH-value: 6.5 - 9.0

The typical appearance of the water accumulated from the production facilities is comparable to urban waste water. It has brownish-gray color and contains paper, plastic parts, hygiene products, food residues and similar hard materials. The grease in the water coming from the kitchen must not reach the treatment plant, because a serious interruption in the pump's operation can occur and cause a damage in the biological part of the station. For this reason, a grease separator should be installed in the waste water drainage from the dining hall in order to remove the fatty ingredients. Thus, this separator greatly reduces fat accumulation.

In accordance with the working regime in the tobacco factory, waste water is discharged during the day during the main shift. The largest quantities of wastewater occur during shifts and during breaks. Up to 30% of daily amount of water to be treated can appear at the plant suddenly. Also, typical for the wastewater coming from a factory is the fact that the flow of wastewater is significantly smaller on weekends.

2.2 Type and technical characteristics of WWTP

There are many different kinds of sewage treatment plants which vary in the process by which they treat wastewater. Generally, they can be classified into the following types of systems:

- Activated sludge plant (ASP);
- Rotating disc system;
- Submerged aerated filter (SAF);
- Suspended Media Filters (SMF);
- Sequencing batch reactor (SBR);
- Non-electric filter;
- Trickling filter.

All of these wastewater treatment plants operate in different ways and produce effluent of varying quality. Moreover, they all cope with different kinds of usage to differing degrees of success; some can tolerate being under loaded where some do not function as effectively. Some plants are most efficient with higher loadings where others are not able to effectively process high levels of sewage.

WWTP installed in the tobacco factory 'Sokomak' in Bitola is of Sequencing Batch Reactor (SBR) type

[4]. The sequencing batch reactor (SBR) is a fill-and-draw activated sludge system for wastewater treatment. In this system, wastewater is added to a single "batch" reactor, treated to remove undesirable components, and then discharged. Equalization, aeration, and clarification can all be achieved using a single batch reactor [5]. A typical process flow schematic for a municipal wastewater treatment plant using an SBR is shown in Fig. 1 [6].

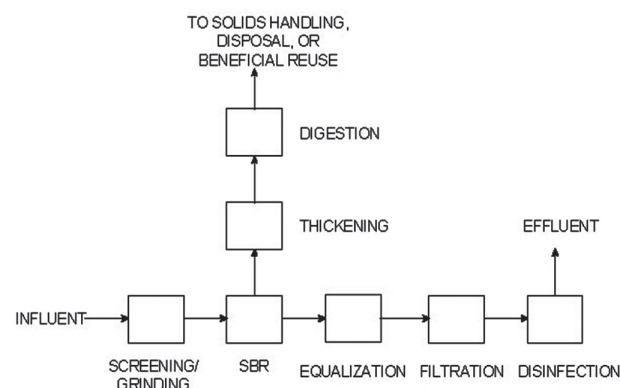


Fig. 1. Process flow diagram for a typical SBR, Source: [6].

The biological work is the most important integral part of the WWTP, where the powerful wastewater treatment begins. Such treatment is based on the action of microorganisms found in the deposits, which in organic waste degrades organic and inorganic impurities. Therefore, oxygen is necessary on one side and intensive mixing of the ingredients on the other. Oxygen is introduced through low-pressure compressor in a so called 'living sand' (a set of all microorganisms). The procedure for such biological preparation is known as the 'living sand procedure' and is a most commonly used biological technique used for water treatment (purification). In the WWTP concerned in this article, the living sand procedure is performed using SBR type of operation.

One exception is that in this case the SB-reactor is filled only once per day because the maximum wastewater flow (ca. 100 m³/day) is in accordance with the filling capacity of SB-reactor. Early in the morning (after the discharge of treated water), the process of filling starts and ends late at night (when there is no water flow anymore). Such a flow regime results in the so-called "24-hour-

cycle", i.e. the reaction process that is performed as daily cycle.

The principal scheme of SBR wastewater treatment plant installed in 'Sokomak' – Bitola is given in Fig. 2 [7].

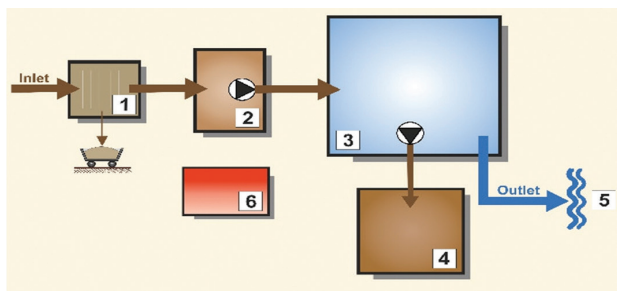


Fig. 2. Principal scheme of SBR water treatment; 1 – Mechanical pre-treatment; 2 – Inlet buffer tank; 3 – Sludge Batch Reactor (SBR); 4 – Sludge treatment; 5 – Receiving water; 6 – Control room.

The operation of an SBR wastewater treatment plant is based on the fill-and-draw principle which can be subdivided into five basic operation modes:

1. Fill cycle: The inflow of wastewater represents the first contact with microorganisms. A smart change of mixing and aeration initiates the purification process.

2. React cycle: After the tank is filled up and the inlet is stopped, mixing and aeration are performed in change to support nitrification and denitrification.

3. Settled cycle: After the react cycle is finished, aeration and mixing will be switched off and the activated sludge starts to settle. Clear water remains above activated sludge barrier.

4. Draw cycle: The clear water (purified water) is discharged by a decanting system until minimum water level is reached.

5. Sludge disposal cycle: Discharge of excess and anaerobic regeneration of settled sludge.

The schematics of a typical SBR cycle is presented in Fig. 3, while a view of the reference WWTP is presented in Fig. 4.

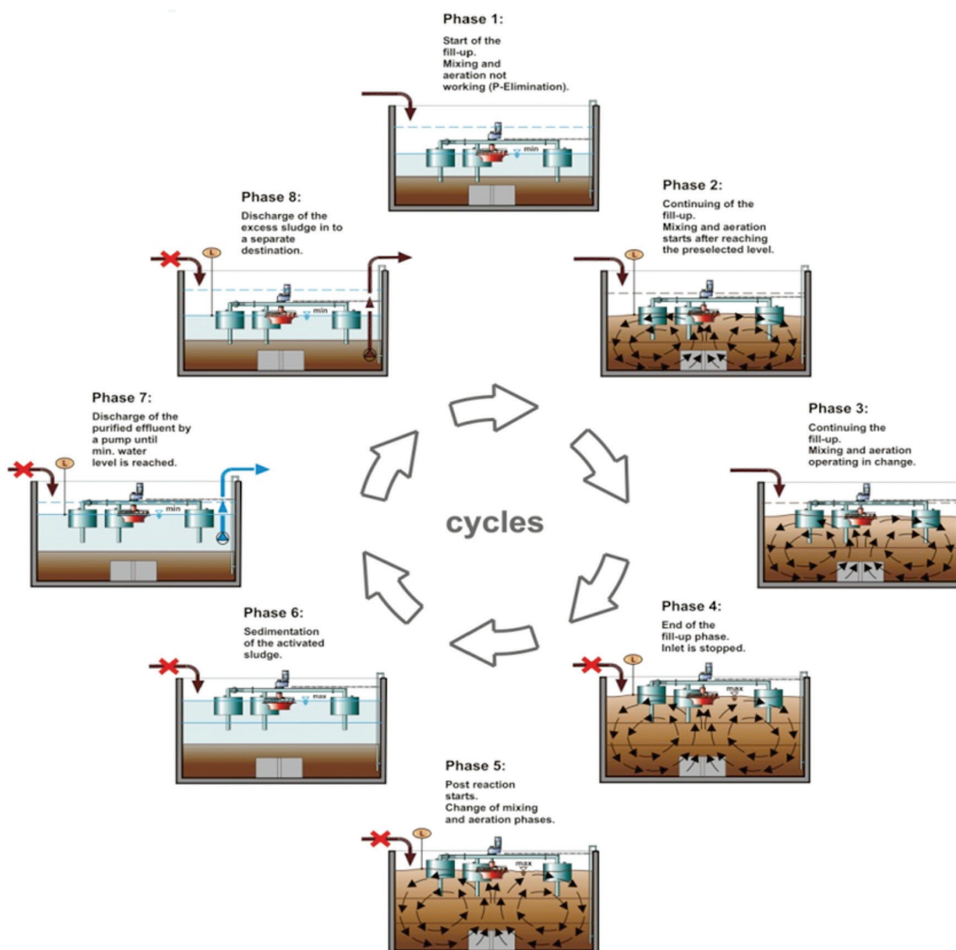


Fig. 3. Schematics of the SBR cycle.



Fig. 4. View of WWTP in tobacco factory 'Sokomak' – Bitola.

3 RESULTS AND DISCUSSION

The sustainable operation of biological WWTP is closely connected to its removal efficiency, cost of sludge management, energy consumption and monitoring cost. The biological treatment offers high organic removal efficiency, and it also entails significant sludge production, which contains active (live) and inactive (dead) microorganisms that must be treated prior to final disposal, in order to prevent adverse impact on the public health and environment [8].

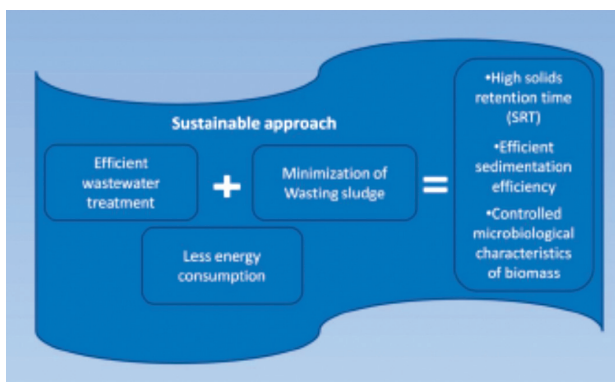


Fig. 5. Key parameters towards sustainability of wastewater treatment technologies, Source: [8].

The performance of SBR is typically comparable to conventional activated sludge systems and depends on system design and site-specific

criteria. This type of WWTP eliminates the need for separate primary and secondary clarifiers in most municipal and industrial systems, which residues operations and maintenance requirements. On the other hand, 'the heart' of SBR system is the controls, automatic valves and automatic switches, thus, requiring more maintenance than a conventional activated sludge system. An increased level of sophistication usually equates to more items that can fail or require maintenance. While some general estimates of the costs can be given, it should be remembered that capital and construction costs are site-specific.

Although detailed analysis of the performance of WWTP regarded to in this article has not been done, a brief analysis of the such experience given in scientific literature is given hereafter. In a comparison for capital and operational costs among four technologies for wastewater treating and purification, Membrane Bio-reactor (MBR) technology, Sequencing Batch Reactor (SBR) technology, Biologically Engineered Single Sludge Treatment (BESST) system and Natural Wastewater Treatment System (NWTs), in terms of both costs (capital and operational), WWTP using SBR technology ranks on the second most favorable position [9]. Having in mind that due to the nature and composition of wastewater coming from production facilities and sanitary nodes of the reference tobacco factory, the usage of SBR technology was the only option available, and there is no possibility to make a comparison of capital and operational costs with other commonly used wastewater treatment technologies.

From the legal point of view, treatment and discharge of wastewater is covered by the Law on Drinking Water Supply and Drainage of Urban Wastewater [10] and several other Rulebooks (secondary regulation acts) [11], [12]. WWTP installed in the tobacco factory 'Sokomak' – Bitola fully conforms to the standard and limit values for the discharge of wastewater contributing to environment protection and reduced pollution of waters.

4 CONCLUSIONS

Wastewater is any water that has been affected in quality. It can be described as contaminated water

or “sick water”. Wastewater can originate from homes, industrial and factory waste, commercial or farming activities, surface runoff or storm water.

Wastewater treatment plants (WWTPs) use several different methods for purification of wastewater. One of these methods is Sequential Batch Reactor (SBR) method. This is a fill-and-draw activated sludge system for wastewater treatment.

The design, construction and operation of WWTP in the tobacco processing factory ‘Sokomak’ in Bitola is used as a reference plant for this research. The domestic wastewater of the tobacco factory ‘Sokomak’, with a maximum staff of 1,096 people (in three shifts), is treated in wastewater treatment plant, which is tasked to purify the sanitary wastewater. The sewer network is designed and built as a free flow system.

The performance of SBR is typically comparable to conventional activated sludge systems and depends on system design and site-specific criteria. Techno-economic analysis of four different wastewater treatment technologies show that SBR technology, used in the reference WWTP, ranks second in terms of capital and operational costs.

The wastewater treatment plant installed in the tobacco factory ‘Sokomak’ – Bitola fully conforms to the standard and limit values for the discharge of wastewater contributing to environment protection and reduced pollution of waters.

Following legal obligations regarding waste water treatment and quality of waste water for the discharge from industry, the installation of such facilities leads not only to environment protection but also significantly contributes to the sustainability of the environment protection and sustainable development of the country in general.

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THE APPROACH OF TEACHERS AND STUDENTS TO THE PHONOLOGICAL ASPECTS OF THE ITALIAN LANGUAGE AS A FOREIGN LANGUAGE

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ABSTRACT

Teaching and learning Italian pronunciation is a very important issue. Many researchers and professors of didactics for foreign languages say that pronunciation is often neglected and that more attention is paid to vocabulary and reading. Having this in mind and the long experience teaching Italian language, it is noticed that this issue is very important. Through questionnaires with teachers and students, we have investigated their approach to teaching and learning the phonological aspects of Italian language, the problems and difficulties they face, the students' reactions during the correction of the pronunciation errors, the time they spend with activities and technologies, the expectations of the teachers and students regarding the level/levels of the correct pronunciation, etc. Based on our findings, teachers are suggested to reflect and reformulate the objectives, in accordance with their students' needs. This is a good approach to meet students' expectations for a reasonable pronunciation and it is also in accordance with the objectives and guidelines outlined in the Common European Framework of Reference for Languages.

Keywords: Italian language, pronunciation skills, reading skills, correction features, metaphonological competence.

1 INTRODUCTION

Many researchers of psycholinguistics, didactics and languages have concluded that the first language is naturally acquired and the other languages that come after the first, no matter if they are second or foreign languages, should be taught. According to Kielljn and others linguists, teaching the phonological issue of the foreign language encourages students to identify the problems and the difficulties of a correct pronunciation and reading; it also brings other benefits to the students¹⁻⁴.

The techniques used to learn pronunciation can be used as techniques for memorizing some grammatical rules (morphological, syntactical and lexical). For example, the ability to learn to pronounce and spell the long consonants can be connected to the semantic field of the word "table" (*apparecchiare, sparcchiare; bicchiere, bottiglia,*

caraffa, piatto, cucchiaio, forchetta, etc). All the words in this semantic field are composed of a long phoneme [p:], [k:], [t:], [f:].

In other cases, the inappropriate morphological word forms can be recuperated through the intonation³⁻⁷. For example, the imperative sentence: *Spegni la luce, per favore!* (Turn off the light, please!) – directed to an adult, an unknown person etc., sounds very strong, perhaps somewhat insulting, for the incorrect use of the verb in the second person of the imperative (this could be used in a polite form by using the conditional *spegnereesti/spegnerebbe*).

Although this command slightly softens in the end, through "*per favore*" (please), it is still insulting. The negative effect of the above command can be neutralized, for example, by turning the

command into a request form, by changing the intonation. The result would be: *Spegni la luce, per favore?* (Turn off the light, please?)

It is very important for students to become aware of the importance of the right pronunciation in communication, and the factors that affect the quality of pronunciation (substitution of one phoneme with another or a deviation from the norm that exceeds any limit, a wrong rhythm or intonation). On the other hand, students and teachers should understand and feel the benefits that the right pronunciation brings in acquiring language skills.

Many teachers may be justified by the lack of a special syllabus regarding correct pronunciation teaching, or even by the fact that there are students who, even though they do not make special pronunciation exercises, have reached a satisfactory level and in some cases even surprising.

Even in Italy, the place and the role of teaching phonological aspects does not seem to be different. In this way, teachers claim that in the first three cycles of primary, elementary and high school, issues that relate to the phonetic aspects of the Italian language can be considered only in the two first cycles, and mainly in the correct pronunciation process. As to the sound element, it turns out to be neglected or assimilated through poetry.

According to Simionato⁶, the situation seems to have changed somewhat over the last 20 years, with the presence of extra-comunitarian students in the Italian schools, where teachers have to reformulate the objectives in accordance with the students' needs, by reviewing the graph phonetic rules, which were not previously treated, but which are certainly bringing benefits even to the Italian students as well.

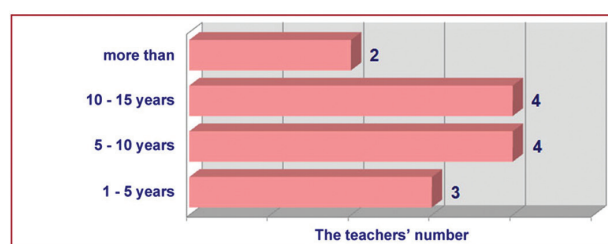
2 METAPHONOLOGICAL COMPETENCE – TEACHERS' AND STUDENTS' APPROACH

From the observations in Italian language classes, conversations with colleagues and from conducted interviews, a reasonable pronunciation is seen more as a desire and opportunity of a small

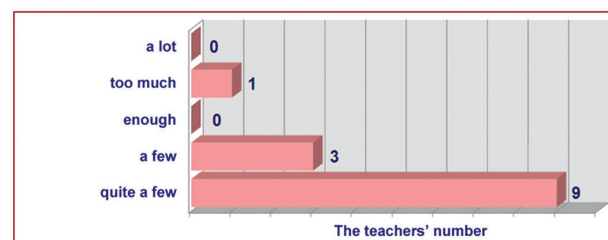
number of students to be identified with natural speakers. According to the difficulty of teaching and learning the phonological issues and the little space provided in programs and textbooks, many teachers and students do not pay too much attention in having a good pronunciation. The difficulties faced by both teachers and students of the Italian language (foreign language) are different. In order to understand the problems related to the teaching and learning the correct pronunciation in the Italian language, we organized a questionnaire divided in two different sections. The questionnaire was completed by teachers who teach in the three levels (primary, elementary and high school) in Elbasan city, as well as teachers from "P. Budi" elementary school in Tirana (a total of 13 teachers). The reason for choosing the latter was personal as well as professional – one of the teachers teaching there not only has the longest career in teaching, but she is also Italian.

Teachers' approach

From social biographical data it turns out that the interviewed teachers in Elbasan and Tirana are relatively young experienced teachers. The teaching experience varies from 5 to 15 years and only 2 teachers have a longer experience. They have attended a relatively big number of trainings in Albania and just a few trainings abroad, but the trainers have been almost Italians.



The duration of the trainings in most of them varies from 1 up to 3 days. During the trainings, the didactics of phonetics and phonology occupies very little space.



Despite the social biographical data, the questionnaire also included questions about the role of teaching phonetics in programs, textbooks and classroom. The data show that teaching phonetics takes enough space. Most of the teachers say they encounter some difficulties in teaching metaphonological competence.

How difficult do you find phonetic teaching?

Answer	a little	quite enough	some-how	very much	extremely
No of teachers	-	2	8	3	-

Teachers found out that students needed more knowledge. Students' level regarding the pronunciation is presented at an average level. Students encounter more difficulties in the reading process of a sentence or text, than in oral communication. Teachers are expressed in high percentage that they often correct students when reading or communicating. Only five of them always correct their students.

How often do you correct your students' pronunciation?

Answer	never	rarely	often	always
No of teachers	-	-	8	5

Most of the teachers prefer to correct their students during oral communication or a reading process. The reaction is more positive when the students are being corrected by their teacher instead of their friends. The students correct themselves very little or little.

When do you correct your students?

Answer	during oral speaking or reading	after oral speaking or reading	at the end of the class hour
No of teacher	9	3	1

How often do your students correct themselves?

Answer	a little	quite enough	some-how	very much	extremely
No of teachers	4	2	6	1	1

A high percentage of the teachers say that it is very important that their students to have a correct pronunciation, even though they are in a slow rhythm. Some of them think that their students need to be fluent even though they are making mistakes. Two of the teachers were not sure and did not even give an answer even though the alternative was part of the questionnaire.

According to your opinion, it is more important that your students are:

Answer	Fluent even though they make mistakes in pronunciation	Correct in pronunciation even though they are in a slow rhythm	Other
No of teachers	4	7	2

In order to understand the role of the approach analyses between the Albanian and the Italian language, teachers were asked a few questions on the teaching and learning process. Their opinion was divided between somehow and very much, regarding the indication of phonological features from the Albanian language to the Italian one, but they say that they stop sufficiently in analyzing the differences between the two languages.

How much do you think that the Albanian language influences the pronunciation of the Italian language to your students?

Answer	a little	quite enough	some-how	very much	extremely
No of teachers	-	2	4	6	1

How often do you stop to analyze with the students the phonetic differences that exist between the two languages?

Answer	a little	quite enough	some-how	very much	extremely
No of teachers	-	1	6	4	1

From a didactical point of view, we addressed some questions to the teachers about the activities they use to teach the pronunciation of the Italian language, the use of technologies and the use

of the phonetic alphabet, with the intention to illustrate the differences between the phonematic and graphemic form of the Italian language.

Teachers said that they mainly use dialogues, short sentences or ask students to conjugate verbs with general objectives. None of the teachers uses activities with well-defined objectives regarding phonological competence.

Do you use the phonetic alphabet to illustrate the differences between the phonematic and graphemic form of the word?

Answer	Yes	No
No of teachers	-	13

The above answers are justified by teachers' need to have a training in the teaching of phonological competence. They express their willingness (within the institutional and ethical-moral legal boundaries) to experiment phonetic methods in their classes. Some of the teachers are against it and some of them are undecided.

Would you like to experiment teaching phonetics to your students?

Answer	Yes	No	Not decided
No of teachers	7	2	4

Students' approach

The questionnaires were completed by 71 pupils of the 8th grade from P. Budi school (Tirana), 84 pupils of two high schools in Elbasan, 62 students of Italian language, and Geography-Italian Language from the University A. Xhuvani (Elbasan). Pupils were asked if they had learned another foreign language. (The rest of the questions intended to gather social biographical data, i.e. age, language/foreign languages, etc.) From the analyses, a high percentage of students showed that English language dominates over other foreign languages like French, German, etc.

With the intention to provide as much data sources as possible, we asked the pupils and the students the same questions that we had previously asked the teachers.

3 RESULTS

Answers regarding the level of pronunciation are divided between poor (31%) and good enough (37.8%).

The answers to the question "Your main difficulties are in ...?" are as in the following: oral communication (62.1%), reading (22.5%), not sure (13.5%), no answer (1.8%). It is clear that the students do not share the same opinions as their teachers who believe that their pupils have more difficulties in reading.

There is also another inconsistency between the teachers' opinions and the students' opinions regarding the difficulties faced by them. Hence, the answers can be summarized as, 31% at the phonemic level, 15.7% at the word level, 13.9% at the sentence level and 30.1% at the text level (no answer or more than one answer, 9%).

36.9% of students prefer to be corrected during speaking/reading, 42.3% after speaking, 16.2% at the end of the class hour and 4.5% do not agree to be corrected at all.

Two major facts have to be emphasized: 71.1% of the students fear their teachers' correction, 24.3% of them fear their friends' corrections and 1.8% of them fear none of the above (2.7% of the students have given no answer). Regarding their reaction towards their friends' correction they react: bad (9.9%), not good (27.9%), good (34.2%), very good (17.1%), do not react (4.5%).

From the questionnaires we can see that the students correct themselves rarely (24.3%) and sometimes (34.2%). From the reading of a given text, it turns out that the majority of the students are not very often self-corrected. This is contrary to the teachers' belief (46.1% of the teachers think that their students are self-corrected).

24.3% of the students find it important and they need more exercises to improve their pronunciation and (24.3%) find it more than important.

Differently from the teachers, 46.1% of whom claim that the Albanian phonological features have a lot of influence in the pronunciation of the Italian language, the majority of the students (24.3%)

believe that the Albanian language have just a little influence and only 11.7% of them believe that it influences a lot.

4 CONCLUSIONS

Phonetics and phonology issues of the Italian as a foreign language are treated very little in texts and curricula. The right pronunciation is somehow passed over in teaching and learning Italian language. For most of the questions there is a satisfactory match between teachers' and students' opinions. Students seem to be more concerned with their teacher's correction rather than their friends' ones. In contrary to most of the teachers who prefer to correct their students during oral communication or reading, students prefer to be corrected at the end of the oral communication or at the end of the whole session. It was also noticed the lack of special trainings for the teachers as well as the lack of a special guidance for teaching the pronunciation in both languages.

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ANALYSES OF IMPACTING FACTORS AND ISSUES IN THE USE OF ICT CAPABILITIES IN ENHANCING EDUCATION

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ABSTRACT

Today, teaching and ICT are two strongly interrelated concepts at all levels of education and in all subjects. Dependence created by ICT teaching can hardly be compensated in another form. Data from numerous global researches proved that using ICT can help students to learn and teachers to manage information more effectively. However, this does not mean that ICT will make a difference, simply by being used. Different findings have suggested that although ICT can improve learning, there are a number of issues that need to be considered if such technology will eventually make the difference. Therefore, care should be taken in this broad level, in where and how and what the impact level will be. Several issues and impacting factors need to be taken under consideration. First is the effect of "interrelated integration" of ICT compared with other interventions, and the second is the effect of the provision and use of ICT at a general level. In order to analyze this, a case study analysis on the use of ICT in universities in Macedonia is realized. Insights and recommendations are provided, argued and discussed.

Keywords: ICT impact on education, Management of education, evaluation of technology enhanced education

1 INTRODUCTION

New technologies are constantly arising and they influence the way how people interact and learn. Recent developments in digital technologies, especially web 2.0 tools such as blogs, wikis and social media, and mobile devices such as smartphones and tablets, have given the end user, the learner, much more control over access to and the creation and sharing of knowledge. This

empowers learners, and innovative instructors in finding ways to leverage this learner control to increase motivation and relevance for learners.

ICT in teaching has an important role and its impact (Itmazi, 2008) on the advancement of educational processes related to effective teaching and learning, and modern research in this field is almost irreplaceable.

These new developments are not emerging as neatly as the above analysis suggests, with many initiatives combining the methods listed above. Professors, teaching, and learning specialists in post-secondary institutions, have been re-thinking pedagogy and designing resources, courses, and programs that benefit from new approaches to teaching and learning.

What drives the development of this new pedagogy? Changes in society, student expectations, and technology are motivating innovative university and college faculty and instructors to re-think pedagogy and teaching methods.

2 LITERATURE REVIEW

This current literature review provides an indication as to the research available in this field, identifies some key documents and emerging messages and suggest priority areas for future research.

Underlying these developments are some common factors or trends:

1. A move to opening up learning, making it more accessible and flexible. The classroom is no longer the unique centre of learning, based on information delivery through a lecture.
2. An increased sharing of power between the professor and the learner. This is manifested as a changing professorial role towards more support and negotiation over content and methods, and a focus on developing and supporting learner's autonomy. On the student side, this can mean an emphasis on learners supporting each other through new social media, peer assessment, discussion groups, even online study groups but with guidance, support and feedback from content experts.
3. An increased use of technology not only to deliver teaching, but also to support and assist students and to provide new forms of student assessment.

It is important to emphasize that these are emerging pedagogical trends. More experimentation, evaluation, and research are needed to identify those that will have lasting and a permanent effect on the system.

There are several separate factors at work here. The first is the continuous development of new knowledge, making it difficult to compress all that learners need to know within the limited time span of a post-secondary course or program. This means helping learners to manage knowledge - how to find, analyze, evaluate, and apply knowledge as it constantly shifts and grows.

The second factor is the increased emphasis on skills or applying knowledge to meet the demands of 21st century society, skills such as critical thinking, independent learning, knowing how to use relevant information technology, software, and data within a field of discipline, and entrepreneurialism. The development of such skills requires active learning in rich and complex environments, with plenty of opportunities to develop, apply and practice such skills.

Lastly, it means developing students with the skills to manage their own learning throughout life, so they can continue to learn after graduation.

Even the most idealistic students expect to find a good job after several years of study, a job where they can apply their learning and which will also provide a reasonable income. This is especially true as tuition increases. Students expect to be actively engaged and see the relevance of their learning to the real world.

Today's students have grown up in a world where technology is a natural part of their environment. Their expectation is that technology will be used where appropriate to help them learn, develop essential information and technology literacy skills, and master the technology fluency necessary in their specific subject domain.

3 SURVEY ANALYSES OF LEARNING MODELLING APPROACHES

In Software Engineering mobile learning software there is evidently a lack of support for instructional techniques and pedagogical learning models, as well as procedures or guidelines how, when and for what particular situation each pedagogical learning model should be supported in the software development process and its conjunction and correlation with the instructional strategies (Fetaji et al, 2008).

Instructional strategy is a very important concept that needs to be addressed because the main purpose of any learning activity should be clear to the learner (Fetaji et al, 2008).

Instructional design models typically specify a method in using the technology that if followed will facilitate the transfer of knowledge, skills and learning process (Fetaji et al, 2008). This learning dimension should provide the context of instruction and desirable outcome. The learning environments require high level of self-organization and metacognitive abilities from learners engaged in the process of learning that should be captured by the instructional techniques.

There are several instructional strategies that are currently considered: Problem-based, Project-based, Inquiry-based Learning, Task-based and Game-based learning (Marjanovic, 2005).

Problem-based learning represents learning that results from working with problems that need solving. The entire learning process is set around an introduced problem and knowledge is developed as a consequence of trying to solve the problem. Official description offered by Lin & Tallman(2006) generally describe it as "an instructional strategy in which learners confront contextualized, ill structured problems and strive to find meaningful solutions and learn in the process of doing it". Problem-based learning is a general approach of learning focusing primarily on solving a problem and acquiring knowledge; with project-based learning students create an end-product (Roschelle, et al 2003). Many research studies have focused on aspects of problem-posing and problem-solving as a way to motivate and teach students about science and math. Problem-based learning (PBL) is collaborative where students work in small groups learning through solving problems and reflecting on their experience.

The approach is also inquiry-based when learners are active in creating the problem. The learners are elevated to the position of analyst and problem-solver and have specific objectives and deadlines to meet. According to Lin & Tallman(2006), there are two critical issues involved in presenting the problem. First, if the learners are to engage

in authentic problem solving, then they must own the problem. A second critical issue in presenting the problem is to be certain that the data presented does not highlight critical factors in the case. Either the problem must be richly presented or presented only as a basic question. Learning should be synthesized and organized in the context of the problem.

Project-based learning (PBL) is a model that organizes learning around projects. Definitions of "project-based instruction" include features relating to the use of an authentic ("driving") question, a community of inquiry, and the use of cognitive (technology-based) tools (Powe et al, 2009).

Project-based learning is a student-centered approach to instruction in which students work in teams to complete an open-ended project. It is ideally suited to the teaching of analysis, design and implementation, especially when using object-oriented analysis and design methods (Fernandez & Williamson, 2003), but not to e-learning that provides instructional material for multiple diverse courses of a university study program which needs to be conducted via small pocket mobile devices. It is a student-centered approach of instruction in which students work in teams to complete an open-ended project. It is closely related to problem-based learning (Fernandez & Williamson, 2003). It promotes higher-order thinking skills which is not appropriate for classes of students with different knowledge and skill levels that is common for university environments. Project-based instruction is an authentic instructional model or strategy in which learners plan, implement, and evaluate projects that have real-world applications beyond the classroom (Helic et al, 2005). Projects sometimes go off track, with teachers and students pursuing questions that are peripheral to the subject matter of interest. The solution, according to Helic et al(2005) is to find ways for projects to centre on "learning appropriate goals."

In university environment, with class groups of vast variability and diversity of cognitive abilities, literacy level, skills and educational background of students, in order to complete the project, the active students will work versus passive ones

who will just stay without engaging themselves in the project and wait for the active one to do it. In problem-based learning, the same will occur. Passive students will just passively wait to end class without doing anything and lose time.

Project-based learning is an instructional method that motivates learning and provides learning experiences, but it is not appropriate for a learning system accessed from a mobile device with many physical constraints to support university education.

Inquiry-based learning according to Lin & Tallman (2006) represents an instructional strategy where involvement in learning implies processing skills and metacognitive abilities in order to seek answers to questions and issues while at the same time constructing new knowledge. "Inquiry" is defined as seeking information by questioning. According to Lin & Tallman (2006), it usually begins with posing a problem or question, followed by generating and pursuing strategies for investigating, collaborating, reflecting, and justifying the solutions of the problem or answers to the question, and communicating the conclusions.

Task-based learning is an educationally sound, effective and efficient instructional strategy for learning focusing the learning activities around tasks (Harden et al, 1996). The term "task-based learning" originated primarily from the work done in language education. The traditional way that teachers have used tasks is as a follow-up to a series of structure/function or vocabulary-based lessons (Harden et al, 1996).

Tasks have been 'extension' activities as part of a graded and structured course [13-what is task base]. Tasks are defined as activities that are meaning-focused and outcome-evaluated and have some real-world relationship (Venkatesh et al, 2005). Tasks can be considered as a curricula unit, so TBL perfectly suits to a university study program learning method. TBL facilitates vertical integration of the curriculum (Marjanovic et al, 2005). Tasks can be used to model activities in a subsequent work. As Venkatesh et al (2005) states, a 'task' has generally been used not as the organizing principle of courses, but as a methodological device for implementing the final step of a well-established methodological

sequence. In TB learning, the learning activity is task-centered. Originally developed by Venkatesh et al (2005) in Bangalore, Southern India (cited in Knight), it is based on the belief that students may learn more effectively when their minds are focused on the task. TBL is learner-centered where learners can work through their needs and interests by selecting materials, activities and tasks accordingly.

According to Helic et al (2005), the learning tasks play a fundamental role in determining the learning outcomes. According to Venkatesh et al (2005), it has three advantages:

1. TBL is learning built on round-tasks and is more *effective* than traditional didactic memory-based or purely apprenticeship-type learning;
2. TBL is learning structured round-tasks and is an *efficient* approach to learning;
3. TBL is likely to lead to more *relevant* and appropriate education;
4. TBL links theory with practice. The practical task becomes the starting point for the theory: in turn, theory informs and leads to a better understanding of the task (suits to curricula study program);
5. TBL provides an appropriate framework for planned education (curricula driven) where it makes explicit what is to be achieved and how the learner should do this (efficient learning);
6. A TBL approach is likely to result in greater relevance of curriculum content (appropriate for curricula learning).

TBL offers a focused and structured approach to learning and increases the learners' satisfaction and motivation, and at the other side is consonant with current theories of education (Helic et al, 2005). This is the reason why we decided to implement a task-based model for the prototype.

Task-based learning offers action and reflection, while in contrast, rote learning is low in action and in reflection. According to Helic et al (2005), incidental learning, such as it occurs in on-the-job learning, is rich in action but may be low in reflection. Classroom, or formal, learning is frequently high in reflection but low in action.

Game-based learning or also lately referred to as digital game-based learning (Marjanovic, 2005) are goal-based scenarios and instructional games and simulations that are alternatively used to describe the instructional strategy where learning activities are organized around a game or simulation. The academic community regarded game-based learning as part of problem-based learning using simulations and did not give much of attention in its research, and still today there are a lot of opinions in this regard (Marjanovic, 2005). Educational games and simulations are defined as activities that have rules and constraints, a goal, and an emphasis on competition and also has the additional feature of having a primary objective of enabling a student to learn either facts, skills, attitudes, or all three. Marjanovic(2005) suggests that the transfer of knowledge is aided when students actively construct explanations for events. Perhaps the biggest benefit for game-based learning is the fact that it involves students who need to learn complex skills and need to transfer these skills to real life.

Table 1. Relationship between intelligence and information technologies [1].

Intelligence	Explanation Variant	ICT (Technology to be used)
Linguistic	Prose, Textual Explanation	HTML, Word
Logic-Math	Bulleted List	HTML list
Spatial	Diagrams, Graphics, Movies	Flash, iMovie, Power Point
Musical	Sound Effects, Sound Track	Flash, Audio
Intrapersonal	Self-Guided Problem Analysis, Journals	HTML forms with script
Interpersonal	Discussions – problems, cases, questions	Threaded discussion
Naturalist	Categories and Metaphors	HTML lists, Flash
Bodily-Kinesthetic	Hands-on Exercises, Simulations	Scripts, Virtual Environ.

The design and development of m-learning cannot be based only in the existing practice of technology, but it is necessary to understand the relation between theory and practice to ensure that the design of practice is founded on learning theory. This concept is given in the figure below:

It describes that the different learning activities that are driven in the learning environment are supported by the m-learning instructional technologies stated above. The learning principles are formed by the learning activities to be done to produce the learning outcome. The learning activities are crucial to define the features and abilities the learning environment has to support and are supported by the technology.

We have identified impacting factors that can facilitate interaction between student and professors. The identified impacting factors are: 1) The use of LMS; 2)ICT general level; 3) ICT infrastructure; 4)Efficiency of ICT systems; 5) Teacher's attitude towards the use of ICT in teaching; 6)ICT use in communication; 7) On time in formation and improved accessibility to learning content. The primary objective is premised on flexibility, benefits, easy to use, access and quick update materials through adaptation of different technologies.

The identified main issues are to be more practical and less theoretical, to consider older professors' attitudes towards new technologies and project-based learning is harder to implement. We have identified impacting factors that can facilitate interaction between student and professors. The primary objective is premised on flexibility, benefits, easy to use, access and quick update materials through adaptation of different technologies. The participants in the questionnaire, as an instrument to evaluate the system, have found e-learning to be a beneficial and convenient platform. An efficient way to improve the system according to them should be the integration of different modules, such as the possibility for creating online quizzes and taking them, audio and video lectures, etc. that should be taken into consideration.

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