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ABSTRACTS "INNOVATIVE TECHNOLOGY" 3 / 2010

COMPARISON OF MRA AND ANN MODELING OF CUTTING FORCE WHEN TURNING AISI 1043 STEEL

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The modeling of cutting force is an important aspect in machining. This paper focuses on developing empirical models for main cutting force in turning AISI 1043 steel. The experimental data from measured main cutting force was used for models development. Two competing data mining techniques, regression analysis and artificial neural networks are applied in developing the empirical models. A comparison of regression models and artificial neural network models with experimental results using statistical measures was carried out. The predictive artificial neural network model was found to be capable of better predictions.

A FEEDIND, MIXING AND DOSING DEVICE FOR SAWDUST, USED AT PELLETS MILLS

Marian Topologeanu[1]; Stefan Velicu[2]; Radu Catalin Tarca[3]; Mirela Sohaciu[4]; Alina Molagic[5]; Tiberiu Vesselenyi[6]

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This article presents some aspects regarding the reduction of the negative impact generated by economical activities in the field of wood processing by realizing some equipments of pressed sawdust and refers mainly at the fuelling, dosage and homogenization mechanism which is a component part of the pellet grinders. The Fuelling, dosage and homogenization mechanism is installed on the pellet manufacture grinder is composed from a dosage device and a fuelling and homogenization device.

SOLUȚIE ECOLOGICĂ DE RECUPERARE A DEŞEURILOR METALICE REZULTATE ÎN URMA OPERAȚIEI DE ŞTANȚARE *(ECOLOGICAL RECOVERY SOLUTION OF METAL WASTE RESULTS FROM THE PUNCHING OPERATIONS)*

Alexandru Rădulescu *, Alecu Ioana-Mădălina**

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The purpose of analysis for this paper is to collect industrial waste and their recovery through reuse. In present the reuse of industrial waste is realized through the application of modern technologies. In this context, the paper proposes a technical-economic analysis regarding a waste chopper.

ÉTUDE PARAMETRIQUE D'UN PALIER A RAINURES EN CHEVRONS *(PARAMETRIC STUDY OF A BEARING GROOVE IN RAFTERS)*

Maria Magdalena Roaită[1], Dominique Souchet[2], Sorin Cănănău[1], Alexandru Rădulescu[1]

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The journal bearings with helical grooves has the advantage of having a low axial flow and also a good static and dynamic low eccentricity. We determined the bearing capacity and the static characteristics of a bearing with fixed parameters and parameters that vary. In this paper, we will present the modeling and numerical analysis for a generic case, using the finite element method.

APLICAȚII ALE FMEA ÎN MENTENANȚĂ PREVENTIVĂ A MAŞINILOR ŞI ECHIPAMENTELOR *(FMEA APPLICATIONS IN PREVENTIVE MAINTENANCE OF MACHINERY AND EQUIPMENT)*

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Preventive maintenance is the planned maintenance of an equipment/machine, performed to improve their uptime and to avoid the unplanned repairing activities. The purpose of preventive maintenance is to reduce the occurence of defects and the excessive worn of the machine/equipment. Using the FMEA for machines and industrial equipments, including tools and dies, helps to identify their potential failure mode in early design stages and as consquence, identification of the actions to be tacken to avoid unplanned breackdowns or their reparing time to be as short as possible. In the article, is presented various types of FMEA and their benefits and a case study of applying FMEA in planning of preventive maintenance of an assembly line of automotive components, working Just in Time, in order to assure its flawless functionality.

LA TENSION SUPERFICIELLE – PROPRIETE INTRINSEC DES LUBRIFIANTS
(SURFACE TENSION - INTRINSICAL LUBRICANTS PROPERTY)

Irina Oana Boldijar[1], Mohamed Hajjam[2], Alexandru Rădulescu[1], Sorin Cănănău[1],

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Surface tension is a physical and chemical parameter with a significant impact. It is present everywhere around us, but its the study appears to be insignificant in comparison with other parameters. We don't take it into account during the dynamic processes because there are much many other more important properties that influence the lubricant. Regarding the static process, the surface tension impose the movement of the fluid which rest, using the pressure of Pascal. This paper present the importance of surface tension on the lubrication process.

ECONOMIC, SOCIAL, NATIONAL, ECOLOGICAL AND MORAL CRITERIA FOR ASSESSING THE EFFICIENCY AND OPPORTUNITY OF AN OBJECTIVE IN THE MINING INDUSTRY. CASE STUDY AT THE ROŞIA MONTANĂ PROJECT

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In the public opinion it became necessary to carry out a debate on the Roşia Montană project. In this article I shall present certain economic, social, national, ecological and moral criteria for assessing the efficiency and the opportunity of the project. Up to present, two options have been revealed: accomplishing the project of the Gold Corporation company or stopping it. The project opponents have not formulated any alternatives. In this article I am analyzing the efficiency and the opportunity of the Roşia Montană project based on a several working hypotheses and including the consequences of these working hypotheses.

ACTUALITATEA ECONOMIEI CUNOAŞTERII. VIITORUL ROMÂNIEI IN ECONOMIA CUNOAŞTERII
(THE ACTUALITY OF KNOWLEDGE ECONOMY. ROMANIA'S FUTURE IN KNOWLEDGE ECONOMY)

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The concept of Knowledge Economy is considered in different ways by specialists and political leaders.In a natural way they obtain different conclusions regarding the relevance of Knowledge Economyand the development strategy of Romania.Step by step we have now a relative consensus regarding the essential problemsabout this subject. In the present the political leaders recognizethe decisive importance of Knowledge Economy for the the future socio-economical development of our country.

ECONOMIA CUNOAŞTERII ŞI STRATEGIA DE DEZVOLTARE
(KNOWLEDGE ECONOMY AND DEVELOPMENT STRATEGY)

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The debates about the Knowledge Economy in Romania, taking into consideration development strategies, are in a great number in contradiction and in perpetual change. So, as results we have selected and we have presented three of the most important points of view: 1. the linear development, 2. the enhanced and continuous development of the industrial economy, 3. the global transformation of the economy.

EDUCATION TRENDS IN ROMANIA – A STATISTICAL ANALYSIS BY GENDER FOR THE LAST DECADE

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The past decade, the demand for international comparative quantitative information on education has grown tremendously, especially in Europe. The Bologna process as well as the Lisbon process has revived the interest for quantitative information on the development of national education systems. Quantitative information, and especially indicators, is a cornerstone of the new EU Open Method of Co-ordination. Comparison of the own national indicators with the rest Member States is seen as an important driving force for the development or adjustment of national policies to move towards the Lisbon objectives.

ABSORPTION OF EUROPEAN FUNDS, PRIORITY OBJECTIVE OF LOCAL COMMUNITIES DEVELOPMENT

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In order to recover a relatively loss of time spended basicly in a system which has differently conceved economy,fredom and development, for outlining in European landscape as a flourishing,educated,free and dignified nation , the adhesion of Romania to European Union must be looked beyound the espousal process by meaning that adhesion is not enough for that matter integration.This complex systemic throughout process entails many results which effects are pulled together for Romania's sustainable social and economic development in order to make a realist participation on European Union intern market.

MAINTAINING COMPETITIVE ADVANTAGE CONSIDERING THE DEVELOPMENT OF ENVIRONMENTAL PROTECTION REGULATIONS

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The need of regulations concerning the protection of natural environment is becoming more and more accepted, despite the belief that environmental regulations affect competitiveness. The prevailing concept is that there is a close relationship between ecology and economy. On the one hand there is the social benefit strict environmental standards produce, on the other hand there are the costs that firms must take to prevent pollution and support ecology - costs which increase prices and lower competitiveness.
However, this static view on the issue of environmental regulations, in which everything, except the regulations is kept unchanged, is wrong. If technology, products, processes and customer needs would be all the same, the conclusion that regulations would contribute to higher costs is inevitable. Yet, firms are operating in real economy of dynamic competition, not in the static environment of most economic theories. They always find innovative solutions to the problems competitors customers and regulators raise.

STRATEGIA MICILOR ÎNTREPRINDERI ROMÂNEŞTI ŞI INOVAȚIA, CA FACTOR DE SUCCES PE PIAȚA EUROPEANĂ
(ROMANIAN SMALL BUSINESS ENTREPRISES STRATEGY AND INNOVATION, AS SUCCESS FACTOR ON EUROPEAN MARKET)

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Innovation is a process whose objective is the achievement of a valuable, original and creative outcome. It gives the invention its economic dimension. Innovation-oriented firms are more likely to win over competitors, either by price reduction by following the reduction of costs, or by making better products that bring greater value to customers. For a leading European company innovation can be very handy having regard to available funds, unlike small businesses, which can be very innovative, but often encounter financing difficulties. However, there are several less expensive types of strategies the former can use, which merged with a correct prioritization can create a strong position on the European market, even for a small firm.

CUPRINS

TEHNOLOGIE INOVATIVĂ / INNOVATIVE TECHNOLOGY

ECONOMIE INDUSTRIALĂ. ECONOMIA CUNOAŞTERII / INDUSTRIAL ECONOMY. KNOWLEDGE ECONOMY

EDUCAȚIE, DEZVOLTARE ŞI INOVARE / EDUCATION, DEVELOPMENT AND INNOVATION

COMPARISON OF MRA AND ANN MODELING OF CUTTING FORCE WHEN TURNING AISI 1043 STEEL

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ABSTRACT

The modeling of cutting force is an important aspect in machining. This paper focuses on developing empirical models for main cutting force in turning AISI 1043 steel. The experimental data from measured main cutting force was used for models development. Two competing data mining techniques, regression analysis and artificial neural networks are applied in developing the empirical models. A comparison of regression models and artificial neural network models with experimental results using statistical measures was carried out. The predictive artificial neural network model was found to be capable of better predictions.

KEYWORDS: modeling, turning, cutting force, regression analysis, artificial neural networks

1. INTRODUCTION

Turning is one of the most commonly machining operations. Study of cutting force is critically important in turning since cutting force is in direct relation with surface quality, machined piece dimensions, tool wear, tool breakage, cutting temperature, self-excited and forced vibrations, and with power requirements of the machine tool.

On the other hand, the cutting force is influenced by geometrical, dynamical, material and tool surface properties. The analysis of cutting force in turning has been a main subject of research over the years. For analysis purposes, various cutting force models were suggested by a number of authors.

In recent years, empirical cutting force models, developed by regression analysis and artificial neural network have become a preferable trend.

In this paper, multiple regression analysis (MRA) and artificial neural networks (ANNs) are used for modeling and prediction of main cutting force when turning AISI 1043 steel. This paper aims to following:

1. First, it applies the experimentation for measuring the main cutting force altering the cutting parameters (depth of cut and feed) and tool parameter (approaching angle) while ensuring constant cross-sectional area of cut.
2. Second, prediction models were developed using both MRA and ANNs.
3. Third, several statistical methods were used in order to compare the prediction accuracy of the MRA and ANNs models with experimental results.

2. EXPERIMENTAL DESIGN AND SETUP

The work piece material used in this experiment was AISI 1043 steel: ultimate strenght R_m=650 MPa, Brinell hardness HB=206.

The cylindrical bar specimen that is utilized in these experiments had a diameter of 62 mm and length of 500 mm. Longitudinal turning was conducted on the universal lathe "Potisje" PA-C30, with a power of 11 kW.

A work piece in the form of a bar was held in the machine with chuck and center to minimize run-out and maximize rigidity.

Cutting tool was tool holder PCLNR3225P12 with insert CNNM120408P25 (4025), rake angle γ=-6°, angle of inclination λ=-6°, and corner radius r_ε=0.8 mm.

In order to ensure constant cross-sectional area of cut the cutting parameters were set as following pairs: seven level of feed rate f= 0.124; 0.142; 0.160; 0.196; 0.249; 0.321; 0.499 mm/rev and seven levels of depth of cut a_p= 4; 3.5; 3; 2.55; 2; 1.55; 1.

Cutting speed of 97 m/min was constant while approaching angle κ was altered from 45 to 90 º, step 5. With defined machining parameters and according to their levels, 70 experiments were conducted.

The main cutting force was measured with a dynamometer Kistler type 9441, mount on the lathe via a custom designed adapter for the tool holder creating a very rigid tooling fixture.

The charge signal generated at the dynamometer was amplified using amplifier Kistler type 5007A. The amplified signal is acquired and sampled by using computer Hewlett Packard HP 9000/300.

The experimental data is given in table 1.

Table 1. *Experimental values of main cutting force*

Exp.	a_p [mm]	f [mm/rev]	κ [º]	F_c [N]	Exp.	a_p [mm]	f [mm/rev]	κ [º]	F_c [N]
1	0.5	0.499	45	511.2	36	0.5	0.499	70	531.7
2	0.775	0.321	45	491.9	37	0.775	0.321	70	501.4
3	1	0.249	45	519.3	38	1	0.249	70	511.1
4	1.25	0.196	45	538.8	39	1.25	0.196	70	546.7
5	1.5	0.16	45	600.1	40	1.5	0.16	70	548.0
6	1.75	0.142	45	601.5	41	1.75	0.142	70	600.3
7	2	0.124	45	662.7	42	2	0.124	70	620.3
8	0.5	0.499	50	567.7	43	0.5	0.499	75	514.4
9	0.775	0.321	50	501.7	44	0.775	0.321	75	532.0
10	1	0.249	50	530.4	45	1	0.249	75	518.0
11	1.25	0.196	50	547.8	46	1.25	0.196	75	533.5
12	1.5	0.16	50	575.5	47	1.5	0.16	75	553.2
13	1.75	0.142	50	618.3	48	1.75	0.142	75	586.6
14	2	0.124	50	634.8	49	2	0.124	75	617.5
15	0.5	0.499	55	527.9	50	0.5	0.499	80	564.4
16	0.775	0.321	55	521.2	51	0.775	0.321	80	489.9
17	1	0.249	55	500.7	52	1	0.249	80	531.0
18	1.25	0.196	55	553.6	53	1.25	0.196	80	537.6
19	1.5	0.16	55	570.0	54	1.5	0.16	80	553.8
20	1.75	0.142	55	583.1	55	1.75	0.142	80	579.6
21	2	0.124	55	627.6	56	2	0.124	80	615.0
22	0.5	0.499	60	526.1	57	0.5	0.499	85	427.6
23	0.775	0.321	60	536.8	58	0.775	0.321	85	521.4
24	1	0.249	60	522.0	59	1	0.249	85	535.0
25	1,25	0.196	60	522.7	60	1.25	0.196	85	549.3
26	1,5	0.16	60	576.4	61	1.5	0.16	85	544.9
27	1,75	0.142	60	615.9	62	1.75	0.142	85	593.3
28	2	0.124	60	622.3	63	2	0.124	85	608.9
29	0.5	0.499	65	538.8	64	0.5	0.499	90	429.6
30	0,775	0.321	65	514.3	65	0.775	0.321	90	503.4
31	1	0.249	65	518.4	66	1	0.249	90	558
32	1.25	0.196	65	539.1	67	1.25	0.196	90	556.9
33	1.5	0.16	65	556.5	68	1.5	0.16	90	546.7
34	1.75	0.142	65	609.3	69	1.75	0.142	90	616
35	2	0.124	65	619.2	70	2	0.124	90	643.1

3. MODEL DEVELOPMENT: BIAS-VARIANCE DILEMMA

In any data-driven empirical modeling, model development comprises of selection of functional form of the model and determining the adjustable parameters using the available data.

These two issues are closely related but result in different types of errors. Decreasing one type of error is likely to increase the other type and vice versa. This is the so-called bias-variance trade-off as shown in figure 1.

In MRA one need to determine the right functional and order form of the polynomial and to determine coefficients of the polynomial equations.

A low degree polynomial will not have the needed flexibility and will make large errors on test sample because of a large bias.

A high degree polynomial is too much sensitive to the sample and will make large errors on test sample because of a large variance.

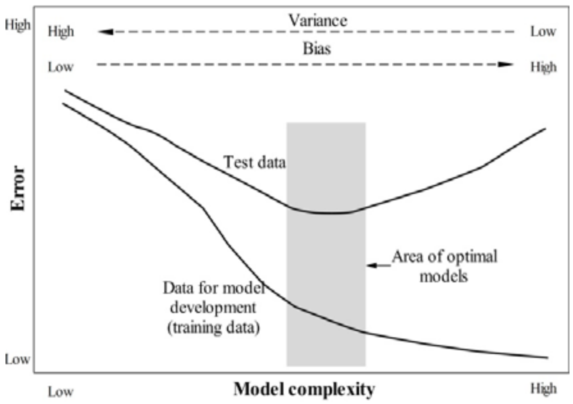

Figure 1. *Bias and variance dilemma*

In ANN modeling, bias-variance dilemma is less well defined since they have many more free parameters. It is closely related to ANN internal architecture (number of hidden neurons) and training (number of training epochs).

A complex ANN model having large number of hidden neurons or trained with excessively large number of epochs has low bias but high variance. On the other hand, a simple ANN model has high bias but low variance.

In both modeling techniques, the goal is to find simplest model that has both bias and variance (the total error) considerably low.

4. MODELING WITH MRA

Regression analysis is a conceptually simple method for investigating functional relationships between variables.

It has four possible uses: data description; prediction; parameter estimation and control [1]. As multiple input variables were used, MRA is applied in this paper. MRA can be generally expressed by the following equation:

$$Y = f\left(X_1,...,X_n;b_0,...,b_p\right)+\varepsilon \qquad (1)$$

where Y is a output variable, $X_1, \ldots, X_n$ are input variables, $b_0,\ldots,b_p$ are regression parameters and ε is a random error.

The starting point in MRA model development is the selection of the input variables (regressors) that will be used for finding the best equation.
Finding an appropriate subset of regressors for the model is called the variable selection problem [1].
In order to find best subset of variables that will represent the final equation, it is inevitable to fit the MRA models with various combinations of candidate regressors.

The best subset of MRA models is usually selected using some of the following criteria: the value of the coefficient of multiple determination R^2; the value of the residual mean square s^2; Mallows' Cp-statistic and Akaike's information criterion.

Computational techniques to generate subset models can be broadly divided into two categories: (1) all possible regressors (full fitted models) and (2) stepwise regression. The latter includes three general techniques: forward selection, backward elimination and Efroymson's stepwise regression [2].

In the present study the following models were developed: full fitted (FF) models, models obtained using forward selection procedure (FSP), models obtained using backward elimination procedure (BEP), models obtained using the stepwise procedure (SP).

Details about the FSP, BEP and SP can be found in [3]. Moreover, the cutting force models were developed by MRA using first and second order with interactions polynomial equations. The unknown parameters in MRA were estimated using the least squares method (LSM). The complete MRA have been carried out with the help of MINITAB 15.

Full fitted models. When developing FF models all regressors are included in equations although some regressors could be statistically insignificant.

Forward selection. The FSP develops a model by including regressors in the model based on the specified p-values of regressors (in our case for 0.05). FSP starts with no regressors in the models and adds regressors to the model one at a time.

The regressor with the highest correlation with the independent variable is added first to the model. Once a regressor is included into the model, it is never removed from the model.

The second regressor that is included in model is one which has the highest correlation with the independent variable after it has been adjusted for the effect of the first regressor.

The procedure is finished when the last regressor entering the model has an insignificant regression coefficient or all the variables are included in the equation.

Backward elimination. The BEP starts with all regressors included in the model. Then the regressors are eliminated one at a time from the model according to a specified p-value of regressors (in our case for 0.05).

For the BEP, once a regressor is eliminated from the model, it is never entered again. The process is finished when all the regressors are significant or all but one regressor has been eliminated.

Stepwise procedure. Stepwise procedure (SP) that develops a model by including regressors in or excluding regressors from the model according to a specified p-values of regressors (in our case for 0.05). Unlike forward selection, a regressor that was included in the model in the earlier stages of selection may be deleted at the later stages. The number of regressors retained in the model is based on the predefined levels of significance for inclusion and exclusion.

Final developed models. Mathematical equations for main cutting force developed using FF, FSP, BEP and SP are given in table 2. At this stage the performance of all proposed models were assessed using the coefficient of multiple determination R^2.

***Table 2**. Equations for main cutting force using FF, FSP, BEP and SP*

Model		Main cutting force	R^2
FF	I order	F_c=-371+319·a+1262·f+6.59·κ+ 1040·a·f-2.75·a·κ-15.2·f·κ	0.8150
	II order	F_c=-451+380·a+1276·f+4.79·κ-18·a^2+108·f^2+0.0151·$κ^2$+1412·a·f-2.82·a·κ-15.8·f·κ	0.8190
FSP	I order	F_c=330.2+132.5·a+422·f-2.74·f·κ	0.7743
	II order	F_c=494.8+32·a^2	0.7153
BEP	I order	F_c=-125.2+322·a+1290·f+6.6·κ-2.7·a·κ-15.3·f·κ	0.8107
	II order	F_c=-125.2+322·a+1290·f+6.6·κ-2.7·a·κ-15.3·f·κ	0.8107
SP	I order	F_c=330.2+132.5·a+422·f-2.74·f·κ	0.7743
	II order	F_c=494.8+32·a^2	0.7153

5. MODELING WITH ANN

5.1. Background of ANN

Artificial neural networks (ANNs) are massive parallel systems made up of numerous simple processing units called neurons that are linked with weighted connections.

By tuning a set of weights in the training process ANN learns the relationship between given inputs and their related outputs. ANNs offer a number of attractive features which make them very popular for modelling complex processes. These include: universal function approximation capability, resistance to noisy or missing data, adaptive nature, accommodation of multiple nonlinear variables for unknown interactions, good generalization capability, etc.

Generally ANNs can be applied to seven categories of problems [4]: pattern classification, clustering, function approximation, prediction, optimisation, retrieval by content and process control. In order to solve numerous tasks a number of ANNs and training algorithms were developed in the past years. There are about 30 different ANN architectures, which are being employed in research at present.

The most used ANNs in machining are: multilayer perceptrons (MLP) also known as multilayer feedforward networks, adaptive resonance theory models (ART), self-organizing maps (SOM), radial basis function network (RBFN), etc.

The most popular ANN for modeling machining processes is MLP. There are a great number of training algorithms which can be used to train MLP such as: back propagation algorithm (BP) and its variations, conjugate gradient algorithms, quasi-Newton algorithms and Levenberg–Marquardt (LM) algorithm. MLP network is a quite powerful tool because with appropriate architecture and training algorithm, the ANN model can be trained to approximate most functions arbitrarily well.

In MLP network all input neurons are in one input layer which receive the inputs from the outside. Similarly, all the output neurons are in output layer which produces the network outputs. The layers lying between the input and the output layers are referred to as hidden layers and the complexity of a network depends on the number of such layers and the number of neurons in each of them.

5.2. Configuring MLP

Configuring MLP usually comprise the decisions about: (1) number of hidden layers, (2) number of hidden neurons in each layer, (3) transfer function in each layer and (4) training algorithm.

Number of hidden layers. The role of the hidden layers is to map complicated input-output relationships between network inputs and outputs.

Until now, no general method for determining the number of hidden layers was proposed. A good praxis should be starting with single hidden layer, and if the number of required neurons is huge, then add additional layers. Reviewing the literature it could be seen that at most two hidden layer are used.

Generally, when talking about of using ANN in metal cutting process modeling and prediction, most authors used only one hidden layer. Guided by our previous experience, we chose single hidden layer MLP.

Number of hidden neurons in each layer. The number of neurons in the hidden layers influences the generalization ability of the network. Adding hidden neurons always results in reduction of the training error, but error decreasing or increasing on test is in direct relationship with actual number of hidden neurons. Namely, to a certain number of hidden neurons the decreasing error would be expect, while after that number the increasing error would be expected which means that the network is over-fitted. It should be underlined that the number of neurons in the hidden layers is data dependent. Hence, in order to ensure that the networks do not over-fit the training data, the relationship between the number of hidden neurons and training data need to be considered. Namely, number of weights should be around or below of the number of training data. The number of weights is equal to the sum of the products between number of neurons in each layer. Required minimum ratio of the number of training data to the number of weights should be 2 and the minimum ratio of the optimum training data size to the number of weights should be 4 [5]. Therefore, for available 50 training data, the upper bound is 6. In searching for best internal architecture it was started with 2 hidden neurons and more neurons were incrementally.

As a guidance for the network selection, the smallest network was selected for both practical and theoretical reasons.

Transfer function. The transfer function, also called the activation function, is a mathematical formula that gives the output of a neuron as a function of its input signals.

The most used activations functions are: sigmoid (logistic or squashing) function, hyperbolic tangent function, sine or cosine function and linear function.

The type of activation function used has a significant impact on generalization ability of the network. The activation function is chosen based on the kind of data used and type of the layer.

For prediction purposes it is common to use a sigmoid or hyperbolic tangent function in both hidden and output layer or sigmoid or hyperbolic tangent function in hidden layer and linear in the output layer. Here, for all developed networks linear transfer function and tangent sigmoid transfer function were used in the output and hidden layer, respectively.

Training algorithm. Two important decisions are related to ANN training: which training algorithm to select and when to stop training i.e. how many training epochs to use. Excessive training results in phenomenon called over-training or memorization. Error on training set can result in near zero while error on test set dramatically increases.

The training algorithm influences to a far greater extent the performance of an ANN rather than the internal architecture itself.

The accuracy of the prediction on test data depends on how the network is trained.

In order to investigate the influence of training algorithm on ANN modeling performance two training algorithms were selected, the resilient BP algorithm and LM algorithm. Additionaly, the automatic Bayesian regularization (BR) in conjunction with LM algorithm was used to improve the generalization of the ANN. The salient advantage of this algorithm is that it implicitly provides a measure of how many network parameters (weights) are effectively used by the network.

This indicates whether a sufficient number of training samples are presented to the network and automatically determines the optimum network size [6].

5.3. ANN models

The MLP network architecture used in this paper is shown in figure 2. As can be seen, three process parameters (depth of cut, feed rate and approaching angle) as ANN inputs are related to main cutting force as ANN output parameter. The ANN models development was performed using MATLAB 2007.

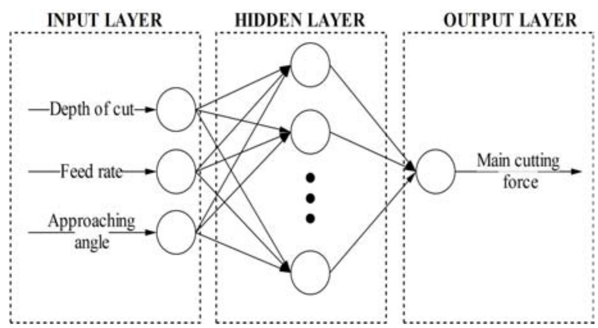

Figure 2. *MLP network for modeling main cutting force*

The complete procedure of ANN model development was conducted. The whole dataset is normalized between -1 and 1. Knowing that training of ANN is also sensitive to values of initial weights, 5 different trials for ANN models architecture were used. The training parameters are sumarized in table 3.

Table 3. *ANN training parameters*

Number of input neurons	3
Number of hidden neurons	varied 2-6
Number of output neurons	1
Training algorithm	resilient BP LM LM with BR
SSE goal	0
Number of epochs	trial and error
Transfer function in hidden layer	hyperbolic tangent function
Transfer function in output layer	linear

5.4. ANN modeling analysis

The analysis of the ANN modeling should be performed by detailed examination of the training and testing behavior of ANN models and by using some performance measures. During the training of the ANN, the weights and biases of the network are adapted in order to minimize the performance function, sum of squared error (SSE).

Ideally, the selection of most suitable ANN model would be based on the criterion which we wish to minimize (prediction, classification, data association error rate, etc.), but there is no principled method for achieving this at the moment. In such situation it remains to minimize the training SSE and at the same time to monitor the error behavior rate on the test set. The more detailed analysis is described bellow.

First observation is that the training process using BP with BR was little sensitive to the initial weights. LM with BR algorithm can be assigned as most stable training, since networks with random initial weights all converged to same results.

Secondly, as expected, with adding hidden neurons the training error was decreased. This is common for all three training algorithms expect that for LM with BR the training error was almost constant.

Given only an error on training set, one cannot with confidence choose best ANN model. For this reasons it is inevitable to monitor the SSE on test data set. Comparing the test results for each ANN and for every trial it could be seen that ANN models behavior in different way. Eventually, in searching for the best smallest ANN architecture, the following models were selected: 3-2-1 for LM, 3-2-1 for resilient BP and 3-4-1 for LM with BR.

6. STATISTICAL COMPARISON OF MRA AND ANN MODELS

The MRA and ANN models are evaluated and compared to determine the best prediction model that provides high accuracy and better results. There are a number of staticical measures for measuring the accuracy of prediction models and each has advantages and limitations.

In this paper the combination of MAD, MAPE and RMSE was used to assess the performance of both MRA and ANN models on training and testing data sets. RMSE is useful because it is expressed in the same units as the dependent variable and thus shows the mean error of the model. RMSE is more sensitive to large errors than MAD due to squaring. MAD is useful as a measure of dispersion when there are occasional large and erratic values. MAPE is a useful measure because it presents errors as a percentage, which is often easier to understand. Also it is useful for comparing relative accuracy of the methods. The comparison of MRA and ANN models on training and testing data is given in table 4.

Table 4 Comparison of MRA and ANN models

Models			**Traing**			**Testing**		
			RMSE	MAD	MAPE	RMSE	MAD	MAPE
MRA	FF	I order	19.903	14.658	2.712	18.525	13.447	2.483
		II order	**19.684**	**13.742**	**2.556**	20.166	14.327	2.652
	FSP	I order	21.976	15.388	2.903	18.161	14.849	2.698
		II order	24.679	17.688	3.345	**16.528**	**12.821**	**2.281**
	BEP	I order	20.524	15.71	2.904	18.331	13.082	2.416
		II order	20.524	15.71	2.904	18.331	13.082	2.416
	SP	I order	21.976	15.388	2.903	18.161	14.849	2.698
		II order	24.679	17.688	3.345	**16.528**	**12.821**	**2.281**
ANN	3-2-1 Resilient BP		22.727	14.364	2.772	15.342	11.738	2.085
	3-2-1 LM		22.854	14.445	2.782	15.258	11.830	2.147
	3-4-1 LM with BR		**16.803**	**11.282**	**2.099**	**13.558**	**10.479**	**1.897**

From the table 4 it is evident that MRA FF II order model showed best results on training set. The smallest error on test set was achieved for second order models developed using FSP and SP. 3-4-1 ANN model trained with LM with BP showed best results on both training and test set. Graphical comparison of selected MRA and ANN model predictions and experimentally measured values is presented in figure 3.

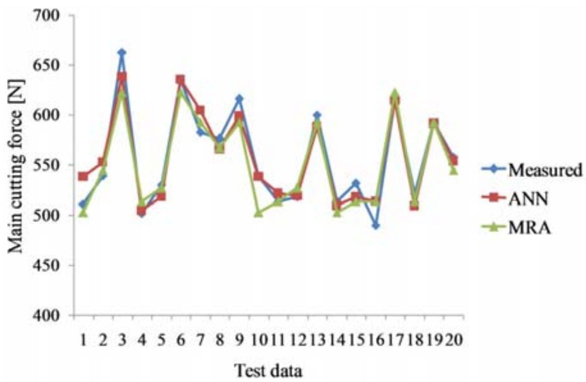

Figure 3. *Comparison of selected model predictions with corresponding experimental values*

CONCLUSIONS

The present work is concerned with development of MRA and ANN models for prediction of main cutting force in turning AISI 1043 steel. Considering modeling issues in both MRA and ANN modeling, various models were developed.

The experimental data of measured main cutting force is used in model development. The MRA models are also compared to the ANN models using RMSE, MAD and MAPE. Eventually, the selected MRA and ANN models were tested with new data and compared with experimental data.

Both MRA and ANN models provided high prediction accuracy, although ANN model yielded better results. ANN modeling is more complex since numerous desicion related to ANN architectural and training parameters had to be made.

However, using BR with LM training algorithm, ANN architecture and training was done in an automated fashion. In such a way, modeling was simplified while model generalization was improved.

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Quick Info

Safety system protects personnel and operations

ABB's latest version of its System 800xA high integrity safety system (SIL 3 rated) is now operating on StatoilHydro's massive Troll A offshore gas production platform. The system will control emergency shut down applications on the platform, located 70 km off the coast of Norway.

The largest gas field on the Norwegian Continental Shelf, Troll represents some 60 per cent of the region's total reserves. The Troll A platform produces about 75 million standard cubic meters (scm) of natural gas per day plus 10,000 barrels per day of natural gas liquid (NGL) condensates. This output supplies approximately 10% of the total natural gas needed by customers in Europe.

System 800xA High Integrity will provide emergency shut down applications, to protect the personnel on the platform, processes and production assets, as well as the environment. At the same time, it is integrated with the platform's ABB automation systems to help Troll A to run at peak efficiency, with minimal interruptions, to safely keep this vital energy supply source in operation.

ABB released its latest generation of the System 800xA High Integrity safety system earlier this year This SIL 3 rated Safety Instrumented System (SIS) provides the highest level of integration of safety and control on the market today, and a unique embedded diverse technology architecture that provides superior protection of the process, plant, personnel, and the environment while it optimizes overall process efficiency.

For more information, visit www.abb.com.

(source: http://www.engineerlive.com)

Variable speed drives promote wind power in urban areas

ABB has helped wind power generation experts quietrevolution ltd to develop an innovative wind turbine that promises to capture wind power in areas never before exploited.

Architects, developers and local councils are already showing strong interest in the company's QR5, a vertical axis wind turbine designed to operate in urban areas, where wind speeds are lower and wind directions change frequently. Its helical design ensures it is robust and able to deal with even turbulent winds. It also eliminates virtually all noise and vibration.

At five metres high and three metres in diameter, the turbine is compact and easy to integrate and with just one moving part, maintenance can be limited to an annual inspection. It is designed for mounting on buildings to generate some of the power load and reduce consumption from the grid.

The wind turbine turns an ABB permanent magnet motor which is linked to an ABB industrial drive acting in regenerative mode to provide the energy conversion and regenerate power back into the grid.

Permanent magnet motors are synchronous machines, designed to drive low speed applications directly, without a gearbox. The motors are designed exclusively for frequency converter supply. ABB industrial drives are available with permanent magnet motor software to integrate with these motors.

The ABB industrial drive offers a number of benefits to the QR5, including the ability to motor to correct speeds to enhance wind turbine efficiencies very quickly, for example, during wind gusts.

Richard Cochrane, quietrevolution's founder and chief technical officer, says: "The sensorless control of the permanent magnet generators is a key benefit to the turbine application because of its simplicity and low cost. The drive allows us to switch seamlessly from regeneration to drawing power, as well as giving accurate speed control. This produces the maximum amount of energy from gusty and turbulent winds which are prevalent in urban environments."

The ABB industrial drives used in the application feature direct torque control (DTC) technology. Says Cochrane: "DTC is crucial in the operation of the turbine as it allows us to effectively vary the rotor speed to optimise performance at any given wind speed."

Meeting the requirements for connection to the grid, the drive also comes as a complete package with everything required for the application already installed on the drive, including an active supply unit, LCL line filter and charging circuitry. Cochrane adds: "Another useful feature of the ABB drive is the simple communications protocols, which are a cost-effective way to control and report on the performance of the system via our web interface."

For more information, visit www.abb.com.

(source: http://www.engineerlive.com)

A FEEDIND, MIXING AND DOSING DEVICE FOR SAWDUST, USED AT PELLETS MILLS

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ABSTRACT: *This article presents some aspects regarding the reduction of the negative impact generated by economical activities in the field of wood processing by realizing some equipments of pressed sawdust and refers mainly at the fuelling, dosage and homogenization mechanism which is a component part of the pellet grinders. The Fuelling, dosage and homogenization mechanism is installed on the pellet manufacture grinder is composed from a dosage device and a fuelling and homogenization device*.

KEY WORDS: pellets, waists, capitalizing, technologies, equipments

1. INTRODUCTION

Our country alignment to the ecological requests imposed by the UE environment standards, and the fulfillment of the assumed obligations by Romania early from the negotiation process in Chapter 22 of the communitarian acquis, demands the total elimination of wastes.

Romania, according to the official data, has a surface of forests of approximately 6.300 thousand ha, representing approx. 27% from the whole country surface. The forestry fund of Romania represents approx. 0,30 ha / inhabitant.

The regulations foreseen in the UE environmental legislation, namely to exploit the wood waste resulting from primary and secondary processing, can meet by placing stationary compacting equipments in the technological flux specific for the economical agents from this field.

The wood pellets are an approximately new fuel which appeared as a response to the new requests for using “clean” and regenerative energy. These represent a cleaner alternative of domestic heating, and as the classic fuel prices are aligned to the European prices, it soon will become in Romania too a cheaper and in the same time a comfortable alternative.

Pellets are produced by pressing the sawdust resulted from the saw mill, from minced wood and in generally from the waste resulted from wood processing. The pellet production in generally does not require any additives or binders due to existence of natural resins in the basic raw material.

2. TECHNOLOGY OF PELLET PROCESSING

The regulations included in EU legislation on environmental ecology on the almost full recovery of wood waste materials require a processing technology for these wastes in order to have an efficient exploit. This technology includes:

- first a manual sorting, during which are removed the unwanted materials, such as: metallic objects, rocks, etc.;
- a mechanical separating operation , during which is selected only the wood waste with an optimum granulation for pelleting;
- an operation of **wood waste pelleting**;
- a packing in plastic bags, boxes, and wood or metallic containers, etc, for handling, storage and efficient transportations.

The packing operation brings to:

a) efficient handling of the pellet bales in the landfill and beyond it;
b) possibility of bales storage vertically;
c) efficient transportation of waste bales to the consumers (a reduction of the transport by 5- 25 for the same quantity of wastes);

d) growing the pellet quality by avoiding the contact with contaminant agents during transportation.

The technological flux for pellet production consists from: chopping and storing of wet sawdust; drying and storing the dried sawdust; pressing the sawdust for pelleting; weighting and packing the pellets.

The technological flux contains the following main assemblies: Hammer mill; Pneumatically transporter; Sawdust drying installation; Snail transporter; Conditioning installation; Module for pellet pressing; Pellet evacuation transporter; Pellet elevator; Vibrating separator; Snail transporter; Pellet elevator; Exhausting unit; Pellet weighting machine; Automated packing machine; Electrical auctioning installation.

In a research project financed from research funds, will be realized a mechanism for fueling, homogenization and dosage of sawdust adapted for pellet manufacturing presses type CMP (California Pellet Mill).

3. DESCRIPTION OF THE FUELING, HOMOGENISATION AND DOSAGE MECHANISM.

The mechanism for fuelling, homogenization and dosage of sawdust adapted for a pellet manufacturing process type CMP (California pellet Mill) presented in picture 1 is composed from a dosage device (picture 1) and a fueling and homogenization device (picture 2).

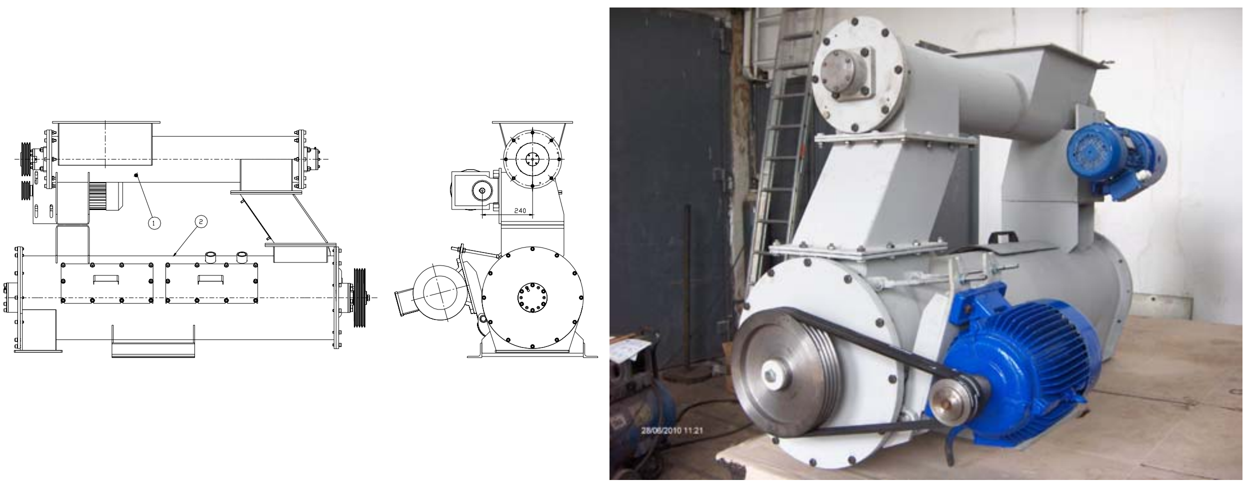

Figure. 1. *Fuelling, homogenization and dosage mechanism*

The dosage device presented in picture 2 is composed from the following main assemblies: snail assembly (position4), snail body (position 2), bearings (position 1 and 3), motto-reducers (position 12), transmission V-belts (position 14).

The dosage device is fitted on the upper side of the pellet press and has the role of assuring a constant flow of sawdust according to the pressing capacity of the press.

The adjustment of the sawdust flow is made by changing the overall driving speed of the motto-reducer of the snail assembly with the help of the frequency converter.

The sawdust enters in the device by a superior trunk and is sent to the fuelling device and mixed by the inferior trunk.

The fuelling and homogenization device presented in picture 3 is composed by the following main components: case (position 1), bearings (position 2 and 3), mixer (position 4), electric engine (position 5), transmission V-belts (position 11).

Fuelling and homogenization device makes the connections between the dosage device and the upper side of the pellet press and has the role of assuring the fueling at a constant flow of the sawdust and its mixture according to the pressing capacity of the press.

Also this device is foreseen with a water spraying installation over the received sawdust received from the dosage device and trained forward with the help of the motion mixer (position 4) which is foreseen with several blades. The aim of spraying a certain quantity of water and mixing the sawdust is to assure a smooth passing trough the mold pressing holes.

The adjustment of the sprayed water flow over the sawdust, passing towards the press, is correlated with the humidity of the sawdust moisture and is controlled with the help of a humidity sensor mounted in the supply circuit of the press.

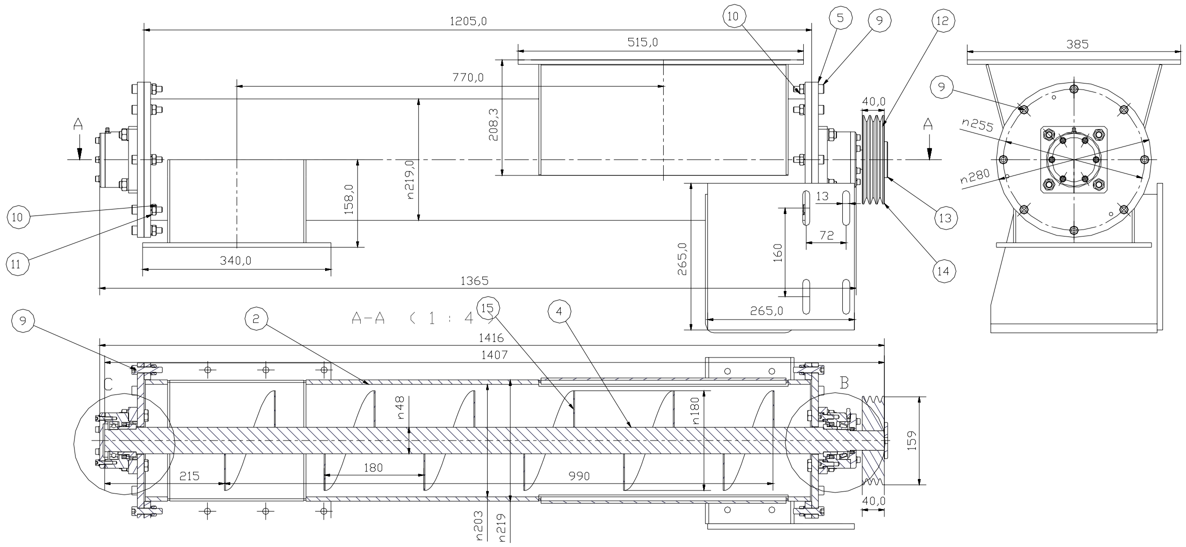

Figure 2. *Dosage Device*

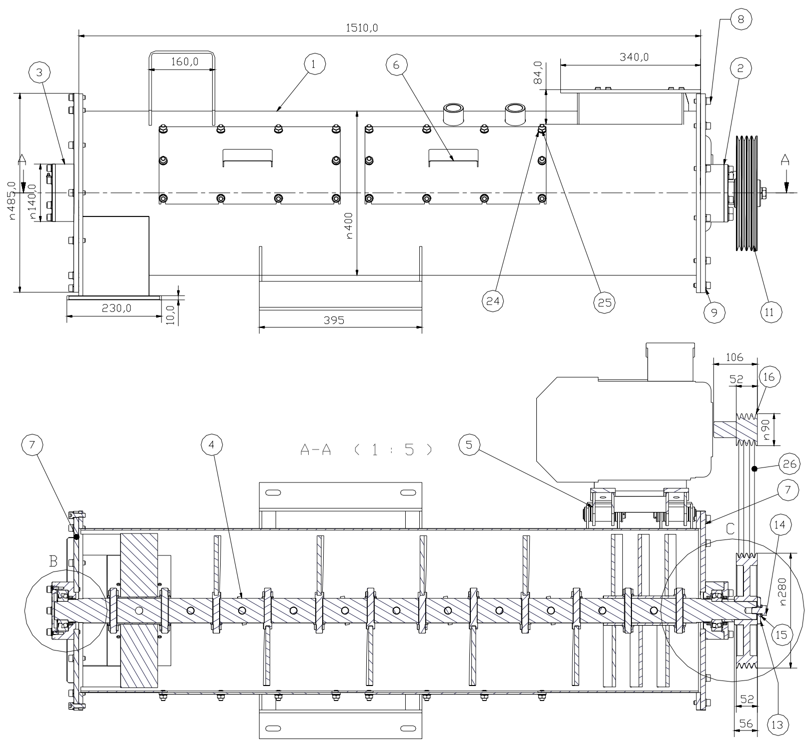

***Figure.3**. Fuelling and homogenization device*

The sawdust enters in the device by the upper trunk and is sent towards the pellet press by the inferior trunk which makes a direct connection to the press.

The fuelling, dosage and homogenization mechanism in the presented variety is realized for the pellet presses type CMP (California pellet mill) with a maximum productivity of 1000 kg/hour.

CONCLUSIONS

The implement of pellet production technologies and the realization in our country of the fuelling, homogenization and dosage mechanism will bring a major contribution to the reduction of environment pollution by capitalizing the sawdust wastes and not in the last the realization of supplementary achievements for the manufacturer of such devices.

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Quick Info

Novel roller bearings offer high load ratings and low friction

Schaeffler is launching a new FAG high-capacity cylindrical roller bearing for wind turbine gearboxes that offers higher load ratings and reduced friction due to a new cage design. The basic static and dynamic load ratings of the new bearings are 6 per cent higher than those of a conventional cylindrical roller bearing with solid brass cage, resulting in a 20 per cent increase in rating life.

These new high-capacity cylindrical roller bearings have a sheet steel cage that enables the design to be more compact than with conventional solid brass cages. This slimmer cage leaves space for at least one additional rolling element in the bearing, which increases the load rating significantly. There are other advantages too.

Due to the new cage, the high-capacity bearing has significantly lower friction than full-complement cylindrical roller bearings with maximum basic load rating. The 'self-retaining' cage also simplifies bearing mounting because the rolling elements are retained even when the ring is removed.

The cage comprises two cage rings lying one inside the other and joined together. The crosspieces of the inner cage guide the roller elements. At the same time, these retain the roller elements in the bearing, even when the bearing ring is removed. This means that the bearing is much easier to mount, as no separate device is required to help prevent the rollers from falling out. In addition, the special geometrical shape of the cage pockets improves lubricant flow, which reduces friction and prevents damage to the bearing..

Schaeffler's new bearings are currently undergoing trials in various customer applications, but the company plans to commence volume production in 2011.

For more information, visit www.schaeffler.co.uk.

(source: http://www.engineerlive.com)

SOLUȚIE ECOLOGICĂ DE RECUPERARE A DEŞEURILOR METALICE REZULTATE ÎN URMA OPERAȚIEI DE ŞTANȚARE

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REZUMAT
Domeniul de analiză al acestei lucrări este acela privind colectarea deşeurilor industriale precum şi valorificarea lor prin reutilizare.La ora actuală reutilizarea deşeurilor se face prin aplicarea celor mai moderne tehnologii. În acest context, lucrarea propune o analiză tehnico-economică privind utilizarea unui tocător de deşeuri.

ABSTRACT
The purpose of analysis for this paper is to collect industrial waste and their recovery through reuse. In present the reuse of industrial waste is realized through the application of modern technologies. In this context, the paper proposes a technical-economic analysis regarding a waste chopper.

CUVINTE CHEIE: Ecologie, Tehnologie, Cost.

KEYWORDS: Ecology, Technology, Cost.

1. GENERALITĂȚI PRIVIND ECOLOGIA DEŞEURILOR

Deşeurile sunt acele materiale rezultate în urma proceselor de producție sau consum, care nu se mai pot folosi, în structura în care sunt, în procesul de producție. Se poate considera că deşeul este orice substanță sau orice obiect din categoriile stabilite de lege pe care deținătorul le valorifică/elimină, are intenția sau obligația de a le valorifica/elimina.

Odată cu dezvoltarea explozivă, mai ales în ultimii 30 de ani, a produselor materiale şi deci a industriilor producătoare au apărut serioase efecte asupra mediului înconjurător, cu implicații negative, pe alocuri catastrofale. Pornind de la această stare, chiar demonstrată, din păcate, de câteva situații concrete (ploi acide, moartea vieţuitoarelor apelor, modificări climaterice), a apărut necesitatea introducerii unor măsuri ecologice mai ales de protejare şi conservare a mediului.

Aceste măsuri se manifestă prin "presiuni" asupra mediului economico-industrial pe mai multe căi: taxe de mediu, bonificații pentru inițiativele de prevenire a poluațiilor, directive şi legi de responsabilizare a producătorilor, constrângerea forțelor de piață în vederea înscrierii, din punct de vedere ecologic, pe o spirală evolutivă.

Astfel, pentru implementarea acestor direcții, s-au înființat multe organizații internaționale (WCED – World Comission on Environment and Development, de pe lângă ONU, EMAS – European Eco-Audit and Management Scheme), naționale (SETAC – Society of Environmentaly Toxicology and Chemistry,USA; ICME – International Council on Metals and the Environment,Canada; UBA – German Federal Environmental Agency), specializate.

Fig.1. *Sistem de reciclare*

Ecologia, definită cu peste 100 de ani în urmă, ca ştiinţa care se ocupă cu studiul interdependenţelor dintre organismele vii şi, mai ales, ale acestora cu mediul înconjurător, s-a dezvoltat puternic în ultimii 15 ani, cu precădere prin cercetări în mediile academice şi institute specializate, rezultând un număr mare de modele şi metodologii ecologice sofisticate, tehnice de evaluare, reguli şi ghiduri de proiectare.

Se remarcă, pornind şi de la faptul că problemele ecologice sunt diferite de la o zonă geografică la alta, uneori chiar şi de la o ţară la alta, că încă niciun model, metodologie sau instrument ecologic nu s-a impus la nivel mondial ca fiind aplicabil pentru orice tip de produs sau proces.

Pornind de la problematicile de mediu generate de produsele moderne, precum şi de tehnologiile aferente, în ultimii zece ani, şi proiectarea produselor s-a adaptat privitor la aspectele de mediu, care urmăresc, pe lângă obiectivul clasic de performanţe ridicate, la costuri reduse, şi ecoeficienţa cuantificabilă prin efecte reduse asupra mediului înconjurător. În ultima decadă, noile tendinţe, mai ales legate de ecologia industrială, se concentrează pe reducerea impactului asupra mediului a bunurilor şi serviciilor, ţinând cont de fluxurile de viaţă ale materialelor, serviciilor şi produselor, în următoarele direcţii: schimbarea climei, managementul gunoaielor, impactul asupra sănătăţii umane, folosirea mediului înconjurător şi urbanizarea (fig. 1).

Ecologia industrială se ocupă cu studiul ciclurilor de viaţă ale produselor şi serviciilor, în relaţie cu o largă varietate de direcţii, incluzând analiza sistemelor de fabricaţie, analiza fluxurilor materialelor, prevenirea poluării, proiectarea ecologică, administrarea produselor, evaluarea tehnologiilor, [1]. Ea oferă perspective pe termen lung, încurajând produsele, tehnologiile şi politicile pentru utilizarea resurselor durabile şi protecţia mediului pentru viitor.

Ingineria ciclului de viaţă a unui produs sau proces are rolul de a optimiza etapele ciclului de viaţă, împreună urmărind să echilibreze câştigurile şi pierderile legate de aspecte energetice, de materiale, de ambalare, chimice, biologice şi de prelucrare a deşeurilor. În acest sens se evidenţiază şapte direcţii de eco-eficienţă: reducerea consumurilor de materiale, reducerea consumurilor energetice, reducerea materialelor toxice, creşterea reciclabilităţii materialelor, dezvoltarea resurselor regenerabile, creşterea durabilităţii produselor şi serviciilor.

În România, protecţia mediului a apărut ca un domeniu de sine stătător al politicilor naţionale în anul 1990, când a fost înfiinţat pentru prima dată fostul *Minister al Mediului*; în 1992 a fost elaborat primul document oficial ce stabileşte obiectivele naţionale în domeniu - "*Strategia Naţională de Protecţia Mediului*", reactualizată în 1996 şi în 2002.

Strategia este structurată în două părţi: o trecere în revistă a principalelor resurse naturale, elemente privind starea economică şi calitatea factorilor de mediu, şi strategia propriu-zisă, adică principiile generale de protecţie a mediului, priorităţile, obiectivele pe termen scurt, mediu şi lung. Încă din 1996 se poate observa o adecvare a strategiei naţionale cu cea comunitară în ceea ce priveşte principiile, priorităţile şi obiectivele.

2. PREZENTAREA SOLUŢIEI TEHNICE

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Prelucrarea prin deformare la rece a materialelor metalice este metoda de prelucrare prin tăiere, deformare sau combinaţii ale acestora, fără îndepărtare de aşchii şi fără încălzirea prealabilă a materialelor. Sculele cu ajutorul cărora se execută prelucrarea se numesc ştanţe, atunci când se realizează tăierea materialului, respectiv matriţe, când se execută deformarea sau combinaţii de tăiere şi deformare a materialului, [2].

Materialele utilizate la prelucrarea prin deformare la rece sunt table, benzi, bare, sârme şi alte profile laminate executate din metale feroase sau neferoase.

Utilajele folosite sunt presele şi diferite maşini automate speciale sau specializate pentru anumite prelucrări prin deformare la rece.

Datorită acestor particularităţi ale prelucrării prin deformare la rece această metodă de fabricare a pieselor mai este denumită şi *presarea la rece* sau *ştanţarea şi matriţarea la rece.*

Caracteristicile principale ale procedeelor şi proceselor tehnologice de presare la rece sunt strâns legate de volumul de producţie, acest caracter constituind o problemă tehnico-economică deosebită. Procesele tehnologice care sunt avantajoase în producţia de serie mare şi de masă nu sunt avantajoase producţiei de serie mică şi invers. Majoritatea materialelor metalice care se prelucrează prin deformare la rece, ca de altfel şi la cald, fac parte din grupa materialelor plastico-vâscoase, adică sunt materiale cu însuşiri comune atât materialelor plastice cât şi celor vâscoase.

Deformabilitatea materialelor metalice, respectiv plasticitatea şi rezistenţa lor la deformare variază în funcţie de anumiţi factori de material sau condiţii de deformare.

Prin plasticitatea materialelor metalice se înţelege capacitatea acestora de a se deforma plastic, adică de a-şi schimba forma şi dimensiunile iniţiale sub acţiunea unor forţe exterioare, fără a-şi distruge integritatea structurală.

Factorii care depind de materialul prelucrat şi care influenţează plasticitatea sunt compoziţia chimică şi structurală, iar factorii care depind de condiţiile de deformare sunt: temperatura de deformare, viteza de deformare, gradul de deformare, starea de tensiune aplicată şi starea de deformare rezultată.

Compoziţia chimică influenţează puternic plasticitatea, metalele pure fiind mai plastice (dar practic inutilizabile în construcţia de maşini) decât aliajele lor. Compoziţia chimică a aliajelor influenţează plasticitatea lor, atât prin natura şi repartiţia elementelor de aliere în masa metalului de bază, cât şi prin transformările de bază pe care le produce.

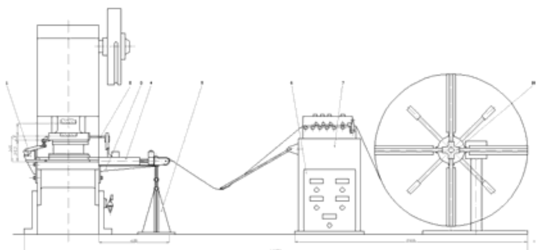

Fig.2. *Schiţa tocătorului de deşeuri*

Tocătorul de deşeuri (fig. 2) este compus din corpul tocătorului, în construcţie sudată având posibilitatea aşezării pe masa presei şi a fixării cu şuruburi de batiul presei. Pentru reglajul înălţimii dispozitivului găurile de fixare pe batiu sunt alungite, [4], [5].

Corpul tocătorului este prevăzut cu doi montanţi între care culisează bacul mobil, şi două urechi cu un alezaj unde se articulează pârghia de apăsare a bacului mobil.

Pe berbecul presei este montat cu ajutorul şuruburilor un suport rigid în care este montat tamponul reglabil pe înălţime şi asigurat cu contrapiuliţă. Între urechile corpului tocătorului se articulează prin intermediul unui bolţ şi a unei bucşe pârghia braţului prevăzut cu două plăci de presiune; o placă de presiune pentru contactul cu tamponul şi o alta la contactul cu rola bacului mobil. Sub acţiunea braţului, bacul mobil format din culisorul pe care este montat cuţitul superior coboară tensionând arcurile.

Pe corpul tocătorului este montat suportul cuţitului fix prin intermediul şuruburilor şi ştifturilor. Reglajul jocului între cele două cuţite se realizează cu ajutorul unor adaosuri.

La comanda operatorului care acţionează butoanele presei (sau prin comandă automată) berbecul presei coboară şi are loc operaţiunea de deformare plastică la rece concomitent cu segmentarea deşeurilor care se realizează astfel: tamponul acţionează asupra braţului prin intermediul plăcii de presiune (realizată dintr-un material călit), acesta din urmă fiind articulat la celălalt capăt acţionează asupra bacului mobil pe care este montat cuţitul mobil prin intermediul bolţului şi a rolei, obligându-l să coboare până la forfecarea deşeului care are loc datorită cuţitului fix montat împreună cu suportul său pe corpul tocătorului. Segmentul de deşeu detaşat cade pe jgheabul fixat de asemenea pe corpul tocătorului într-un container pentru deşeuri. La ridicarea berbecului presei de la PMI la PMS arcurile se destind aducând bacul mobil în poziţia iniţială. Realizarea ajustajului dorit între culisor şi montanţi se face cu ajutorul şuruburilor de reglaj şi a contrapiuliţelor. Pentru ungerea suprafeţelor mobile au fost folosite ungătoare cu bile.

3. ANALIZA COSTURILOR ŞI A EFICIENŢEI ECONOMICE

O gândire economică presupune ca atât producătorii cât şi consumatorii să aibă în vedere costurile şanselor, deoarece în adoptarea unor decizii sunt confruntaţi cu alternative din care trebuie să aleagă, având la bază raţionamentul economic, comparând costurile şi beneficiile anticipate rezultate în urma diverselor alternative, [3].

Costul de producţie constituie un indicator economic cu o largă sferă de utilizare, calcularea lui având loc la nivelul tuturor unităţilor economice (tabelul 1). Autonomia economică şi financiară a agenţilor economici impune printre altele o activitate riguroasă de măsurare şi cunoaştere a costurilor.

Costul serveşte drept criteriu de fundamentare a opţiunilor şi deciziilor fiecărui producător. În cazul în care efectele sau rezultatele variantelor de proiect sunt identice, criteriul de alegere a variantei optime îl constituie nivelul cel mai scăzut al costurilor.

Cunoaşterea conţinutului costului de producţie necesită luarea în considerare a relaţiei dintre costuri şi preţul de vânzare, în sensul că întotdeauna costul de producţie reprezintă numai o parte a preţului de vânzare şi anume acea parte care înseamnă cheltuială suportată de către producător.

Pentru orice produs, în condiţiile existenţei unei anumite marje de profit, mărimea costului exercită presiune asupra preţului de vânzare:

$$P_v = C_{proprii} + P_f$$

Tabelul 1. Deviz postcalcul (general):

Nr. Crt	Tip cheltuieli	Lei	Euro
I	**Cheltuieli directe – total**	**21876, 72**	**5087,6**
1	Cheltuieli de personal	6521,89	1516,71
1	Cheltuieli salariale	7283	1693,72
1.a	Cheltuieli cu salariile (Cs)	52621,88	12237,64
1.b	Contribuţii (29,547% * Cs)	1661,09	522,69
a	CAS (19,5% * Cs)	1096,27	386,3
b	Şomaj (2% * Cs)	110,43	25,68
C	CASS (6% * Cs)	337,31	78,44
d	Fond pentru accidente de muncă (0,947% * Cs)	53,24	12,38

Nr. Crt	Tip cheltuieli	Lei	Euro
e	Cota de contribuții pentru concedii și indemnizații (0,85% * Cs)	44,8	10,41
1.c	Alte cheltuieli de personal	900	209,3
a	Diurnă (2 zile)	26	6,04
b	Cazare	0	0
2	Cheltuieli materiale și servicii	15355,43	3571,03
2.a	Cheltuieli materiale	15355,43	3571,03
a.	Materii prime	1000	232,55
b.	Materiale consumabile	1000	232,55
c.	Combustibili	0	0
d.	Piese de schimb	882,63	205,26
3.	Alte cheltuieli specifice proiectului	0	0
II.	**Cheltuieli indirecte – total**	**6521,256**	**1516,57**
1.	Regie	6521,256	1516,57
1.a.	Regie generală	2869,35	667,29
1.b.	Regie de secție	3651,9	849,27
III	**Dotări independente**	**1080**	**251,16**
1.	Mobilier	1080	251,16
2.	Închiriere camion	0	0
	Total tarif (valoare contract) +I+II+III	29478,2	6855,39

$P = C_{pp} + P_r + C_v + C_r$
Unde:
P – preț de vânzare fără TVA
C_{pp} – costul propriu al produsului
P_r – profit
C_v – costuri de vânzări
C_r – costuri de reprezentanță
$C_{pp} = 6855,39$ Euro
$P_r = 10\% * C_{pp} = 685,53$ Euro
$C_v = 5\% * C_{pp} = 342,76$ Euro
$C_r = 5\% * C_{pp} = 342,76$ Euro
$P = 6855,39 + 685,53 + 342,76 + 342,76 = 8226,44$ Euro
$P_{TVA} = 9789,46$ Euro

În urma analizei de costuri a rezultat că pentru realizarea sistemului de prelucrare a tablelor prin deformare plastică la rece prețul componentelor sistemului este P=4831,8 Euro, cheltuielile cu salariile (C_s) sunt de 1769 Euro, iar prețul de vânzare al produsului fără TVA este de 8226,44 Euro.

4. CONCLUZII

În cadrul lucrării prezentate au fost urmărite majoritatea aspectelor ce țin seama de o imagine completă a procedeelor de prelucrare prin deformare la rece și respectiv analiza economică a tocătorului de deșeuri.

Prin elaborarea acestei lucrări am putut concluziona următoarele:

- produsele tehnologice de prelucrare la rece a metalelor sunt generatoare de resturi de prelucrare (deșeuri) care la rândul lor se pot constitui în surse de materii pentru prelucrare în vederea refolosirii;
- multitudinea deșeurilor rezultate în urma activității umane a dus la apariția de noi domenii de activitate, la apariția și definiția ecologiei ca știință de foarte mare însemnătate în dezvoltarea viitoare a societății umane;
- prin realizarea tocătorului s-a rezolvat problema deșeurilor provenite din industria prelucrătoare. Pornind de la problematicile de mediu generate de produsele moderne, precum și de tehnologiile aferente, în ultimii zece ani, și proiectarea produselor s-a adaptat privitor la aspectele de mediu, care urmăresc, pe lângă obiectivul clasic de performanțe ridicate, la costuri reduse, și ecoeficiența cuantificabilă prin efecte reduse asupra mediului înconjurător.

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ÉTUDE PARAMETRIQUE D'UN PALIER A RAINURES EN CHEVRONS

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ABSTRACT
Les paliers à rainures, plus particulièrement à rainures en chevron, présente l'intérêt d'avoir un faible débit axial et aussi un bon comportement statique et dynamique à faible excentricité. Nous avons déterminé la charge portante ainsi que les caractéristiques statiques d'un palier avec des paramètres fixes et aussi des paramètres qui varient. Dans l'article on va présenter la modélisation et l'analyse numérique pour un cas générique ; la méthode utilisée est la méthode des éléments finis.

MOTS-CLÉS: Paliers a rainures, chevron, simulation numérique, pression

1. INTRODUCTION

Les paliers à chevrons sont des paliers d'un type particulier car sur l'une des deux parois, des rainures ont été usinées. Ces car rainures ont une forme hélicoïdale, elles partent des deux extrémités et se rencontrent généralement au milieu du palier.

Les études qui traitent ce genre de paliers ne sont pas nombreuses, et leur analyse se déduit de celle des paliers à rainures de forme quelconque (figure 1).

Les paliers à rainures, plus particulièrement à rainures en chevron, présente l'intérêt aux moins de quelques points de vue :

- d'une part d'avoir un bon comportement dynamique à faible excentricité
- d'autre part, de présenter un faible débit axial

C'est pour ces raisons que leur utilisation est recherchée dans les mécanismes qui nécessitent soit une grande stabilité. Un exemple est représente par les disques d'ordinateurs, mai aussi les cas des débits de fuites réduits.

Dans l'article on va présenter la modélisation et l'analyse numérique pour un cas générique ; la méthode utilisée est la méthode des éléments finis.

Pour l'étude présentée on va utiliser le modèle du palier a double chevrons, palier découverte pendand les années 80 de Kawabata, Kamaya, Miyake [1].

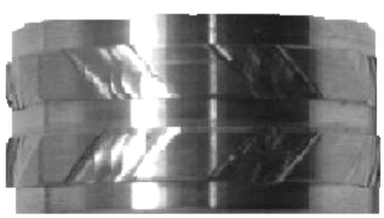

Fig. 1. *Paliers à chevrons*

Ce palier est muni d'une double rainure en chevrons, figure 1, permettant un fonctionnement du palier dans les deux sens de rotation.

Dans la partie suivante, on donnera les détails sur cette méthode ainsi que sur les différentes méthodes semi analytiques et numériques utilisées, [2].

2. LE MODEL PHYSIQUE ET MATHEMATIQUE DU COMPORTEMENT

L'équation de Reynolds qui permet de déterminer le champ de pression dans le film doit être vérifié pour les zones actives (zones sous pression) et pour les zones inactives (zones en cavitation) [4].

Dans ce dernier cas, la pression régnant dans la zone inactive est constante et égale à la pression de vapeur saturante Pcav.

C'est dans les zones actives que la pression hydrodynamique s'établit et que l'équilibre avec la charge appliquée se réalise. Dans les zones inactives, il y aura la conservation du débit massique.

Nous avons donc [2],[3]:

$$A\left\{\frac{\partial}{\partial x}\left(K'\frac{\partial D}{\partial x}\right)+\frac{\partial}{\partial z}\left(K'\frac{\partial D}{\partial z}\right)\right\}-U\frac{\partial F'}{\partial x}+\frac{\partial h}{\partial t}+ \\ +(A-1)\left(\frac{1}{2}U\frac{\partial D}{\partial x}-\frac{\partial D}{\partial z}\right)=0 \tag{1}$$

et, avec la consideration dessus, pour les zones actives on aura:

$$\begin{cases} D=P \\ A=1 \end{cases} \tag{2}$$

Dans cette équation *F'* et *K'* sont deux termes qui dépendent de la viscosité du fluide, h est l'épaisseur du film au point considéré.

Donc en considérant la pression de cavitation comme pression de référence, on aura $D \geq 0$ dans les zones actives. Pour les zones inactives on aura :

$$\begin{cases} D=r-h \\ A=0 \end{cases} \tag{3}$$

où *r* est le coefficient de remplissage donné par:

$$r=\frac{\rho_{am}h}{\rho_{fluid}} \tag{4}$$

ou ρam c'est la masse volumique de mélange et ρfluide c'est la masse volumique du fluide

Comme la masse volumique ρam est toujours inférieure à ρ fluide dans les zones inactives, la variable universelle *D* sera donc négative.

Pour tout point du film, la compatibilité devra être vérifiée entre le signe de *D* et l'état supposé actif ou inactif du film en ce point.

La détermination du champ de pression dans le film implique la connaissance de la pression aux frontières du domaine de résolution. Les conditions aux limites, utilisées pour résoudre l'équation de Reynolds généralisée modifiée, sont basées sur la séparation des zones actives et inactives.

Soit le domaine d'étude défini sur la figure ci dessous. Il comprend une zone active Ω et inactive Ω_0, séparées par une frontière $\partial\Omega$. Pour une même ordonnée y, on aura un point de rupture situé à xr et un autre de reformation situé à xf.

Les conditions aux limites que doit satisfaire l'équation de Reynolds généralisée modifiée sont :

(a) sur les frontières extérieures (*y=0* et *y = L)* : *p = p0* donc *D = p0* où *p0* représente la pression extérieure ambiante,

(b) sur les frontières *x = 0* et *x = B* : *Dx=0 = Dx=B* (continuité de la fonction D),

(c) sur la frontière de rupture ou de cavitation Ω^-

p = pcav ; $\left.\frac{\partial P}{\partial h}\right|^{-}_{(x,y)=(x_r,y_r)}=0$

(d) sur la frontière de rupture ou de cavitation Ω^+, on aura p = pcav .

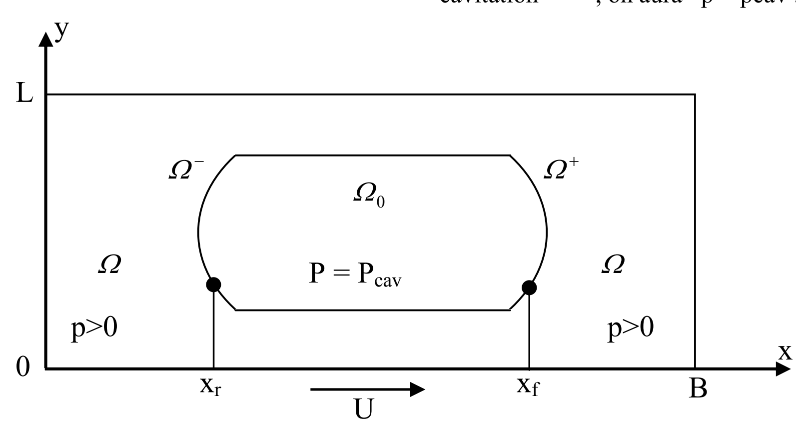

***Fig. 2.** Domaine d'étude : Ω zone active et Ω_0 zone inactive*

3. INFLUENCE D'UN PARAMETRE SUR LA VALEUR MAXIMALE DE LA PRESSION

Les paliers à rainures en chevron sont étudiés dans cet article tout d'abord par une par une modélisation numérique. Une analyse bi et tridimensionnelle du mouvement du film fluide est effectuée. Celle-ci est résolue numériquement par la méthode des éléments finis. L'étude du comportement dynamique des paliers à chevrons permet de déterminer les valeurs la pression.

Les paramètres qui on utilisé dans ce chapitre sont :

(a) paramètres fixes:

le rapport de la longueur totale du palier sur le rayon du palier, *L/D=0.4*

- la viscosité (η=0.055 Pas)
- la vitesse de rotation (ω=25000 rot/min) ;

(b) aussi on a ete introduit des paramètres qui varient:

- l'angle d'inclinaison
- les nombres des chevrons (6,8,10)
- le jeu radial (0,1-0,5).

Les figures suivantes montrent la valeur maximale de la pression en fonction de l'angle d'inclinaison des rainures et pour différents jeux radiaux.

Il est à noter que pour un angle de 90° on retrouve la configuration géométrique d'un patin de Rayleigh. Nous avons de plus fait varier le nombre de chevrons : Fig.3 pour 6 chevrons, Fig.4 – 8 chevrons, Fig.5 – 10 chevrons.

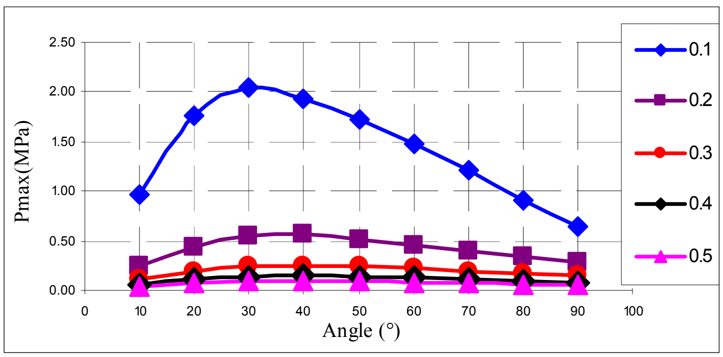

Fig. 3. *Variation de P_{max} en fonction de l'angle pour 6chevorns avec hg=c=0,1 a 0,5mm*

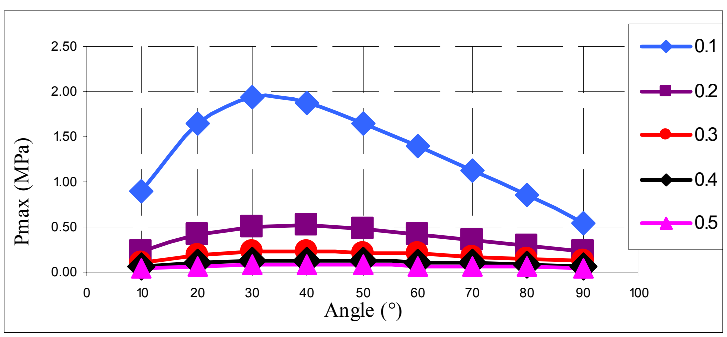

Fig. 4. *Variation de P_{max} en fonction de l'angle pour 8chevorns avec hg=c=0,1 a 0,5mm*

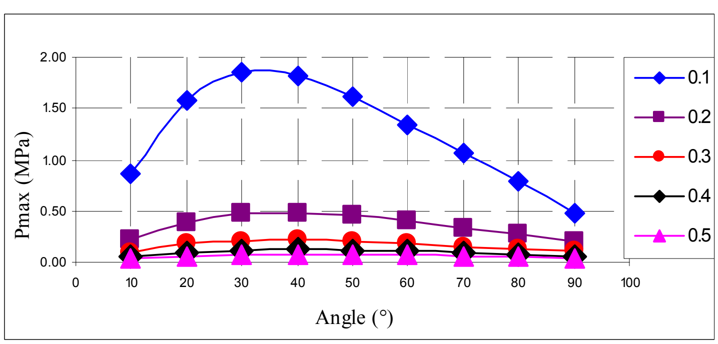

Fig. 5. *Variation de P_{max} en fonction de l'angle pour 10 chevorns avec hg=c=0,1 a 0,5mm*

On peut observer quelque soit le nombre de chevrons sur le palier on constate que l'on a sensiblement toujours la même forme des répartitions des pressions maximales.

Une remarque que l'on peut faire c'est que le nombre de chevrons n'influence pas la forme générale de la pression maximale pour un jeu radial donné et un angle donné (Figure 5.)

On peut cependant noter que la valeur maximale est obtenue pour un angle d'inclinaison d'environs 30° et pour un jeu radial de 0,1mm ; on note aussi que celui-ci se situe plus proche des 40° pour un jeu radial de 0,5mm.

D'autre part la valeur de la pression maximale semble être peu influencée par le nombre de chevrons, au moins pour le nombre de chevrons prisent en compte (Figures 3 - 5).

De même manière on a continue l'analyse numérique pour le model 3D. On a utilise le code d'éléments finis developee au Laboratoire Mécanique du Solide de L'Université de Poitiers. Dans la Fig.6 on a été représenté les résultats de l'analyse pour un palier pour 6 chevrons avec un angle d'inclinaison égale à 40° et un jeu radial de 0,1 et 0,5.

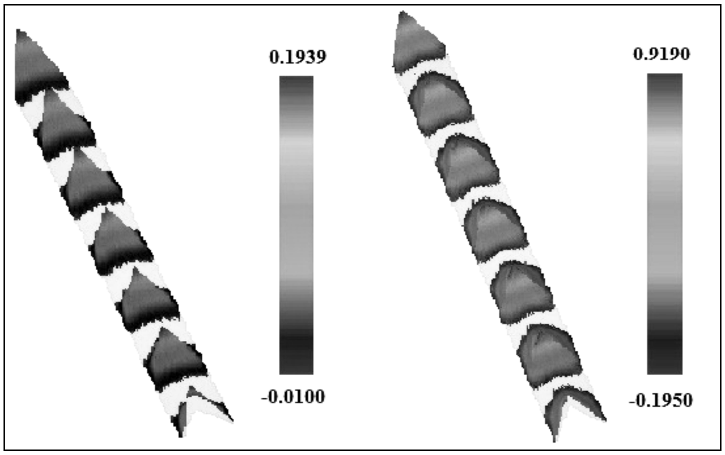

Fig. 6. *Variation de champ de pression pour un palier pour 6 chevrons avec un angle d'inclinaison égale à 40° et un jeu radial de 0,1 et 0,5*

CONCLUSIONS

Dans cette étude, l'originalité réside dans le fait qu'on a été étudie un sort spécifique de palier, palier à rainures en chevron et d'utiliser une analyse numérique bidimensionnelle et 3D avec un code d'éléments finis.

Nous avons déterminé la charge portante ainsi que les caractéristiques statiques d'un palier avec des paramètres fixes et aussi des paramètres qui varient

Dans touts les cas étudie on a conclue que la valeur maximale de la pression est obtenue pour un angle d'inclinaison d'environs 300-400 pour un jeu radial qui a été varie de 0,1 a 0,5.

Finalement l'étude paramétrique des caractéristiques statiques et dynamiques en fonction de la géométrie des rainures fournit aux ingénieurs un nouvel outil de conception des paliers à rainures en chevron.

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APLICAŢII ALE FMEA ÎN MENTENANŢĂ PREVENTIVĂ A MAŞINILOR ŞI ECHIPAMENTELOR

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REZUMAT
Mentenanţa preventivă reprezintă mentenanţa planificată a unui echipament/maşină, efectuată în vederea îmbunătăţirii timpului de operare al acestuia/acesteia şi pentru diminuarea sau evitarea activităţilor de întreţinere neplanificate. Scopul aplicării acestei forme de mentenanţă preventivă este de a reduce frecvenţa de apariţie a defectelor şi uzura excesivă a echipamentului analizat. Aplicarea Failure Mode and Effect Analyse (FMEA) pentru maşini şi echipamente industriale, inclusiv pentru unele scule şi dispozitive de lucru, ajută la identificarea modurilor potenţiale de defectare ale acestora încă din faza de proiectare şi în consecinţă identificarea soluţiilor sau a acţiunilor care trebuie întreprinse. Astfel, se evită oprirea lor neplanificată sau se asigură ca intervenţia corectivă în caz de defectare să fie cât mai scurtă. În lucrare sunt prezentate câteva tipuri FMEA şi aplicabilitatea acestora, precum şi un studiu de caz privind folosirea FMEA în planificarea mentenanţei preventive a unei linii de asamblare componente auto, care lucrează în sistem Just in Time (JIT) cu scopul asigurării funcţionarii acesteia fără întreruperi neplanificate.

ABSTRACT
Preventive maintenance is the planned maintenance of an equipment/machine, performed to improve their uptime and to avoid the unplanned repairing activities. The purpose of preventive maintenance is to reduce the occurence of defects and the excessive worn of the machine/equipment. Using the FMEA for machines and industrial equipments, including tools and dies, helps to identify their potential failure mode in early design stages and as consquence, identification of the actions to be tacken to avoid unplanned breackdowns or their reparing time to be as short as possible. In the article, is presented various types of FMEA and their benefits and a case study of applying FMEA in planning of preventive maintenance of an assembly line of automotive components, working Just in Time, in order to assure its flawless functionality.

KEYWORDS: reliability, machine, equipment, failure mode, FMEA

CUVINTE CHEIE: fiabilitate, maşină, echipament, mod de defectare, FMEA

1. INTRODUCERE

FMEA reprezintă prescurtarea din limba engleză a „Failure Mode and Efect Analysis”, care în limba română se traduce prin „Analiza Modurilor de Defectare şi a Efectelor Criticităţii” acestora, pe scurt AMDEC. FMEA poate fi aplicată atât produselor aflate în faza de proiectare ce urmează a fi fabricate, cât şi produselor aflate în fabricaţie de serie. Metodologia de elaborare a FMEA este descrisă în Manualul editat de Automotive Industry Action Group (AIAG) precum şi în Manualul editat de Ford Motor Company (FMC), [1, 2] Conform acestora, FMEA se defineşte ca un grup sistematic de activităţi prin care:

- se recunoaşte şi se evaluează modul potenţial de defectare a unui produs/proces şi efectele criticităţii acestora;
- se identifică acţiunile care ar putea să elimine sau să reducă probabilitatea de apariţie a defectărilor;
- se documentează procesul, [1, 2].

FMEA este specifică atât procesului de proiectare a produsului, cât şi procesului de fabricaţie al acestuia.

În funcţie de destinaţie sunt cunoscute mai multe metode de analiză a modurilor de defectare ale unui produs, şi anume: FMEA pentru proiectare produs (DFMEA), FMEA pentru procesul de fabricaţie (PFMEA). De asemenea, s-au dezvoltat: Concept FMEA, pentru proiecte şi procese şi Machinery FMEA ca o aplicaţie a DFMEA pentru maşini şi echipamente.

În funcţie de scopul propus, pot exista şi alte tipuri de FMEA, toate având în vedere identificarea modurilor potenţiale de defectare ale entităţii studiate înainte de faza de fabricaţie a acesteia.

Beneficiile aplicării FMEA constau în: planificarea activităţilor de prevenire a apariţiei unui defect potential, identificarea cerinţelor de modificare ale produsului/procesului, reducerea pierderilor de fabricaţie datorată opririi echipamentelor, reducerea costurilor de exploatare ale unui echipament, inclusiv a celor pentru reparaţii în garanţie, reducerea costurilor cu non-valoarea generată de un proces de proiectare/fabricaţie, [10].

2. REGULI GENERALE PENTRU ELABORAREA DFMEA ŞI PFMEA

DFMEA se aplică la analiza unui produs înainte ca documentaţia de execuţie şi de asamblare ale acestuia să fie transmise pentru fabricaţie. Astfel, se asigură focalizarea activităţii echipei de proiectare pe modurile potenţiale de defectare ale produsului cauzate de procesul de proiectare.

PFMEA se aplică la analiza proceselor de fabricaţie şi se concentrează pe modurile potenţiale de defectare ale produsului cauzate de procesul de fabricaţie al acestuia, [3].

FMEA, în general, se construieşte pe baza unui algoritm care poate fi sintetizat în următoarele activităţi, [1]:

- identificarea funcţiilor sistemului/componentei sau a procesului;
- identificarea modului potenţial de defectare şi a efectelor potenţiale ale acestuia pentru componentă/proces;
- determinarea *severităţii* efectului generat de defectul potenţial;
- cauzele potenţiale ale defectului;
- probabilitatea de *apariţie* a defectului;
- controlul procesului de proiectare (DFMEA) sau de fabricaţie (PFMEA) în scopul prevenirii apariţiei defectelor,
- *detecţia* este asociată celui mai bun control al procesului de proiectare sau fabricaţie efectuat în scopul identificării defectelor;
- determinarea valorii de prioritizare a riscului de apariţie a defectului potenţial, numărul priorităţii de risc (RPN)- definit ca produsul *severităţii* defectului, probabilităţii de *apariţie* a acestuia şi al ratei de *detecţie* de către proces a defectului, ierarhizarea defectetor potentiale şi a consecinţelor acestora;
- stabilirea acţiunilor ce trebuie întreprinse pentru eliminarea defectului şi a consecinţelor acestuia, pentru reducerea probabilităţii de apariţie a defectului sau pentru creşterea abilităţii procesului de proiectare/fabricaţie;
- reevaluarea impactului defectului după aplicarea măsurilor de la etapa precedentă prin reevaluarea RPN, [1].

3. FMEA PENTRU MAŞINI ŞI ECHIPAMENTE

3.1. Domeniu de aplicare

FMEA pentru maşini şi echipamente este o metodologie de analiză standardizată pentru evaluarea în faza de proiectare a maşinilor, echipamentelor, a dispozitivelor şi sculelor de lucru în vederea îmbunătăţirii fiabilităţii acestora şi a siguranţei de lucru a operatorilor, [2, 10].

Astfel, aplicarea FMEA pentru maşini şi echipamente este utilă în procesul de proiectare al acestora în scopul reducerii riscurilor de defectare ulterioare, între altele, prin:

- evaluarea specificaţiilor unui echipament, a cerinţelor de proiectare şi a studiilor de proiectare alternative;
- creşterea probabilităţii ca un mod potenţial de defectare asupra maşinii să fi fost luat în considerare în procesul de proiectare şi, sau dezvoltare;
- furnizarea de informaţii suplimentare pentru planificarea unui program complet şi eficient de proiectare, dezvoltare, validări şi încercări;
- întocmirea unei liste cu modurile potenţiale de defectare ierarhizate în raport cu efectul lor la client, stabilind astfel priorităţile pentru îmbunătăţirea proiectului, [2].

O maşină, un echipament sau un sistem, oricare ar fi acestea, trebuie să funcţioneze în condiţii, specificate. Condiţiile respective pot include parametrii de mediu, caracteristici tehnice (ex: temperatură de funcţionare, capabilităţi, timp de ciclu, media timpului între două defectări-MTBF, media timpului până la reparare-MTTR etc.), [9].

Efectele defectelor potenţiale reprezintă consecinţe ale modurilor de defectare ale maşinii/echipamentului exprimate în termeni de securitate şi de pierderi.

În industrie, în general, şi în industria auto în particular, sunt cunoscute şi luate în considerare şapte activităţi importante generatoare de pierderi: defectări ale maşinii/echipamentului, reglări şi ajustări, funcționarea în gol şi opriri minore, cicluri de fabricație reduse, pierderi la pornire datorate reglajului inițial, componente defecte, pierderi datorate uzării sau ruperii unor scule, [2, 5].

FMEA pentru maşini şi echipamente trebuie să ia în considerare limitele fizice ale produsului, ale procesului de producție, de montaj, de reciclare şi de întreținere, cum ar fi: aptitudinea acestora de a fi eficiente în funcționare, de a fi demontabile, de a fi întreținute uşor, reciclabile, nepoluante, [4].

3.2. Aplicarea FMEA în mentenanța preventivă. Studiu de caz

3.2.1. Descrierea echipamentului

Echipamentul din studiul de caz este o linie de asamblare componente auto a unei companii, specializată în fabricația de ansambluri, de complexitate medie sau mare, care lucrează în sistem de producție JIT. Sistemul JIT este o strategie de logistică şi fabricație care se bazează pe cerințe, precum: reducerea pierderilor, simplificarea proceselor interne, reducerea dimesiunii stocurilor şi reducerea timpilor de reglare a proceselor şi lucrul în procese paralele. Un astfel de sistem de fabricație este specific companiilor care lucrează în medii dinamice şi concurențiale, în care eficiența şi eficacitatea sunt permanent îmbunătățite, [7].

În acest context, funcționarea echipamentelor de fabricație şi a celor care deservesc activitatea logistică a companiei trebuie sa funcționeze conform cu cerințele menționate şi fără opriri accidentale. Activitățile de prevenire a apariței defectelor devin astfel foarte importante şi solicită specializarea la nivele înalte a personalului de mentenanță. Plecând de la premisa că este mai uşor să previi decât să tratezi, personalul de mentenanță a dezvoltat o metodă eficientă de identificare a modurilor potențiale de defectare a liniei de asamblare a componentelor, [8]. Studiul de caz are în vedere structura, configurația, caracteristicile funcționale ale liniei de asamblare, istoricul defectelor şi resursele de care dispune compania pentru a aplica măsuri de prevenire a apariției defectectelor.

Linia de asamblare a componentelor produsului este constituită din patru subsisteme (a se vedea figura 1):

- Elevator (L_f) - are rolul de a ridica, respectiv de a coborâ paletele atunci când acestea ajung la capătul liniei;
- Segmente ale transportorului de palete (S_t)- cu dispozitive adecvate şi conectate la transportorul cu mişcare liniară intermitentă şi care asigură deplasarea paletelor între posturile de lucru (*PL*), deservite de operatori umani;
- Dulap cu echipamente electrice (D_e), în care se află aparataj specific pentru realizarea comenzilor necesare desfăşurării diferitelor mişcări, operații tehnologice şi auxiliare, într-o succesiune şi cu durate determinate;
- Palete (P_t) care susțin componente pe parcursul operațiilor de asamblare a produsului în sistemul „*one piece flow*”.

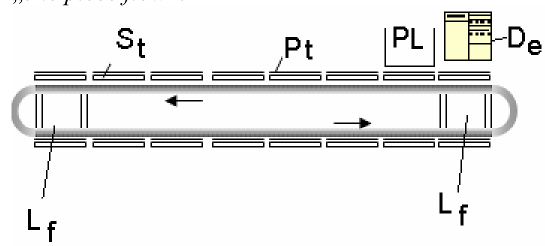

Figura 1: *Schemă şi componente ale liniei de asamblare*: L_f - lift, P_t - paletă, S_t- segmente articulate pentru transportul paletelor, *PL*-posturi de lucru, D_e - dulap cu echipamente electrice.

Linia de asamblare este pilonul central al fabricii de componente. In figura 2 este reprezentată schema flux al unui proces JIT la care s-a făcut referire mai sus. Procesul de fabricație de desfaşoară astfel:

- fabrica JIT primeşte comenzile de la clienți în sistem electronic asigurându-se astfel că procesul de producție de componente şi ansambluri este paralel cu cel al beneficiarului care a lansat comanda;
- odată primită comanda, la capătul benzii de asamblare încep să fie asamblate componentele subansamblului. Acestea sunt montate pe paleții suport (P_t) care le transporta de la un post de lucru la altul în procesul asamblării de-a lungul linei de fabricație;
- în ultimul post de lucru produsul final este controlat din punct de vedere funcțional, după care este livrat către client.

Paletele transportoare se deplasează intermitent pe traiectorii rectilinii în linia de fabricație; la partea superioara a liniei acestea susțin subansambluri în fluxul de fabricație (procesul asamblării), şi, totodată, la partea inferioară se asigura recircularea acestora în postul de încărcare.

Aceste mişcări sunt realizate de fiecare segment al sistemului de asamblare. Ridicarea paletelor de la nivelul inferior la nivelul superior şi coborârea acestora la capătul liniei, de la nivelul superior la nivelul inferior se face cu ajutorul unor elevatoare acționate de motoare electrice şi un sistem constituit din pârghii şi transmisie prin lanțuri.

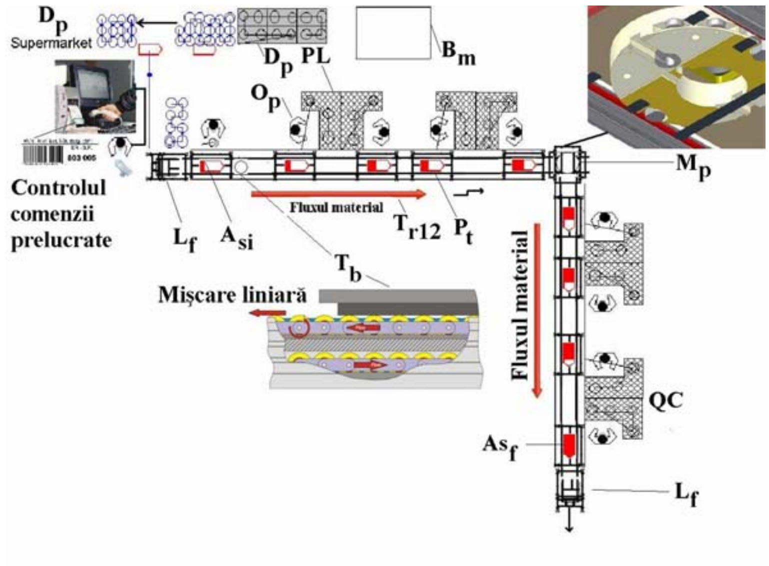

Figura 2: *Schema unei linii de asamblare în sistem de producţie JIT:*
PL-post de lucru, D_p-depozit componente, *Bm*-Birou de mentenaţă, *Tb*-transportor cu banda şi role, L_f-lift, O_p-operator uman, P_t-paletă de transport, As_i-produs ansamblu iniţial, As_f-produs ansamblu final, Tr_{12}-traseul de asamblare, *Mp*-masă rotativă pentru poziţionare

3.2.2. Elaborarea FMEA în mentenanţă

Principiul de elaborare a FMEA privind activitatea de mentenanţă preventivă este similar activităţilor DFMEA şi PFMEA prezentate mai sus.

Unele diferenţe sunt determinate de interpretări diferite date criteriilor privind estimarea *severităţii* modului potenţial de defectare, probabilităţii de *apariţie* a defectului şi estimarea *detecţiei* asigurată de procesul de mentenanţă şi a valorilor acestora.

Aşa cum s-a precizat în studiul de caz prezentat, FMEA a fost elaborată pentru activitatea de mentenanţă asupra liniei de asamblare pe baza istoricului de defectare al acesteia şi având în vedere cerinţele privind timpul de operare şi disponibilitatea acesteia pentru fabricaţie. Ca oricare din celelalte aplicaţii ale FMEA şi mentenanţa poate fi adaptată în continuare, la condiţiile de funcţionare şi la modurile de defectare ale echipamentelor din structura liniei.

Modul potenţial de defectare precum şi consecinţele acestuia sunt consemnate într-un document (tabelul 1), după cum urmează:

Informaţii generale: tipul echipamentului, subansamblul studiat, echipa de elaborare FMEA, aprobarea, data elaborării şi reviziei etc.;

Subansambulul funcţional – descrierea echipamentului studiat şi a funcţiei acestuia;

Analiza defectelor – sunt descrise cauzele defectelor şi efectele acestora,

Indici de lucru – este descris modul de *detecţie* precum şi indicii de lucru: probabilitatea de *apariţie* a defectului, *severitatea* defectului şi *detectabilitatea* acestuia; *RPN* ierarhizează modurile de defectare şi stabileşte priorităţi privind acţiunile ce trebuie întreprinse pentru eliminarea defectului potenţial;

Măsuri corective – sunt descrise acţiunile ce trebuie întreprinse, responsabilii de aplicare a acestora, timpul de intervenţie, reevaluarea indicilor de cuantizare şi a produsului acestora şi estimativ variaţia produsului indicilor. Acţiunile corective pot fi grupate în următoarele categorii: formarea personalului de mentenanţă, formarea personalului de producţie, stabilirea modificării tehnice minore, implementarea mentenanţei preventive la reparaţia curentă şi la reparaţia capitală, asigurarea pieselor de schimb critice (întârzieri mari la aprovizionare şi costuri importante), [6].

Indicii de lucru ce descriu un mod potenţial de defectare au în vedere impactul potenţial al defectelor asupra funcţionarii sistemului studiat şi implicit performanţele companiei.

In tabelul 1 este prezentat un exemplu de aplicare a acestei tehnici pentru două subsisteme ale liniei de asamblare (masa elevatorului şi pârghia acestuia), iar pentru fiecare subansamblu, respectiv element se prezintă un singur mod potenţial de defectare.

Tabelul 1*. Exemplu de aplicarea FMEA în mentenanța preventivă pentru un elevator al liniei de asamblare*

FMEA – Mentenanță preventivă																
Proprietate și confidențialitate:			Cod document				Difuzare autorizată de: Nume Prenume			Data inițială: zi/lună/an			Revizie zi/lună/an			
Mijloace AMDEC																
Echipament	Linie asamblare		Elaborat de: Nume Prenume	Verificat de: Nume Prenume					Aprobat de: Nume Prenume				Pag.			
Ansamblul funcțional	Elevator linie															
Subansamblu funcțional			Analiza defectelor		Indici de cuantizare				Acțiuni corective				Indici finali			
Reper	Funcție	Efectele potențiale ale defectării	Cauze potențiale de defectare	Controlul curent al procesului	S	O	D	RPN	Operația de verificare (min)	Timp de verificare (min)	Operația de intervenție	Resp/Data	S	O	D	RPN
Masa elevator	Suport	Înclinare	Fixare neconformă	Măsurare	4	2	1	8	20	5	Utilizare șurub special		4	1	1	4
Pârghia elevator	Ridicare	Deformare	Asamblare necorespun zătoare	Vizuală	2	7	3	42	120	5	Poka Yoke		2	3	1	6

De menționat, că pentru fiecare dintre acestea se pot considera mai multe moduri potențiale de defectare.

Datele exemplului prezentat mai sus confirmă câteva din caracteristicile ce definesc FMEA, şi anume:

- FMEA este un proces in permanentă actualizare, dezvoltat pe baza istoricului procesului de defectare;
- Acțiunile întreprinse se decid în urma analizei defectului potențial identificat şi al *severității* acestuia;
- Acțiunile întreprinse vizează pe de o parte prevenirea apariției defectului potențial, în situația în care acesta a fost anticipat în faza de proiect sau reapariția acestuia, dacă defectul s-a produs deja;
- Identificarea unui mod de defectare care nu a fost luat în considerare inițial va conduce la actualizarea FMEA, în scopul prevenii apariției ulterioare a acestuia.

În acest caz, acțiunile au avut în vedere intervenții de îmbunătățire a funcționării liniei de asamblare prin proiectarea, execuția şi adaptarea unui şurub special, având rolul de a preveni fixarea neconformă a mesei elevatorului, astfel şurubul este prevăzut cu o zonă de ghidare care asigură o bună poziționare în timpul operației de preînfiletare.

Pentru cel de-al doilea element, a fost conceput un sistem Poka Yoke care previne asamblarea necorespunzătoare a pârghiei elevatorului. Mai precis, pârghia trebuie sa fie asamblată doar într-o singură poziție.

Sistemul Poka Yoke este un sistem care impiedică apariția unei erori in timpul asamblarii unei componente, erori care pot avea consecințe asupra securității utilizatorului final al produsului asamblat sau asupra operatorului în timpul lucrului.

4. CONCLUZII

Efortul făcut de companiile producătoare din industria auto, pentru menținerea unui ritm de livrare către clienți a componentelor şi a ansamblurilor fabricate, determină ca maşinile şi echipamentele de producție, inclusiv cele auxiliare, să funcționeze la parametrii proiectați. Dar cum prevenirea este mai eficientă decât detecția sau repararea, aplicarea mentenanței capătă un rol foarte important. Echipele şi tehnicile de mentenanță fie că sunt proprii companiei, fie că sunt sub-contractate trebuie să aibă o reactivitate foarte bună în cazul apariției defectelor echipamentelor de lucru, de comandă şi de control. Acestea trebuie să se concentreze în principal pe prevenirea apariției defectelor. Tehnicile utilizate, printre care şi FMEA, dezvoltată în articol, sprijină atât reactivitatea echipei de mentenanță, dar şi anticiparea modului de defectare a echipamentelor.

FMEA pentru mentenanța preventivă se recomandă la planificarea activității de întreținere a echipamentelor sistemului prezentat prin gruparea tipului de intervenții atât în timp, cât şi pe zone şi componente ale liniei de asamblare. Scopul final a fost acela de a avea un echipament funcțional cu perioade cât mai mici de oprire şi costuri de întreținere reduse.

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Quick Info

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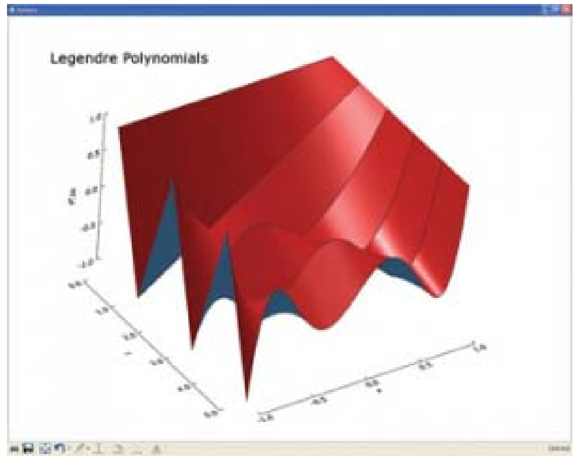

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LA TENSION SUPERFICIELLE – PROPRIETE INTRINSEC DES LUBRIFIANTS

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RESUME
La tension superficielle est une grandeur physique et chimique avec un impact non négligeable. Elle se trouve à tout pas autour de nous, mais son étude parait être insignifiant en comparaison avec d'autres grandeurs. On a l'habitude de ne pas en tenir compte dans la dynamique parce qu'on a beaucoup d'autres propriétés plus importantes qui influence le lubrifiant. En ce qui concerne le processus statique, c'est la tension superficielle qui met en mouvement le fluide au repos, à l'aide de la pression de Pascal. Ce papier présent l'importance de la tension superficielle sur les processus de lubrification.

MOTS-CLÉ: Lubrifiants, Tension superficielle, Lubrification

1. INTRODUCTION

Les molécules d'un liquide se comportent très différemment en surface et au sein du liquide. A l'intérieur du liquide, chaque molécule d'eau subit l'attraction de ses voisines proches (Fig. 1). La résultante des forces est nulle. Mais lorsqu'elle se trouve en surface, les choses se gâtent, d'une part, elle perd la moitié de ses voisines, d'autre part, au-dessus d'elle, il n'y a que de l'air, pour lequel elle n'éprouve qu'une très faible attirance, [1]. La résultante des forces est donc dirigée vers le bas.
C'est la raison pour laquelle les molécules de surface se comportent comme celles d'une membrane confinant le liquide. Comme les molécules sont attirées vers le liquide, elles forment la plus petite surface pour un volume donné. C'est le phénomène de tension superficielle.

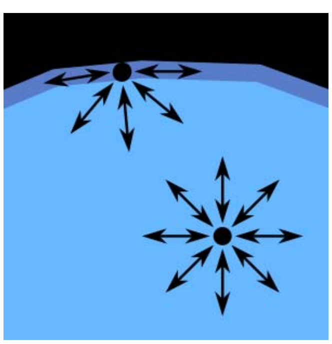
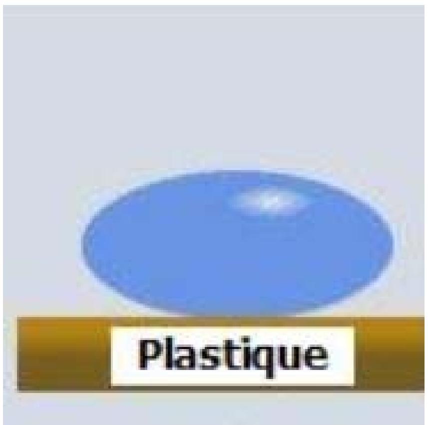


Fig. 1. *Illustration des forces intermoléculaires, [1]*

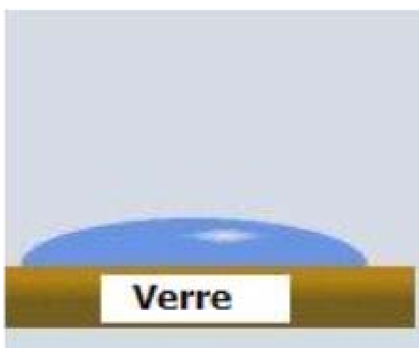
En rajoutant d'infimes quantités d'autres substances, il est possible de modifier radicalement les propriétés de tension superficielle d'un liquide. Il s'agit des agents tensio-actifs. Quand une molécule de soluté arrive à la surface du liquide, elle y reste car elle est beaucoup moins attirée au sein de la solution que les molécules du solvant. Il en résulte que la concentration de soluté est beaucoup plus grande en surface que dans la solution. Comme la force exercée sur les molécules de soluté de surface est beaucoup moins grande, la tension superficielle est fortement diminuée.
La tension superficielle est une force résultante de la cohésion, qui abaisse au minimum le nombre de molécules à la surface d'un liquide. Cela crée une sorte d'enveloppe invisible qui occupe la plus petite surface possible. La tension superficielle représente la force de la pellicule de la surface du liquide. De la différence des interactions entre atomes ou molécules qui s'exercent au niveau d'une interface résulte une force appelée tension interfaciale. Elle s'exerce parallèlement à la surface et s'oppose à l'accroissement de celle-ci. Le nom tension superficielle est réservé au cas où les deux phases en présence sont un liquide et l'autre un gaz.

2. PARTICULARITES DE LA TENSION SUPERFICIELLE

Les molécules d'eau sont attirées entre elles par l'énergie moléculaire et les molécules périphériques le sont donc uniquement en direction de l'intérieur, ce qui dans certains cas forment une goutte d'eau (la sphère étant la forme de surface la plus petite possible). Si l'on place cette goutte ronde sur un support à faible énergie de surface, les forces d'attractions internes de la goutte seront prépondérantes et la goutte aura un minimum de contact avec le matériau (ex. film plastique). Si au contraire, le matériau (ex. verre) développe une énergie moléculaire de surface qui se rapproche de celle de l'eau, cette énergie aura tendance à contrebalancer les forces à l'intérieur de la goutte et celle-ci aura tendance à augmenter sa surface interfaciale avec le matériau, aplatissement de la goutte, mouillabilité (Fig. 2), [2].



a) Contact avec du plastique



b) Contact avec de la verre

Fig. 2. *Tension superficielle - exemple de l'eau en contact avec divers matériaux, [2]*

Si au lieu d'utiliser de l'eau, on utilise un liquide beaucoup plus faible en énergie (ex. hydrocarbure, alcool, ...) sur un film plastique bien que de faible énergie mais suffisante, ce film provoquera par attirance interfaciale l'applatissement de la goutte d'alcool (le matériau réussira à être prépondérant sur les forces internes dans la goutte d'alcool, cette goutte s'étalera encore mieux sur le verre mouillable à l'eau, donc d'énergie encore plus élevée que le plastique).

Concernant l'angle de contact (mouillabilité), les relations géométriques liquide-solide, rendent compte de leurs interactions et sont décrites par la loi de Young (Fig. 3), [1]:

$$\gamma_{sv} - \gamma_{sl} = \gamma_{lv} \cos\theta \quad (1),$$

où : γ_{sv} - tension interfaciale solide – vapeur ;
γ_{sl} - tension interfaciale solide – liquide ;
γ_{lv} - tension interfaciale liquide – vapeur ;
θ - angle de contact entre le solide el le liquide.

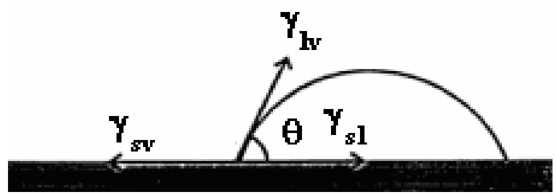


Fig. 3 *Etat d'équilibre d'une goutte de liquide sur un solide dans une situation de mouillage partiel*

Une autre propriété importante c'est la tension capillaire. Dans un tube capilaire, au contact liquide-solide , les forces interfaciales déterminent un ménisque à l'interface entre l'eau et l'air. La pression capillaire est définie par la différence de pression existant de part et d'autre de la courbure du ménisque ; la pression la plus forte étant du coté concave du ménisque (Fig. 4).

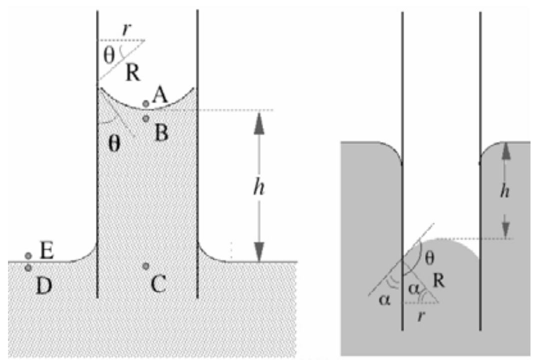


Fig. 4. *Comportement dans les tubes capilaires, [3]*

Dans le cas d'une imbibition par l'eau en présence d'air , la partie concave du ménisque reste à la pression atmosphérique ; aussi pour des pressions capillaires qui dépasseront 1 atmosphère les pressions dans l'eau , c'est à dire dans la partie convexe du ménisque , seront négatives. Au point de vue mécanique, la pression capillaire dans un tube est reliée à la géométrie du tube par la loi de Laplace:

$$P_c = \gamma\left(\frac{1}{R} + \frac{1}{r}\right) \quad (2),$$

où: R et r - les deux rayons permettant de définir la forme du ménisque ;

γ - la tension superficielle.

Une autre particularité c'est le drainage et l'imbibition. La phase de drainage est le déplacement d'un fluide mouillant par un fluide non-mouillant. L'imbibition est le déplacement d'un fluide non-mouillant par un fluide mouillant. Lorsqu'un milieu poreux est envahi par un fluide, et qu'il en éjecte un autre (ou le même dans un état différent), ce processus peut-être soit un drainage, soit une imbibition. Lors d'une imbibition à faible nombre capillaire, le fluide va envahir préférentiellement les zones à faible ouverture proches des parois solides, alors que lors d'un drainage, il va envahir les zones de grande ouverture, loin des parois solides (Fig. 5).

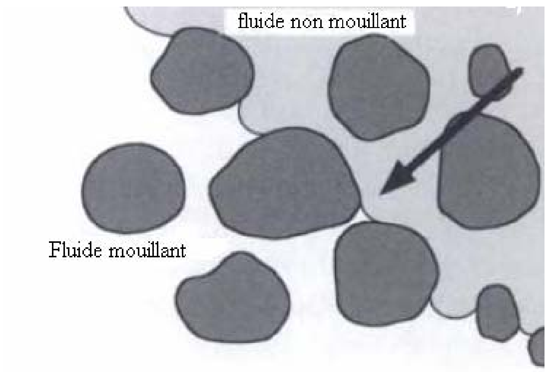


Fig. 5. *Représentation schématique de la pénétration d'un fluide non mouillant à l'intérieur d'un milieu poreux rempli initialement d'un fluide mouillant, [1]*

3. MESURE DE LA TENSION SUPERFICIELLE

Il est capital dans l'industrie de connaître la tension superficielle d'un matériau. En effet, plus celle-ci est élevée plus le matériau sera apte à être imprimé ou collé par exemple. Au contraire plus le matériau a un niveau de tension de surface bas, plus il servira de filtre. La notion de tension superficielle est omniprésente notamment dans les industries du plastique, de la céramique ou du métal. Pour le plastique : Il s'agit de savoir si on peut imprimer ou coller tel ou tel matériau, savoir si le matériau a été traité pour cela. Pour les métaux : Mesurer la tension superficielle sert à savoir si le matériau est propre et donc apte au processus de transformation.

Parce que la tension de surface a de nombreux effets, il existe plusieurs façons de la mesurer. La méthode optimale dépend de la nature du liquide mesuré, des conditions dans lesquelles on mesure la tension de surface et de la stabilité de déformation. On peut identifier les methodes suivantes :

- Méthode de Wihelmy (Fig. 6) et de l'anneau du Noüy (Fig. 7): on tire hors du liquide une plaque ou un anneau tout en mesurant la force exercée. On note la valeur de la force juste avant que le ménisque se détache. On divise la force ainsi obtenue par la largeur de la plaque ou par le périmètre de l'anneau, et on obtient la valeur de la tension superficielle, [4], [5];
- Méthode de la goutte pendante: une goutte est observée de profil. Un ajustement précis de la forme par une famille de courbes connues, combiné à la taille de la goutte, permet de connaître la longueur capillaire. Connaissant la densité du liquide, on en déduit alors la tension surperficielle, [5];
- Méthode de pesée de goutte: cette méthode consiste à peser une goutte qui tombe d'un capillaire de rayon r connu. En première approximation, les forces qui s'appliquent sur la goutte sont son poids, $P = mg$, et la force due à la tension superficielle γ au niveau du capillaire, $F = 2\pi r\gamma$. Au moment précis où la goutte se détache, le poids de la goutte est égal aux forces capillaires, $P = F$. Connaissant la masse m de la goutte, on peut remonter à la tension de surface γ. On retrouve la loi de Tate, [5]:

$$m = \frac{2\pi r\gamma}{g} \tag{3}$$

- Méthode de la goutte tournante: on fait tourner un liquide 1 dans un liquide 2 de telle manière à avoir une géométrie de cylindre de longueur supérieure à quatre fois le rayon. Dans ce cas là, la tension de surface est lié à la vitesse de rotation, au rayon du cylindre intérieur et à la différence de densité entre les deux liquides. Cette méthode est adaptée aux faibles tensions interfaciales. On mesure la tension de surface entre deux liquides dans ce cas là, [3].

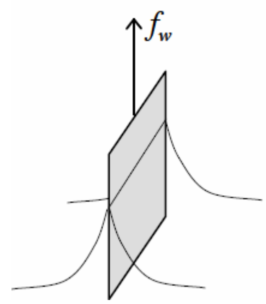


Fig. 6. *Méthode de Wihelmy (plaque), [4]*

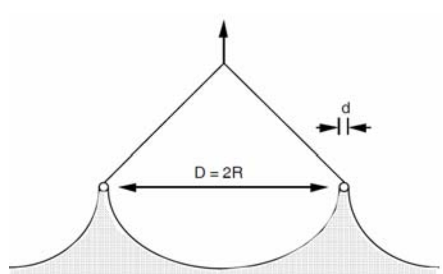


Fig. 7. *Méthode de l'anneau du Noüy, [5]*

4. CONCLUSIONS

La tension superficielle est une grandeur physique et chimique avec un impact non négligeable. Elle se trouve à tout pas autour de nous, mais son étude parait être insignifiant en comparaison avec d'autres grandeurs. On a l'habitude de ne pas en tenir compte dans la dynamique parce qu'on a beaucoup d'autres propriétés plus importantes qui influence le lubrifiant mais, en statique, c'est elle qui met en mouvement le fluide au repos, à l'aide de la pression de Pascal.

Un des avantages qu'elle présente pourrait être qu'on peut faire la lubrification d'un mécanisme avec seulement quelques gouttes d'huile. Pour expliquer ce fait, on va donner un exemple: si on met une bille sur une goutte d'huile et on la bouge (Fig. 8), on peut observer que la goutte se colle de la bille et ainsi elle est portée avec la bille partout. Si on met de l'eau, l'aspect se modifie (Fig. 9). C'est ce qui se passe aussi dans un mécanisme. L'explication c'est la tension superficielle. Donc, on réussit à faire la lubrification du mécanisme et en plus, on fait de l'économie au lubrifiant.

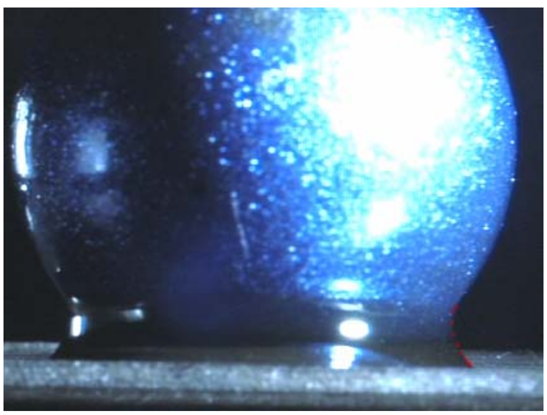


Fig. 8. *Sphère d'huile sur PTFE, [6]*

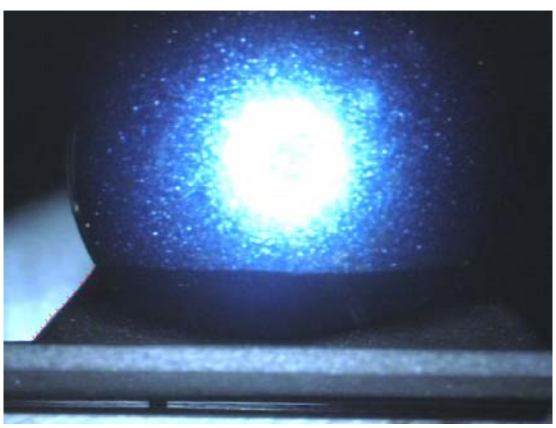


Fig. 8. *Sphère d'eau sur PTFE, [6]*

La problématique de l'étanchéité statique est un sujet qui pose beaucoup de questions à cause de la fuite, car on risque que le fluide envahit préférentiellement les zones à faible ouverture. Une approche macroscopique globale par le biais de l'analyse dimensionnelle permet de résoudre la plupart des problèmes. L'étude des phénomènes de transport nécessite par contre une approche plus approfondie de la structure fine de l'écoulement.

Une autre conséquence de la tension superficielle, la pression capillaire, est présente aussi et pose des problèmes : celle de l' humidité d'une maison, c'est la plus rencontrée. Les murs des fondations d'une maison se trouvent très souvent au contact de l'eau. Ils peuvent être implantés dans un terrain humide et parfois sur une nappe phréatique. L'humidité pénètre dans le mur de fondation et remonte à l'intérieur de celui-ci par les effets de capillarité.

A ce moment, même si ce sujet est très vaste et dans un développement continu, on ne trouve pas des informations dans la littérature. Alors, ce travail revient aux chercheurs. Ils doivent découvrir les « secrets » de la tension superficielle dans le domaine de la lubrification.

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ECONOMIC, SOCIAL, NATIONAL, ECOLOGICAL AND MORAL CRITERIA FOR ASSESSING THE EFFICIENCY AND OPPORTUNITY OF AN OBJECTIVE IN THE MINING INDUSTRY. CASE STUDY AT THE ROŞIA MONTANĂ PROJECT

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REZUMAT
Apare necesitatea desfăşurării unei dezbateri în opinia publică asupra proiectului Roşia Montană. În acest articol voi prezenta unele criterii economice, sociale, naționale, ecologice şi morale pentru evaluarea eficienței şi oportunității proiectului. Până în prezent au fost prezentate două opțiuni: susținerea proiectului companiei Gld Corporation şi stoparea proiectului.Oponenții proiectului nu au fomulat încă o alternativă. În acest articol analizez eficiența şi oportunitatea proiectului Roşia Montană pe baza câtorva ipoteze şi prin includerea consecințelor acestor ipoteze.

ABSTRACT
In the public opinion it became necessary to carry out a debate on the Roşia Montană project. In this article I shall present certain economic, social, national, ecological and moral criteria for assessing the efficiency and the opportunity of the project. Up to present, two options have been revealed: accomplishing the project of the Gold Corporation company or stopping it. The project opponents have not formulated any alternatives. In this article I am analyzing the efficiency and the opportunity of the Roşia Montană project based on a several working hypotheses and including the consequences of these working hypotheses.

CUVINTE CHEIE: industria minieră, eficiența uunui obiectiv, oportunitatea unui obiectiv, criterii economice, sociale, naționale şi morale, Roşia Montană.

KEY WORDS: mining industry; efficiency of an objective, opportunity for an objective, economic, social, national and moral criteria, Roşia Montană.

1. INTRODUCTION

I am analyzing the efficiency and the opportunity of the Roşia Montană project based on a several *working hypotheses* and the :

- budget funds are used acording to certain economic rationality rules;
- there are no hidden interests of certain private or politically exposed persons, and if they exist they can not be arbitrarily imposed;
- the legal norms in force are complied with during the project execution;
- there is continuity in the Romanian public politics;
- there are no safe long-term bussinesses in the market economy; such an hypothesis is all the more important under the conditions of the major restructuring of the Romanian economy in order to achieve the real convergence with the European Union;

The motivation of the working hypotheses:

- if we exclude the hypothesis according to which the budget funds are used according to certain economic rationality rules, the optimization calculations from the point of view of the State consolidated budget lack of sense in all the possible projects;
- if we exclude the hypothesis according to which we comply with the legal norms during the entire project execution, the reasoning exceeds the institutional framework of the legal state;
- if there are certain hidden interests of certain private or politically exposed persons that can be arbitrarily imposed, the efficiency and opportunity calculations for any kind of project become useless; the public authorities should take measures in order to eliminate the imposing of any kind of interests through other ways except the transparent and concurrential ones;
- if we do not take into account the hypothesis according to which there is continutity in the Romanian public politics during the accomplishment of an objective, even if the most rigurous calculations initially set the efficiency and the opportunity of its launching, the modification of the realities and politics make it inoperative, unefficient or simply useless; this conclusion comes out for any type of project, not only for those in the mining industry such as Roşia Montană.

2. CONSEQUENCES OF WORKING HYPOTHESES

The hypothesis according to which the budget funds are used in conformity with certain economic rationality rules :

- eliminates the fear of the majority of the non-governmental organizations according to which the budget funds shall be received during the operational carrying out of the project and shall be spent in an unreasonable manner (shall be wasted) and in case certain damages shall need to be fixed the necessary amount shall no longer exist;
- eliminates the fear that the majority of the amounts due to Romania are collected into the central budget from which they are spent for low efficiency objectives and the possible negative consequences shall be borne by the local community;

The hypothesis according to which there are no hidden interests of certain private or politically exposed persons, and in case these exist, they can not be arbitrarily imposed:

- eliminates the scenario according to which the underground pressure of certain persons having nontransparent personal interests and the possibility that they impose their point of view independently of calculation results and of the argument force;

The hypothesis according to which *we comply with the legal norms in force* during the entire project execution is essential in any project where public entities are involved or where calculations are also done from a macroeconomic perspective. This hypothesis implies:

- in the absence of certain contrary evidence we must trust the State controlling bodies, especially those in the fiscal field, the Environmental Guard Institution and the Territorial Labour Inspectorate, institutions in which people trust in an increasing manner; if we do not trust the State controlling bodies, the legal State is in danger and we must change the persons that are employed at the controlling bodies, including the managers of the controlling bodies;
- the provisions of the fiscal legislation are complied with in the sense that a tax evasion does not occur, all the obligations towards the State consolidated budget are paid; in the absence of this hypothesis the State may become the owner of all the bussinesses and capital goods, by resuming all the mechanisms of the planned economy which operated in Romania and in the Eastern Europe; we know the consequences of these mechanisms and the great majority of us do not want to see them coming back;
- the accounting legislation is complied with, in the sense that all the legal norms shall be applied when the project transactions shall be recorded, including the transposition of the European Union Directives and of the International Financial Reporting and Accountancy Standards; when it comes to a project of such proportions and having such evolution in time as Roşia Montană it is very important to set the provisions for closing the mine while the mining activity is carried out.

The hypothesis acording to which there is continuity in the Romanian public politics takes into account the preservation of a certain set of values and priorities at least for the duration of an investment or a project that makes the object of a cost-benefit analysis. The permanent change of the economic policy direction leads to a waste of resources and to the impossibility of getting involved in medium and long-term projects even if the calculations reveal their efficiency and their opportunity.

The hypothesis of keeping the present regulations in force makes easier the carrying out of simulations for calculating the indicators, especially when it comes to assessing the economic criteria.

The fiscal legislation engendering taxes and charges to the State consolidated budget is extremely important. In the absence of this hypothesis we should introduce a new hypothesis, of the direction in which the legislation is modified, by also including the justification of the new quantitative parameters necessary to modelling.

The hypothesis according to which there are no safe long-term bussinesses in the market economy reduces the intensity of the Roşia Montană project critics concerning its strictly limited duration.. There have been many major investments in the economy that actually had an economic life as long as the Roșia Montană project.

3. THE ECONOMIC CRITERIA

The economic criteria concern the efficiency at a macroeconomic, regional and personal level. Due to the existing options (the launching or non launching of a new project) we can lead the approach to the typology of a cost-benefit analysis for the Roşia Montană project as it has been proposed by the Gold Corporation company.

At the national economy level we must compare the revenues from the taxes immediately collected to the State consolidated budget, on the one hand, with the potential incomes obtained from the fact of keeping the present situation plus the costs related to the repairing of the possible damages caused to the natural environment.

The hypothesis according to which the negative effects on the environment are completely irreversible can not be included in the strict approach on economic criteria: the effects can be irreversible according to the present technologies, but the investments for developping the scientific research can create solutions for solving the respective problems in the future. In economic terms, the stress is laid on collecting and allocating resources.

We can also formulate the problem in other ways:

- at present, we need the respective supplemental revenues to the State budget, with the risk of certain future expenses;
- can Romania afford at present to give up a certain amount of revenues to the State budget with the risk of certain future additional costs.

At a regional level we compare revenues from taxes collected to the local budgets (county, locality) with possible costs taken over by the community for repairing the environmental damages that have occured.

At a personal level the economic criteria of the project analysis involve the comparison between the income of the future employees of the exploitation with the actual situation, respectively the payment of the welfare and of the unemployment benefit or unemployed persons who receive no unemployment benefits.

From the point of view of the people living in the area, the Roşia Montană project of the Gold Corporation company appears to be the only solution at present. None of the opponents of the Roşia Montană project of the Gold Corporation company formulated a realistic and efficient alternative for the economic development of the area, that may involve employing the persons that would have been attracted in the variant of the project carrying out.

For the people living in the area, the comparison is between poverty (plus suffering and humiliation) in case the present situation continues and incomes from salaries in case the project is launched.

Concerning the evaluation of the incomes that Romania collects following the project, we must sum up the following elements:

- the social contributions and the taxes withold from the employees' gross salary;
- the social contributions and the taxes due by the employer and calculated based on the employees' gross salary;
- other taxes and charges specific to the respective activity;
- the profit tax according to the 2nd Title of the Fiscal Code updated on January 1, 2010 (in the various existing reports we make a reference to the legislation of the year 2002);
- the tax on the gross dividends due both to the Romanian and to the Canadian party according to the provisions of the Fiscal Code and of the Convention for avoiding the double taxation between Romania and Canada;
- the share of 20% of the total dividend, due to the Romanian party;
- the tax on the non resident incomes due for the executive bonuses of the Gold Corporation company representatives, Canadian citizens or citizens of other states;
- the interest related to the VAT activity (the average settlement period of 3 months) which depends on the material purchase and exernalized service performance;
- the effect of attracting investment for other activities (the amount of working posts created in other activities for every working post created in the main activity).

4. THE SOCIAL CRITERIA

The social criteria must take into account the possibility of the mining operators in the area to carry out the profession for which they have been trained and who has been mainly inherited from the ancestors, the elimination, even for a temporary period, of the unemployment phenomenon in the area, the possibilities for relaunching an area that was negatively affected by the economic processes during the last years.

The professions that shall be used in the Roşia Montană project belong to the mining industry. We know from the history classes that the mining industry has been the key factor of the industrial development and also a main economic progress factor. Without the mining industry we would not have reached to the present knowledge economy. In addition to this, there is a real tradition in the area for the mining field, which has also made the Roşia Montană ommune well known.

The persons who will be employed shall be happy to discover that the profession for which they have been trained continues to be useful. The feeling that you are still useful is extremely important for the state of mind of a community.

A judgement that can guide us in assessing the social efficiency of a project is that *no profession is of more importance than the others*. More than this, we are talking about professions which have influenced our present existance. The long-term existence of certain professions or trades has been frequently invoked in financial support from the State budget. It is all the more necessary to introduce certain hierarchization parameters favorable for traditional professions when it comes to whether or not approve a project with private financial support.

5. THE NATIONAL AND COMMUNITY CRITERIA

The national and community criteria in this case take into account the existence of certain historical vestiges that may be affected in case the projet is launched. There are several topics that should be discussed about. The first topic is related to the fact that we can find in Romania a great number of documents of the multimillenar civilisation on the earth as well as monuments having a real national, European and international historical value. Unfortunately we have not paid enough attention to maintaining and preserving them. Neither the government nor the local public authorities understood the special value of the respective monuments. This is the reason why a great number of them are in danger of irreversible degradation or effective destruction.

In sustaining the above statements, we can invoke the documentary of the public television channel TVR 1 and the campaign for saving a monument.

A commission of experts selected 30 monuments having a significant historical value located on the Romanian territory which are in danger and that may have been introduced into the tourist circuit through an investment effort.

We should also mention that a great number of other monuments, also extremely valuable, have been eliminated in order to comply with the show format. The people who watched all the 11 shows that hosted the campaign felt extremely unhappy with the unpleasant situation we are in through the impossibility to maintain and to include in the tourist circuit such proofs of heroism, civilisation and skills of our ancestors.

The monuments that represent real European and international values which are located on the Romanian territory could not receive the necessary funds for being presented to the contemporary people. We could thus notice how far we are from the European standards concerning the integration into the public circuit of ertain monuments that remind us of a glorious past.

During the campaign for saving a monument, which has been carried out by the public television channel TVR 1 in an extremely professional manner, in which we could watch exceptional shows about the 30 selected monuments, we collected funds that may be used for the partial repairing of one single monument, the one who won the competition. For all the other 29 monuments having an extraordinary historical value, no amount will be allocated.

From all the thinggs mentioned above it comes out that the problem can be summed up to some sources of money for the historical patrimony on the Romanian territory. Using the funds collected to the public budget on the occasion of the Roşia Montană project it would be possible:

- to film the monument and show this film in all the Romanian schools;
- to move the monument and include it in an international tourist circuit;
- to allocate funds for a few other moments of the 10 monuments qualified in the finals of the campaign organised by the public television mentioned above;
- other investments for the community and national cultural patrimony; In the category other investments for the community and national cultural patrimony we could also mention the improvement of the access roads to the well-maintained monuments so that they can be included in circuits according to their patrimonial value; in this category of investments we could also include the purchase of certain symbolic monuments of the national patrimony given back to the owners such as the Peleş castle, which is an actual proof of the capacity to take over and assimilate the European values, mainly German, by the Romanian people.

We must take into account the fact that, in the knowledge economy that we are going through nowadays, the main value of a nation are the people, the inhabitants of different ages and qualifications.

The answer to the question what is the country should be well-balanced: the Romanian territory, the history, the national symbols (flag, national anthem, etc), the people who live on the Romanian territory and those who, due to various reasons, in spite of their Romanian origins, are now living in other countries. We can not affect the inhabitants' life by invoking patriotical arguments since through a careful analysis one should realize that people themselves form the country, they are the country.

6. THE MORAL CRITERIA

The moral criteria refer to social justice elements and to historical evolutions. We can ask the question whether the efforts for a cleaner environment, an extremely important aspect of the modern society, should be focussed on the disadvantaged areas, those which have already borne in an excessive manner the social costs of the evolution during the last few years.

The inhabitants of the areas where the knowledge economy showed its positive effects have a moral debt towards the inhabitants that depended upon industries that have disappeared, and not inversely.

As a consequence the inhabitants of the great urban agglomerations which are characterized by a development that has temporarily stopped due to the international economic crisis have a moral debt towards people living in areas such as Roşia Montană.

The inhabitants of the university ask centres or district cities can not ask for additional efforts from the inhabitants of the areas affected by the post-industrial restructuring. And they obviously can not ask for greater efforts than those they do themselves.

The moral obligations are all the more intense towards the traditional mining industry areas, a branch upon which the evolution of the modern economy and civilisation relied.

Another moral argument against the Roşia Montană mining project is the desire to leave a gold deposit to the future generations. This argument can not be admitted due to several reasons.

The potential gold deposits have not got an economic value themselves; what matters as a support for satisfying the economic needs of the future generations is the net economic value of the deposits, calculated as a difference between the sale price of the ore and the exploitation costs; in the future it is possible that the level of the exploitation costs increases because the present generation of mining workers shall no longer work.

On the other hand it is more important that the gold deposits be exploited now and the benefits be used by the future generations through the reduction of the public debt or through investments in infrastructure. We can not be proud of the inheritance consisting in gold deposits while we have a public debt and an infrastructure that is entirely bakward as compared to the present standards.

7. THE ECOLOGICAL CRITERIA

The ecological criteria are the main argument of the Roşia Montană project's opponents. The contrary points of view often give the sensation that the only major pollution source is related to this project.

In fact, many of those who do not take part in the Roşia Montană project have a substantial contribution to the pollution of the environment in other areas: the immense quantities of garbage resulting from the every day life, the excessive consumption of drinking water, the gas coming from the personal vehicles, the noise created by the daily activities, etc.

The heating systems in the urban developed areas mainly take into consideration the economic efficiency to the detriment of the ecological balance.

Many installations in the processing industry go on with the pollution „to admissible limits" which have been exclusively set in an administrative way and that take into account the companies' economic efficiency criteria.

Pollution must be reduced through all the possible methods, not prioritarily in the mining areas. If we accept the pollution in all the great urban centres who benefit from the contemporary comfort and civilisation progresses, why shouldn't we allow it in a disadvantaged area, too?

8. CONCLUSION

The present reports concerning the Roşia Montană project should be modified by taking into consideration the updated economic efficiency information, the environmental protection, the social justice, the national interests. A strict methodology should be complied with arguments .

For assessing the efficiency and opportunity of an objective in the mining industry are very important the economic criteria, the moral criteria and the ecological criteria.

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Pentru început, dl. Prof. **Aurelian Virgil Băluță,** de la **Universitatea Spiru Haret din Bucureşti** prezintă un articol privind industria minieră, favorabil proiectului Roşia Montană:
„ECONOMIC, SOCIAL, NATIONAL, ECOLOGICAL AND MORAL CRITERIA FOR ASSESSING THE EFFICIENCY AND OPPORTUNITY OF AN OBJECTIVE IN THE MINING INDUSTRY. CASE STUDY AT THE ROŞIA MONTANĂ PROJECT”.

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For the beginning, Mr. Prof. **Aurelian Virgil Băluță**, from **Spiru Haret University of Bucharest**, has an article on mining industry, favourable to Roşia Montană project:
„ECONOMIC, SOCIAL, NATIONAL, ECOLOGICAL AND MORAL CRITERIA FOR ASSESSING THE EFFICIENCY AND OPPORTUNITY OF AN OBJECTIVE IN THE MINING INDUSTRY. CASE STUDY AT THE ROŞIA MONTANĂ PROJECT”.

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ACTUALITATEA ECONOMIEI CUNOAŞTERII. VIITORUL ROMÂNIEI IN ECONOMIA CUNOAŞTERII

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REZUMAT
Conceptul deEconomie a cunoaşterii (E.C.) este utilizat în moduri diferite de către specialişti şi factorii de decizie, dintre care unii sunt aflaţi la nivel înalt. În mod firesc, rezultă concluzii diferite privind relevanţa E.C. în raport cu strategia de dezvoltare a României. Treptat s-a impus un relativ consens privind problemele esenţiale referitoare la acest subiect: s-a recunoscut că E.C. are o importanţă decisivă pentru viitorul dezvoltării economico-sociale a ţării.

ABSTRACT
The concept of Knowledge Economy is considered in different ways by specialists and political leaders.In a natural way they obtain different conclusions regarding the relevance of Knowledge Economyand the development strategy of Romania.Step by step we have now a relative consensus regarding the essential problemsabout this subject. In the present the political leaders recognizethe decisive importance of Knowledge Economy for the the future socio-economical development of our country.

CUVINTE CHEIE: Economia Cunoaşterii, politica naţională, antreprenoriat, inovare, comportament

KEYWORDS: kowledge economy, national policy,entrepreneurship,innovation,behaviour

1. INTRODUCERE

În prezent se recunoaşte că strategia tradiţională bazată pe industrializare nu va mai fi suficientă, în vreme ce fabricaţia la nivel global devine înalt productivă, intens competitivă şi reprezintă o parte tot mai mică din volumul de ocupare a forţei de muncă.

Răspunsul la Noua Economie nu înseamnă doar implicarea într-un efort de adaptare progresivă a instituţiilor, sistemelor şi politicilor care s-au afirmat în ţările avansate şi au înfăptuit era industrială. Este nevoie a gândi noi abordări specifice pentru strategia de dezvoltare care să considere atât circumstanţele specifice ale României cât şi noile realităţi globale, în regim de urgenţă.

Considerăm că aceste abordări vor duce la promovarea unor noi domenii:
- stimularea creşterii sectorului serviciilor industriale;
- acordarea unei atenţii speciale ocupării forţei de muncă, nu doar creşterii producţiei şi productivităţii;
- acordarea de prioritate noilor produse şi calităţii tehnologiilor de procesare, nu doar proceselor tehnologice care economisesc forţa de muncă;
- industrializarea zonelor rurale şi dezvoltarea activităţilor anexe, pentru creşterea continuă a angajării în zone rurale.

Strategiile de dezvoltare adecvate ale economiei României sunt înfluenţate de presiunea rezultată ca urmare a integrării în U.E., de strategia de la Lisabona (2000), economia INTERNET, discuţiile aprinse despre globalizare şi poziţia României în raport cu O.M.C.

Pentru unii specialişti conceptul de E.C. înseamnă o nouă paradigmă economică, pentru alţii o transformare socială în care economia este numai o parte. Există diferenţe între conceptele privind similarităţile şi diferenţele conceptului de Economie a Cunoaşterii şi Economie a Informaţiei, Noua Economie şi Economia Reţelelor.

Unii practicieni susţin că economia României e o economie industrială în stadiu incipient de dezvoltare, deci este nepotrivit să vorbim despre E.C. în acest stadiu.

România e însă constrânsă de practica economică să treacă de la vorbe la fapte, la inovarea în domeniul cunoaşterii. Apreciem că acestea sunt:
- restructurarea instituţiilor de cercetare pentru a deveni mai eficiente în generarea cunoaşterii şi aplicarea acesteia;
- revitalizarea sistemului educaţional pentru a-l pregăti pentru provocările Noii Economii în secolul XXI;
- încurajarea inovării tehnologice, dezvoltarea industriilor de înaltă tehnologie;
- realizarea comercializării eficiente a noilor tehnologii.

2. PROBLEME PRIVIND RELEVANŢA EONOMIEI CUNOAŞTERII PENTRU ROMÂNIA

Decidenţii se întreabă dacă România trebuie să fie aşa de preocupată de conceptul E.C. atâta vreme cât nu are nici măcar o economie industrială dezvoltată (aproape 40% din populaţia ţării este situată în zona rurală).

Ecomomia Cunoaşterii este adesea prezentată ca fiind bazată pe ştiinţă şi tehnologie avansată, pe industrii de vârf şi înaltă tehnologie .

România este încă în urmă în aceste domenii. Priorităţile actuale se concentrează mai ales pe ieşirea din criza economică, oferirea de locuri de muncă, supravieţuirea firmelor şi realizarea unui volum de producţie vandabilă care să permită un minim profit.

Are rost ca managerii români să se preocupe de Economia Cunoaşterii ? Ar fi mai bine ca România să se concentreze pe industrii înalt consumatoare de forţă de muncă, capabile să absoarbă numărul mare de desponibiluzaţi din sectorul public ?

Care este diferenţa dintre Economia Cunoaşterii şi iesirea din criză, învigorarea economică a României prin ştiinţă şi educaţie (strategie aflată în atenţia guvernului actual).

Dacă cele două sunt acelaşi lucru de ce să introducem termeni noi şi creăm confuzie?

Un alt set de preocupări se referă la problema implementării.

Este ideea de Economie a Cunoaşterii un concept, o teorie sau un plan de acţiune. Şi cum anume ghidează conceptual sau teoria acţiunile noastre ?

Care sunt ideile specifice şi concrete pentru a implementa conceptul de Economia Cunoaşterii, în afară de: mai multe investiţii în ştiinţă, tehnologie, educaţie ?

Este posibil să se promoveze Economia Cunoaşterii în unele zone ale ţării şi în altele nu, de vreme ce Economia Cunoaşterii, este adesea asociată cu tehnica de vârf şi industriile informaţiei, care sunt implicaţiile Economiei Cunoaşterii pentru industriile tradiţionale ?

3. POLITICA NAŢIONALĂ PENTRU ECONOMIA CUNOAŞTERII

În Economia Globală a Cunoaşterii prosperitatea este condiţionată de capacitatea naţiunii de a crea şi exploata cunoaşterea ştiinţifică şi tehnologică.

Pentru a înfăptui aceasta, este necesară: o bază ştiinţifică bine dezvoltată, o infrastructură de informaţii puternică, însoţite de utilizarea eficientă a acestora.

Apreciem că aceste condiţii sunt dificil de îndeplinit, mai ales pentru economii relativ mici, ca a României, în care există importante probleme structurale:

- dependenţa de industriile tradiţionale;
- o structura a întreprinderilor care nu se pretează cu uşurinţă la inovare.

Considerăm că pentru a promova schimbarea, este imperios necesară dezvoltarea unor **legături** puternice între cei **doi poli ai dinamizării** Noii Economii: **producătorii** şi **consumatorii** de cercetare. Reuşita vitalizării celor doi poli **impune menţinerea şi creşterea preocupărilor pentru asigurarea forţei de muncă înalt calificată,** esenţială pentru a efectua schimbarea spre E.C., pentru a obţine astfel o înaltă calitate a educaţiei la toate nivelurile.

Calitatea politicii guvernului este importantă pentru determinarea cursului viitor al evenimentelor şi asigurarea unor răspunsuri politice dezirabile. Pentru ca România să se adapteze E.C.G., ţara are nevoie de cultivarea sistematică a capacităţilor de a crea şi exploata cunoaşterea ştiinţifică şi tehnologică.

Apreciem că esenţialul pentru a dezvolta aceste capacităţi sunt:

- un sistem **ştiinţific şi educaţional** de nivel înalt, comparabil cu cel mondial;
- un cadru de elită în privinţa condiţiilor, în termeni de infrastructură fizică, legală, financiară;
- **cultură de antreprenoriat şi inovare**;
- dezvoltarea unor **capabilităţi de afaceri** la niveluri care să fie adecvate capacităţii ştiinţifice a ţării;
- **promovarea unor modele de comportament care încurajează continua căutare şi învăţare** de către organizaţii şi indivizi;
- legături şi interacţii dinamice care să asigure **sinergii pozitive** care la rândul lor unesc toate aceste elemente într-un sistem eficient de inovare.

Considerând cele de mai sus, apreciem că se pot considera ca fiind

- **PUNCTE TARI pentru Romania următoarele elemente:**
  - un nivel relativ bun al cunoaşterii în raport cu mărimea populaţiei ţării, considerând zona Europei de Sud- Est;

- infrastructura este pe cale de dezvoltare în domeniul tehnologiei informaţionale şi cel al telecomunicaţiilor;
- domenii industriale relativ competitive în I.T.(soft) şi unele nişe din industria prelucrătoare (în M.U.C.N.), a se vedea cazul Titan Maşini Grele (TMG);
- unele preocupări de asimilare treptată de tehnologii moderne şi un curent relativ puternic de a aborda **economia online;**
- societate pe cale să se deschidă, o tradiţie democratică în formare;
- asimilarea treptată a limbii **engleze** de către un număr crescător de persoane;
- creştere relativ stabilă a economiei, descreşterea inflaţiei şi a şomajului;
- rapida reajustare a unor firme competitive;

• **PUNCTE SLABE**

- structura industrială prezintă discontinuităţi importante;
- multe firme româneşti, private mici (I.M.M.) au sub numărul de personal necesar pentru a putea fi competitive la nivel internaţional;
- companiile multinaţionalele se focalizează doar pe piaţa internă a României şi nu pe promovarea exporturilor;
- reorganizarea firmelor mari, privatizate, s-a făcut mai ales prin reducerea de personal, prin **contractarea extremă** a firmei, denumită în mod eronat **restructurare;**
- privatizarea a avut loc fără existenţa unei concurenţe interne puternice, fără **recalificarea** personalului şi **dezvoltarea de noi capabilităţi** ale firmelor;
- eşecul de a atrage un număr suficient de investitori străini direcţi pentru crearea de capacităţi productive, altele noi, nu cu utilizarea unor bunuri de capital obsolete.
- descreştere relativ imprtantă a economiei, creşterea şomajului;
- lenta reajustare a unor firme anterior competitive.

4. CUNOAŞTEREA ŞI DESCHIDEREA

S-au realizat unele eforturi în dezvoltarea educaţiei şi cercetării în ultima jumătate de veac, cu înfăptuirea unei baze ştiinţifice, dar care a suferit un regres în perioada 1990-2010.

Măsura internaţională a creşterii C-D în diferite ţări este procentul din P.N.B. a cheltuielilor pentru C-D, domeniu în care economia românească este deficitară.

Cheltuielile în infrastructura de telecomunicaţii şi a dezvoltării de software ar putea creşte nivelul de participare la economia online.

Se remarcă o creştere a penetrării P.C.-urilor la nivel naţional, a utilizării Internetului precum şi creşterea densităţii utilizării tehnologiei online.

Se are în vedere realizarea unui sistem mai avansat de telecomunicaţii.

Există în prezent un important deficit de preocupări privind sectorul de servicii avansate, inclusiv în educaţie, îngrijirea sănătăţii şi unele serviciile financiare.

Este binevenită şi se înfăptuieşte cu succes extinderea învăţării limbii engleze pentru a ne apropia de avantajul natural al ţărilor anglofone, inclusiv înglobarea de cunoaştere în practicile de afaceri şi discuţiile politice.

5. DEZVOLTAREA C-D ÎN SECTORUL PRIVAT

Forţa economică redusă a firmelor româneşti, limitează posibilităţile acestora de a efectua activitate de C-D. şi a dezvolta exporturile.

Remarcăm rolul **pasiv** al firmelor străine din România care au o implicare modestă în inovare, C-D şi export dar care au poziţii dominante în tehnologia înaltă sau medie în sectoarele de fabricaţie dar şi în servicii.

Intensitatea este relativ redusă pentru C-D în industria tradiţională.

Structura industrială a Economiei Globale a Cunoaşterii va fi fundamental diferită de cea a prezentei societăţi industriale. Această mutaţie are deja loc în ţările dezvoltate de peste două decenii.

Vom utiliza clasificarea curentă:

- industria producătoare de bunuri;
- industria de bunuri şi servicii (corelate);
- servicii de cunoaştere cele bazate pe persoane (educaţie, sănătate, comunicaţii, distracţie).

Recomandăm reducerea volumului activităţii industriei producătoare de bunuri şi o creştere corespunzătoare a activităţii în industria cunoaşterii şi a celei bazate pe **persoane înalt calificate** şi în industria bazată pe bunuri-corelate cu serviciile - deci o **schimbare masivă în angajarea forţei de muncă în aceste trei sectoare.**

Acest proces vast de ajustare la Economia Globală a Cunoaşterii şi creşterea aplicării cunoaşterii în industria producătoare de bunuri, duce în primul rând la o mai înaltă eficienţă în producţie, pentru un domeniu dat de bunuri şi la o creştere relativ modestă în stocul de bunuri produse şi consumate.

În contrast**, aplicarea cunoaşterii la servicii duce la o expansiune rapidă a varietăţii, calităţii şi intensităţii cunoaşterii** în cadrul acestor servicii şi la o rapidă creştere în cererea acestora.

6. CONCLUZII

În general, aplicarea cunoaşterii conduce la o **schimbare în structura afacerilor din domeniul C-D, cu diminuarea accentului pe fabricaţie şi cu sporirea serviciilor**, precum şi a unui **nou model** ce se dezvoltă pentru **creşterea intensităţii serviciilor în fabricaţie**. Datele structurale curente nu reflectă aceste schimbări foarte bine, dar este clar că: în vreme ce industriile preocupate cu creaţia, producţia şi distribuţia de bunuri vor rămâne forţa mobilizatoare centrală în economia viitorului, majoritatea locurilor de muncă pe care aceasta le generează va fi în industria serviciilor.

Firmele româneşti care pun accentul şi-şi dezvoltă competenţele în: managementul de proiect, design, proiectarea noilor produse şi procese, distribuţie şi transport, controlul costurilor etc., vor avea avantaje, în pofida crizi economice deoarece costurile de producţie scad, ca parte a costurilor totale. În plus, odată cu clusterizarea industriilor şi reţeaua globală în schimbare a economiilor de scară, firmele româneşti mici şi agile vor putea să concureze eficient cu firmele străine mai mari dar mai puţin flexibile.

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ECONOMIA CUNOAŞTERII
ŞI STRATEGIA DE DEZVOLTARE

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REZUMAT

Din dezbaterile privind Economia Cunoaşterii în România în privința strategiilor de dezvoltare, numeroase, contradictorii şi în permanentă schimbare, am selectat şi prezentăm mai jos trei puncte de vedere cu pondere însemnată: 1.dezvoltarea liniară, 2. continuarea lărgită a economiei de tip industrial, 3. transformarea globală.

ABSTRACT

The debates about the Knowledge Economy in Romania, taking into consideration development strategies, are in a great number in contradiction and in perpetual change. So, as results we have selected and we have presented three of the most important points of view: 1. the linear development, 2. the enhanced and continuous development of the industrial economy, 3. the global transformation of the economy.

CUVINTE CHEIE: transformare globală, dezvoltare, dilemă, productivitate, strategie

KEYWORDS: global transformation,development,dilemma,productivity strategy

1. DEZVOLTAREA LINIARĂ

A vorbi despre E.C. şi dezvoltarea industrială constituie o periculoasă distragere de la probleme importante ale dezvoltării României, cum ar fi ieşirea din criză, creşterea producției, reducerea şomajului şi industriile de tehnicitate redusă (inclusiv lohnul) în care România este încă relativ competitivă, datorită costului redus al forței de muncă.

Febra E.C. care sensibilizează pe unii politicieni sau cercetători perturbează astfel efortul de concentrare a atenției de la sarcinile cotidiene ca: ieşirea din criza economică care presupune economisirea, sporirea producției şi scăderea şomajului, într-o țară cu o economie încă rămasă în urmă. Este deci irelevant să pui E.C. în centrul discuțiilor privind dezvoltarea României.

Acest punct de vedere este exprimat deseori de către manageri şi alți specialişti mai conservatori, în discuții informale, dar este mai rar exprimat fățiş în materiale scrise (articole, la seminarii etc.).

2. CONTINUAREA LĂRGITĂ A ECONOMIEI DE TIP INDUSTRIAL

Aceasta susține că E.C. este o etapă superioară a economiei de tip industrial, în care rolul cunoaşterii şi al competiției la nivel global sunt mult amplificate. O economie de succes este aceea care hrăneşte efectiv creația şi achiziționarea de cunoaştere şi aplicațiile sale la toate aspectele vieții economice şi sociale.

Nici acest punct de vedere, mai larg răspândit, nu propune o schimbare **fundamentală,** E.C. fiind privită doar ca **o intensificare**, de mult apărută, a economiei de tip industrial.

Problema este de a moderniza în România cunoaşterea şi abilitățile / competențele, mai ales în domeniul infrastructurii, prelucrărilor şi al creşterii productivității muncii. Deci România trebuie să-şi dezvolte mai ales sistemele şi structurile care s-au dovedit eficace în economiile țărilor avansate din cadrul U.E. şi să-şi dezvolte sistemele de inovare în aceste direcții, în timp.

Este o cale relativ cunoscută din experiența altor națiuni şi se pune doar problema unei voințe politice mai ferme.

3. TRANSFORMAREA GLOBALĂ

Cel de al treilea punct de vedere, poate fi descris ca fiind: transformarea globală a viziunii. Acesta susține că E.C. reprezintă **o schimbare fundamentală** în structura şi caracterul economiei globale, cu un potențial tot aşa de original şi profund ca acel al revoluției industriale.

Țările în curs de dezvoltare, ca România, trebuie să înțeleagă că această lume nouă, poate fi total diferită de cea care a avut succes în țările dezvoltate sau în țările care au progresat rapid în ultimii ani, din punct de vedere industrial.

Aceaste strategii trebuie gândite din nou, în lumina strategiilor emergente globale şi particularităților caracteristice ale României. Nu există vreo garanție că, drumul dezvoltării tradiționale va da rezultatele dorite în cadrul E.C.

Considerăm că, punctul de vedere nr.1. este irelevant şi nu este corect. E.C. nu este o denumire pentru industriile de înaltă tehnicitate, ci **o tranformare** atotcuprinzătoare ce afectează toate zonele geografice ale țării şi toate industriile.

Industria textilă şi a confecțiilor furnizează un exemplu bun. Procese complexe ce implică fluxul global de tehnologii, proiectarea şi informațiile de marketing, precum şi segmentarea sistemelor de producție refasonează în prezent aceste industrii. Obiectivul de a capta o valoare adăugată importantă în industria confecțiilor şi cea textilă, prin competiția bazată pe costuri reduse, este în declin rapid. Nu e o opțiune viabilă pentru firme şi pentru țară să ignore E.C. şi să urmărească creşterea în industrii în care în mod curent competitivitatea se bazează pe costul redus al forței de muncă. Forțele economiei E.C. transformă aceste industrii şi bazele competitivității din cadrul lor.

Prezintă importanță problema locurilor de muncă pe care le furnizează industria de joasă tehnologie. E.C. constituie un context global în cadrul căruia România va acționa, dar nu este o scuză pentru a ignora realitățile existente. Rămâne de stabilit dacă o strategie industrială extinsă este valabilă pentru România în E.C. emergentă sau dacă este necesară o redirecționare mai vastă, sugerată de către viziunea transformatoare globală.

Creşterea productivității muncii determină creşterea standardului de viață. Este însă adevărat că rata şomajului se reduce mai lent decât creşterea productivității muncii.

Privatizarea a crescut (aparent) nivelul şomajului, dar productivitatea muncii creşte continuu şi se crează noi I.M.M.-uri performante.

Dilema şomaj / productivitate

Productivitatea forței de muncă are încă un nivel redus în raport cu standardele internaționale şi ale U.E, în ciuda creşterii ei relativ rapide. Există un surplus masiv de forță de muncă în agricultură şi exces de angajați în firmele mai recent privatizate

Este necesară crearea de noi locuri de muncă. Dar majoritatea creşterii economice se datorează în România creşterii productivității muncii şi doar o mică parte creşterii numărului de locuri de muncă. În sectorul public numărul locurilor de muncă este în scădere datorită crizei. Inițiativele politice de creştere a productivității muncii prin noile tehnologii moderne vor accentua tendința de a scădea numărul de locuri de muncă.

Deci dilema creşterii productivității în industrie este o forță importantă de dezvoltare a standardului de viață. Aparent, E.C. riscă să amplifice problema şomajului.

Implicații pentru angajarea forței de muncă şi pentru productivitate.

Modelul englez al puternicei expansiuni în ocuparea forței de muncă în industrie (transferate din agricultură) şi apoi transferate din industrie în sectorul serviciilor caracterizează toate economiile țărilor avansate, mai devreme sau mai târziu.

O țară ca România, care urmăreşte o strategie de dezvoltare bazată pe industrializare, la începutul secolului 21, se confruntă cu probleme mult mai dificile decât în 1980. Productivitatea în industria prelucrătoare s-a dublat iar piețele la nivel mondial sunt mult mai deschise şi mai competitive.

Ca urmare a creşterii productivității muncii, numărul de locuri de muncă în industrie s-a redus la nivel absolut, încă din 1980, ca parte a numărul total de locuri de muncă.

Odată cu afirmarea sistemului global de producție, țările avansate abordează domeniile de valoare ridicată ale sistemului de producție şi externalizează elementele de valoare redusă, pe baze concurențiale în țările cu un cost redus al forței de muncă, influențând procesul de devoltare al acestora.

Întreaga producție industrială se datorează înaltei productivități şi nu creşterii numărului de locuri de muncă. Serviciile înfloresc în defavoarea industriei, care în bună măsură şi-a atins cota maximă.

În cazul României se observă:

- nivelul redus al productivității muncii în fabricație, în raport cu standardele internaționale;
- excesul de forță de muncă în firmele proprietate de stat (sau recent privatizate);
- creşteri în activități ca valoare redusă a prelucrării, cum este cazul industriei lemnului;
- sunt remarcate totuşi semnale clare privind creşterea serviciilor, în mod tot mai rapid.

Se ridică întrebarea: este viabilă pentru România o strategie bazată pe industrializare ?

Calea tradițională de dezvoltare se bazează pe creşterea volumului producției şi a productivității prin introducerea unor tehnologii avansate, a unor sisteme şi procese evoluate. Sporirea producției industriale este principalul factor de creştere a P.N.B. Creşterea productivităţii în industrie şi în agricultură este motorul creşterii standardului de viaţă.

Creşte astfel numărul locurilor de muncă în industrie şi în sectorul serviciilor. Firmele mici absorb persoanele eliberate ca urmare a de creşterii productivităţii în agricultură; se crează un cerc virtuos.

Nu există contradicţii între creşterea în productivitate, descreşterea numărului de angajaţi pe unitatea de producţie şi angajarea completă, datorită creşterii numărului locurilor de muncă în industrie şi servicii.

Acest rezultat corespunde curentului principal al teoriei economice conform căruia asemenea tensiuni nu pot exista, deoarece teoria afirmă că **pieţele se adaptează în timp pentru a menţine angajarea completă.** În cazul României, exită însă un conflict între creşterea productivităţii şi creşterea corespunzătoarea a numărului locurilor de muncă şi deci între P.N.B. şi nivelul ocupării forţei de muncă.

Regândirea strategiei de dezvoltare

Cum trebuie gândită strategia de dezvoltare a României în Economia Cunoaşterii ? Scopul dezvoltării este bunăstarea individului şi a comunităţii.

Sectorul serviciilor este un sector prioritar nu periferic, anexă. În strategiile de dezvoltare tradiţionale accentul s-a pus pe industrie şi pe agricultură. Sectorul serviciilor era considerat rezidual. Deşi serviciile sunt principalul generator de locuri de muncă în ţările dezvoltate, până în prezent s-au făcut relativ puţine progrese pentru crearea de politici sistematice de dezvoltare a sectorului de servicii.

Experienţa internaţională e destul de redusă, insuficientă pentru orientarea României sau a altor ţări în curs de dezvoltare. Este adevărat că au loc dezbateri internaţionale referitoare la sectorul public şi privat privind serviciile cheie, cum ar fi: **educaţie, sănatate**. Nu există însă o **practică a dezvoltării serviciilor industriale** în ţări care încearcă să reducă decalajul major din acest domeniu.

Sugestiile disponibile se referă la rolul pieţei în promovarea noilor tehnologii şi a serviciilor industriale aferente acestor noi tehnologii, în vederea sporirii locurilor de muncă de înaltă calitate. Sunt recomandate reducerea barierelor de intrare, creşterea deschiderii faţă de investiţiile străine, a investiţiei în cunoaştere, a numărului de locuri de muncă în domeniul serviciilor care presupun cunoaştere intensivă.

Regândirea angajării, creşterea producţei şi productivităţii

În ţările în care forţa de muncă este redusă şi există angajare completă, creşterea standardului de viaţă se bazează pe creşterea productivităţii. Dacă ţara are o forţă de muncă importantă şi o angajare mai redusă, atunci extinderea angajării cât şi a productivităţii sunt decisive pentru standardul de viaţă. Pentru România nivelul angajării şi al productivităţii sunt ambele importante.

Gândirea actuală privind dezvoltarea este dominată încă de modelul: transferul agricultură – industrie - angajarea completă.

Creşterea productivităţii este însă decisivă pentru competitivitatea firmelor româneşti pe pieţele deschise ale lumii. A urmări creşteea producţiei, neglijând calitatea într-o lume globalizată, expune industria la un pericol major: producţia nu va fi acceptată nici de consumatorii autohtoni, nici vândută pe pieţele externe.

Achiziţionarea şi crearea de cunoaştere

Investiţiile străine directe constituie o sursă importantă pentru achiziţionarea de cunoaştere şi transfer tehnologic.O altă sursă, ceva mai greu accesibilă întreprinderilor româneşti, o reprezintă licenţele.

Achiziţionarea eficientă din exterior ridică însă unele probleme:

- **managerii nu vorbesc limbi străine şi mai ales nu au legături internaţionale**; acestea constituie limitări grave în economie, pentru creşterea la nivel global;
- firmele româneşti nu dezvoltă în general mărci renumite ;
- reputaţia privind calitatea lasă mult de dorit.

Toate aceste elemente intangibile, specifice E.C., nu îngăduie un aflux de beneficii mari firmelor româneşti, care se mulţumesc să concureze prin preţ, renunţând la avantajul competitiv oferit de E.C.

În privinţa creării şi adaptarii cunoaşterii putem constata că**:**

- numărul de cereri de patente este redus;
- fonduri publice pentru C-D sunt scăzute;
- **sectorul de afaceri nu investeşte în C-D;**
- exportul de componente de înaltă tehnologie este scăzut;
- lipsa de capital constituie încă o mare constrângere pentru dezvoltarea tehnologică;
- capacitatea firmelor de a promova noi produse şi procese este deosebit de modestă;.
- **cercetătorii ştiinţifici se preocupă insuficient de dezvoltarea economică şi tehnologică**;
- cooperarea tehnologică între firme şi universităţi este **redusă;**
- preocupările privind dezvoltarea durabilă –număr cercetători / ingineri în cunoaştere şi ameliorarea organizării acesteia sunt încă în stadiu incipient.

Prezentăm în tabelul nr.1. relaţia investiţie în cunoaştere - excelenţa firmei, modul în care intervenţia **investiţiei în cunoaştere** promovează şi susţine efortul evolutiv al întreprinderii spre competitivitate şi excelenţă durabilă.

Tabelul nr.1.

Relația investiție în cunoaștere, excelența firmei.

Nr.	Investiția în cunoaștere Acționează ca o/un:	Domeniul de acțiune al investiției în cunoaștere	Rezultatul transformării
1	Bază de informații	a)Activitatea managerială. b)Cultura organizației.	Noua concepție. Comportamente ameliorate.
2	Sursă de idei și soluții	Cuplul: Strategia firmei- Cultura organizațională.	Armonizarea cuplului. Strategie cultură
3	Catalizator	Sinergii pozitive generate de cuplul strategie - cultură	Rafinarea sinergiilor pozitive.
4	Transformator	Sinergii rafinate care ameliorează întreg sistemul	Excelența firmei
5	Sursă de excelență durabilă	Firma, ca sistem adaptat și competitiv.	Asigurarea excelenței și a durabilității firmei.

4. CONCLUZII

Din tabel constatăm că, pe primele trepte de evoluție, investiția în cunoaștere are doar un rol de lărgire a bazei de **informare** în vreme ce pe treptele superioare, investiția în cunoaștere intervine direct în procesul **de formare și de rafinare al sinergiilor, constituie o componentă a procesului** de urmărire și asigurare a excelenței și ulterior a excelenței durabile.

Piedici observate în diseminarea cunoașterii în România:

- birocrația îngrădește încă dezvoltarea afacerilor;
- informația despre afaceri nu este încă ușor acceptată;
- taxele pentru organizarea unei firme nu încurajează activitatea antreprenorială;
- băncile și bursele nu tratează I.M.M-urile egal cu marile firme;
- managerii au nevoie de dezvoltarea abilităților și competențelor în marketing, antreprenoriat etc.

Utilizarea cunoașterii și performanța în promovarea dezvoltării presupune:

- reforme orientate spre realizarea în fapt a economiei funcționale de piață;
- creșterea puternică a productivității muncii, eliminarea tehnologii neperformante;
- reducerea drastică a poluării, nu numai cea cu dioxid de carbon, manifestarea unui interes real pentru problemele privind **dezvoltarea durabilă**;
- sporirea capabilității firmelor de **a transforma ideile științifice în produse viabile din punct de vedere comercial,** cu costuri reduse și apte să absoarbă noi tehnologii;
- pregătirea masivă de **personal înalt calificat**;
- conștientizarea managerilor privind **nevoia de consultanță în management și I.T.;**
- accelerarea creșterii infrastructurii informaționale.

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Quick Info

Making the most of process automation knowledge

In the 1960s, the early days of process control, a plant might have 5000 measurement points to achieve the basic regulatory control demanded. Since then this number has grown in order to match demands for advanced process control, real-time optimisation, supply chain management, asset management and business control. Today a typical refinery, for example, might have 150 000 measurement points.

The systems managing and controlling today's process plants are a closely integrated blend of 'traditional' measurement and control with applied IT. So much so that many of the distinctions between the two and between the plant floor and the enterprise are blurring or even disappearing entirely. Up until now, however, the tools available to manage this sophisticated environment have focused on its individual components while largely ignoring their interdependencies and overall context. All this at a time when not only is complexity is growing exponentially, but also resources, both in terms of finance and personnel, are becoming ever more constrained.

An additional challenge here is that the installation and implementation of these assets involves an engineering investment many times greater than their original cost but, even then, their true value to the enterprise may only become apparent after an incident or when the empirical knowledge associated with them walks off the plant as experienced personnel leave or, more likely, retire.

One leading US refiner recently reported losing 2500 man-years of operator experience through retirement at a single site in one year, while a major chemical company said that it expected to lose 75 per cent of the operating staff at one of its largest plants through retirement by the end of the decade.

Arguably the most important aspect of that 'added value' is the production knowledge which is embedded in a plant's automation assets as a result of their configuration and operation.

It's a challenge which has been likened to mapping the human genome, with the added complexity that the 'Automation Genome' is continually changing as a result of integration and interaction. However, a new solution from Texas-based company Process Automation Solutions (PAS) is rising to the challenge.

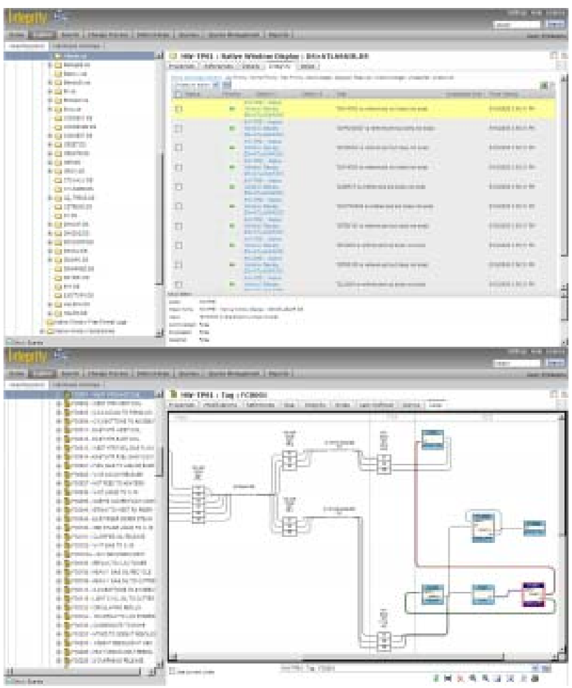
This help comes in the form of Integrity from PAS. Integrity builds on earlier generations of automated documentation systems developed by PAS including the widely accepted DOC 3000 and DOC 4000 systems for Honeywell DCSs. However, rather than being specific to one particular vendor or one class of systems, Integrity can capture data from any source. Moreover it's not restricted to what would normally be regarded as automation assets but can capture knowledge from paper based and even human sources and handle it in essentially the same manner as that from electronic sources.

In order to maximise adaptability and future development potential, PAS has adopted a three-tier, modular structure for Integrity. Underpinning the entire solution is Integrity Foundation which provides a universal framework for aggregating and contextualising data from across the entire process automation environment, irrespective of the individual source. It captures and archives explicit knowledge from each source, mapping the genealogy of the dataflow, and also provides a set of common search, query and reporting functions.

Actually interfacing with and extracting data from the individual data sources is the task of a large and growing family of Asset Models. These driver-like plug-ins convert the source data into a common data format for the Integrity database. Currently some 50 Asset Models are available, covering not only most popular DCSs, PLCs and safety systems but HMI/SCADA packages, historians and asset management packages as well as less automation specific applications including Microsoft Office and Sharepoint.

Building on the capabilities of Integrity Foundation, a series of three additional modules provides Integrity's higher level functionality. Integrity Essentials establishes the asset hierarchy, organising data from the individual assets into a tree structure which enables drill down discovery of increasingly granular data.

Meanwhile the complementary Reference Explorer exposes all of the automation references, supporting progressive exposure of the data, while Genome Mapping provides a third view of automation assets, generating a graphical block diagram of all automation relationships. Essentials also includes a 'Smart Tags' facility to link text in Microsoft Office documents to the Integrity database, a Defects Finder (Fig. 1) which automatically identifies 'genetic defects' or configuration errors and a Change Tracker which maintains a complete history of configuration changes.



Integrity Advanced Elements then provides a further degree of management capability in four key areas, with Spares Capacity maintaining a central inventory, identifying spare hardware and software capacity and allowing spares to be reserved against projects; Backup and Recovery providing a central backup and recovery resource, identifying the health of back up databases and providing a step by step recovery procedure on a system by system basis; Integrity Loop Sheets (Fig. 2), which integrates with Intergraph InTools and provides integrated field and control strategy loop drawing, with automatic identification of discrepancies between instrument and control system databases; and Plant Hierarchy, which extends the Genome concept from automation to plant assets, supporting S88 and S95 asset configurations and correlating plant asset and automation asset data.

But the most innovative module according to Lyden is Integrity Collaboration which supports the capture of empirical knowledge and its incorporation into and access from the Integrity database. The primary collaboration platform is the Plant Wiki which allows users, depending on their authorisation level, to view, add to, edit or approve plant knowledge. Wiki articles can be imported into and contextualised with the Integrity database, tagged for easy search and linking and have hyperlinks added.

A further Sticky Notes facility allows users to add short notes to any asset or data object. The notes are integrated with the Integrity database and can be searched and accessed in context from their associated objects. It's also possible to add electronic media such as video and audio files which can again be searched and accessed in context from their associated objects.

In addition users can access the huge amount of knowledge now held in emails using the Email Explorer which aggregates and contextualizes tagged emails in the Integrity database where they can be searched and accessed or shared in context. There's also a Data Mining facility for searching for specific patterns across all databases, systems and document, a Subscriber Notification function which sends updates to subscribers by web page, email or pager whenever the Integrity database is modified and an Amazon-like "If you loved this, you might also like ... " Smart Guide to provide additional information based on context.

Invensys Process Systems (IPS) has just announced that Integrity Automation Genome mapping software will be utilised by project teams within Invensys Operations Management's delivery organisation, enabling collaboration among multiple Invensys Operations Management teams. IPS has already reported 3-7 per cent improvement in performance when using the system. According to Tyler, other users have gone as high as 10 per cent. Current users among operating companies include Chevron, Mobil, ConocoPhillips and Celanese.Integrity is also helping Chevron as it goes through the process of standardising on Yokogawa Centum and migrating to it on all the company sites. "The company is using our system to capture 'as-is' data on a legacy system and then export it to the Centrum," notes Lyden.
(source: http://www.engineerlive.com/Process-Engineer/Plant_Management/Making_the_most_of_process_automation_knowledge/22541/)

EDUCATION TRENDS IN ROMANIA – A STATISTICAL ANALYSIS BY GENDER FOR THE LAST DECADE

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REZUMAT

În ultimul deceniu, cererea de informații cantitative referitoare la educație, comparative la nivel internațional, a crescut enorm, mai ales în Europa. Procesul de la Bologna, precum şi procesul de la Lisabona a revigorat interesul pentru informații cantitative privind dezvoltarea sistemelor naționale de educație, informații şi mai ales indicatori care sunt primordiali pentru implementarea Metodei de coordonare deschisă a Uniunii Europene. Compararea indicatorilor proprii naționale cu restul statelor membre este văzută ca o forță motrice importantă pentru dezvoltarea sau ajustarea politicilor naționale care vizează îndeplinirea obiectivelor de la Lisabona.

ABSTRACT

The past decade, the demand for international comparative quantitative information on education has grown tremendously, especially in Europe. The Bologna process as well as the Lisbon process has revived the interest for quantitative information on the development of national education systems. Quantitative information, and especially indicators, is a cornerstone of the new EU Open Method of Co-ordination. Comparison of the own national indicators with the rest Member States is seen as an important driving force for the development or adjustment of national policies to move towards the Lisbon objectives.

CUVINTE CHEIE: tendință, educație, rata de participare, ISCED, paritate de gen

KEY WORDS: trend, education, enrolment rate, ISCED, gender parity

1. INTRODUCTION

The past decade, the demand for international comparative quantitative information on education has grown tremendously, especially in Europe.

The Bologna process as well as the Lisbon process has revived the interest for quantitative information on the development of national education systems.

Quantitative information, and especially indicators, is a cornerstone of the new EU Open Method of Co-ordination.

Comparison of the own national indicators with the rest Member States is seen as an important driving force for the development or adjustment of national policies to move towards the Lisbon objectives.

2. INDICATORS OF EDUCATION

Education trends from 2000 to 2009 for the following education indicators:

- Proportion of B/G in early childhood care
- Proportion of F/M teachers in early childhood care
- B/G enrolment rates in pre-primary education (ISCED 0)
- Gender parity index in pre-primary education (ISCED 0)
- Proportion of F/M teachers in pre-primary education (ISCED 0)
- B/G enrolment rates in basic education (ISCED 1 and 2)
- Gender parity index in basic education (ISCED 1 and 2)
- Proportion of F/M teachers in basic education (ISCED 1 and 2)

- Repetition rates of B/G in primary and lower secondary education (ISCED 1 and 2)
- B/G enrolment rates in upper secondary education (ISCED 3)
- Gender parity index in upper secondary education (ISCED 3)
- Proportion of F/M teachers in upper secondary education (ISCED 3)
- B/G enrolment rates in tertiary education (ISCED 5)
- Gender parity index in tertiary education (ISCED 5)
- Proportion of F/M teachers in tertiary education (ISCED 5).

3. EDUCATION TRENDS DURING 2000[1] TO 2009

a. Early childhood care

The total number of children in early childhood care in public institutions in Romania was in 2000 by 13.2 thousands of boys and girls. In 2009, the number of children registered in early childhood care increased to 22.2 thousands. There is a balance between boys and girls in early childhood care, proportion of boys/girls being almost 1:1 every year. Trend of gender disaggregated data collection is available since 2005.

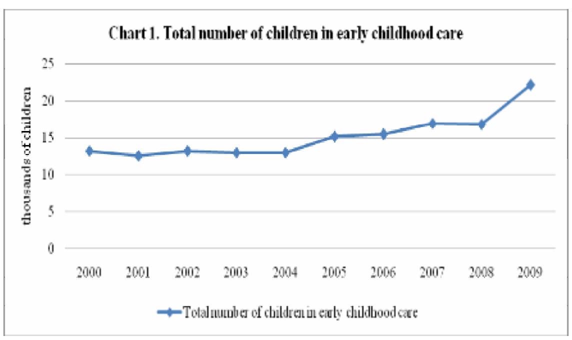

Figure 1. *Total number of children in early childhood care*

Data are not available for private institutions for children in early childhood care, because there is not a statistical survey to collect data on this issue. Anyway, the first private institutions for early childhood care are recently established in Romania (in the last five years).

Data are also not available for teachers in early childhood care for both public and private institutions.

[1] Data for 2000 refer to beginning of school year 2000/2001, for 2001- beginning of school year 2001/2002, etc.

b. Pre-primary education

The total number of children enrolled in pre-primary education was 611.0 thousand in 2000. In 2009, the total number of children enrolled in pre-primary education (3-7 years old and over) increased by 666.1 thousand.

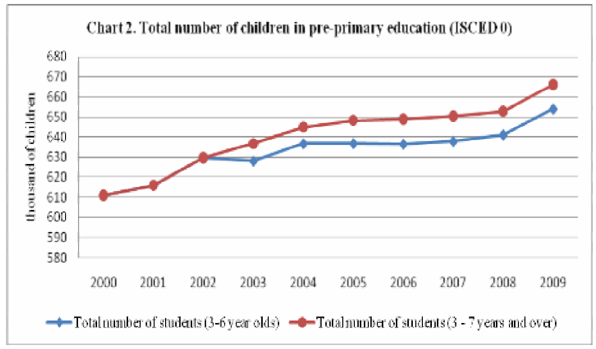

Figure 2. *Total number of children enrolled in pre-primary education*

Enrolment rates in pre-primary education (ISCED 0) have an ascendant trend during the reference period (from 66.1% in 2000 to 77.0% in 2009). The figures are higher for girls than form boys (77.4% for girls, respectively, 76.6% for boys, in 2009).

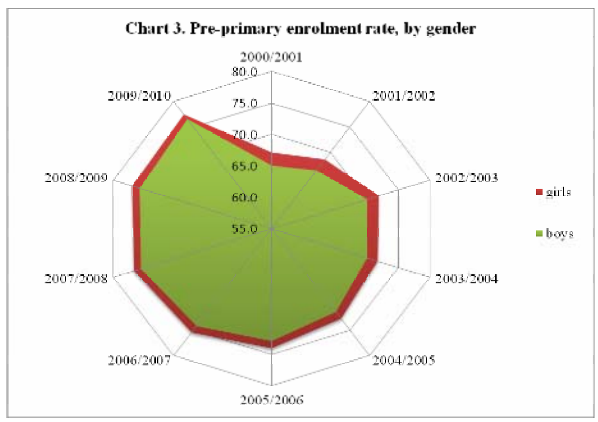

Figure 3. *Pre-primary education rate, by gender*

Gender parity index in pre-primary education was almost constant from year to year, varying between 1.02 in 2000 to 1.05 in 2009.

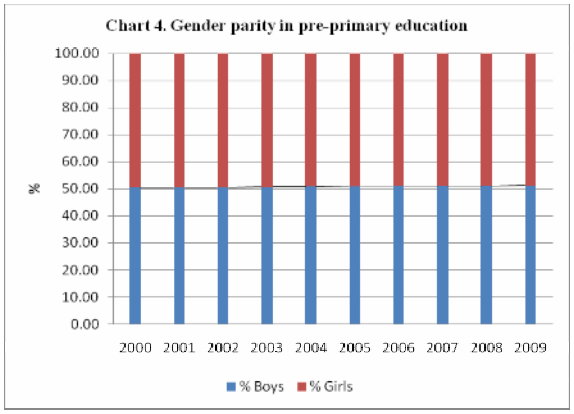

Figure 4. *Gender parity index in pre-primary education*

The private education is not yet widespread across the country, the majority of children being enrolled in pre-primary public institutions (99% in 2000, 98% in 2009).

Total number of classroom teacher was 34.0 thousand in 2000, the average rate of growth in the period 2000-2009 is 1.33% yearly.

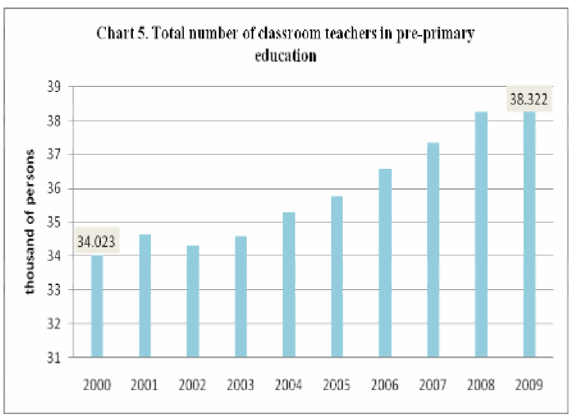

Figure 5. *Total number of classroom teacher in pre-primary education*

Teachers in pre-primary education are majority women (in 2009, 112 male persons, compared to 38.2 thousand of female).

c. Basic education

The trend of net enrolment rates in basic education (ISCED 1 and 2) has a sinusoidal shape in the reference period. The lowest value (88.3%) was calculated for the total pupils aged 7-14 years, in 2008.

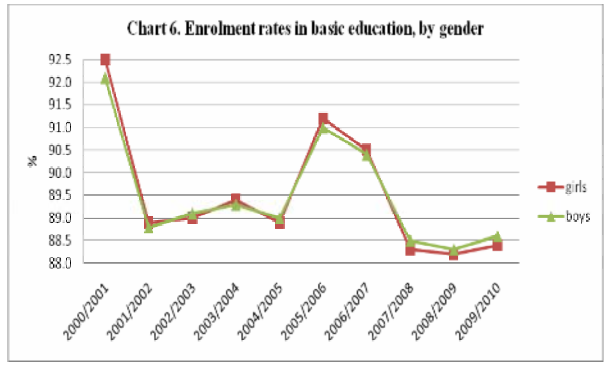

Figure 6. *Enrolment rates in basic education, by gender*

In 2009, the number of students in basic education (ISCED 1 and 2) decreased to 71.3% of the level registered in 2000 (77.5% in primary education, respectively 65.4% in lower secondary education).

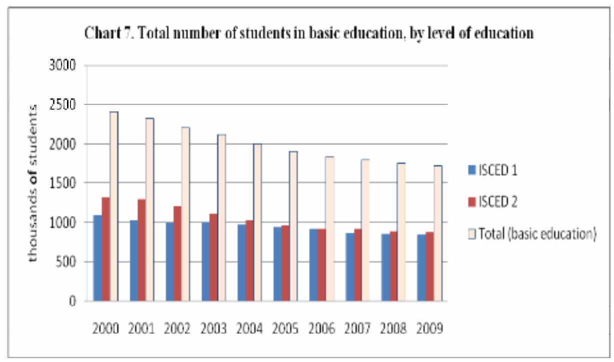

Figure 7. *Total number of students in basic education, by level of education*

Generally, basic education in Romania is public (98.2%), even though the number of students enrolled in private basic school institutions has increased in 2009 compared to 2000 over three times (3.3 in primary education and 3.8 in lower secondary education).

The school population enrolled in basic education is almost balanced between male and female students. Gender parity index in basic education (ISCED 1 and 2) is the same every year since 2004 (B/G: 1.07).

The number of female teachers in basic education is three times more than male teachers. The highest proportion of F/M teachers in basic education (3.07) was in 2006.

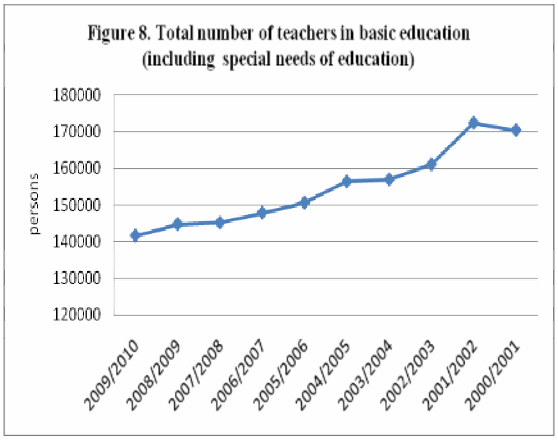

Figure 8. *Total number of teachers in basic education*

d. Upper secondary education

The total number of students in upper secondary education[2] decreased since 2004. In 2009-2010, 953.2 thousands of students were enrolled across the country in high-schools (921.3 thousands students in public education and 31.9 thousands students in private upper secondary education).

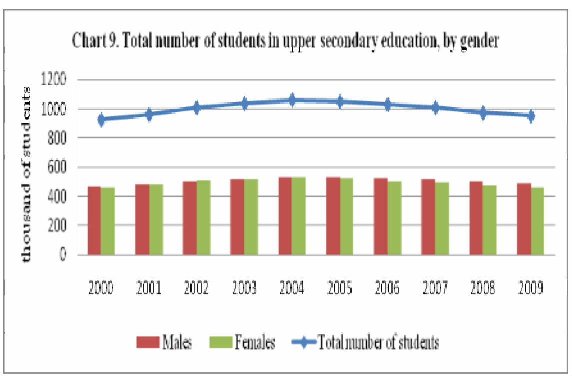

Figure 9. *Total number of students in upper secondary education, by gender*

Because of the gender parity of Romanian population, the B/G enrolment rates in upper secondary education (ISCED 3) is almost 1:1 every year (the value of this indicator has increased to 1.4 beginning of 2006, and to 1.6 in 2009).

Trend of teacher in upper secondary education is correlated with the diminishing number of students. The number of female teachers has always been superior compared to male during the reference period; the proportion of F/M teachers in upper secondary education increased from 1.6 registered in the school year 1999-2000 to 2.0 in 2009-2010.

[2] Upper secondary education comprises both theoretic and vocational education

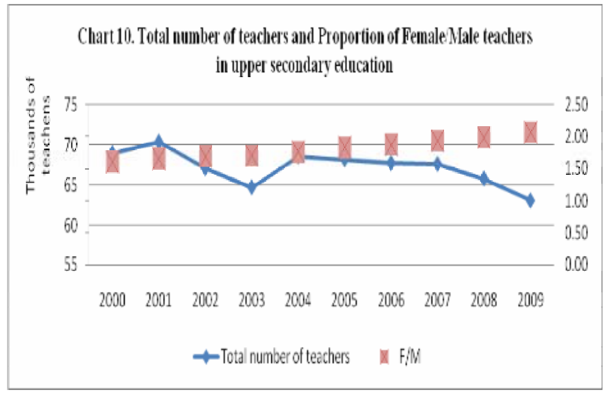

Figure 10. *Total number of teachers and proportion of Female Male teachers in upper secondary education*

e. Tertiary education

Total number of students in tertiary education (ISCED 5) was 775.3 thousand in the academic year 2009-2010, with 242.2 thousands of students higher than 1999-2000.

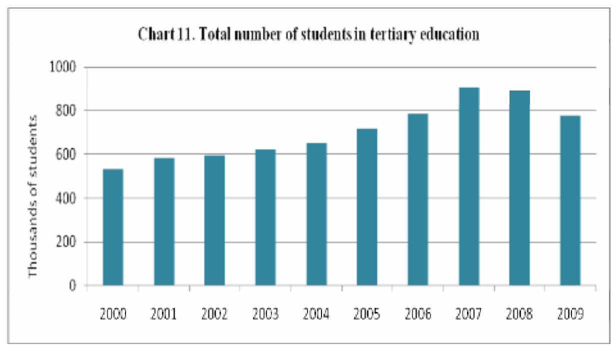

Figure 11. *Total number of students in tertiary education*

Enrolment rate in tertiary education is 26.8 in 2009, but there are differences between the rates calculated for female and male students (30.3%, respectively 23.4). A reason could be the higher number of girls enrolled in tertiary education than boys, the gender parity index being 1.24 (F/M).

The structure of teachers, by gender shows that in tertiary education the number of male teachers is superior of female, although the proportion of M/F trend is decreasing.

CONCLUSIONS

In Romania, for all levels of education, the statistical indicators show that education follow positive trends.

There are no differences by gender in Romanian education, even though the potential gaps are referring to access to education or other criteria. Education is mostly seen as confirming/reinforcing national priority: this is the process' biggest strength, it "crystallises" major trends and reveals that issues and solutions have a national and European dimension.

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Quick Info

Design Engineer - Computer Systems Software

Scan2CAD V8 converts PDF to CAD and raster to vector

Softcover is releasing Version 8 of Scan2CAD, its popular, professional raster-to-vector converter that now integrates accurate and advanced, near-instant automatic conversions of vector PDF files into a DXF file format suitable for editing in Autocad and/or any similar compatible PC CAD, CNC or GIS program.

Scan2CAD v8 combines both comprehensive PDF-to-CAD and raster-to-vector conversion in one cost-effective program. It enables allows CAD, AEC, CNC and GIS users to convert the full range of PDF files - including single and multi-page raster, vector and hybrid (raster and vector) - as well as scanned raster images of technical drawings, site plans, contour maps, schematics and shape outlines, etc. Flexible new licensing options permit users to run Scan2CAD on more than one PC and to share it with colleagues via a USB stick, floating network or fixed network licence, all at no extra cost.

In recent years, the popularity of PDF for sharing CAD data has resulted in a huge increase in the number of vector PDF files (ones created in a CAD program and saved as a PDF file). The distinct differences between raster and vector PDF file types has forced CAD users to buy two separate standalone converters. However, Scan2CAD v8 now provides them with a cost-effective, professional two-in-one utility.

Scan2CAD v8 will open vector PDF files as vector DXF, giving near-instant vector PDF file conversions. Users can immediately view the converted PDF file on screen with the option to edit it in Scan2CAD or save it for export to and editing in any PC CAD or similar program. As PDF files are often saved in the wrong orientation, Scan2CAD v8 enables users to rotate the vector file before export to CAD. In multi-page PDF files users can navigate to a specific page. Raster images included in the PDF can be cleaned and converted with Scan2CAD or saved as a BMP, JPG or TIF file attached to any DXF file.

Among the practical innovations that are said to distinguish Scan2CAD v8's vector PDF conversion quality, and which make its results easier to edit in any PC CAD program, are the following:

* True arc, circle and Bezier curve recognition
* Individual PDF characters can be reassembled into editable words and sentences
* PDF line type and line thickness recognition
* Efficient file management - multiple raster images on a single PDF page can be mapped to one image

Among the other new features in Scan2CAD v8 are:

* Save as PDF (both raster and vector)
* New Command Line functions to support Batch PDF conversion
* Open CYMK images and images with colour depth greater than 24-bit
* Change the colour of all or individual vectors in an area
* Improved Bezier curve drawing
* New Raster and Vector Draw functions
* Updated Raster Cut, Copy, Move and Paste
* Circle and Polygon Raster Erase

Steve Hannath, Softcover's marketing director, comments: "When a CAD user receives a PDF file, they seldom know what type of PDF they are getting until they try to open it. Is it raster or vector? Most converters will do one or the other but not both. If you have got the wrong type of PDF file for your converter, you are stuck! It makes sense to purchase a solution that provides a two-in-one conversion capability. As almost all PDF converters focus on vector PDF conversion, the quality of their raster-to-vector conversion is generally very poor, a check-box feature at best. CAD users wanting to invest in a PDF-to-CAD converter should buy one that is based on a proven raster to vector converter."

A fully-working 14-day trial of Scan2CAD v8 Pro can be downloaded from the website.

For more information, visit www.scan2cad.com

(source: http://www.engineerlive.com/Design-Engineer/Computer_Systems_Software/Scan2CAD_V8_converts_PDF_to_CAD_and_raster_to_vector/23146/)

ABSORPTION OF EUROPEAN FUNDS, PRIORITY OBJECTIVE OF LOCAL COMMUNITIES DEVELOPMENT

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REZUMAT
Pentru a recupera o perioada de timp relativ mare,pierduta practic intr-un sistem care a conceput altfel economia,libertatea si dezvoltarea,pentru creionarea in peisajul European a unei natiuni prospere,educate,libere si demne,integrarea Romaniei in Uniunea Europeana trebuie privita depasind semnificatia procesului de aderare,in sensul ca aderarea nu este o conditie suficienta pentru integrarea propriu zisa.Acest proces reprezinta un parcurs complex,sistemic,care presupune rezultate multiple,ale caror efecte conlucreaza la dezvoltarea durabila a Romaniei in plan economic si social, in vederea unei participari competitive si performante pe piata interna a Uniunii Europene.

ABSTRACT
In order to recover a relatively loss of time spended basicly in a system which has differently conceved economy,fredom and development, for outlining in European landscape as a flourishing,educated,free and dignified nation , the adhesion of Romania to European Union must be looked beyound the espousal process by meaning that adhesion is not enough for that matter integration.This complex systemic throughout process entails many results which effects are pulled together for Romania's sustainable social and economic development in order to make a realist participation on European Union intern market.

CUVINTE CHEIE
Fonduri europene,comunitati locale,dezvoltare durabila,globalizare, parteneriat public privat.

KEYWORDS
European funds, local communities, sustainable development, globalisation, Public-Private Partnership.

1. INTRODUCTION

The main backround that started this paper is based on the unanimous recognized importance of european funds in the process of sustainable development for all regions in Romania. In nowadays conditions romanian economy is still dealing with highly structural problems coroborated with world economic crisis,accounted by some critics as unprecedented.

Given this situation the financial support from E.U. is an extremely important financing source and absolutely necesary for romanian state to recovery the significant differences towards other european states.

Therefore, the absorption of european funds has become a phenomenon which seems to guvernate any attempt of strategic planification for development at national,regional and local level.

The fundamental theme of these paper is that sustainable development would not be the result of an evolution process without the essential support of european funds.

2. STRATEGIES AND IMPLEMENTS FOR LOCAL AND REGIONAL DEVELOPMENT

Local and regional strategies not only involves the aspects of adiministrative organisation adjustments but the government reform at subnational level which follows stimulation of economic growth and utilisation of specific public zone financial instruments. This implements first of all adapting public finance to the new requests that are imposed by our statute as european member.

Modernisation can be achieved by concentrate actions using fiscal-budgetary techniques (budgeting programs) by elaborating and applying public investments projects in order to stimulate economic growth and life standard quality improvement.

The term of development implies a multitude of economical, social and politic pieces which are dissimilar as each country has it's own values and traditions.

Globalisation can be described as an open window for exchanging products,investments capital,work,competition,extending at worldwide scale all production systems,standardisation of quality rules, working, quality-price balance and improving transport means, basically transforming economical systems in the last 20 years.

Because of economic and financial crisis undertakings have reorganised their product system,refocusing activities and modernising technologies, in one word they have had adapted to technologycal evolution and market segmentation. Thereby great concerns have abandoned marginalized activities using more and more often local resources in order to obtain all categories of services: law, financial engineering,development,research.

Thus services built themselves as genuine systems capable of providing the necessary goods and services for that matter quality though quantity othertimes just intern obtained.

The trend of using the most appropriate resources involves the support of local authorities for undertakings (public systems, infrastructure,utility,for them to became one of the essential pieces in the competition between big concerns[1].

On the other side, following this springiness had as consequence the valorification of cooperation between local Small and Medium Enterprises and also between them and it's economical environment,to carry out a network of economic agents (a structure like an endogenous network) having the purpose of choking more easier the innovation investments, the production of subsets and introducing it on several markets.[2]

2.1.The need for administration and policy making reformation

Governments did not stode impartial in front of globalisation turbulences. After having indepted very much the governments have made drastic structural adjustments in order to refresh public finances, reforming services administration,markets streamline and flexibilisation of financial and material flows.

Great efforts have been made to maintain inflation rate at low level. The guarantee of prices has replaced subsidies in many cases and public authorities are talking more often about economic development decentralisation and backing up for local undertaking.

2.2.The importance of local communities in national economy development

It's not easy to define the term of local community.This concept involves a large amount of geographical,historycal,cultural,economical,administrative and social parameters.

A local community can be defined as a group of people placed in a geographical and historical area,encompassed from values, people, institutions,undertakers,activities and resources.This area formes a region were most workers can change working places devoiding migration.

Therefore we can add to the local community level term the fact that it represent a economic and social coherent criterion. Local community is capable to elaborate it's own aims and projects and define itself to regional,national and other communities.

In the frame of territorial demarcation, local communities contributes in a large measure to administrative segmentation and dispersed services.Local level is often typified by local authorities presence responsible for their actions in front of the people, having the power of elaborating charges and initiate actions at local community level.This is an interesting characteristic which can be made into a genuine development tool.

Another important aspect of local level is human scale of organisation,undertaking and actions.At national level it is possible to elaborate an economic policy based on quantity pattern which will allow the identification of performance parameters strategies and normal applied levels liable of producing some predictable effects. It is true that local communities are not big enough to adapt themselves to macroeconomics policy changes.All is specific:leadership.institutions,concerns, communitary groups,with their strong and weak points, the peculiarities of involved stakeholders.

As a consequence local development is not a mechanical process but first of all is shaped by all classes of stakeholders who must be called up to participate to activities which regard the whole community.It also must be stimulate the synergy of creative benefical effects for organic process ,a human phenomenon which cannot make a discount of values and behaviour of those who interfere in it's deployment.

2.3. The importance of small and medium enterprises (SMEs)

When we talk about local economic development it must be said that beside economic theories used at national

[1] Planque B.(1998) ,*Le development local dans la mondialisation, p 5-23, dans Territoire et Development Economique sous la direction de M.A. Proulx, l'Harmattan.*

[2] *Charland Janine et Young Dennis, Succesful Local Economic Development Initiatives,ICUUR Press,Toronto, 1992,p. 53.*

level regarding administrative organisation,modifications must be added in order to keep hold of local development specific realities.Thereby an efficient strategy of local community otherwise questionable results will be obtained and also negative effects at macroeconomical level. In case of structural adjustments SMEs represents a priority policy of interest for public authorities because they are a source of employment, takes less financial support and have a good territorial distribution. Therefore The Organisation for Cooperation and Economical Development(OCDE) defines local level as the environment where most enterprises, especially the small ones, establish and develop themselves by identifying services and resources in order to exchange technological and comercial informations.

The community of stakeholders offers human,financial and physical support generating ideas and development projects. SMEs and it's undertakers must have from the beginning a priviledge action field for local communities in order to assure development.For example SMEs have concured in a large measure to canadian economic growth thus much as productive achievements at all creation of new workplaces.In several periods the results have been simply impresive.The projects promoters as the whole community must adopt an undertaking aproachment.

In this manner they both wouldn't hesitate in taking risks and innovating, multiplying the undertakings and new projects proposals.They have to prove that are capable in facing continous changings, cooperate,communicate,negociate,participate,etc.

These behaviours are often more important then the mechanisms already set in the equation by carrying "development values" and are comparative with those of a modern enterprise.Shortly this means corroborating behaviours with specific proposed targets. In modern public administration in both theoretical and practical levels is allowed the fact that local development is an especially human phenomenon and that local power is necessary divided between different institutions.

In this manner partnership and institutional relationships between public authorities at all levels with private,social or economic character represent the link bridge in associating the existing local powers and forming the necessary coalitions in starting local development projects. Partnership is more than a simple resource focusing on the harmonization of strategies and orientations.Throught PPP we are looking for some innovatory results other than the individual terms of equal parts.Even thought partnership starts from a rational combined actions and the aim is to solve the initial problems, obtaining low costs and realise targets in an easy manner cames on first place.

2.4. Local development – an emergent phenomenon

Local development is an endogenous, emergent phenomenon because it emphasise local communities dynamism and undertaking. It also emphasise very original practices and financial and material resources of local communities encouraging taking tasks,creativity and entrepreneurship. As an emergent, endogenous phenomenon local development emphasise entrepreneurship and privat local or public SMEs in adopting an undertaking aproachment to capital parts with the aim of energy and resource mobilisation.

Pointing autonomy, creativity and solidarity local development involves a basic changing in local and territorial development.

Local development does not include regional, national, world dinamics contrariwise it places local undertakers in the middle of the community development efforts and default globall development.

3. CONCLUSIONS

Nowadays in the context of economic crisis it has becamed more and more obvious the fact that european funds are a doubtless financial source for the implementation of sustainable development. My intension was to present an assembly of actions that local authorities must follow in using european funds with the purpose of fulfilling local,regional, national and european purposes.

Local development must be seen as a process addicted to innovation and entrepreneurship sustained by society and flexible institutions with a high rate in cooperation and local and central interaction.

Each local community has it's own specific characteristics that sustain or contrariwise it brakes economical development.

This local peculiarities are standing at the base of economical development strategy in order to improve local competitivity.

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Quick Info

Multi-million pound project creates sorting facility for industrial waste

Commissioned to supply automation, motor control and SCADA for a new waste recycling plant, automation control systems specialists DB Controls chose Schneider Electric to supply all of the automation and control equipment. By choosing this one-stop solution from Schneider Electric, DB Controls was able to offer a cost-effective Form 2 type-tested control panel.

The waste facility has been designed and installed by OKLM Recycling Technology for family-owned waste management company Cawleys. The plant, in Luton, represents a multi-million pound project to create a sorting facility for commercial and industrial waste, the first in the country to feature automated separation of paper from this type of waste. Operating as a sub-contractor to OKLM, DB Controls was responsible for all of the system integration.

For the control systems, the Schneider Electric M340 PLC platform was chosen, a compact solution which offers plug-and-play options with other Schneider Electric devices. The PLC has twin Ethernet ports programmed with Unity Pro IEC 61131-3 compliant software. Although small in size, this PLC controls 80 Tesys Model U direct on-line integrated motor starters, 18 ATV71 variable speed drives and four racks of Advantys fieldbus IO with Telefast 2 direct termination units.

The Tesys U DOL starters can be installed in a very compact space resulting in a reduced footprint and work in conjunction with VSDs and remote IO that are all networked using Modbus over TCP.

This package of equipment has been built into a Prisma Plus intelligent Motor Control Centre, a BSEN 61439-2 compliant offer, based on proven Prisma Plus distribution switchboard and designed to be fully integrated with Schneider Electric distribution, control and automation products.

The recycling plant is designed using a complex arrangement of conveyors to transport waste from stage to stage, recovering different types of recyclable material at each phase. The MCC's high-technology inverter drives ensure the motors powering the conveyor system run at the correct speed, even though the loading may be continuously changing.

The separation process uses a range of technologies, including infra-red, magnetic and sorting by blowers in a large rotating drum. The plant runs continuously and requires constant monitoring to ensure the safety of workers and the protection of the machinery should abnormal items get onto the conveyor system or blockages occur. Ensuring safe and reliable plant operation is the primary function of the SCADA system.

For DB Controls there were cost and efficiency advantages in using all Schneider Electric components, as sales director David Trueman explains: "Being able to purchase all of the equipment from one source meant that integration of the various components was very straightforward, particularly with the model used by Schneider Electric for network production. By building the MCC in this way, we were able to offer a fully verified solution.

"We have an established relationship with Schneider Electric and a good knowledge of their range built over previous applications. One of the key benefits of working with them has been the ability to use Ethernet networks in control applications: Schneider Electric was one of the first manufacturers to introduce this."

In operation, the M340 and ATV71 both have an active web page, accessed through the system software, to open up windows on the SCADA display to show device parameters and status. The system is fully accessible remotely at DB Control's engineering office.

Now fully operational at Cawleys' Luton plant, the control system has since been replicated at two further waste recycling facilities.

For more information, visit www.schneider-electric.co.uk.
(source: http://www.engineerlive.com/Process-Engineer/Environmental_Solutions/Multi-million_pound_project_creates_sorting_facility_for_industrial_waste/22811/)

MAINTAINING COMPETITIVE ADVANTAGE CONSIDERING THE DEVELOPMENT OF ENVIRONMENTAL PROTECTION REGULATIONS

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REZUMAT

Nevoia de reglementări privind protecția mediului este din ce în ce mai acceptată, în pofida ideii că măsurile de protecție a mediului afectează competitivitatea. Concepția dominantă este aceea că există o relație foarte strânsă între ecologie şi economie. De o parte se află beneficiul social pe care reglementările stricte de mediu le generează, iar de cealaltă parte se află costurile pe care trebuie să le suporte firmele pentru prevenirea poluării şi susținerea ecologizării- costuri care conduc la creşterea prețurilor şi reducerea competitivității.

Totuşi, această abordare statică a problemei reglementărilor de mediu, în care totul, cu excepția reglementărilor este menținut neschimbat, este greşită. Dacă tehnologia, produsele, procesele şi nevoile clienților ar rămâne la fel, concluzia că reglementările determină costuri mai mari este inevitabilă. Firmele operează, însă, în economia reală a concurenței dinamice, şi nu în mediul static presupus de majoritatea teoriilor economice. Ele găsesc mereu soluții inovative la problemele pe care clienții şi concurenții le ridică.

ABSTRACT

The need of regulations concerning the protection of natural environment is becoming more and more accepted, despite the belief that environmental regulations affect competitiveness. The prevailing concept is that there is a close relationship between ecology and economy. On the one hand there is the social benefit strict environmental standards produce, on the other hand there are the costs that firms must take to prevent pollution and support ecology - costs which increase prices and lower competitiveness.

However, this static view on the issue of environmental regulations, in which everything, except the regulations is kept unchanged, is wrong. If technology, products, processes and customer needs would be all the same, the conclusion that regulations would contribute to higher costs is inevitable. Yet, firms are operating in real economy of dynamic competition, not in the static environment of most economic theories. They always find innovative solutions to the problems competitors customers and regulators raise.

CUVINTE CHEIE: reglementările protecției mediului, productivitatea resurselor, costul poluării, inovația, avantajul competitiv

KEYWORDS: environmental regulations, resource productivity, the cost of pollution, innovation, the competitive advantage

1. INTRODUCTION

Properly designed environmental standards can stimulate innovation, which reduce total cost of a product or increase its value.

Such innovations allow companies to more effectively use a wide range of resources - from raw materials to energy and labour – thus, offsetting the costs of reducing the negative effects on the natural environment and contributing to overcome the problems.

Ultimately, the increase of resource productivity helps companies become more competitive.

2. THE INCREASE OF RESOURCE CONSUMPTION PRODUCTIVITY

Pollution is often a form of waste [1]. When waste, harmful substances or other forms of energy are released into the natural environment as pollution, it is a sign that the resources have been used incompletely, unproductive or inefficient. Moreover, companies should conduct in this case activities that increase costs, but do not create value for customers, for example, handling, discharge and disposal of waste substances.

The concept of resource productivity analysis offers new analysis possibilities for both the full system costs and the value associated to a product. Inefficient use of resources is highlighted within a firm by the incomplete use of materials and poor process control measures, which favour the appearance of waste, defects and over size stocks.

But there are many hidden costs in the product life cycle. For example, the packaging discarded by distributors or customers is a waste and increases costs. Customers bear additional costs when using products that pollute or consume too much energy. Resources are lost when products containing recyclable materials are discarded and when customers pay - directly or indirectly - for waste disposal.

In the past, efforts to improve environmental quality have generally ignored the costs of the system. They were more focused on limiting pollution through the more efficient identification, treatment and disposal of waste – a costly approach.

In recent years, however, more efficient firms and regulatory bodies, both at national and European level have adopted the concept of pollution prevention or reduction of pollution sources, which are based, for example, on the use of replacement materials and the development of closed circuit systems meant to prevent pollution.

However, even if pollution prevention is an important step ahead in the right direction, ultimately, companies must learn to address the issue of improving environmental quality in the context of efficient use of resources.

They must turn their attention to the opportunity costs of pollution - wasted resources, wasted effort, the lower value products have for their clients. In terms of resource use productivity, improving environmental quality is closely correlated with competitiveness. Costs of environmental regulations implementation can be reduced or even eliminated by developing other innovations that provide competitive advantages.

3. THE USE OF INNOVATION TO MAINTAIN COMPETITIVE ADVANTAGE

Innovations resulting from introduction of environmental regulations can be divided into two categories.

The first category includes new technologies and methods that help reduce the costs of pollution disposing from the moment of its appearance.

The essence of these methods is often embedded in transforming resources incorporated in pollution in high value products. Firms must learn to give a usable form to toxic materials and emissions, recycle waste and to better treat secondary products.

The second category innovations, even more important, eliminate the main causes of pollution, primarily by improving resource productivity. The benefits of innovation can take many forms, such as more efficient use of certain resources [2], increasing product performance and improving product quality.

In the past, countries were competitive if their companies had access to the cheapest factors of production - capital, labour, energy and raw materials. In areas dependent on natural resources, for example, competitive companies and countries were those that had an abundance of local resources.

Because technology is changing slowly, a comparative advantage in terms of endowment with production factors was sufficient for success.

Globalization today makes outdated the idea of comparative advantage. Companies can get cheaper inputs anywhere and new technologies, which develop rapidly, can compensate disadvantages caused by factor costs. For example, given that in the country of origin labour costs are high, a company may resort to automation in place of unskilled workers. If there are shortages of raw materials, the company can find an alternative raw material or can create a synthetic one.

To eliminate the high costs of storage, companies can use the method of production without stocks and can avoid storing products in the factory.

It is no longer enough for a company to simply have the resources. The productive use of resources is what determines productivity nowadays.

Companies can increase resource productivity, by producing more efficiently or developing higher value products for customers - products for which customers are willing to pay a higher price.

In the present, the most competitive countries and companies are not the ones that have access to the cheaper production factors, but those who use the most advanced technologies and resource recovery methods. Because of changing technology, the new paradigm of global competitiveness requires the ability to innovate quickly.

This new paradigm has profound implications over the debate on environmental policy – over the way to approach the problem, strict regulations and regulatory procedures.

The new paradigm has created a link between the improvement of environmental quality and competitiveness.

It is important that resources are used productively, whether the subject are natural, physical, human or capital resources.

In order to progress in the field of environment protection, it is necessary for companies to make innovations designed to increase resource productivity - these are actually the new challenges of global competition.

Developing countries, such as Romania, which still apply methods based on irrational use of resources and ignore environmental protection standards because those are too costly, will miss competitive advantage, and will convict themselves to poverty.

4. CONCLUSIONS

The way companies respond to environmental problems may actually be an indicator of their competitiveness. Environmental regulations do not automatically lead to innovation and competitiveness or to higher productivity for all firms.

Only those companies which carry out successful innovations will benefit. It is more probable that really competitive companies will accept a new standard as a challenge and respond to it with innovation.

In contrast, uncompetitive firms may not be oriented towards innovation and thus may be tempted to oppose any legislation.

Economically damaging conflicts on redistribution are a common fact in many areas of public policy. International competition has changed dramatically in recent decades.

Regulatory bodies and companies will increasingly reject the old compromises and will be based on fundamental economic logic that links the natural environment quality, resource productivity, innovation and competitiveness.

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Quick Info

Process Engineer - Environmental Solutions

Accurate gas analysis drives process efficiency

Being able to accurately measure the presence of gases is crucial to the success of any process. The latest monitoring technologies are particularly focused on hydrogen, oxygen, carbon monoxide and hydrogen cyanide.

The presence of other gases is an important requirement in many process industries for both process optimisation and for safety. These measurements are difficult or costly to perform, however. Now instrumentation specialist Quantitech is launching a new technology from the USA that resolves the issues concerning hydrogen.

Commenting on the market for hydrogen sensing, Quantitech sales director Dominic Duggan says: "Hydrogen monitoring does not take place in many applications because of the problems or costs associated with the available technologies, for example lack of specificity. However, the new sensors from H2scan resolve these issues offering significant advantages in process control and safety management."

US company H2scan has developed inline, solid-state palladium-nickel based sensors that are highly selective to hydrogen, do not require oxygen to operate, and can detect hydrogen in concentrations from a few ppm to 100 per cent (Fig. 1).

Hydrogen has the potential to be an important source of clean fuel in our energy-driven economy. The use of hydrogen is widespread in both traditional applications, such as petroleum refineries, and growing rapidly in newer sectors such as fuel cells and power generation.

Based on recent market reports, global hydrogen consumption has grown from 21 million metric tons (MMT) in 2005 to more than 32 MMT 2007. Global hydrogen usage is expected to surpass 50 MMT by 2012 and is expected to exceed 79 MMT by 2016.

Currently, over 90 per cent of all hydrogen produced is used in the petroleum refining industry, where continuous monitoring of hydrogen is highly desired to improve both the quality and yield of hydrocarbon-based fuels. Because of hydrogen's combustible and explosive properties, accurate leak detection is also important for safe hydrogen transport, storage, and use.

In certain industrial applications - such as hydrogenating cooking oil and hydro-treating petroleum crude into heating oil, gasoline, and diesel and jet fuels - it is critical to quantify the absolute concentration (partial pressure) of hydrogen in process operations to ensure process safety and operational efficiency. A typical refinery application for an inline hydrogen sensor is to measure the total hydrogen content in a mixed gas matrix (a mixture of hydrocarbons, carbon dioxide, hydrogen and other gases) as a function of time. The H2scan inline process hydrogen sensor allows direct point-of-use analysis of hydrogen concentration from 50 per cent to 100 per centv/v.

Hydrogen producers are also interested in accurate sensing as a key part of hydrogen management. For instance, within the pharmaceutical industry, multiphase hydrogenation reactions involving solid catalysts play a critical role. Accurate hydrogen monitoring is also needed in hydrotreating and in hydrogenation processes in hydrogen production facilities.

Hydrogen sensors can now be applied to current and future gas- or liquid-filled pipelines, offering safety improvements with a hydrogen-specific sensor that can be wrapped around pipeline joints and valves to detect the first level of leakage, or additional sensors can be employed to quantify the hydrogen content of natural gas within the pipeline.

The applications for hydrogen-specific sensors have increased markedly as a result of the new technology and because accurate hydrogen monitoring is a key component of several emerging areas of the hydrogen-driven energy economy.

Complete gas analysis

Chematur Engineering of Sweden has selected Servomex and channel partner OmniProcess to supply a complete gas analysis monitoring system to a new toluene di-isocyanate (TDI) plant currently under construction in Dahej, India. The 50000t/y plant is being built on behalf of Indian chemical manufacturer GNFC.

The new system will help control the process and monitor the quality of output in the manufacturer of TDI, a key isocyanate used in the manufacture of polyurethane and used for a variety of applications including flexible foams used in furnishings and the motor industry.

Servomex will supply a range of its world-leading gas analysers to fulfil the complex requirements of TDI monitoring, including 15 SERVOTOUGH SpectraExact (2500) process gas analysers, two SERVOPRO 4210 gas purity analysers, one SERVOTOUGH OxyExact (2200) paramagnetic oxygen analyser and three k1550 katharometer-based analysers.

Designed, manufactured and tested in configurations specific to the required measurement and background stream, the SERVOTOUGH SpectraExact is a photometric process analyser that offers single or dual component gas analysis to suit virtually any process, combustion or emissions gas analysis application, making it ideal for several TDI measurement processes including monitoring the off-gases from mixing chlorine with carbon monoxide to make phosgene and monitoring for both carbon monoxide and chlorine in phosgene.

Control of residual oxygen concentration in pure carbon monoxide in the range 0-0.5 per cent will be made by the SERVOTOUGH OxyExact 2200, with a measurement precision made possible by Servomex's paramagnetic cell technology that enables an oxygen measurement that is totally unaffected by other gases in the monitor stream. The SERVOPRO 4210 gas purity analysers will monitor the level of specific impurities in pure hydrogen and pure carbon monoxide respectively, with one unit monitoring a pure hydrogen stream for trace carbon monoxide and other 4210-based system monitoring for the presence of methane in carbon monoxide. Finally three k1550 katharometer analysers will monitor the hydrogen purity and the quality of carbon monoxide supply to the TDI process by checking the level of residual hydrogen remains between 0 and 1 per cent.

Each Servomex gas analyser will be installed in its own cubicle with an appropriate sampling system and all necessary pipework, ready for connection in the appropriate area of the plant.

In addition to Servomex's experience in offering reliable and accurate process analysers suitable for different and tough applications, Chematur selected Servomex on proven experience in the design and build of TDI analyser systems, as well as the ability to provide industry-best levels of service and support to the project.

"TDI production is by its nature a complex process, so Servomex is delighted to have been selected once again by Chematur to supply this gas analyser system through OmniProcess AB," says Servomex md Chris Cottrell. "We have been chosen not simply on the acknowledged quality of our instruments, but in our ability to deliver a complete gas analysis solution that ranges from the design and build of the system to providing 'local-for-local' service and support in India."

The TDI plant is scheduled for completion in September 2010.

(source: http://www.engineerlive.com/Process-Engineer/Environmental_Solutions/Accurate_gas_analysis_drives_process_efficiency/22153/)