

## **ABOUT INFLUENCES OF ENVIRONMENTAL REGLEMENTATION ON MANUFACTURING SYSTEMS IN MECHANICAL ENGINEERING**

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### **ABSTRACT**

This paper presents some observations and conclusions after analyze on the relations between environment and manufacturing systems in mechanical engineering, considered in Romanian specific conditions. There were examined the transition condition, the aim of functional market economy, implementation of new European environmental conditions, according to the conditions of Environmental Programme for Europe. There are presented proposals for the management of such enterprises in difficult decisional process

### **1. General considerations**

Currently the most important problem in the activity of attempt to enterprises with mechanical manufacturing system is to optimize the work process, according to different and difficult criteria, which are considered at the same time in many fields: technical, economic, political, social and strategic.

It is well-known that important problems are them concerning environment, pollution and wastes recuperation or incineration.

Also, from the past, it is known that these gains will be lost again if economic growth continues to be based on traditional, environmental damaging activities, still prevalent, rather than on more sustainable, eco-efficient options.

For the EU accession countries this could be a particular risk to which large amounts of manufacturing industry have been transferred from western Europe and elsewhere in the world.

According to Europe's environment: third assessment [3] : "the EU sustainable development strategy is a step in the right direction but needs more operational actions by the relatively well-off Member States to remain environmentally credible. The accession countries face the major challenge of managing with limited resources, and against competing economic, social and environmental priorities, the transitions to EU membership, sectoral integration and sustainable development all at the same time".

Better coordination and use of existing funding sources and mechanisms available at the European level would help overcome some of these problems but what is most lacking is a decision-making framework that takes proper account of the competing but often complementary economic, social and environmental considerations.

This environmental problem was initiated by international recognition at Stockholm UN environmental conference in 1972. The major policy initiatives were adopted in 1979 at Convention on long-range transboundary air pollution and in 1980 at "First EU air directive". It actions under Convention protocols and EU directives gives effects during the 1980's and 1990's.

This paper tries to analyze possible solution and give methods for economic analysis, in the case of mechanical manufacturing enterprises, especially SME.

## 2. Possible pollution sources

Production and consumption by human societies have always been linked with the use of natural resources, which can often have negative environmental effects.

The challenge for sustainable economic development is to increase the economic welfare and well-being of society while, at the same time, reducing resource requirements to a level consistent with the natural carrying capacity of ecosystems.

Most changes are brought about by human activities and by the resulting flow materials, generated by “industrial metabolism”.

In mechanical manufacturing systems environmental, analysis of the flows of materials, there are used next indicators:

- total material requirements, TMR;
- direct material inputs, DMI;
- direct material consumption, DMC.

These are three basis variable used in material flow accounting for derive indicators on the metabolic performance of the enterprise, for instance resources inputs and the efficiency of resource use.

A good signal of enterprise management is the increasing of productivity of materials and energy using and increasing of economic added value generated with less use of energy and natural resources.

The environmental pressure forced also on the structure of energy origin. It is necessary to use the renewable energy resources that offer the cleanest source of energy, but they can have same adverse impacts on the environmental, such as loss of natural amenities, loss of habitat, visual intrusion and noise.

From the fossil fuels natural gas is the cleanest because of its even lower carbon content and lower propensity to cause acid emission (energy use is the major source of sulphur dioxide and nitrogen oxide emission, accounting for over 90% of both acid gas emission in Europe).

Another risk could be the use and disposal of products containing hazardous chemicals that generate chemical pollution.

A major challenge for mechanical manufacturing enterprises pollution control is to improve the cost-effectiveness of environmental regulations in ways that safeguard the environment while maintaining Europe’s competitive industrial base.

## 3. Methods and models for economic analysis

The pollution has different degrees and it’s possible to talk about an optimum level of the pollution.

The question is how we can establish this optimum level, which are the methods adequate, who are the conditions for assimilate in Romania specifics values for the Europeans countries.

Total costs are determined by the costs of implementing the measures themselves and those of administration, monitoring and enforcement.

There are three methods for establish the optimum level of the pollution:

- 1) elaboration and applying of standards for the pollution;
- 2) payment taxes for the pollution;
- 3) buying of licenses(rights) for the pollution.

Recent regulation of the European Union went to a compromise based on next thinking: “The best technology disposable don’t determine external costs”.

So that the economical agents be forced to reduce the pollution and, in the same time, the external costs.

In the case of payment taxes for the pollution, the governments introduce taxes which values are proportional with the volume of wastes emitted, in these situations. It generates an internalization of negative externalities.

For an mechanical manufacturing enterprise, if the taxes level will be  $t$  and if enterprise  $j$  get out  $y_j$  wastes units, the total taxes will be  $t y_j$ .

The profit will be:

$$p_j = p_j q_j - CT_j(q_j, y_j) - t y_j$$

Where  $p$  and  $q$  are the prices respective production volume and  $CT$  total costs.

In the situation of profit maximization:

$$\frac{\partial p_j}{\partial q_j} = p_j - \frac{\partial CT_j}{\partial q_j}(q_j, y_j) = 0$$

If it considering that the unitary taxes has the same level with the total of marginal disposability for paying for reducing the pollution quantity  $Y^*$ , optimum taxes  $t^*$  will be:

The solutions of the system are  $q_j = q_j^*$  and  $y_j = y_j^*$ , it means that enterprise choose in fast time the optimum level of the production and the pollution, in this case the taxes has

$$t^* = \sum_i v_i^1(Y^*) > 0$$

internalized the social costs generated by the pollution.

In the situation of rights for pollution, enterprises can buy the authorizations for get out a quantity of wastes  $y_j$ , at the prices on each unit ?.

The profit of the enterprise will be:

$$p_j = p_j q_j - CT_j(p_j, y_j) - g y_j$$

The optimum conditions are:

$$\frac{\partial p_j}{\partial q_j} = p_j - \frac{\partial CT_j}{\partial q_j}(q_j, y_j) = 0$$

$$\frac{\partial p_j}{\partial y_j} = -g - \frac{\partial CT_j}{\partial y_j}(q_j, y_j) = 0$$

On the market of rights for pollution, the price of rights it is considered perfect flexible and it equilibrates the done and demand, that means it established at level  $g^*$ , which verify the equation:

$$Y^s(g^*) = Y^d(g^*)$$

Where  $Y^d$  is the function for demand for pollution's right and  $Y^s$  is the function for done for pollution's right.

#### 4. Situation in Romania

In the case of ISAP, in Romania, implementation of the "acquis communautaire" rules in the environmental and pollution policy, until the date of accession, suppose some measures that must be correlated with the evolution and enterprise's strategy.

The usage of principle “polluter pays” and “internalization of costs” meaning that all costs associated with the environmental protection should be included in enterprises production costs.

Taking into account the specific difficulties of enterprise for a period of three years, from the adoption of new compulsory standards, Government give investment aid, which is guaranteed in order to help these enterprises to meet new standards.

The Regulation provides the conditions to be observed in order to authorize the governmental aid for environment protection taking in view the following categories: investment aid, rehabilitation of polluted industrial sites, relocation of enterprises, aid to Small and Middle Enterprises (SME) for advisory services in the environment and the ceiling of eligible costs for these State Aid categories.

In some cases, exemption from or tax reduction are guaranteed to enterprises of particular categories in order to avoid the situation of placing them in a difficult competitive situation. Such measures may constitute State Aid within the meaning of the provisions of the Law on State Aid no 143/1999.

Where the enterprises such mechanical manufacturing enterprises adopt the standards more stringent those existing or in the absence of some mandatory standards, the gross intensity of environmental aid may be authorized up to not more than 30% gross of the eligible investment costs.

Investments in energy saving, combined production of electric power and heat, investments to promote renewable sources of energy are eligible for investments aid at the basic rate of 40% of eligible costs.

Investments made in renewable energy installations serving all the needs of an entire community such as an island or residential area may qualify for a bonus of 10% on top of the basic rate of 40% of eligible costs.

In the case of prove the necessity, the granting authorities will in a position to grant investment aid to support up to 100% of eligible costs. In such cases the installations concerned will not be entitled to receive any further support.

Generally, the bonuses for assisted regions and SME, may be combined, but the maximum rate of environmental aid may never exceed 100% gross of the eligible costs.

## 5. Conclusions

It is obvious that the evolution of mechanical manufacturing enterprises in Romania is in accordance with the general strategy and the “acquis for the pre-accession stage”, so that the efforts must be well distributed in the next business environment.

The environment problem must be considered as a cost problem, which diminishes the profits, even can determine bankruptcy for enterprise.

For general manager these problems must be treated as a complex situation, by combining mathematical methods with other situation like Governmental or European aids, on different grant programs.

## References

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- [2] \* \* \* *Romania-your business partner*, Ministry of Public Information, ANEIR Centre, Bucuresti, 2003
- [3] \* \* \* *Europe's environment: the third assessment*, European Environment Agency, Copenhagen, 2003, ISBN 02-9167-574-1