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Environment Degradation Basis for Industrial Systems Rengineering

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Abstract: *Presently, the most environmental pressure in Serbia comes from urban areas and associated industries,with collection, treatment and disposal all kinds of hazardous waste, non hazardous waste, and waste water being among the most challenging issues.There is an urgency to prevent further environmental degradation and to initiate new environmental and industrial management practices. Industrial systems reingeneering is one of possible solutions, from the authors stand point.*

Keywords: *risk, environment, reingeneering, industry*

1. INTRODUCTION

During the nineties there was considerable degradation of the environment in the Republic of Serbia. Lack of new investments and minimal investing in water supplies, wastewater treatment and solid waste treatment caused high deterioration of infrastructure and decline in providing basic services and also led to decline of environment conditions and general conditions of water quality. Besides this, excessive industrial pollution occurred in Serbia in many identified hot spots which poses a serious risks to public health and the surrounding ecosystem. The main hot spots are in the cities of Bor, Kragujevac, Pancevo and Sabac. Polutants in the ambient environment include several extremely toxic substances, such as dichlorethane, mercury and other heavy metals, PCBoils and petrolium product wastes, and phenols. Levels of these pollutants are frequently found, to exceed national and European Union (EU) Standards.

Additional environmental hot spots have developed as a result of NATO bombing 1999 while others are due to improper operations of industrial plants over a number of years. Analyses points out that economic value of environmental degradation in Serbia is from 4,7% to 14% GDP (in other countries this value falls between 4-8 %GDP)

The biggest problems in environment protection in Serbia are caused by air pollution, water pollution, loss of water resources, soil pollution and inadequate handling of waste.
General causes of environment pollution are: weak integration and inconsistency of ecological problems in sector regulations and policies, environment protection principals are not fully applied in regional planning, there are no coordinated laws, regulations and standards on environment issues, insufficient development capacity and lack of implementation and running of ecology legislation and standards capacity, insufficient carrying out of environmental laws and emission standards (including inspection services and jurisdictional organs, lack of national environment polluters register, undeveloped monitoring systems and information systems on environment and low level of ecological awareness.

2. INDUSTRIAL PRODUCTION AND ITS EFFECT ON THE ENVIRONMENT

The level of industrial production of processing industry in 2005 was 7,3% higher than in 2000**.** Higher production level in 2005

comparing to 2000 has been reached in 9 production areas: production of food andbeverage, tobacco products, production of coke and petroleum derivates, chemical production, production of rubber and plastic products, production of base metals, electrical devices and machines, precise and optical instruments production, and motor vehicles and trailers production. A large decline has occurred in the following areas of industrial production of processing industry: textile industry, leather articles, leather shoes production and lumber industry.This does not necessarily mean that the production decline in the last ten years has resulted in total reduction of the waste amount.

Figure 1 shows main causes from industrial systems that lead to environment degradation.

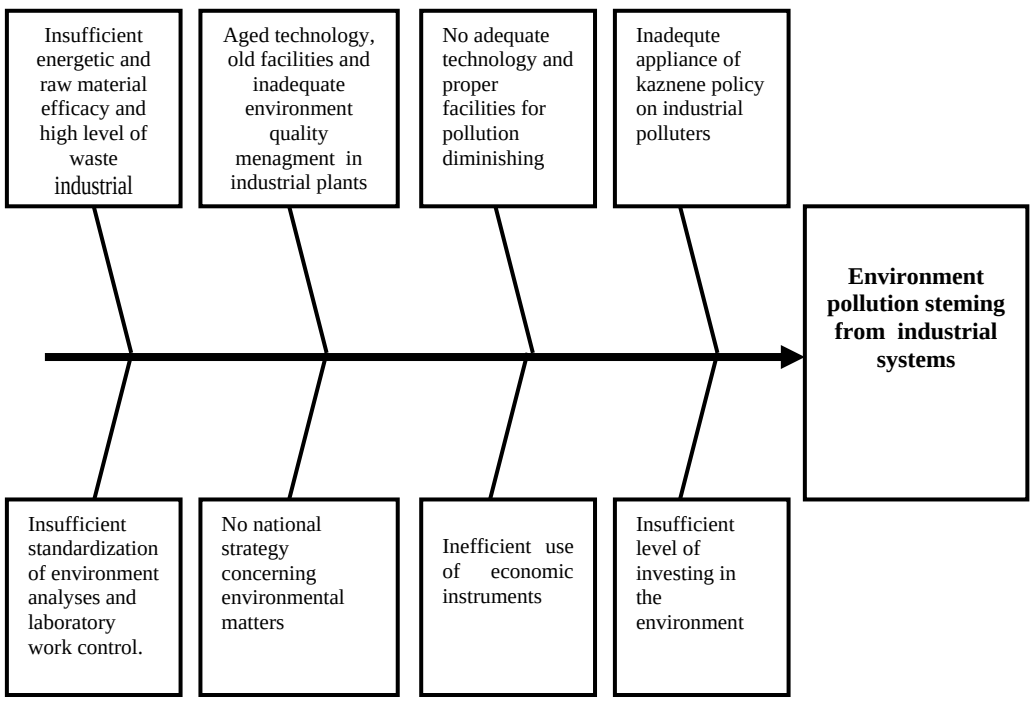

Figure1. Industrial causes of pollutiona

Besides the above mentioned (Figure 1) the following should also be listed:

- Lack of strategy and not enough support and encouragement to economy for introducing purer production.
- No stimulating policy on stopping industrial pollution.
- Small number of companies that have introduced and that are actually applying environment management system (JUSISO14001).
- Problems and obligations in environmental matters have not been adequately dealt with in the process of privatization.
- Improper handling and especially inappropriate storage of industrial and dangerous waste.
- NATO bombing of industrial facilities in Novi Sad, Pancevo, Bor and Kragujevac etc.
- Insufficient and inappropriate monitoring of pollution emissions into the environment.

The listed causes of environment degradation bring the following risks:

- Enhanced industrial emissions of SO2, NOx, VOC, NH3, mercaptans**,** benzene, zinc, iron,mercury, PAH and other polluters in the hot spots on the following locations: Bor, Sabac, Pancevo, Novi Sad, Smederevo ...

- Contamination of soil and ground waters with dangerous substances in the hot spot areas of Bor, Pancevo, Novi Sad, Smederevo, Belgrade i Kragujevac etc..
- Most industrial waste waters are released without being previously treated.
- Soil contamination and contamination of water currents and ground waters with dichlorethane and mercury in Pancevo, due to the NATO bombing of chemical and petrochemical facilities. Contamination of soil, ground waters and water currents with carbohydrogens caused by NATO bombing of refinery facilities.
- Contamination of soil and ground waters with PCB, Ni, Cr in Kragujevac caue by NATO bombing of transformer station at the car factory.
- Air polluted by the industries causes acute and chronic respiratory illnesses and cancer as well.
- There is no proper treatment and storage of industrial hazardous waste
- Inappropriate handling of dangerous industrial substances and inadequate information and labeling of those.
- No suitable technology and lack of facilities for pollution reduction
- Inadequate and inappropriate use of penalty policy towards industrial polluters.

2.1 Industry production analysis 2001-2005 from the aspect of development of physical scope of production

Further in this paper I will give the analysis of dynamics of some industrial branches' participation and special attention will be given to development of physical capacity of production in the period of 2001-2005 as the important parameter for the effect on the environment.

In addition to this, final analysis (conclusions) on some of the biggest problems in the business of these branches will also be given. This is important concerning the effect on environment degradation as well as it is of great importance for finding ways of solving existing problems.

2.1.1.Motor vehicles and trailers production

Business problems that can occur in this industrial field are: operating-tecnological falling behind, illiquidity and lack of working assets, insufficient credit activities of banks, business inefficiency (high production costs), low marketing and production management level, manpower surplus, anticipating whether or not the firm would be made private, lack of direct investments etc.

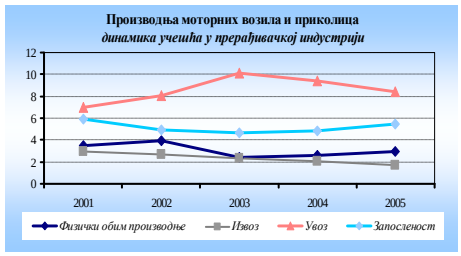

Figure 2.

2.1.2 Production of machines and devices (other than the electrical ones)

In 2005, total production level was 19% lower than in 2000(industrial production was declining by the average annual rate of 4,1%).

Production of machines and devices (all but electrical ones) has made more favourable results in 2005,comparing to the previous period. There are many causes of poor business achievements, some of which are the following:operating-tecnological falling behind the greater part of facilities**,** cumulative loses**,** illiquidity and lack of working assets**,** insufficient credit activities of banks, business inefficiency (high production costs), low marketing and production management level, manpower surplus, anticipating whether or not the firm would be made private, lack of direct foreign investments etc.

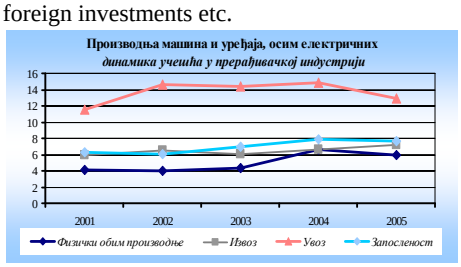

Figure 3.

2.1.3 Production of chemicals and chemical products

In 2005 total production of chemicals and chemical products was 58,2% higher than in 2000 (average annual growth rate being 9,6% from 2001-2005).

The biggest problem of this industry is its dependence on import. A great number of final chemical products are being imported which implies that home manufacturers should work on improving the competitiveness (by cost, quality or design) in order to increase their presence on the home market. Quality of production capacities' technology is low or at medium level, and technology solutions are not aged.

Development of pharmaceutical industry within chemical industry is of great importance because it possesses high-quality staff

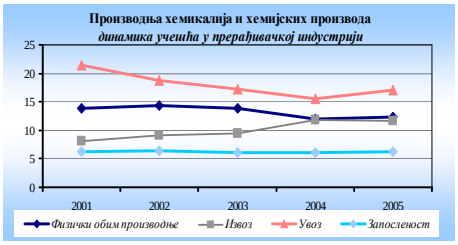

Figure 4.

and its products are competitive on the home market and some on the foreign market as well.

Advantages:

Human factor (good engineering staff, high percentage of Engineering Faculty graduates, low cost of qualified and highly-skilled manpower

Valorization of unused natural development and production potential(faster growth possibility))

Geographic position- (vicinity of current and future EU members from SE Europe) Vicinity of EU.market

Preferential trade arrangement with Russia.

Dynamic private sector growth

Weaknesses:

Existing economic structure: no perspective in exporting primary and low-technology products.

Unused production capacities.

Aged technology.

Degraded infrastructure**.**

Monopoly position of firms in the public sector.

Weak connection and cooperation between universities and institutions for development and research with the actual economy .

Emigration of high-quality staff.

Domestic (home) production larger than BDP.

Small(low) home(internal) investments.

Implementation gap, inefficient state administration

Great regional differences.

Inefficiency of the legal state.

Corruption.

Poor image of Serbia in the worldSlab imidž Srbije u svetu.

Opportunities:

Greater use of existing human resources (less highly-skilled staff leave the country, high-quality Diaspora, high-quality technical intelligence) Faster valorization of unused capacities through larger SDI influx.

Serbia's engagement in international conveying and energetic corridors.

EU.integration

Zona Free trade Zone in the countries of SE Europe

Importance of a stable Serbia for EU.

Increase of the public-private sector

Threats:

Relatively lagging behind other countries.

Vague position of Serbia in the matter of EU integration.

Unfavourable demographic trends.

Lagging behind in some segments of transition (privatization of public enterprizes...).

Political instability.

Figure 5. SWOT analysis

2.1.4 Food and beverage production

Production of food and beverage in 2005 participated in processing industry's export structure with 17,1% and in the import structure with 5,0%, ,and it also notes continual export, import and surplus growth. Export covers import by 174,3%.

The number of employees in 2005 was 90.779 lica, which is 11.954 employees less than in 2001, but relative participation of these employees in the processing industry has increased by 3%.

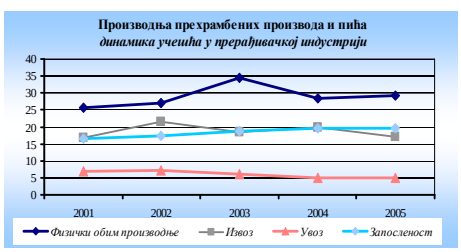

Figure 6.

Development of physical scope of production. In the period between 2001 and 2005 processing industry was growing at the average annual rate of 1,4%. Physical capacity of industrial production of processing industry 2001-2005 was characterized by unstable dynamics of growth **(** the biggest growth of **9,6**% was noted in 2004, whilst the biggest fall of -4,6% was noted in 2003). *Production of chemicals and chemical products* is the only field of processing industry that has been making positive growth rate continually from 2000 to 2005.

Developmental role is based on natural potential, characteristics of the national demand which absorbs the largest part of the family food budget, dynamics of world's demands, existence of processing capacities that need to be reconstructed and modernized, and cost competitiveness for some of the most important exporting products.

It is interesting to note and therefore draw a conclusion by looking at the industrial branches' display, considering engineering profession and environment pollution, that all the industries (except production of food and beverage) have common characteristics which can be summarized in the following sentence: operating-tecnological falling behind most of capacities, increased losses, illiquidity and lack of working assets, business inefficiency (high production costs), low marketing and production management level.

This conclusion has also found its place among the weaknesses of Serbian economy identified in the SWOT analysis and shown in the document called Strategy of Serbian economic development, Figure5.

3. CAUSES OF ENVIRONMENT DEGRADATION AS STIMULUS FOR REENGINEERING OF INDUSTRIAL SYSTEMS

Analysis of the list of problems which lead to the risk of environment degradation created by NAP, and their categorization gave us 4 basic groups as a result:

The first one Group A includes problems concerning technology; aged technology equipment, improper maintenance, insufficient use of capacity, inadequate resource arrangement, lack of waste filtration equipment**...**

- The second group - Group B - includes problems concerning knowledge, among which lack of information technologies dominates, and is actually shown through lack of informatics infrastructure, ignorence, undeveloped systems for the monitoring of the environment, no polluters register, standards, legal regulations..
- The third group of factors – Group C - includes all factors which refer to inappropriate handling of waste (both industrial and public waste) and dangerous substances, no matter whether it's air pollution, water or soil pollution. Legal and other regulations are of great importance here as well.

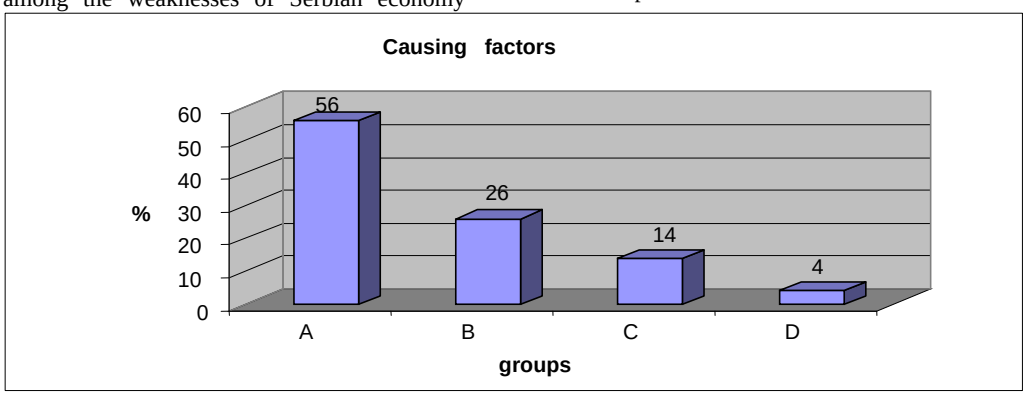

Figure.7 Pareto diagram

- The fourth group-Group D includes problems concerning other influential factors, very important of which are: awareness of the importance of

maintenance and protection of the environment and sustainable development of the individuals,institutions and industrial entrpreneurs.

Detailed analysis of the mentioned risks on environment degradation, developed by NEAP forum gives us percentage of previously classified groups' participation shown on a diagram on Figure 7.

What we can see on the diagram is that group A causes 57% of risks that refer to technology and facilities. 27% of risks are caued by lack of knowledge, primarily in the field of information technolgies.17 % of risk causes are connected to to waste management, the most prominent of which is air pollution, and remaining 4% are other factors such as lack of the awareness of the fact that the environment needs to be protected.

In order to successfully protect the environment it is necessary to deal with all factors, that can contribute to its protection, simultaneously. Yet, if we look at it from the observation of engineering structures' point of view, considering previous analysis, it turns out that technology of industrial plants and information technologies should be dealt with first.In other words we should start with reengineering of technological processes and information reeingineering and then go on to reengineering of human resources and organizational reengineering.

5. CURRENT CONDITION AND THE NEED FOR REENGINEERING OF TECHNOLOGY AND INFORMATION PROCESSES IN OUR COUNTRY

The actual economic situation concerning our industry is very hard due to sanctions that were imposed on our country during the nineties.

Industrial production hastily declined because of the isolation the country was in, and becaue of drastic losses of traditional markets and business partners. Difficulties in replacing materials that were being imported such as raw materials, and industrial spare parts, had serious effect on the environment. For example, production processes were being conducted in industry that were utterly unsuitable for the environment, and yet the industry could not reduce pollution in any way with its existing technology and devices such as factories for waste waters treatment and air emission filters.

The production in industry has declined by 60% since 1990. godine. Some industries were using only 10 % of their production capacity and some are still using only from 5-30% and some have even been closed down. Lack of means and investments have seriously disturbed the necessary reconstruction and modernization of industry, including introduction of cleaner technology and this keeps on happening.

Most industrialization processes in former Yugoslavia (now Serbia) happened in the late seventies and during the eighties. Since the country was open for cooperation with western countries, technology of new industries was somewhat advanced in comparison to that of central European and countries of SE Europe. However, due to the economic situation and poor maintenance and no improvement of the now, old and feeble industrial plants,in the last 15 years, there is a great need for technological improvement and modernization.

Apart from this there are other examples , but now of some relatively modern industries which use old technology imported from western Europe, which is in many ways bad for the environment. This explicitly shows that permissions should be issued in Serbia for reconstruction and modernization of industry,reengineering and development of new industries based on pure technology. Since the strenght of economy i not in its best shape, and since it is not possible to import new equipment and technology from the developed countries, reengineering of technological processes in the sense of environment protection gets its full importance in our conditions.

Serbia does not have an integral information system, nor does it have a comprehensive information system on the national level.We are lacking regular records of emissions, analysis of emissions measurings, reports on air quality and official statistics on pollution sources and their effect on the environment.

This result in lack of reliable data that would describe emissions and the impact of industrial work on the environment, and industrial development trends as well. This is a serious problem when it comes to analysing the situation of today and determaining priorites in precautionary environment sanitation measures

Based on everything that has been stated so far, the natural way out of this situation would be a informatics reengineering inside the firm and on the level of the Republic of Serbia as well.

6. CONCLUSION

Awareness of the environment in industry and it enterprizes is very limited due to lack of financial support, modern production and informatics technologies, legal and other types of regulations and expirience in environmental management. There is an extended need for introduction of clear views and strategies for industrial development, including guidelines and facilitating actions for stronger environmental awareness, and fast introduction of cleaner technologies and environment management in industry. Insisting on technology and informatics reengineering under the existing circumstances contributes to the previous statement, which actually was the intention of this paper since there are no economic conditions for investing in completely new technologies.

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