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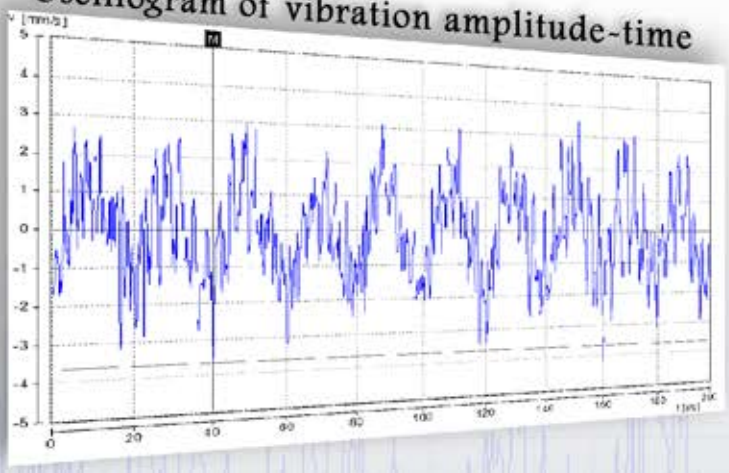
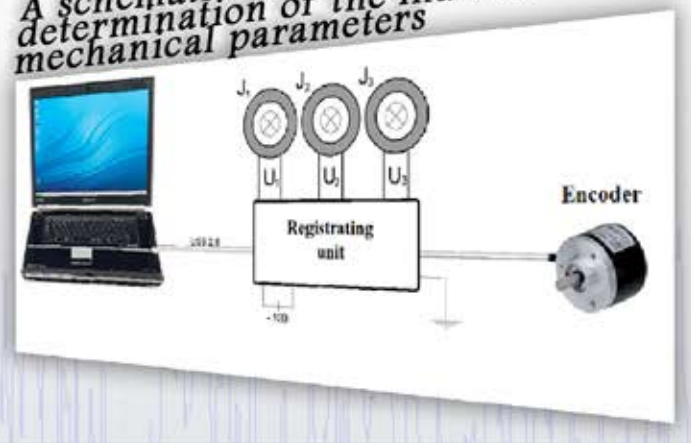
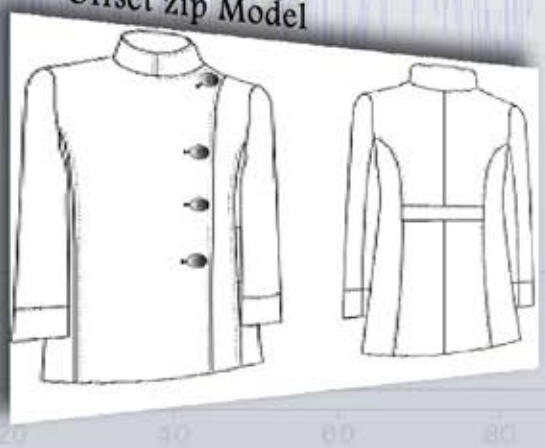
Oscillogram of vibration amplitude-time



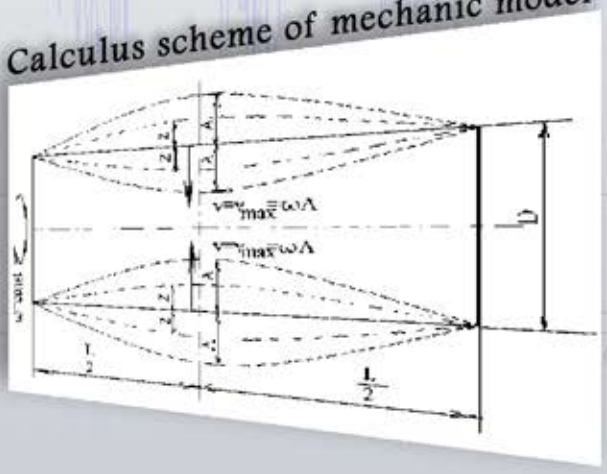
A schematic diagram of HSC for determination of the induction motor mechanical parameters



Offset zip Model



Calculus scheme of mechanic model



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CURRICULUM VITAE (CV) OR SHORT BIOGRAPHY OF GUEST EDITOR OF INDRIE LILIANA

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UDK: 004.92:677 COBISS.SR-ID 220567564 Review Article

OPTIMIZATION OF GARMENT DESIGN USING SPECIALISED SOFTWARE

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Abstract: *Considering the speed of change in fashion trends, time is one of the most important factors characterizing the marketing of a product. Product quality depends heavily both on design quality and the experience of the person executing the technological phases of the product. Computer aided design systems aim at reducing the time necessary for designing a product and increasing the quality of its design and execution.*

The paper also presents the product "Women Coats" from the creation of the pattern design in Adobe Illustrator, the execution of the patterns in Gemini CAD software up to the presentation of the finished product. The basic pattern of the product was then transformed into 3 model patterns. Some of the coat models presented in paper were designed to be worn in winter and some during the spring-autumn seasons.

Key words: *GEMINI CAD System, Adobe Illustrator, coat for women, basic pattern, model pattern*

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1. INTRODUCTION

Given the speed of change regarding fashion trends, time becomes one of the most important factors that is characterizing the marketing of a product. Product quality depends heavily both on design quality and the experience of the person executing the technological phases of the product. Computer aided design systems aim at reducing the time necessary for designing a product and increasing the quality of its design and execution. Mid-twentieth century is characterized by a new phase in the evolution of the clothing product design methods by introducing automated design systems.

Currently there are many foreign companies that have approached apparel constructive design aided by computer, featuring on the market embedded systems of specialized computer design (CAD / CAM systems) for the creation of new models and product prototyping.

CAD in Textile is used to design fabrics and fabric variations, and to simulate quickly their final appearance through prints reproducing faithfully their color and structure. The

usefulness of CAD has driven the market to produce specific software packages that are tailored to the fashion industry. [1], [2]. The programs are focused on design, pattern making, size grading, nesting of the pattern pieces to maximize use of materials, and integration with automated textile-cutting machines:

- **Auto CAD:** Explore and visualise 2D/3D concepts with a powerful set of intuitive design tools;
- **Assyst** - develops various integrated CAD, PLM products for fashion, interiors industries;
- **Audaces** - CAD/CAM for apparel, footwear, caps, bags;
- **Autometrix** - precision cutting systems, sail design software, CAD software for sewn products industry;
- **Bluewater Software** - develops DeSL web-based software for apparel, footwear, accessories, PLM, more, with Microsoft .NET technology;
- **Centric Software** - PLM software for apparel, luxury goods, consumer goods makers;
- **FashionCAD** - pattern making software by CAD CAM Solutions;
- **Gerber Technology** - patternmaking, footwear, plotting systems, includes AccuMark, Pattern Design, Made to Measure, APDS-3D, Optimizer, Silhouette;
- **Gemini CAD** Product development tools and automated production solutions for sewn and flexible goods; includes **Gemini Pattern Editor**, **Gemini Cut Plan**, **Gemini Nest Expert;**
- **Lectra Systems** - CAD-CAM for apparel, upholstery, footwear, industrial textile applications;
- **Modaris** - flat patterns, fabric specification, grading, 3D virtual prototyping, by Lectra;
- **NedGraphics** - CAD, CAM provider dedicated to apparel, textile industry;
- **OptiTex** - CAD/CAM solutions for sewn goods industry;
- **Patternmaker Software** - CAD system for garment pattern design. Home, expert, professional versions available;
- **Plus 2D** - nesting software for generating optimized layouts, reducing scrap, by Nirvanatech;
- **Quest CAD/CAM** - provides independent sales, services for CAD/CAM systems used in apparel, textile industries;
- **TUKATECH, Inc.** - provides CAD/CAM/CIM services, products for sewn goods industry, including TUKAstudio for fabric, apparel design, TUKAcad for pattern design, grading, marker making;

- **Viable Systems, Inc.** - manufacturer of CAD/CAM systems for design of Jacquard woven fabrics;
- **WhichPLM** - news, information hub for apparel, retail companies looking for PLM solutions;
- **YuniquePLM** - product lifecycle management tool for apparel sector, by Gerber Technology;
- **Zweave** - provides design automation software for clothing, footwear, equipment design companies, tools like Fit Studio, Design Studio, Boston, MA.

Gemini [3], [4], [5], is an integrated system consisting of both software applications and specialized equipment designed to support the entire business of designing and tailoring the products in textile factories and it provides both the technological flow for those working in Lohn system and also for those who design their collections. Gemini CAD system includes three subsystems: Gemini Pattern Editor, Cut Plan program, Gemini Nest Expert.

With the help of **Gemini Paternal Editor** are designed the patterns, the products gradings are performed, it is checked if the the product corresponds dimensionally with the specifications and if the pieces fit perfectly together in order to be sewn, it digitizes templates to be entered into the computer and can be imported models sent by customers on a diskette.

Gemini Cut Plan program is used for: planning and automatic optimization of sizes combinations on different framings and the number of sheets in facings; extraction and preparation of templates for framing making; previewing and storing of the optimized framings; establish the framing and cutting restrictions according to the knitted fabric parameters; automatic calculation of costs and efficiency, fabrics consumption according to color and sizes, report on the quantities ordered, cut effectively and the differences emerged while printing the framings on the plotter and export for the automated cutting head; editing and printing of the cutting plan sheet, archiving the processed orders.

Gemini Nest Expert software is used for the fully automated optimization of the framings with time limit, export to the plotters and automatic cutting machines;

2. THE PRODUCT "WOMEN COAT" - FROM DESIGN TO FINITE PRODUCT

2.1. The product "Women Coat" was drawn with the help of Adobe Illustrator.

The first step in any design activity should be the formulation of the problem in our case, the first step consisted in the artistic design of the model. **Women coat** model has been made using Adobe Illustrator Draw graphics program.

Adobe Illustrator is the perfect solution for the design process**.** This software has become recognized in the software industry to create vector graphics that can be scaled and edited without loss of resolution or clarity. Illustrator is a very powerful tool that can handle any graphic work. This includes fashion sketches, fashion illustration, print design etc. With proper tuition, it is possible to adapt the generic tools to enable you to produce fast and accurate fashion drawings. For example Illustrator's Symbol functionality allows to create

libraries of garment components, such as buttons, rivets, pockets etc that can be called upon and added to any sketch using a drag and drop, so basic elements never have to redrawn.[6]

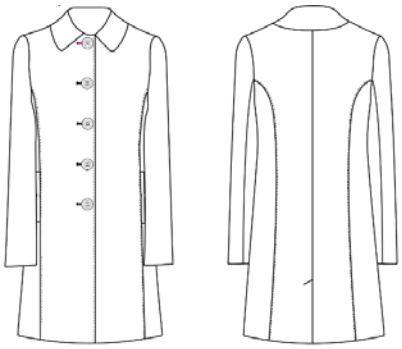
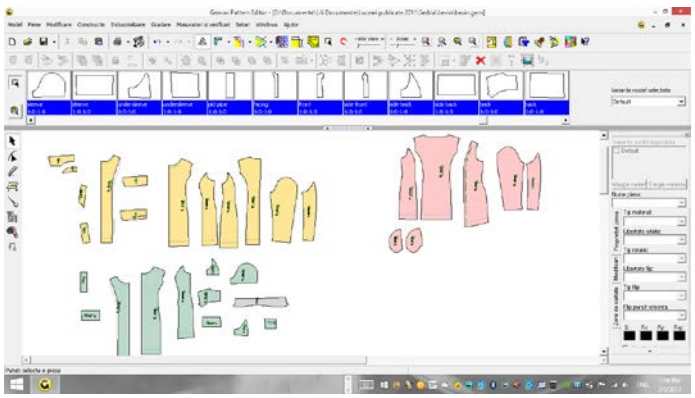


Fig.1. The initial model of the women coat (Bevin Model)

The product was designed to be worn in winter by using thick material.

The next stage of design consisted in patterns development using CAD Gemini and then grading them.

In Gemini Pattern Editor were made the patterns for the coat. The patterns were designed, the gradings of the product were done, it was checked that the product corresponds dimensionally with the specifications and if the pieces fit perfectly together to be then sewn. The patterns of designed and graded models in Gemini Pattern Editor were then extracted by Gemini Cut Plan application. In Gemini Nest Expert were done their optimizations and framing.



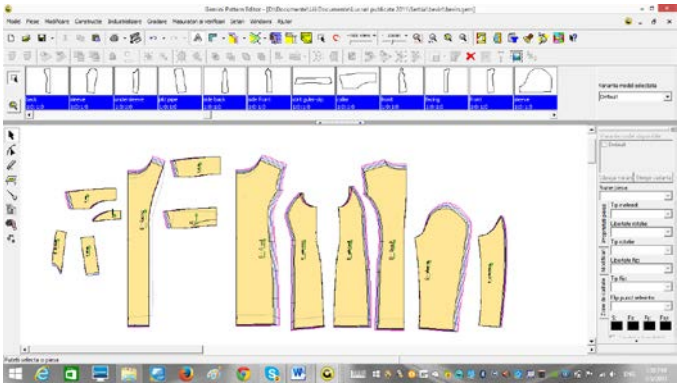


Fig. 2. Elaboration of the basic patterns for Women Coat product by using Gemini CAD program and then their grading

2.2. The transformation of the basic pattern of "Women Coat" in print model

The classic pattern Women coat, in our case Bevin, was then transformed into model pattern -

"Offset buttons" model following the following steps:

- It is modified the right front part widening around the neck area so when it is closed the right front part should keep in line with the line along the neck from the left side until it reaches halfway up the shoulder as shown here
- The edge line follows in a parallel line the cut between the front and gusset parts, a stitch in which the pocket is mounted
- The model is buttoned
- The collar is also changed, passing from the classic type shirt collar to high collar without being provided with any closing system.

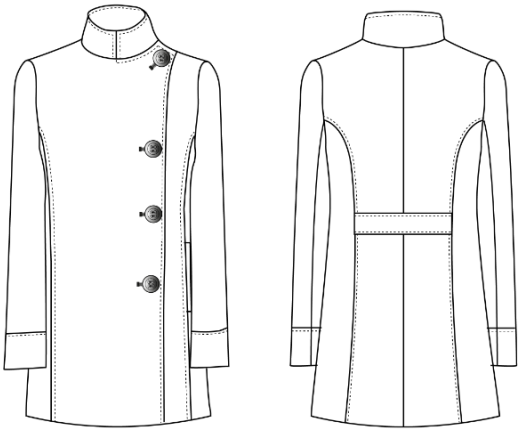
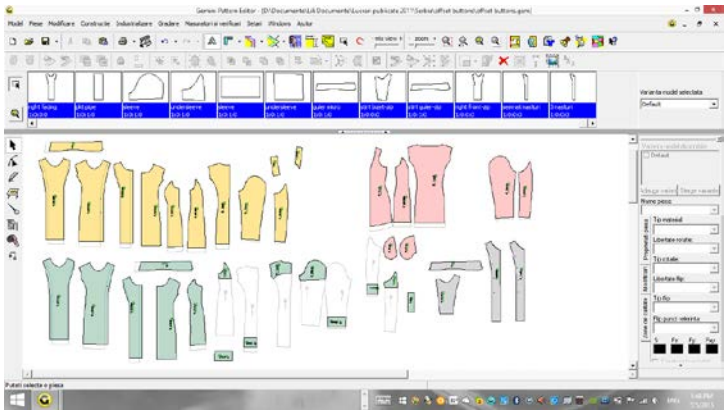


Fig. 3. The transformation of basic patterns in model pattern (Offset buttons model))

Like in the previous case this product was also designed to be worn in winter for its fabrication was used thick material.

The creation of the model patterns using Gemini CAD software and their grading is shown in the following figure:



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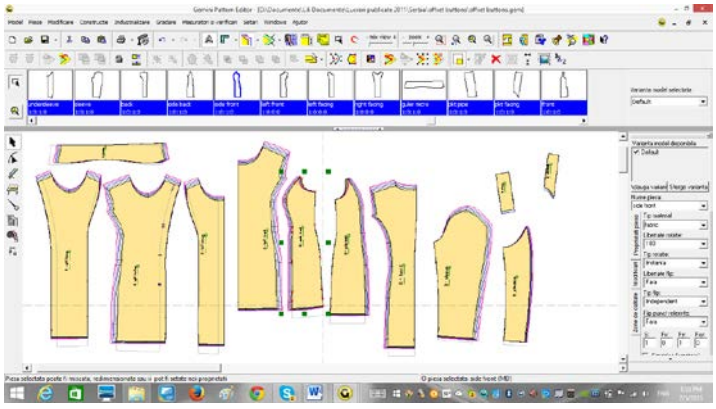


b.

Fig. 4- a, b. Patterns creation in Gemini CAD for Offset Model buttons

2.2.1. Coat model transformation designed to be worn in winter, into another model that can be worn in spring-autumn season

Based on the previous model (Offset Buttons), a model for the cold season, made another model-Offset Model zip- was created, very comfortable and trendy, this time for spring-autumn seasons, using thinner materials (e.g. cotton, polyester or leather or leather substitute).

For this model, which in this case has a zipper closure, the same parts as in the previous model were kept, modifying only the front left part which was cut following the line

of the front right part edge, inside the cut the zipper was sewn. The sleeves were also changed: the sleeves will not be cut around the cuff but there will be a simple sleeve. The collar was extended on the right side so it can be tacked.

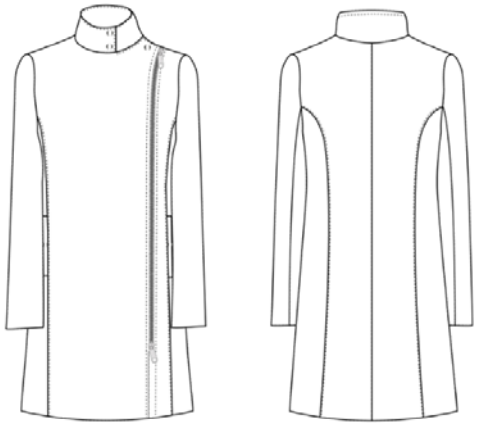
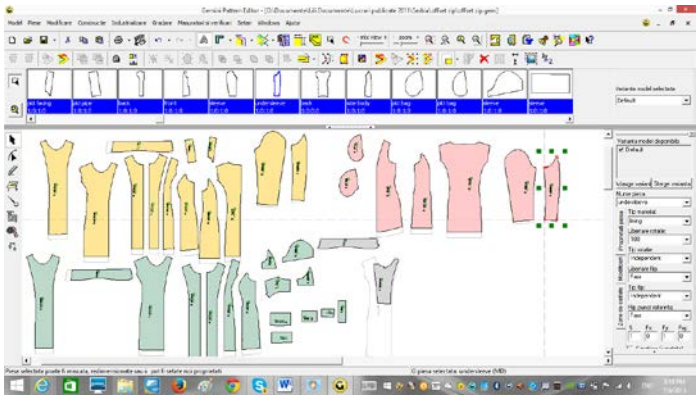
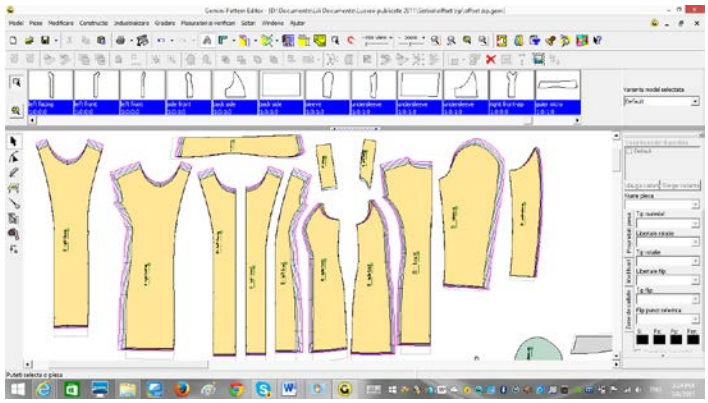


Fig. 5. Offset zip Model

The creation of the model patterns using Gemini CAD software and their grading is shown in the following figure:



a.



b.

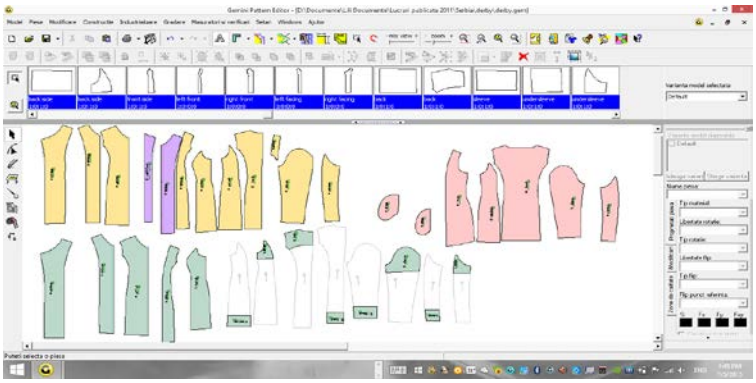
Fig. 6- a, b. Patterns creation in Gemini CAD for Offset zip Model

2.2.2.1. Modifying the Offset zip model in another model Derby Model

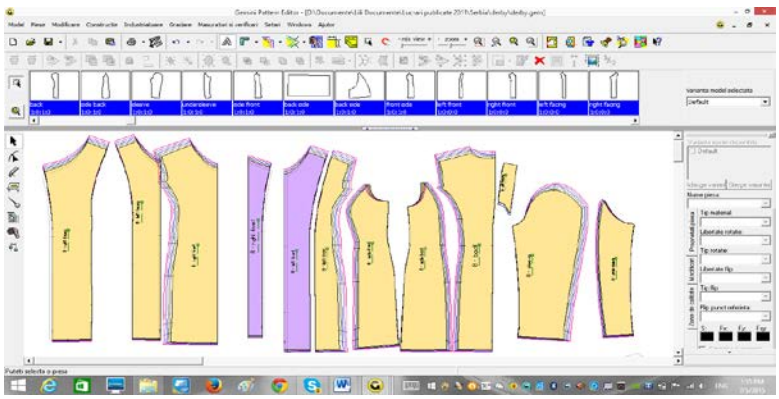
In this model we used all parts of the previous model except the collar which was given up. The front right pattern was cut on a line parallel to the front left edge part at a distance of approximately 2 cm and thus two colors or materials of different compositions can be combined.

Fig.7. Derby Model

The creation of the model patterns using Gemini CAD software and their grading is shown in the following figure:



a.



b.

Fig. 6- a, b. Patterns creation in Gemini CAD for Derby Model

All the 4 variants of the model "Women coat" were executed at the Sayatex SRL company from Oradea, Romania and are presented in the following figure:

Fig. 7. The 4 variants of the model "Women coat"

3. CONCLUSIONS

We wish to conclude by affirming that the use of automated systems of clothing design presents a number of advantages over manual methods. They are increasing the design results reliability in eliminating the repetitive design phases, and in reducing the amount of manual calculations specific to the creation of clothing patterns.

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SELECTION OF THE MANNER OF MEASURING SIGNIFICANT CHARACTERISTICS OF THE INSURANCE COMPANIES' SERVICE QUALITY

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Abstract – *The paper has studied the possibility of selection of the manner of measuring quality of the selected significant characteristics of services. The objective of the selection of the manner of measuring quality is to identify the significant characteristics of services that are not at the level of competitors. Their improvement will raise the level of satisfaction of customers and eventually also increase the market participation and quality of companies' business operations.*

The first phase of the study has referred to the presentation of the manner of measuring quality of the selected significant characteristics of services. In the second phase, based on the application of the selected manner of measuring quality of the selected significant characteristics of services, the identification has been performed of those characteristics of services that are not at the level of competitors.

The study has proved that by the application of the selected manner of measuring quality it is possible to identify significant characteristics of services, whose improvement can raise the level of the companies' business operations.

Key words: *service, characteristics, measuring, quality, insurance companies.*

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1. INTRODUCTION

Nowadays more and more attention is paid to the problem of measuring quality of significant characteristics of services at the world market under the conditions of very strong competition and all the faster changes in the surroundings. The study has indicated that the services nowadays in the OECD countries represent more than 60% of the overall economic activity, and in the most developed countries even more than 70% [8]. That is why a special importance is nowadays attached to the problem of managing service quality, both from the practical and research point of view, because the service quality has become the most important strategic factor of the success of organizations. When an organization gets a bad reputation with regard to the quality, it takes it a lot of time to change the situation. If the organizations want to remove bad reputation, it is necessary for them to manage competitive advantages, particularly quality of significant characteristics of service quality, because by an adequate satisfaction of users requirements it is possible to express satisfaction – intense

enthusiasm of the service beneficiary and gain the reputation – attribute of an "extraordinary distributor".

Exactly within the framework of this study we shall consider the possibility of the manner of measuring, as well as its application in selecting the significant characteristics of services that are not at the level of competitors. Their improvement will increase the satisfaction of customers and consequently also the market representation and business quality. How to find out what are the requirements of customers with regard to the significant characteristics of services that should be raised to a higher level, is one of the most frequent questions posed to organizations of any kind. For that purpose, various methods and techniques are developed and modified in order to select a manner of measuring significant characteristics of service quality aiming at the improvement of those characteristics that are not at the level of competitors.

The subject of research is the business process of service organizations. In this case we shall observe the business process of Kosig Dunav Insurance that offers services in the field of insurance of property and persons. In the most general sense, the aim of the research is a selection of the manner of measuring quality of the selected significant characteristics of services in order to advance the characteristics that increase the satisfaction of customers. The purpose of an increased attention to the significant characteristics of service quality is to act by a feed-back on increasing **the observed use value** of the service. The observed use value implies the value that the customer sees when purchasing or using a service. Therefore the organizations aspire to increase their competencies, necessary in order to permanently increase the observed use value of services [4].

2. MEASURING QUALITIES OF SELECTED SIGNIFICANT CHARACTERISTICS OF INSURANCE COMPANIES' SERVICES

2.1 Selection of the manner of measuring quality of significant characteristics of insurance companies' services

Maximizing satisfaction of service users is a basic task of each company that bases its business both on a short-term and long-term efficiency and effectiveness. Namely, it has been proved that a bigger quality level also provides a bigger loyalty of service users [1]. That is why the companies that operate in a dynamic and competitive environment, characterized by the processes of liberalization and globalization of the market, are faced with the problem of measuring quality of significant characteristics of their products and services and satisfaction of service users. According to Todorovic [9], measuring is a process that is composed of certain number of operations for the purpose of determining the unknown value of some characteristics of products, services, processes, etc. It can be quantitive and qualitative.

A special problem is measuring satisfaction of the service user in the service sector because of his/her specific outputs (e.g. impalpability, indivisibility of production from consumption, etc.), since service sector is more abstract and demanding than it is the case in

the production sector. That is why the developed tools of quality have a common goal, and that is creation of conditions both for management and measurement of the service quality [5]. Hentschel [7] also mentions that measuring satisfaction of customers by the service quality is one of the most critical elements in the mutual relationship of the company producing quality and the consumer perceiving quality.

Basic problem of users in using services of the insurance companies is that they, if not satisfied, cannot replace them with some other service, and very often they will not even complain. However, the user can take a simple decision to use in future services of the insurance companies the service of another company. Therefore, satisfaction of needs and wishes of more and more demanding users at the markets due to a more intensive competition is the imperative of each insurance company.

In order to prevent migration of users towards the competitors, the insurance companies should continuously conduct research with the purpose of measuring quality and degree of user satisfaction. Namely, attracting new users is a lot more difficult and expensive than directing efforts to preserve the present ones, so the insurance companies have to base their business on a high service quality. That is why the insurance companies should understand quality as an absolute and not a relative value. The focus of the insurance companies should be directed towards expectations of the current and/or potential service users, where it is also of an extreme importance for them to understand that their basic task is to give a maximal satisfaction to the service users. That has given rise to a need for changing the approach in forming the structure of services of the insurance companies in order to achieve an optimal mixture of mandatory, necessary and desirable elements, with a goal of providing service users with maximal satisfaction.

For the mentioned reasons more and more insurance companies decide to undertake various activities of measuring quality of their services. They do that chiefly by measuring satisfaction of beneficiaries, in which they can choose among various qualitative (e.g. panels of beneficiaries) and quantitative methods and techniques of market research (e.g. questioning satisfaction in a questionnaire). That is why it is necessary to conduct:

- selection of the manner of data collection and
- selection of target groups.

For solving the first problem there is a possibility of collecting data by questionnaires and interviews with the target focus groups. What manner will be selected depends on the activity of the organization. Since it is the case of insurance companies where clients rarely use the same kind of service from two or more companies, and it is difficult to get such clients, the problem will be solved by the questionnaire method.

In drafting a questionnaire it is also necessary to solve the manner of assessment. Namely, the assessment will be performed in several ways: descriptively, numerically, Likert scale, etc. Each of these solutions has its advantages and disadvantages, but numerical assessment seems to be a reasonable one. Namely, it has been indicated that the process of

measuring significant characteristics of services is simplest if the assessment is performed by numbers.

The problem of a measuring value is also pointed out by Arsovski [2]. He has proposed five conditions that should be taken into account in selecting the measuring value. Those are:

1. Measuring quantity must be important for the process,
2. Measuring quantity must be understandable,
3. Measuring quantity must indicate true characteristics,
4. Measuring quantity must support quantities and actions and
5. Necessary data for getting measuring quantities must be easily obtained.

According to Arsovski [3] it is very important for each company to recognize and select key indicators of performances that provide specific information with regard to its basic activities, risks and potentials. In establishing the level of performances it is important that the goals should be challenging and attainable.

When it comes to target groups, they can be divided into the following sectors:

- Industry,
- Trade,
- Tourism,
- Traffic,
- Agriculture,
- Services,
- State and local governance,
- Public sector,
- Professional organizations and
- Energy.

2.2 Measuring quality of significant characteristics of services in „Dunav Insurance"

Measurement as the process of determining unknown value of the quality of significant characteristics of services can be performed by using different qualitative and quantitative methods. It is considered that the problem is best resolved by measuring satisfaction of service beneficiaries, since measuring is conducted exactly for the purpose of increasing satisfaction of the present and future service beneficiaries, as well as for increasing profitability. That is why it is necessary in this phase to collect data by target groups.

Since it is the case of the insurance companies where clients in a certain time period seldom use the same kind of service from two or more companies, as above mentioned, the problem of selecting the manner of data collection will be resolved by the questionnaire method and assessment will be performed descriptively. Namely, it is considered that the main method of studying satisfaction of service beneficiaries is the questionnaire. It must not

be considered exclusively as a series of questions that the examinee should answer, but as the basic instrument by which the researcher realizes the research objectives.

The basic postulate for designing an adequate questionnaire is to know the necessary information determined by the research objectives and research subject. The questionnaire is a two-way communication tool, from the researcher to the examinee and vice versa, from the examinee to the researcher. That is why it is necessary for the examinee during the communication by the questionnaire to:

- Understand the questionnaire questions,
- Know the answer to most of the questions,
- Wish to answer the questions,
- Give answers that the researcher can understand [10].

In designing the questionnaire one should stick to the following steps:

- make a plan of what is going to be measured and studied,
- formulate questions for collection of necessary information,
- establish the schedule and manner of asking questions and questionnaire layout,
- test the questionnaire by using a small sample for the purpose of revealing the potential,
- failures and ambiguities and
- correct problems and failures.

By sticking to the mentioned steps, in the mentioned order, it will be easier to create a questionnaire and by doing so also to avoid big failures and mistakes [10].

Exactly by taking into account the mentioned facts, a Questionnaire has been structured, so that it is reasonable for use and understanding and does not require a lot of time for fulfilling. The questionnaires have been distributed to the target groups of „Dunav Insurance".

When it comes to target groups, they are divided into four groups because of the specific activities of „Dunav Insurance" and selection of service beneficiaries. Those are:

- the RS citizens,
- industry,
- service activities and
- budget institutions.

The questionnaire has been delivered to 78 different service beneficiaries, those being:

- the RS citizens – 55 questionnaires,
- industry – 41 questionnaires,
- service activities – 50 questionnaires and
- budget institutions – 28 questionnaires.

The number (percentage) of answers has been as follows:

- the RS citizens – 35 answers (63.6 %),
- industry – 25 answers (60.9 %),
- service activities – 28 answers (56 %) and
- budget institutions – 16 answers (57.1 %)[6].

In the analysis, only the questionnaires of the insurance companies from group A have been taken into account. The reasons for this should be looked for in the fact that 40% of the insurance companies are placed in group A. Other insurance companies also are represented at the market by less than 5%. In doing so it is necessary to provide the biggest possible objectivity of the collected data (non-involvement of researchers).

The deeper analysis of the insurance companies from group A shows that three companies have a broader program of services („Nešković" Insurance, „Dunav" Insurance and „Jahorina" Insurance), and they accordingly make a good basis for assessment. Other four companies have a narrower program of services. That means that:

- „BRČKO-GAS" Insurance, provides mainly services in the field of insurance of motor vehicles,
- „DRINA" Insurance, provides mainly services in the field of insurance of motor vehicles,
- „TRIGLAV" Insurance, provides mainly services in the field of insurance of motor vehicles,
- „GRAWE" Insurance, provides mainly services in the field of life insurance[6].

Although the mentioned four companies have a narrower program of services, it is very important to consider them as one entirety, since it may happen that they have some significant characteristics to be compared with in order to, by providing it at a higher level than the competitor's one, increase the representation of „Dunav Insurance" at the market of the Republika Srpska.

The research is structured in a way to enable comparison and repeated experiment after a certain period of time.

Since the goal of the process of selecting the manner of measuring service characteristics is to reveal advantages and disadvantages of „Dunav Insurance" compared with the competitors, in this phase the assessments have been presented by the target groups and insurance companies, which have been a subject of assessment according to the significant service characteristics as subject of consideration. In doing so, in table 1. average assessments have been presented for all target groups marked with „A", „B" and „C". For the purpose of protecting data, the insurance companies hereinafter have been replaced by adequate signs known only to the author of this study[6].

Table 1.: Average assessments of service characteristics by insurance companies

	AVERAGE ASSESSMENT OF SERVICE CHARACTERISTICS				Doc. sign: QM 38 List: No. of lists:
NAME OF CHARACTERISTICS	**SERVICE BY INSURANCE COMPANY**				
	Dunav Insurance	"A"	"B"	"C"	Other insurance companies
Quality - (equity) of paid damages	3.9	3.6	2.3	2.6	2.7
Completeness - (entirety of service)	4.3	3.5	2.8	2.8	3.2
Consistency - (uniform approach to clients from the aspect of offer/payment of damages)	4.0	3.3	2.4	2.4	3.0
Quality of documentation - (correctness of filled policy)	4.1	4.3	2.9	3.0	3.4
Professional capability of employees	4.5	3.4	3.3	2.9	3.8
Reliability - (confidence client has in underwriter)	4.0	4.2	2.9	3.0	3.6
Brand of the Company - (size, capital, tradition)	4.8	3.2	3.3	2.9	3.6
AVERAGE ASSESSMENT	**4.2**	**3.6**	**2.8**	**2.8**	**3.3**

4. CONCLUSION

The research performed within this study has had a goal to show that it is possible to perform selection of the manner of measuring quality of the selected significant characteristics of services in the insurance companies. The goal of application of the manner of selection of measuring quality of the selected significant characteristics of services is a systemic search for the more significant characteristics of services of „Dunav Insurance" that are not at the level of the competitor. Their improvement by applying quality tools enables increase of the observed use value of the service by the service beneficiary, and consequently it will increase the market representation and quality of the company business operations.

The above mentioned facts enable the following conclusions:

1. It is possible to perform selection of the manner of measuring quality of the selected significant characteristics of services,
2. Application of the selected manner of measuring quality of the significant characteristics of services enables a correct direction of the process of improvement with the goal of raising the level of significant characteristics of service quality,
3. Application of the selected manner of measuring quality of significant characteristics in a real system requires a team approach, and
4. Significant characteristics of the quality of services and processes should be permanently reconsidered, because that is done also by the best ones in the class, and then the processes that they are achieved with should be improved with the goal of raising the observed value of services.

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THE DYNAMIC STUDY OF VIBRATING TUBE MILLS. THE CALCULUS OF VIBRATION AMPLITUDE WITH THE MODEL MECHANIC APPROACH OF „DIVIDING MASS IN TOW HALF CYLINDER"FOR DIFFRENT DIMENSION OF THE BALL MILL AND DIFFERENT FREQUENCY

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Abstract: *This paper wants to demonstrate how is possible , by a simple model mechanic approach for the movement of grinding in vibrating ball mills to determined different elements of movement . With the model of " dividing mass in tow half cylinders" it can be determined the vibration amplitude , for different dimension of grinding chamber , and the filling ratio of grinding elements.*

Key words*: vibrating ball mills, model mechanic approach, operation range, filling ratio, vibration amplitude.*

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1. INTRODUCTION

The movements of grinding in vibrating boll mills in the model mechanic adopted is not real but imagined. They are intended to replace dynamic random and very complex process that takes place inside the ball mills used in building materials during their operation through a simplified scheme allowing as accurate mathematical dynamic process studied.

Thus, it designed a mechanical model approach for the movement of grinding mills "divided mass in two half cylinder" deemed mill load divided as two semi-cylindrical (fig 1) of diameter D and length L, the pure translational motion. The cylindrical body of the mill executes an harmonic oscillatory movement with vibration amplitude A and frequency ω [1] ($f = \frac{\omega}{2\pi}$ $perioadT = \frac{2\pi}{\omega}$)

2. THE MECHANIC MODEL APPROACH OF "dividing mass in tow half cylinder". GEOMETRICAL CONDITIONS FOR IT

Law of motion of space in the lower half-cylinder for the first half oscillation period

$$T = \frac{2\pi}{\omega} \tag{1}$$

for the inferior half cylinder is :

$$s = \omega A t - \frac{g}{2} t^2 \tag{2}$$

and for the superior half cylinder:

$$s = \omega A t + \frac{g}{2} t^2 \tag{3}$$

As we can see that in the second half oscillation period the sign of the term: $\frac{g}{2} t^2$ is changing .

The initial velocities:

$$v = \omega A \tag{4}$$

also change if the amplitude change.

The amplitude z, of harmonically up and down movement of the grinding tube is given by:

$$z = A \sin \omega t \tag{5}$$

The instantaneity speed v, is:

$$v = \dot{z} = \omega A \cos \omega t \tag{6}$$

The maximum speed of the inferior half cylinder have been at the moment: t=0,t=T;t=2T, etc. when the grinding tube is perfect cylinder (fig.2):

$$v_{\max} = \omega \cdot A \tag{7}$$

the tow half cylinder are dropt on vertical in opposite way with this maximum speed for the inferior half cylinder . In this moment is given to them a rotary movement with frequency ω of the vibrating grinding tube.

The low of movement of the tow half cylinder is given by:

$$s = \omega \cdot A \cdot t \mp \frac{g}{2} t^2 \tag{8}$$

The vibration input should take place after exactly half an oscillation period (t=T/2) That means that in the impact moment, take place without delay at time for the upward moment and t=T/2 for the downwards movement . In figure 1, et the moment

$t = \frac{T}{2}; s = y = \frac{D}{2} - d$, we consider the space of the tow half cylinder in the time interval T/2 as approximate equal between them, and equal with y [4], so , we can write:

$$y = \frac{D}{2} - d = \omega \cdot A \cdot \frac{T}{2} \pm \frac{g}{2}\frac{T^2}{4} == \pi \cdot A \pm \frac{g}{2}\frac{\pi^2}{\omega^2}$$

and:

$$y = \frac{D}{2} - d = \pi \cdot A \pm \frac{g}{2}\frac{\pi^2}{\omega^2} \tag{9}$$

The ”minus” sign is for the ascendant movement of the inferior cylinder in his movement, which for the same time is smaller than the movement of superior cylinder, in his descendent movement. To complete the space: $y = \frac{D}{2} - d$ of the inferior cylinder, we adopt sign “plus“ in relation (8), and results a biggest value for the amplitude A [4]. So, we obtain:

$$A = \frac{y}{\pi} + \frac{g\pi}{2}\frac{}{\omega^2} \tag{10}$$

The two cylinder will run in the time T/2, the distance $y = \frac{D}{2} - d$, the term: $\frac{g}{2}\left(\frac{T}{2}\right)^2$ should have a valour smaller then the valour $\omega \cdot A\frac{T}{2}$ to y. So, for D=0,6 m, η=0,4 si ω=20π rad/sec, we obtain: $y \cong 0{,}0316m, \frac{g}{2}\left(\frac{T}{2}\right)^2 \cong 0{,}0122m$ and valour to $\frac{g}{2}\left(\frac{T}{2}\right)^2$ does not be neglected in front of the value of y . With a *decreased of* frequency ω and diameter D of the vibrating grinding tube, the term: $\frac{g}{2}\left(\frac{T}{2}\right)^2$ has smaller value in rapport with y. So, for the diameter D=1m of grinding tube, and η=0,4, and ω=40π rad/sec, we obtain the following values [3]:

$$y \cong 0{,}057m; \frac{g}{2}\left(\frac{T}{2}\right)^2 \cong 0{,}00306m.$$

The movement of grinding tube mills is imaginary represent. The dynamic process is very complex. The mechanic model gives a mathematic schema qualitatively and quantitatively way for the study of dynamic process. In the fig.3 is presented the variation of harmonically vibration amplitude of the tow half cylinder. So, the harmonically vibration amplitude has maximum at the middle of cylinder, and zero at the beginning of the cylinder and in the end of this. We adopt a simplification: we consider that the harmonically vibration amplitude of grinding tube is constant [4] (figure 3).

At the moment $t = \frac{T}{2}$:

$$s = y = \omega \cdot A\frac{T}{2} \mp \frac{g}{2}\frac{T^2}{4} \tag{11}$$

And

$$y = \frac{D-d}{2} \tag{12}$$

At this moment $t = \frac{T}{2}$ so ,

$$y = \frac{D-d}{2} = \omega \cdot A\frac{2\pi}{2\omega} \mp \frac{g}{8}\frac{4\pi^2}{\omega^2} = \pi \cdot A \mp \frac{g\pi^2}{2\omega^2} \tag{13}$$

We consider the sign "-" , as we said .So :

$$y = \frac{D-d}{2} = \pi \cdot A - \frac{g\pi^2}{2\omega^2} \tag{14}$$

From the relation (14) , the vibration amplitude will have the expression:

$$A = \frac{y}{\pi} + \frac{g\pi}{2\omega^2} \tag{15}$$

3.DETERMINATION OF VIBRATION AMPLITUDE AS A FUNCTION OF THE FILLING RATIO η:

For the characterization of the movement of the " divided mass in tow half cylinder "it is necessary to describe the geometric relationship in the grinding tube. Here we start out with the definition of the filling ratio η [4]:

$$\eta = \frac{2\frac{\pi \cdot d^2}{8}L}{\frac{\pi \cdot D^2}{4}L} = \left(\frac{d}{D}\right)^2 = \left(\frac{D-2y}{D}\right)^2$$

(16)

By transpose, one obtains the following for the distance y:

$$y^2 - Dy + \frac{D^2}{4}(1-\eta) = 0 \tag{17}$$

with:

$$y_{1,2} = \frac{D}{2}\left(1 \pm \sqrt{\eta}\right)$$

(18)

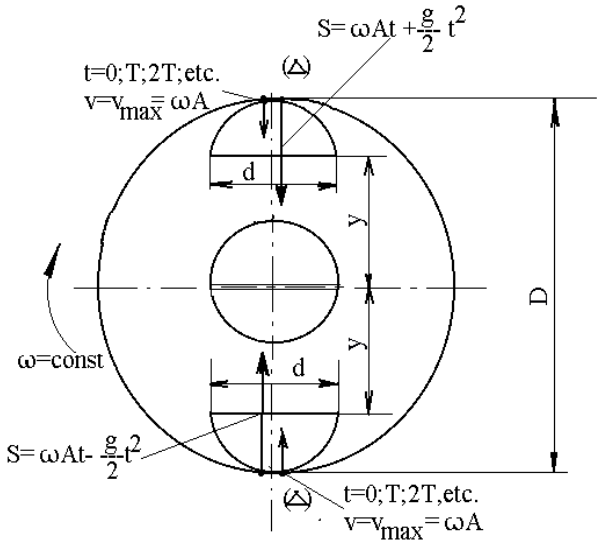


Fig.1: *Geometrical conditions for the "dividing mass in towhalf cylinder". " Mechanic model [1]*

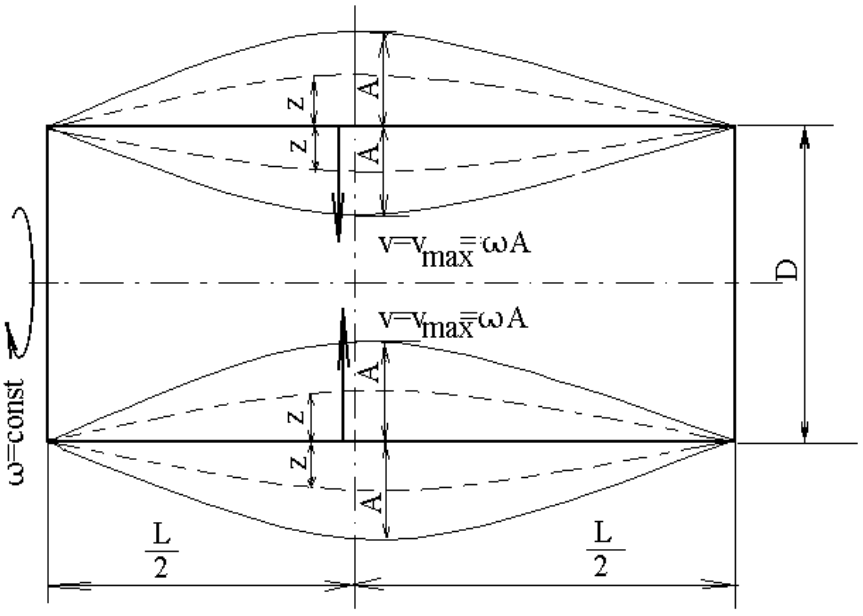


Fig.2: *Calculus scheme of mechanic model [4]*

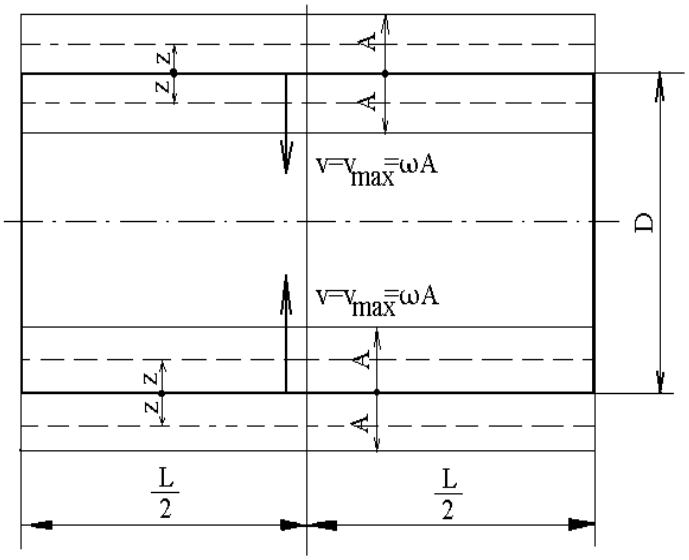


Fig .3: *Scheme for determination of vibration amplitude[4]*

Because $y < \frac{D}{2}$, we adopt for the distance y:

$$y = \frac{D}{2}\left(1 - \sqrt{\eta}\right) \tag{19}$$

From the expresion:

$$y = \frac{D-d}{2} = \frac{D}{2}\left(1 - \sqrt{\eta}\right) \Rightarrow d = D\sqrt{\eta} \tag{19}$$

Substituting (19) in (15) results in the required vibration amplitude :

$$A = \frac{D}{2\pi}\left(1 - \sqrt{\eta}\right) + \frac{g\pi}{2\omega^2} \tag{20}$$

4. CONCLUSIONS

From the graphical evaluation of equation (20), it can be recognized that:

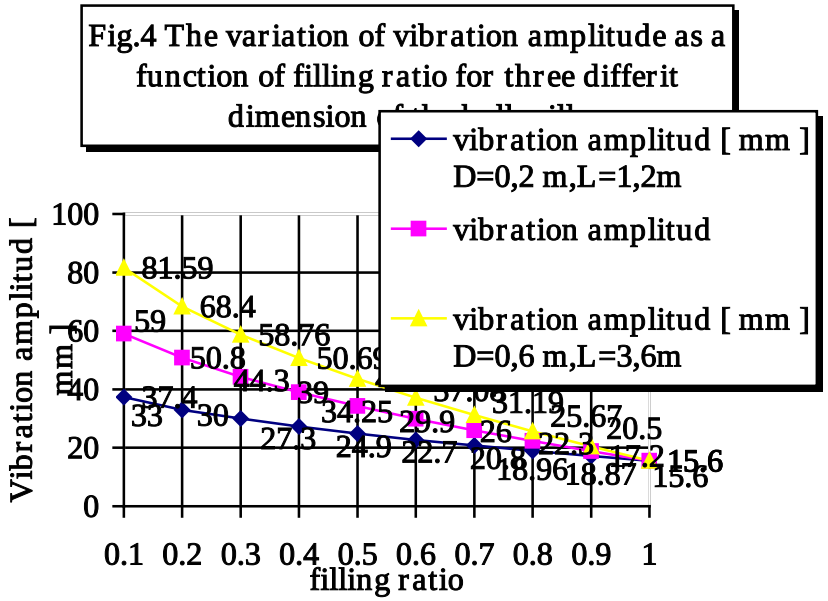
-with an ***increased of filling ratio***, only ***low amplitudes*** are required for obtaining the described sequence of movement ;

-an ***increase in diameter*** of the grinding tube requires a ***proportional increase*** in the oscillation ***amplitude*** ;

-mills with large grinding tube diameters should be operated with a ***high filling ratio***, since oscillating amplitudes greater than 10 mm can only be achieved at great technical effort.

However, in order to make statements of the filling ratios which should be selected for a specified grinding tube diameter, the energy input must be examined as a function of filling ratio.

We represent the graphical evolution of the vibration amplitude as a function of filling ratio, and different dimensions of the tub mills: . D=0,2 m L=1,2 m 2. D=0,4 m L =2,4 m 3. D=0,5 m L=3,6 m



In fig. 5 is represented the variation of vibration amplitude of the boll mills as a function of the filling ratio, for three different frequency ω: ω_1= 10 π rad / sec ω_2=20 π rad / sec ,ω_3=30 π rad / sec .The dimensions of the boll mill are : D=0,4m,L=2,4m.

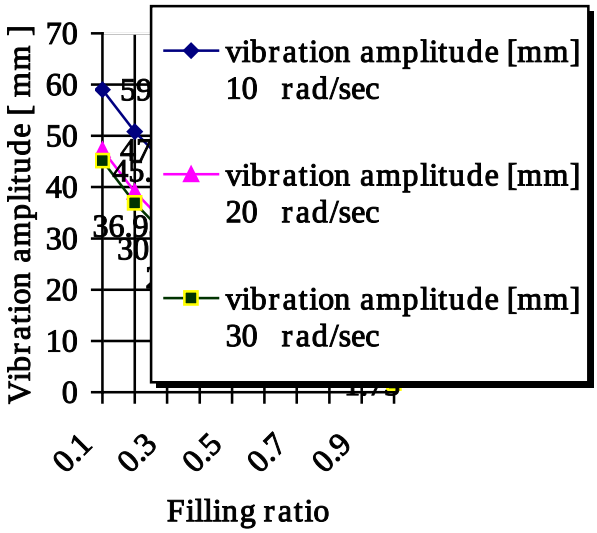


Fig . 5: *Vibration amplitude as a function of filling ratio for different frequency*

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ENTREPRENEURIAL EDUCATION FOR ENGINEERING STUDENTS (Review)

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Abstract: *There is a global consensus that traditional education is inadequate to prepare students who are capable of adapting to the changing market conditions and who are capable of creating and enhancing innovations. In this context, we can say that the engineering students need an entrepreneurial education that should be focused, mainly, on the development of an entrepreneurial mindset, together with the development a set of vocational skills. From the first ideas in 1938, a lot of programs at all levels of higher education was developed in many universities across the world. For dynamising the culture of entrepreneurship in Europe and for achievement the stated challenge "more entrepreneurs for Europe", in 2012 the European Commission elaborated "ENTREPRENEURSHIP 2020 ACTION PLAN". In accordance with it, universities should become more entrepreneurial. To achieve this goal, is necessary that the universities to introduce in curricula the key competence "entrepreneurship" and to assure for teachers opportunities to learn and practice new and innovative methods to the teaching in an entrepreneurial style. Applying an entrepreneurial education, we will obtain a new generation of engineers that will be capable to realize their full professional potential and apply it in satisfying and responsible ways. They will be job creators, not job seekers.*

Key words*: creativity, innovation, initiative, entrepreneurship, entrepreneurial education, engineer*

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1. INTRODUCTION

In our days, the enterprises need engineers who are prepared to adapt to the changing market conditions and who are capable of creating and enhancing innovations that offer new value to customers and society as a whole.

There is a global consensus that traditional education is inadequate to prepare students who can meet these requirements. Innovation and creativity are essential to prepare students for a successful professional life. In this context, entrepreneurial education is a way to transform the traditional education system.

Entrepreneurial education is not only about educating people to start a business. Entrepreneurial education means, also, to develop to the students the knowledge, skills and

competencies which will help them to engage in a more enterprising, innovative and flexible manner in the changing workplace environment from today. [1]

The most commonly cited objectives of entrepreneurship education are the following:

- to acquire knowledge germane to entrepreneurship
- to acquire skills in the use of techniques, in the analysis of business situations, and in the synthesis of action plans
- to identify and stimulate entrepreneurial drive, talent and skills
- to undo the risk-adverse bias of many analytical techniques
- to develop empathy and support for all unique aspects of entrepreneurship
- to devise attitudes towards change
- to encourage new start-ups and other entrepreneurial ventures. [2]
- After several studies in the field, Trevor says that to be successful in the 21st century, graduates of engineering programs obviously need:
- to develop technical and analytical skills
- to be able to lead and collaborate with colleagues and peers in diverse, geographically dispersed teams both within and across organizational boundaries
- to be flexible, resilient, creative, and empathetic
- to be able to recognize and pursue opportunities. [3]

In this context, we can say that the entrepreneurial education for engineering students should be focused, mainly, on the development of an entrepreneurial mindset, together with the development a set of vocational skills.

2. DEFINITIONS AND EVOLUTION

In the Guidance for UK higher education providers, „enterprise education" is defined as the process of equipping students (or graduates) with an enhanced capacity to generate ideas and the skills to make them happen. „Entrepreneurship education" equips students with the additional knowledge, attributes and capabilities required to apply these abilities in the context of setting up a new venture or business. All of this is a prerequisite for „entrepreneurial effectiveness", that is, the ability to function effectively as an entrepreneur or in an entrepreneurial capacity, for example within small businesses or as part of 'portfolio careers, where multiple job opportunities, part-time work and personal ventures combine'. Enterprise and entrepreneurship are transdisciplinary, with a strong connection to issues of employability, innovation, knowledge transfer, commercialization, and intellectual property. [4]

The earliest roots of the entrepreneurial education are traced in Japan in 1938 by the Professor Shigeru Fujii, who initiated the first efforts in applied education in entrepreneurship. [5]

Within fifty years, the field of entrepreneurial education has evolved from a single course offering to a diverse range of educational opportunities available at more than 1500 colleges and universities around the world. [6]

Scholars and researchers in entrepreneurship education in the United States have reported that small business management and entrepreneurship courses at four-year college and university levels have grown in both the number and diversity of course offerings from 1990-2014. A study concluded that 40% of schools in the United States offer specific courses in social entrepreneurship, and 61% teach it in their core entrepreneurship courses. [7]

This expansion of educational offerings has been fueled, in part, by dissatisfaction with the traditional Fortune 500 focus of business education voiced by students and accreditation bodies. [8]

3. LESSONS LEARNED AND COURSES

At the Stanford University, twenty years ago, Dr. Tom Byers came with an audacious idea. He said that entrepreneurship education need to be a fundamental part of the curriculum for every student in the fields of sciences and engineering. Also, he argued that all the universities have to develop a rigorous research on the entrepreneurial education. For this purpose, he founded the Stanford Technology Ventures Program (STVP). Over the past twenty years, STVP has proceeded to revolutionize research on and teaching of entrepreneurship in the context of engineering and the sciences. In 2011, the National Science Foundation (NSF) awarded $10 million – one of its largest single grants in history – to STVP to support the development and launch of Epicenter, a national center to support teaching and innovation, and entrepreneurship in engineering across the country. [3]

A study sought to examine how engineering students experience studying entrepreneurship in a course that is based on a socio-constructivist view of learning and the integrative pedagogy model. As a result of the study, four qualitatively different categories of experiencing entrepreneurship as part of an engineering degree program were identified. Entrepreneurship studies were experienced by students as a first step to self-directed learning, a preparation for work life, a path to possible self-employment, and a context for developing leadership and responsibility for group achievement. [9]

Engineering Entrepreneurship Program at the Penn University of Pennsylvania, under the slogan “Engineering Entrepreneurship preparing students for Leadership”, aims to train the founders and leaders of tomorrow's high-tech companies. The courses, at both undergraduate and graduate levels, are approached from the perspective of the students interested in technological innovation and who has little or no prior business education. [10]

Western Michigan University has a program called Industrial and Entrepreneurial Engineering that combines the traditional industrial engineering program with an entrepreneurial engineering program. Here the engineering design, creativity, and innovation are emphasized throughout the curriculum. The students learn how to be an entrepreneur in a small company, or how to lead successful entrepreneurial projects in a larger company. Through a combination of academic courses and practical experiences, the students gain knowledge and understanding of industrial and entrepreneurial engineering. [11]

Mercer University School of Engineering is a school that promotes entrepreneurial mindset for engineering students through the curriculum development and extracurricular activities. Through the course developed and implemented this school are: integrated elements of entrepreneurship with engineering; developed an entrepreneurial mindset for engineering students; fostered innovation and creativity for engineering disciplines; helped the students to develop business plans for the entrepreneurial design projects and compete in the annual business plan competition, and is promoted new ventures creation. [12]

Brown School of Engineering is a leader in entrepreneurial education. There are entrepreneurial classes at the undergraduate level - the Business, Entrepreneurship and Organizations program (BEO) and at the master's level - the Program in Innovation Management and Entrepreneurship (PRIME) and IE Brown MBA programs. BEO program aims to give students a coordinated, interactive approach to examining problems in the workplace, formulating solutions, and suggesting actions. The students for th PRIME

program learn to use emerging science and technology as a basis for the creation of commercial value and new ventures. IE Brown Executive MBA is a highly innovative program designed to provide senior managers with the opportunity to develop and broaden their management and leadership skills in an intensive, international environment. [13]

The Master programme in Entrepreneurial Engineering from the Aalborg University (Denmark) develops mindset and skills that enable the students to create and realize new value for people and organizations. The students have the opportunity to acquire the tools, methods, knowledge of processes, as well as an organizational and managerial understanding of innovation and entrepreneurship that will allow them to make a difference. [14]

4. ENTREPRENEURSHIP 2020 ACTION PLAN

At the level of European Union was made few surveys that conclude that between 15% and 20% from the students who participated in a mini-company program in secondary school started later their own company. The young people who benefit from entrepreneurial education, develop business knowledge and competencies, skills and attitudes like initiative, creativity, tenacity, responsibility teamwork. That means an entrepreneurial mindset that helps the young people to transform the ideas into action and at the end this will contribute to the increased of the employability.

For dynamising the culture of entrepreneurship in Europe, in 2012 the European Commission elaborated the Communication number 795, *ENTREPRENEURSHIP 2020 ACTION PLAN*.

This Action Plan is a blueprint for decisive joint action to unleash Europe's entrepreneurial potential, to remove existing obstacles and to revolutionize the culture of entrepreneurship in Europe. It aims to ease the creation of new businesses and to create a much more supportive environment for existing entrepreneurs to thrive and grow. [15]

"More entrepreneurs for Europe" is the stated challenge of this Action Plan. For achievement it, the Commission comitted to:

- develop a pan-European entrepreneurial learning initiative
- reinforce cooperation with the Member States for boost the introduction of entrepreneurship education in each country
- establish a guidance framework for encourage the development of entrepreneurial schools and VET institutions
- promote the recognition and validation of entrepreneurial learning in an informal or non-formal learning environment
- disseminate the entrepreneurial university guidance framework
- facilitate th exchanges between universities interested in applying the guidance framework
- endorse successful mechanisms of university-driven business creation (spin-offs etc.) and emerging university-business ecosystems around key societal challenges.

"Universities should become more entrepreneurial". Against this backdrop the European Commission in collaboration with OECD has developed a framework for entrepreneurial universities, designed to help interested universities assess themselves and improve their capability with tailor-made learning modules.

5. TEACHING ENTREPRENEURSHIP

In one of the most comprehensive empirical analyzes on entrepreneurship education is stated: "A core objective of entrepreneurship education is that it differentiates from typical business education. Clearly, for entrepreneurship education to embrace the 21st century, professors must become more competent in the use of academic technology and also expand their pedagogies to include new and innovative approaches to the teaching of entrepreneurship." [16]

European Commission says in "Entrepreneurship Education – A Guide for Educators" that:

- teachers have a central role because they have a strong impact on the attainment of learners
- they have to be reflective teachers, to keep their practice under constant review and adjust it in the light of desired learning outcomes and the individual needs of students
- teachers do not provide students with the answers but help them to research and identify right questions and find the best answers
- they need a wide range of competencies related to creativity and entrepreneurship
- teachers require a school environment where creativity and risk-taking are encouraged, and mistakes are valued as a learning opportunity. [17]

In a conference entitled "Teaching Entrepreneurship to Engineering Students" which was held in Monterey, California during the period January 12 to 16, 2003, the session topics included was the following:

1. What are attributes of successful entrepreneurs?
2. What are models of successful programs teaching entrepreneurship to engineers?
3. What is the culture at a university that fosters a spirit of innovation and entrepreneurship?
4. What partnerships are needed to create an environment for student and faculty innovation?
5. How can engineering faculty become role models of innovation and entrepreneurship? [18]

The current trend in most universities is to develop and expand entrepreneurship programs and design unique and challenging curricula specifically designed for entrepreneurship students. [19]

Thomassen writess a paper about a didactic strategy that can be applied in entrepreneurship education for increasing the student's self-efficacy. The so-called "push" method incorporates seven enterprise-didactic strategies:

- change of habits
- role models
- reward for action
- courage to fail
- mean driven
- self-awareness and reflection
- experiences of success. [20]

The main responsibility of engineering educators is to teach their students to be more innovative and entrepreneurial. Successful student innovators become powerful role models for their classmates. [21]

Entrepreneurship for engineering students must be taught within the global context. To meet the needs of engineering students, must be created institutional and individual partnerships that to promote international collaborations. [22]

6. CONCLUSIONS

In our days, once with globalization and emerging international competition, when jobs are an international problem, is necessary that students to be educated to be job creators, not job seekers. For this, there is a growing need to enhance the entrepreneurial education in universities and is obligatory to engage more engineering students in entrepreneurial education for obtain a new generation of engineers which will be capable to realize their full professional potential and apply it in satisfying and responsible ways. How this can be obtained? On the one hand, by introducing into curricula at all levels of education, of the key competence "entrepreneurship". On the other hand, the teachers must expand their competencies related to creativity and entrepreneurship and change their pedagogies, including new and innovative teaching methods, offering a truly entrepreneurial education.

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UDK: 677.05 **COBISS.SR-ID 220571660** **Review Article**

SYSTEMS PROPOSED FOR MEASURING, MONITORING AND ANALYSIS VIBRATION OF MACHINES FROM TEXTILE INDUSTRY

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Abstract: *The purpose of this paper is to find various monitoring systems and vibration analysis of machines in the textile industry to improve their reliability. The need to reduce production costs has determined, over time, the evolution of different systems and maintenance concepts in the textile industry. Monitoring the equipment through periodic or continuous measurement of global vibrations indicates that the intervention on a machine will be made only when measurements show that this is necessary.*
According to the authors, the most obvious development directions of study are the following: a system for measuring, monitoring and vibration analysis with triaxial piezoelectric accelerometer mounted on each machine in the textile industry which will be connected to a data acquisition system with FFT spectrum analysis system, which will include a program for automatic calculation of the optimum operating modes; system for measuring, monitoring and FFT spectrum analysis with laser vibrometer for distance speed measurement, acceleration, displacement and vibration. This laser vibrometer which includes a PC program for automatic calculation of the optimum operating modes and modal analysis.
On-line monitoring systems of vibration and other industrial parameters are designed for continuous monitoring of vibration amplitudes to equipment and industrial machinery and for study and analysis of vibration on laboratory stands. Also, the system can also be used for on-line monitoring of the other parameters in the textile industry.

Key words: *measuring systems, vibrations, software, operating modes, regimuri de lucru, FFT spectral analysis.*

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1. INTRODUCTION

The development of consumer society has imposed development of industrial activity and determined some bigger productions, of better quality and at a low price. The price of any product, no matter the industry or the type of production, maintenance costs represents a significant percentage of the price of the products. [1]

The need to reduce production costs has resulted, over time, the evolution of different systems and maintenance concepts.

Monitoring the equipment through periodic or continuous measurement of global vibration indicates that intervention on a machine will be made only when measurements

show that this is necessary. [2] Vibration monitoring can be performed with a wide range of devices. Their goal is to accurately measure the vibrations amplitudes, vibration frequency and phase to allow effective diagnostic status of the machines. On the market there is a wide range of devices, each capable of a variety of performances. These can be classified as follows [3]:

- Vibrometers (devices for measuring global vibration)
- Analyzers swept filter
- Data collectors, including FFT spectrum (FFT Fast Fourier transform)
- Real-time Spectrum Analyzers
- On-line systems, acquisition boards (analog and digital).

In practice, the vibration signals are composed of a large amount of frequencies occurring simultaneously, so that they can not be analyzed, only by studying the characteristic amplitude – time (Figure 1) to determine the number of simultaneous components and frequencies of production of these vibration. [4]

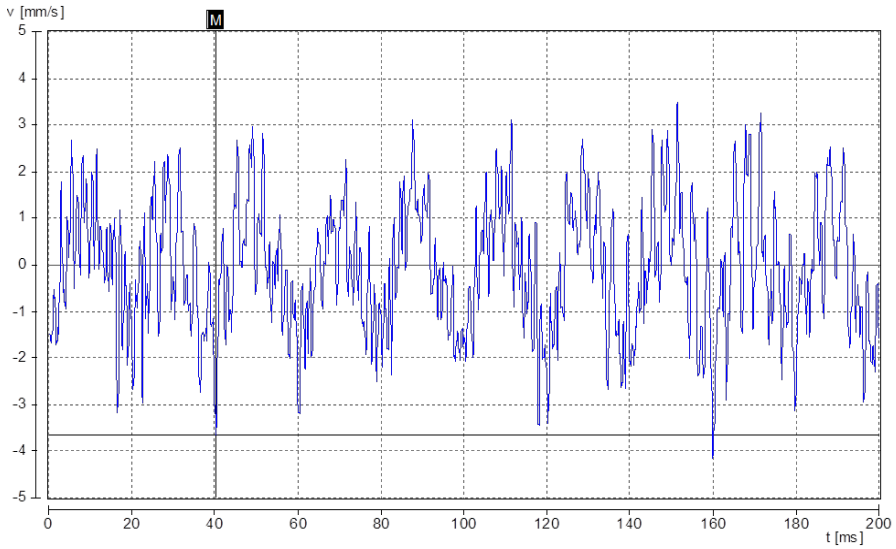

Fig.1: Oscillogram of vibration amplitude-time

These components can highlighted by tracing the characteristics amplitude-frequency (Figure 2.)

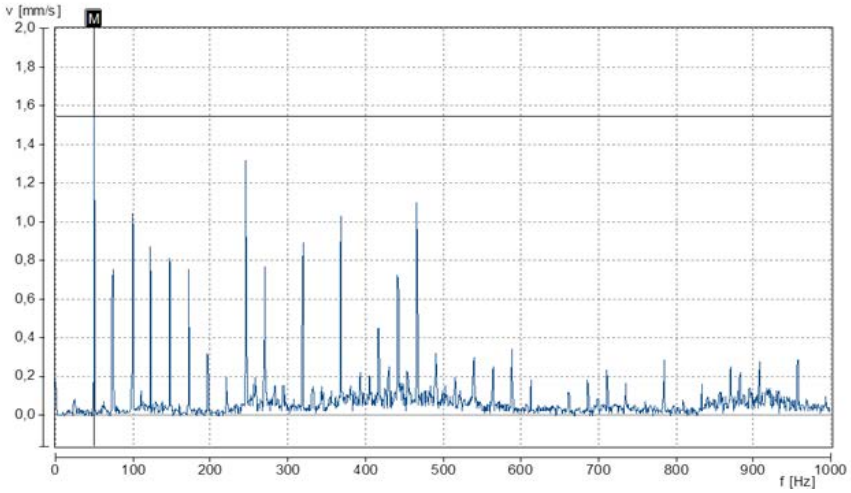

Fig. 2: *Frequency spectrogram*

Dividing the vibratory signals in individual frequency components is called frequency analysis, a technique which can be regarded as the fundamental stone of diagnosis based on vibration measurements. The curve which indicates the vibration level according to the frequency is called frequency spectrogram. In this way we can determine, using spectral analysis, the unwanted vibration source and types of faults that cause these vibrations. [5] The use of modern methods of diagnosing these machines allow correct identification of the defect, by measuring the machines vibrations.

The vibrometers, analyzers and data collectors which are considered off-line systems are designed, in general, for implementing predictive maintenance, and on-line systems are considered tools needed to implement proactive maintenance [6].

Currently, many industrial companies have both monitoring systems on-line and off-line and hybrid systems.

With the help of off-line systems the data are collected at a predetermined time, then being transferred to a computer, where, with the help of maintenance programs they are analyzed.

In this case, monitoring of dynamic equipment shall be based on program tracking their operating status in terms of vibration measurements.

On-line monitoring systems of vibration and other industrial parameters are designed for continuous monitoring of vibration amplitudes for equipment and industrial machinery and also for vibration study and analysis and on laboratory stands. Also, the system can also be used for on-line monitoring of industrial or other parameters, such as temperature, pressure, flow, voltage, etc.

The systems can be used both as stationary equipment, laboratory and as portable equipment for field measurements.

These systems allow the performance of three categories of vibration measurements and monitoring of other industrial parameters by connecting the appropriate sensor.

Laser vibrometer system consists of the following parts:

- laser sensor ("laser head"), which emits laser beam on the sample measured
- central unit (module controller) that processes the signal from the sensor. [7]

In Figure 3 there is shown a laser vibrometer system of high-frequency Speed Vector OptoMet and in Figure 4 a laser-Vector Speed vibrometer system with optional modules.

Fig. 3: *Laser vibrometer system of high frequency – Vector Speed OptoMet*

The central unit contains a speed decoder D-VD-3 to extract the signal measured, the vibration speed of the sample in the point where it is illuminated by the laser beam.

Main technical characteristics

- ✓ Maximum frequency of the signal measured 2,5 MHz.
- ✓ Measuring the speed through the decoder, between limits 0 and 10 m/s to 2,5 MHz
- ✓ The number of measurement domains of vibration velocity: 11 (0,01 / 0,02 / 0,05 / 0,1 / 0,2 / 0,5 / 1 / 2 / 5 / 8 / 10 m/s)
- ✓ Sensitivity: 10 nm / $(s\sqrt{Hz})$
- ✓ Measurement domain 500 mm – 100 m. Other measurement domains can be chosen optionally Resolution of vibration speed: 0,01 µm/s
- ✓ Power of laser sensor: < 1 mW for eye protection, 633 nm, visible red beam.
- ✓ The laser sensor does not weigh more than 4 Kg. The sensor with the central unit can be easily mounted on positioning devices - tripod.
- ✓ Central unit (Module controller), can be controlled from an external computer through the RS232 or USB interface.
- ✓ Central unit weight together with laser sensor is 11 kg
- ✓ Output signal: analog, BNC connector
- ✓ Interfaces: touch screen 3.5 "+ 20 LED bargraph segments, menu buttons, key switch type (power) laser switch ON / OFF.
- ✓ Dimensions: length 370 mm x width 120 mm x height 100 mm
- ✓ The decoder D, DD-3 for measuring the displacement amplitude in the range 1 µm - 100 mm

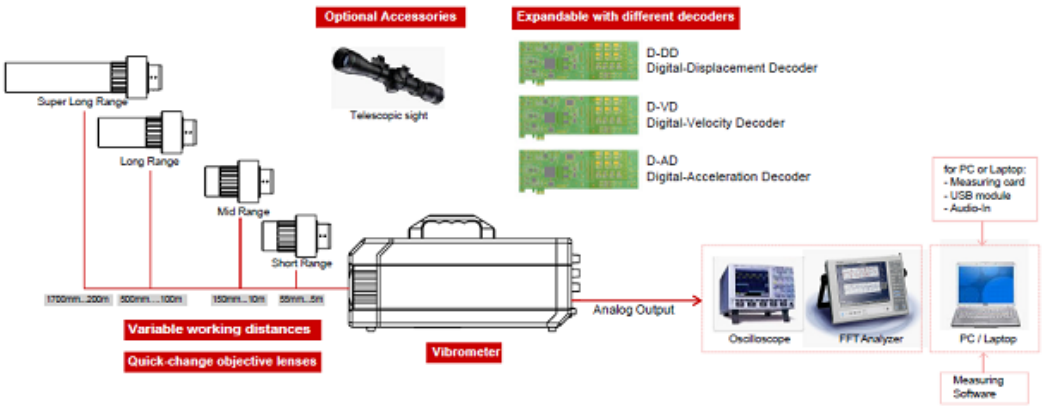

Fig. 4: *The laser vibrometer Vector Speed with optional modules*

Composition of delivery

a. Laser vibrometer of high frequency Vector-Speed - 1 piece
   - - D-VD-3 decoder for measuring the vibration velocity - 1 piece
b. Lens objective for long distance 500 mm - 100 m, bayonet lens - 1 piece
c. Digital oscilloscope with software for data acquisition and analysis on laptop or PC: -1 piece

- Osciloscope Picoscope, USB of high resolution, resolutin of 16 bits bandwidth 5 MHz, low noise, dual channel sampling 10 MS/s
- Arbitrary waveform generator
- Connection to PC: USB 2.0 Hi-Speed
- Software PicoScope, SDK compatible with Windows XP, Windows Vista and
- Windows 7
- FFT spectral analysis program included. [7]

2. THE EXPERIMENTAL PART

It is well known that recorded increased vibration of textile industry machines can cause a series of significant defects affecting the production process such as:

- thread breakage,
- needle wear,
- excessive wear of mechanisms and parts that make up the powertrain..

To this end, in order to reduce vibrations and diagnosing the cause of accidental shutdowns on Happy embroidery machine have been performed a set of measurement vibrations in order to determine the optimum operating regimes. [8]

Before performing the vibration measurements were established the following technical requirements: type of vibration measurements; establishing the measurement points and directions; vibration parameters and their values; setting the operating modes.

Considering that embroidery machine manufacturer does not specify the allowable vibration level of the machine nor the optimum operating modes leading to increased reliability, we determined that these can be determined by measuring the vibrations. [9]

The experimental part conducted on Happy embroidery machine consisted in determining the optimum operating modes to which the quality and productivity is increased and ethe mbroidery machine reliability will be maintained at a high level.

The operating modes of may change depending on the wear of machine parts (components of the driveline, needle, engine drive etc.) and highlight the weaknesses or non-compliances that may occur during the manufacturing process. These can be influenced by the type of needle, the density of the material, etc. and can be considered after analysing the vibration levels and a complex process, this operating method can be expanded to other machines in the textile industry. These operating modes were established and published by the authors in an earlier paper. [9]

Determining operating modes by measuring vibrations can be considered as a personal contribution to increasing the reliability of the machines used in the textile industry. For the Z measurement direction (the direction on which the sensor is installed) and fabric advance on the X direction, the optimal operating mode is at 700 sinking/min. Operating modes can change based on the wear of machine parts (components of the kinematic chain, needle, motor drive etc.) and highlight the weaknesses or nonconformities that may occur in the production process.

The results obtained in this study will allow a number of potential directions to be sketched out and followed in order to continue this research. The **most obvious ulterior development directions for the study** are, in the author's opinion:

1. A system for measuring, monitoring and analyzing vibrations with triaxial piezoelectric accelerometers installed on every machine in the textile industry which will be connected to a retrieval system with FFT spectral analysis, a system which will include an application to automatically calculate the optimal operating modes (Figure 5).

The vibration measurement system consists of:

- piezoelectric accelerometers: n pieces
- ICP modules: n channels
- AMDT retrieval module: - n analog inputs, 8 digital inputs, 8 digital outputs, 4 analog outputs

The data retrieval system consists of:

- 2 base devices with 16 GB of memory
- 2 retrieval modules for AMDT vibrations

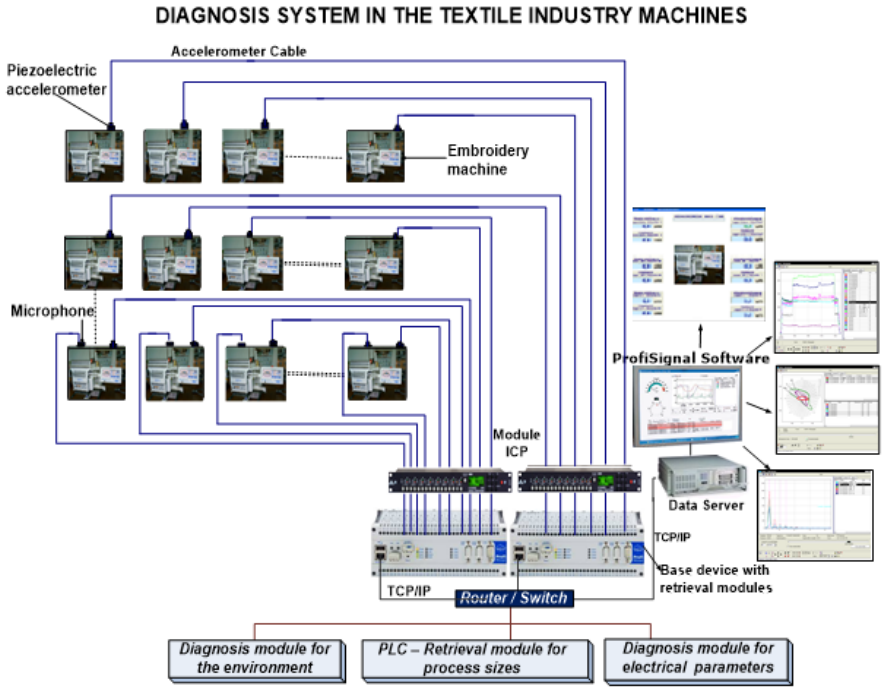

Fig. 5: *System for measuring, monitoring and analyzing vibrations with triaxial piezoelectric accelerometers*

2. System for measuring, monitoring and FFT spectral analysis with laser vibrometer for non-contact measurements of vibration velocity, displacement and acceleration. This laser vibrometer will include a computer program to automatically calculate the optimal operating modes and perform modal analysis (Figure 6.).

The laser vibrometer system consists of:

- Laser sensor ("laser head"), emitting the laser beam towards the measurement sample
- The central unit (modulated controller), which processes the signal from the sensor.

The central unit contains a D-VD-3 decoder to extract from the measured signed the vibration velocity of the sample in the section illuminated by the laser beam.

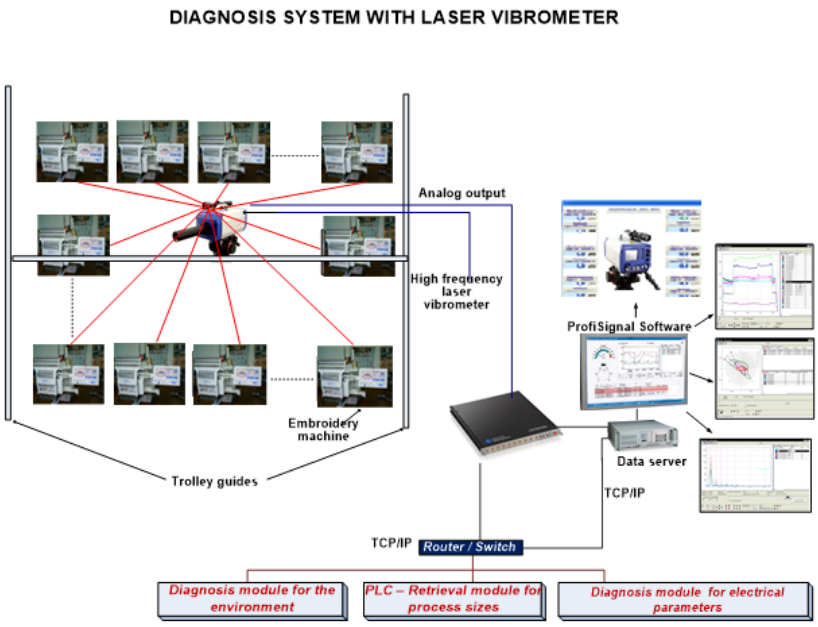

Fig. 6. *System for measuring, monitoring and FFT spectral analysis with laser vibrometer*

3. CONCLUSIONS

In conclusion the authors propose:

A system for measuring, monitoring and vibration analysis with triaxial piezoelectric accelerometer mounted on each machine in the textile industry which will be connected to a data acquisition system with FFT spectrum analysis system that will include a program for automatic calculation of the optimum operating modes of the embroidery machines.

A system for measuring, monitoring and FFT spectrum analysis with laser vibrometer for remote measurements of speed, acceleration, displacement and vibration. This laser vibrometer which includes a PC program for automatic calculation of the optimum modes and modal analysis of the embroidery machines.

All these proposals were foreseen and can be subject to possible future research that would lead to the automatic monitoring with the help of the computer of the sewing process and the implementation of significant reliability of the machines from the textile industry.

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UDK: 005.96:338.432.5(497.11) COBISS.SR-ID 220572684 Review Article

HUMAN RESOURCE DEVELOPMENT AND EMPLOYMENT IN AGRO-INDUSTRIAL SECTOR

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Bojana Pejčić, MSc, City of Nis Administration

Abstract: *It is widely known that efficiency of modern development, and of the agro-industrial sector as well, cannot be based solely on material component but now, more than ever, on human resources. It is concluded in the paper that the concept for the increase of export in agriculture and food industry, along with the stable and sustainable increase of the production, implies the adjustment of the export structure of these kinds of products to the global demands. Also, it is emphasized that the improvement of the export competitiveness can be realized by using one's own comparative advantages, based not only on agro-ecological potentials but also on: technological modernization, improvement of the educational concept, application of adequate management and organizational knowledge and experiences, etc. In this paper, human resources and their employment in the agro-industrial sector, being one of the fundamental factors for economy growth and development of the Republic of Serbia, will be presented*

Key words: *agro-industrial sector, human resources, employment, development, strategy;*

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1. Introduction

Food is the basic natural resource which guarantees life. Food production is important ever since a man was born, and food exchange within national economies but also on the international level, have a constant growing tendency [9]. Agriculture and food industry are strategic branches of economy with long traditions and remarkable potentials on which the strengthening of economic performances of a country can be based. Agro-industrial sector, production of food and beverages, tobacco, fertilizers and production of agricultural machines, in domestic economy can represent a leading sector, having in mind the dynamics and considerable potential for further growth.

Agro-industrial complex is based on the organization and socio-economic relations of primary production, food industry and food trade. Establishing and developing the agro-industrial complex is polivalent, technologically, economically and above all an eminent social process. However, the economic development of our country so far, the agro-industrial complex, especially the primal production, did not get appropriate attention. Such an attitude towards this branch, together with its inherited extensive character, influenced the level of growth and the growth dynamics of agro-industrial production is considerably legging behind in comparison to other branches of economy. One of the unfavorable consequences is the gap between the increasing daily needs and consumption, on one hand, and insufficient level of food production, on the other hand. Food production in sufficient quantities and adequate

quality represents one of the most important objectives of any social community, not only from the economic, but also from the political point of view.
Having in mind that domestic agro-industrial sector lags behind other branches, one of the most important and at the same time the most difficult task in the future will be the necessity of transforming the agro-industrial complex from the capital intensive into a professional-science intensive branch.
Modern ways of doing business is characterized by numerous restraining factors, where the world economic crisis, energy limits, impact of climate changes are only some of them. These factors have a strong impact especially on branches such as agriculture and food industry. Moreover, the subject of this paper is to study the problems and perspectives of development of agro-industrial sector in Serbia and its importance for further development of the country. Since human resources are the most important factor for resolving this complex problem, because food production development is impossible without human resources, economic reforms and development of agro-industrial sector cannot be implemented without radical changes of human resource structures. Serbia is a country which has comparative advantages for agriculture development in respect to favorable natural and climate conditions. These advantages can result in adequate raw basis for food industry development. However, the analysis of the export balance points to the fact that despite the favorable raw basis, the export structure of agro-industrial sector mainly consists of raw materials, while the percentage of those products, which require higher levels of processing, is low. Also, there is the need for long-term, strategic approach in both production and introducing products to new markets, which would enable the domestic agriculture to considerably change its concept into a branch which guarantees development and export. The process would enable the improvement of the competitiveness of the agricultural goods, where the introduction of the quality standards would significantly increase the quality level of products.
Today, the efficiency of the modern development in general as the development of the agro-industrial sector cannot be based only on material component but on others as well, such as the human resources component. People and their knowledge are becoming the base and the most important development resources. That is why it is impossible to do the rehabilitation and revitalization of the agro-industrial sector without the human resources component. Continuous education and development of employees are the most efficient ways of acquiring the competitive advantage, the basic precondition for entering a market and competing for the trust of customers. The concept of the continuous learning and development is an important potential and the key of future success [16].

2. Development of the agro-industrial sector as the integral part of the economic development of Serbia

Serbia is a country which has comparative advantages for the development of agriculture as a single branch. Those comparative advantages are the result of the natural and climate conditions, in which the domestic economy operates, and they secure the adequate raw basis for food industry development. However, the analysis of the export balance of domestic economy points out the fact that favorable raw basis is not taken advantage of in a proper way, having in mind that the export structure of the agro-industrial sector is mostly comprised of raw materials, while the percentage of those products which require higher levels of processing, is low.
Agricultural production, as the integral part of the whole national production forms specific and very important links with other industrial branches. The connection between the agriculture and other branches is of great importance for the development of Serbian

economy. Factors which degrade those links are unequal regional development, dispensed market, presence of industry in major urban areas, etc. It is very important to point out the fact that the slow development of agriculture has an unfavorable impact on the development of industry and industrial branches which deal with processing of agricultural products.

First, the fact that the level of import in listed branches in constantly increasing is very unfavorable for domestic economy. Numerous elements that are being imported are used in both textile and leather industries and in other branches of food industry.

Second, there is a significant disproportion between the existing processing capacities and the raw basis. The disproportion is characterized by oversized capacities to such an extent that it can hardly be overcome by export. Also, the existing capacities are not fully used which increases the production costs due to high permanent costs per product, which makes the products uncompetitive on the market. High percentage of the lack of use of capacities is evident in the field of meat processing, fruit processing, production and processing of milk and dairy products, production of sugar, etc. On the other hand, the decrease in cattle breeding had a significant influence on the decrease of the food industry potential. The lagging behind of agricultural development has negative consequences for the economic development on the whole, which caused some of the economic and social consequences, and the regional development of the country [7].

The domestic agricultural policy has so far ignored major strategic and some of the persistent problems such as degraded economic state of agriculture, unfavorable conditions for doing business in agriculture, disinterest of agricultural producers for larger scope of production, etc. Moreover, one of the disadvantages concerning agricultural policy management in our country is the fact that agricultural policy did not succeed to encompass all of the elements of economic policy, price policy, credit and tax policies, export and import policies, etc.

Serbian economy has been functioning for a while now in a specific environment created by long-term social and political and economic changes. Due to this, when considering the strategies related to future economic development, the specific environment had to be considered first. It is characterized by:

- Higher percentage of service sector presence in GDP,
- Significant increase of domestic production cover by the import, privatization income and loans,
- Lack of qualified resources (human capital and infrastructure),
- Serious demographic problems (aging and depopulation) [6].

When defining the strategy of rural development the respective institutions demanded special attention for the necessity of institutional changes in order to achieve the higher level of decentralization of the economy and its faster regional development. The estimated growth of agricultural production is expected to be based on the increase of crops due to modern technologies [8]. Also, it is vital to say that the redesign of the role of Serbian agriculture in the region is planed, in the sense of increasing its importance and role in comparison to other countries in the region. That is plausible only if the domestic agricultural production introduces the necessary quality system and standardization of products, which would grant the entrance onto developed markets. On the other hand, improvements and the production increase of traditional products with the protected geographic origin would strengthen comparative advantages of our producers.

However, the analysis of recent results shows that rural economy in Serbia makes around 30% less of GDP per capita in comparison to the national average and it is usually based on primal branches. On the other hand, this sector also faces the problem of the unemployment and demographic changes which affect also other parts of the economy [11].

Due to listed problems related to the development of agro-industrial sector which have been present in the Serbian economy for quite some time, the programming of rural development of Serbia should be done based on the new principles. Official documents foresee the operationalization of three visions in this field:

1) *vision of agricultural development* (which should be based on the concept of dynamic development and establishing competitive family based agriculture, and which could, in such a way, be more integrated with the food and processing industry and contribute to the sustainable development through environmental protection and protection of rare natural resources);
2) *vision of development of food industry and marketing* (focus on consumers, standardization and innovation);
3) vision of rural economy of Serbia as a whole (creation of a demographically balanced concept of rural regions which would, as the urban regions as well, contribute the creation and development of GDP) [11].

In the new economic development strategy of the Republic of Serbia, as in the new strategy of industrial development for the period from 2011 to 2020, the food industry occupies on of the important stands.

The development of food production in the future period should be directed towards the increase of the scope of production, improvement of the quality of food products, increase of quality and improvement of packaging of food products, and especially towards the more efficient health control of this group of products [2]. Nowadays business is characterized by taught competition and strict requirements in relation to standards which represent the assumptions of development of food industry which need to be fulfilled in order to have the development all together [3]. The development of this branch implies the application of the latest technological procedures in order to secure more efficient usage of available capacities and resources and which would be in line with the sustainable development principles [1].

The research shows that there are expectations of the more intensive development in the food production sector of the so called projected food and new groceries whose production is based on improving the existing or new compositions of food through aromatization, coloring, vitaminizing, and also by adding ingredients for improving the taste, appearance, smell and other characteristics. On the other hand, the application of other construction materials in the process of manufacturing processing machinery and packaging enables the introduction of new and improvement of the existing technologies in the food industry. Mass production and the application of special materials for packaging enable adequate packaging and quality protection of all types of food. Aseptical processes in the whole chain of processing, distribution, storing and consuming, and the stressed hygiene requirements and sanitary conditions in production, transport and usage have a significant influence as well, and they will have a greater impact on the technological development and on the greater involvement of science in the sector in the future [7].

3. Possible directions of development and perspectives for achieving faster development of the agro-industrial sector

Agriculture represents one of the oldest activities of the human society and the majority of the population nowadays is still doing agriculture. Agriculture had been the basic and the only occupation of people for a long period of time, but especially in the last century it made way for the industry to a some extent. Today, having in mind the production capacities, the agricultural development is closely related to the industrial development. At one point the industry detached itself from the agriculture in order for the agriculture to become part of the

industry. While the agriculture dictated the development of other branches in the earlier period, and by its accumulation enabled the rapid industrial development, now the industry is a leading branch which initiates and speeds the agricultural development [5].

Despite these tendencies, the importance of agriculture is increasing having in mind that the modern man is interested not only for the richer nutrition but also for satisfying some of the modern needs enabled by the agriculture, in the wider sense, which are a direct result of the dynamic industrial development.

On the basis of the set priorities, present and future tendencies of technological development worldwide, it is possible to determine the basic directions of long-term technological development of agriculture and food industry. Those directions are as follows:

- faster growth and development of food production,
- change in the structure of food production, wider offer and quality of products,
- eliminating disproportions between the primary production and processing capacities,
- enabling new production procedures and the use of energy resources and other resources,
- optimal connection among the production factors from the economic effects stand point of view,
- directed and more congruent regional, sectorial and spatial development,
- reduction of technological and development dependence from the developed world,
- strengthening of own technological potential,
- strengthening of export capacities and competitiveness on the world market,
- employment increase,
- more rational and efficient usage of domestic raw materials, energy and other natural resources,
- more efficient use of scientific, technical and innovative achievements,
- increase of work productivity, professional potentials and other qualitative production factors,
- more congruent division among certain branches and groups based on needs, possibilities and specificities of technological development,
- broadening of cooperation and specialization of companies,
- protection and improvement of the environment,
- increase of the accumulative and reproductive capabilities,
- achieving higher levels of technological and economic development,
- enabling science and companies for setting and achieving higher development goals.

These tendencies can be realized through the following goals:

- expand the agricultural land,
- draft detailed construction programmes for irrigation systems, begin the construction of smaller systems and arrange the water flows of the mountainous areas, in order to expand the surfaces intended for irrigation with the tendency to secure 20% of the cultivated land for irrigation and the draining of flooded areas [7].

By achieving the set goals the cattle breeding production would increase its presence in the final agricultural production and would make the basis for improving the agricultural production. In such a way, it would be possible to secure the high income integration between the primal production of crop farming and cattle breeding production and their connection with the food industry. The process would contribute to the realization of considerable effects in production and trade on the domestic and international market.

If there was an initiation to increase the production in the food industry, it would secure the processing of raw materials from the agriculture, with a higher processing phase in all branches. Those processes would condition the significant increase of production and specialization with a far better offer and product quality, in line with the demands of domestic and international markets. On the other hand, in such a way the level of usage of available capacities would increase which would influence the production growth rate and the production structure being more favorable. The expected annual average growth rate could be over 5% [7].

The vision of agro-industrial sector development should focus on three priority investment directions:

- The first direction is towards improving the market efficiency and the application of standards. These activities would contribute to the restructuring of farms and achieving EU standards which would enable these products to enter the market of EU countries. On the other hand, the improvement of the agricultural production would contribute to the development of processing and marketing of agricultural products.
- The other direction is towards improving the environment and villages, and the preparation and implementation of local rural development strategies.
- The third direction represents the economic development on the whole, in the sense of improvement and development of underdeveloped infrastructure, diversification and development of other economic branches, and development of human resources in rural areas [4].

4. Development of human resources and employment in the agro-industrial sector

Contemporary development tendencies of countries with market economy proved that education and creation of human resources are priorities by national strategies and policies of social, economic and technological advancement. When talking about the Republic of Serbia and its development – the reconstruction and transformation of education, especially vocational, represents one of the assumptions of the complete sustainable development of the Republic of Serbia. Investing in education and securing adequate human resources who can adapt to changing circumstances, is also characterized as an investment and represents an obligation for the Republic of Serbia. Therefore, the educational policy is not only directed towards creating human resources but is part of the general development policy of a society.

Having in mind the fact that human resources are being treated as the basic generator of the society, human capital can be described as a personality of certain social need and socially recognized physical, psycho-social, educational and social characteristics, favorable for occupying certain posts and performing certain tasks, function and role in a society. Human resources represent a limitation to development, high technology and the reflection of technological progress, science as the basic production strength and the modern organization being the generator and the production results, are the determining factors of the socio-economic development.

Employment as the component of the economic development, also being the index of the achieved level of economic development, represents one of the constant and prior development goals. While considering the issue of employment, apart acknowledging the achieved level of economic development, one should pay attention to specific characteristics of the country or economic branch and time. Employment represents a state in which the capable members of society individually or altogether do something useful and gather resources for satisfying their need and fulfilling certain social demands.

The problems of engaging people in the agro-industrial sector started in the 50s when good farmers were turned into bad industrial workers. A lot of them mentally stayed in their villages. That caused controversial thinking whether those people were more useful for the industrial sector and less harmful for the development of the agro-industrial sector. Maybe it was time for a certain historical come back. Certainly it was, because our industry shrinked few times in comparison to the scope of industry from 1989 which marked the beginning of the transitional period [7].

Discussing the problems of engaging the human resources in the agro-industrial sector obliges us to say that those problems are more evident in the primal part and that regardless of the increase in the employment in the last decade, quantitative dimension of that increase is disturbing. In order to make the possibility of choice of these people at least comparable to the one others have in other branches, the conditions for the young to stay in villages have to be made. Their unwillingness to be part of the primal sector is characterized by:

- Hard work in the primal sector of the agro-industrial complex,
- Lack of cultural and leisure activities,
- Inability to achieve higher family standards,
- Continuation of schooling, etc.

The engagement of human resources in the processing sector of the agro-industrial sector is problematic in relation to the working conditions in certain segments. Certain number of people of the agro-industrial professions do tasks and jobs for which they have not educated for which represents a special problem in engaging people for the agro-industrial complex from the qualitative point of view. The fluctuation in the agro-industrial sector is much higher because fluctuations of workers with lower qualifications are higher, especially the fluctuations of unskilled workers.

Employment of women in the agro-industrial sector is also interesting not so much because of efficiency, but because of broadening the array of professions in the agro-industrial production which makes room for additional employment and change in the gender structure. Age structure in certain parts of agro-industrial sector is surely important for the territorial aspect of employment.

In order to secure the progressive relation between the science-technological processes and the employment, in general and in the agro-industrial complex, it is necessary to provide permanent monitoring of the science-technological progress and its influence on the status of employment through the employment policy.

In the policy dealing with the agro-industrial development, that is, in the battle for the bigger quantity of food, which certainly influences the progress and especially the implementation of the employment policy, one should take into consideration the following circumstances [14]:

a) Decision of a society to faster develop the agro-industrial sector, especially the primal agricultural production,
b) The influence of the science-technological progress results onto the agro-industrial complex leads to the more intensified production, both primal and processing, widens the array of required human resources. That is how the scope of work is being broadened.
c) The concept of the active policy of employment has to enable the creation of the similarly attractive working conditions in the agro-industrial complex, in the future, also through the system of delegation, which was not the case so far. In the primal allocation the weight of prices was made on the back of agricultural and food products, in the secondary, the companies in the agro-industrial complex are not in the more favorable position, and in the unintended, personal incomes of the employees considerably lag behind the incomes in the economy.

d) There is a growing presence of equal valuation of work in the agro-industrial complex in comparison to other branches. Once there was an attitude, especially among the young, that agricultural work was less valuable that in industry. Today, more and more the human resources are being promoted in the agro-industrial complex, and the latest social research shows that there is a growing interest among the young for the agro-industrial complex. However, this growing interest can be the result from the long time spent waiting for the job. Thus, the framework is still not as favorable, especially when agricultural production is considered alone.

In the employment policy and also in the agro-industrial complex, one should count on the increase of the percentage of those with university education. This is an ongoing process in developed countries. The expansion of scope of production and services and better organization are the two far more important factors for employment of new staff.

The projection of employees in every company of the agro-industrial complex, and consequently on the whole agro-industrial complex, should contain the following:

- Needs of employees according to education, professions, profiles, etc,
- Educational need and their providers,
- Education along work and advancement,
- Employment (resources and schedule),
- Inflow and outflow of employees,
- Employee needs (housing, standard, culture, etc.).

Since there is a lack of certain profiles in the agro-industrial complex, first one should comprise the list of basic professions and profiles (professions directly linked to the company's business), then general professions and profiles (present in all companies), then the specific professions and profiles which deal with the side business.

The problem of employment is present in all environments, to some extent, both economically developed and undeveloped. The problem of unemployment has become one of the biggest ones of our economy. This problem was evident especially after the economic reform thanks to the restrictive investment politics and low level of economic development.

Weak results concerning employment are due to: deranged economic flows, string process against agricultural policies, gap between the education and what economy needs, weak links with the international partners, etc.[16].

It is evident that certain expected results concerning employment in the agro-industrial complex and SMEs have been left out. The unemployment is particularly high in big cities where the employment is the only way of earning and where taking care of several family members, with high inflation rates and recession, is becoming a social and a personal problem of numerous families, especially of those with low or medium income.

4. Conclusion

One can conclude that agro-industrial sector has an important role in the future development of the domestic economy. This importance is derived from the fact that this branch, due to competitive advantages which our country has for their development, can provide enough food for the population and direct most of its production towards export. In order to realize this in the future it is necessary to modernize the production capacities and the production technology, do the restructuring and focus on certain markets, its needs and demands. The increase of the production efficiency represents one of the basic tasks which would improve the competitiveness of the branch, both on domestic and international market. The necessity of developing human resources in the agro-industrial complex certainly provides a chance for

rehabilitation and revitalization of the whole agro-industrial sector. The food production should be categorized as the development priorities which is impossible to do without the adequate human resources.

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