

2018-01

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# General Principles on Environmental Policy in Industrial Units

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**Abstract:** Within the environmental policy framework, one could distinguish two categories, both of which aim at the protection of the environment. The first category is based on the concept of reducing the use of non-renewable resources and energy, as well as on the replacement of “poisonous elements” and “hazardous” types of energy. This second category includes different kind of actions which tackle the issue of unwanted by-products of production and consumption. More specifically, it includes measures that aim at: conversion of leftover substances or materials (e.g. elimination of poisonous gas), utilization of leftover substances or materials, waste avoidance, reduction of waste production, waste “dispersion” which includes “decentralization” (disposal) and “centralization” (collection). “Decentralization” describes the process of controlled diffusion (emission) of waste in water, air and soil. “Centralization” involves waste collection into designated storage premises, which of course need to comply with certain requirements and regulations.

**Key words:** Environmental policy, methodology framework, product, production.

## 1. Introduction

Within the framework set by the two basic categories regarding the protection of the environment, a series of measures will be examined that could apply to businesses and industrial units in particular. Those measures could be described as “Measures of Environmental Policy” and include for instance: the production process inside the industrial unit, the identity and composition of the products, their number and life-cycle, the choice of raw materials and by-products, the ways and methods of production and waste management [1].

## 2. Product and Production Process

Environmentally friendly product (eco-friendly) is the product that its production process minimizes the use of natural resources and energy and also inflicts reduced or zero waste.

Thus, the identity and composition of the product have immediate effect on the environment. Its identity

and composition involve the shape, material, size, color, scent, function and its impact (e.g. noise) and so on. Furthermore, the product packaging is of vital importance, as it can be harmful for the environment [2].

Consequently, one could say that the nature of a product includes all those characteristics that constitute “quality”. Product quality is initially a technical term, which however has economic and ecological implications. To be more specific, from an ecological aspect, the identity and composition (quality) of the product directly affect the production process, use and waste processing.

The production of specific products defines to great extent the raw materials, the semi-finished materials and the energy that will be used during this process. The above statement however, allows some flexibility. As a result, in chemical technology, sulfuric acid can be formed using a series of raw materials such as gypsum and sulfate minerals etc., through various methods each time though. During the selection of raw materials and production process, one should take under consideration not only the cost, but how

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“friendly” the product is towards the environment too [3].

In the mechanical engineering and production technology field, the nature of the product specifies the raw materials and semi-finished materials necessary for its production. This rule, however, applies to the kind of the raw materials, not to the quantity needed.

Thus, it has been calculated that by changing the type of milk packaging could contribute to 18% less material use, while the bottling industry in Germany could reduce the weight of bottles by 49% if single-use bottles were used. In the metal products industry—besides the manufacturing or production process—the nature of the product plays a crucial role. Various technological systems (both software and hardware) are being employed and targeting to material decrease [4].

Additionally, in the cosmetics industry, the specification of ingredients and directions about function on the finished product are of great importance. Raw materials that have been used can be either natural or chemical or both. There is no much doubt that the nature of the product affects to great extent the nature and quantity of raw materials. There is some degree of freedom in the making process though. The correct choice of production process and product processing can generously contribute to environmental protection (e.g. reduce of dissipated energy).

Moreover, it should be mentioned that economic and ecological impact could significantly be reduced, if during the decision making process regarding the composition, factors that lead to recycling and avoidance of waste production are taken into account. Furthermore, waste processing and storage are costly procedures.

It is easy to understand that the negative impact on the environment is the result of both the quantity of the produced goods, having been produced in a certain time period and the overall time spent for production and consumption. In other words, it is the amount of

products and the production process that contribute to the preservation of the environment [5].

### 3. Production Methods

Within the environmental policy framework, enterprises shouldn't only focus on the composition of the product. On the contrary, they should take into consideration all the individual stages through the final product passes. Environmental pollution is the result of the production of each individual product inside the industrial unit and it piles up either because of waste production, hazardous substances, emissions etc.. As a result, all the above create negative environmental impact caused by this one industrial unit.

The state or the industrial unit itself set (or have the ability to do so) specific limits on industrial emissions. These limits apply to all emissions per time unit. Consequently, as soon as it becomes obvious to the unit that it approaches or exceeds those limits, it can either reduce the production or intervene in the production process. In the second case, pollutants could be decreased if, for example, part of the necessary products were purchased from another unit which—at least geographically—belonged to another region [6].

It is necessary that the typical decision-making model about production methods, which most of the times is profit oriented, embrace additional regulations about the protection of the environment. Thus, starting with maximizing the production function, that is the contribution of all the factors in the time period, one should add beyond the classical constraints such as the potential or the availability of products, the following limitations too: the use of the necessary resources should not exceed the sum of the initial ones together with the reused (recycled) materials, substances harmful to the environment should not exceed the limits.

Assume that it start from a linear production function. After taking into account the variable cost of

production and waste processing, then the optimal production can be calculated with relative precision. The mathematical function can become particularly complex if all the substances harmful to the environment are taken into consideration. In this case, one must consider all pollution factors per unit of production and time. A common denominator should be created with the aid of simulation coefficients. This latter procedure is covered under the “Ecological Accounting”. This thesis does not look in depth the presentation of the model of such a mathematical function. Its target is to present a production process that includes the ecological dimension without focusing on the theoretical approach of the problem [7].

#### 4. Selection of Product Life-cycle

Environmental damage is—among other reasons—the result of the product life-cycle. As a rule, the longer the life-cycle of a product, the lesser the damage of the environment, caused by the production and consumption of the product.

“Life-cycle” could be the time or duration of a product, which either as means of production or as a good for consumption, fits the purpose for which the product had been created, before it becomes useless (waste). The product lifespan depends on the product composition. The life-cycle of a product regarding its technology should guarantee a minimum service life, which can be achieved due to the characteristics and specifications which have been given to the product. Undoubtedly, product’s lifespan is directly affected by the “intensity” of its use. Consequently, driving at continuous high speeds could ruin the engine of the car much sooner than driving at “regular” speeds [8].

The “Economic” life-cycle of a product is different from the technology life-cycle and depends to great extent on the values each individual sets. As a general rule, the sales department’s strategy aims at shortening the “economic” lifetime of a product, which is quite often considerably shorter compared to its service

lifetime. The fact that the entire industry uses “trends” as a motive, leads to withdrawal and destruction of products, which otherwise would function properly. The words once said by a member of the general motors board of directors were very interesting. He pointed out, in a speech he made years ago, that the pre-planned product aging is another expression of the word “progress”. Without a doubt, from the sustainability standpoint, statements such as the one above are quite wrong.

Extending the life of products, in order to achieve some of the ecological and economic targets, requires change in the mentality of both the producer and the consumer.

Consumers shall gradually turn their attention to products with long lifespan, while industries, taking into account the economic and social consequences that may occur to the industrial unit due to wrong environmental policies, should gain power in the market by distributing products with long lifetime.

#### 5. Choosing the Right Production Method

The final product (its composition, properties etc.) largely depends on the method it was produced. Generally speaking, production of mechanical products, that is products coming from the modification of raw materials or semi-finished products usually are products of the same composition as the original ones.

The possibilities of choosing other materials and/or completely different methods of production are limited. The undesired negative effects on the environment can be controlled relatively easy. So, for instance, it is possible that remains of metal processing to be reused in production, noise can be reduced with noise-absorbing materials, temperature can be controlled with thermal insulation materials and so on. Contrary to the production of mechanical products, the choice of the method in chemical-technology production has immediate effect on the qualitative and quantitative composition of the

final product. The potential environmental effects caused by those methods can be harmful or even disastrous. As a result, phenol trichloride can be produced—a product used in the cosmetics industry—in two different ways. The first way, which is relatively safe, is to use low temperature and high pressure [9].

The second method, which is definitely more dangerous, uses high temperature and low pressure. In this case, performance grades are higher compared to the first method, but it could lead to undesired results. A boiler overheating led to the tragic Seveso accident, when the extremely poisonous substance dioxin diffused into the atmosphere, causing catastrophic environmental damage. Moreover, it should be taken into consideration that dangerous materials used as raw materials and intermediate goods occurred during the production process must be transported and stored with the maximum care, so as environmental accidents be avoided.

Finally, comparing the composition of the product to the production method, one could claim that the production method defines the remains of the production process, while the composition of the product is responsible for the consumption waste, if it is about consumption goods.

While selecting the raw materials one must take into account the raw materials and semi-finished products as well as the types of energy necessary to the production process and function of the final products. Each business should be aiming at replacing materials and/or energy harmful to the environment with sustainable materials and eco-friendly forms of energy.

Generally, this replacement means to change the production methods. However, there are exceptions to the rule. As a result, without changing the production process, non-cyanide electrolytes can be preferred over cyanide ones. Similar replacements could happen not only in the chemical-technology production, but could relate to the composition of the product.

Consequently, in the telecommunications industry, copper wires could be replaced by optical fibers [10].

## 6. Recycling

A measure of vital importance, which nowadays is becoming more and more necessary, is recycling. The definition of the word describes the process of converting waste materials either from production or consumption into new materials and objects that can be used again in the production stream. There is a number of recycling variations such as: reuse: waste materials or remains are used again for the original purpose they had already been produced (bottles); repurpose: waste materials or remains are channeled with or without processing into the original process (e.g. scrap iron pieces for steel production); further use or exploitation: waste materials or remains are used with or without biological or/and chemical processing in a new production process to fulfill a new purpose (e.g. old car tires for new rubber flooring, hot air turbine waste for heating a household).

Depending on the origin and the place of recovery of the waste, there is: internal recycling: waste materials or remains from the industrial unit are used afresh in the production process in the same industrial unit; inter-industrial recycling: recycling as a result between industrial units, for instance semi-finished products used in an industrial unit are processed further by another unit. Waste materials produced during the last process are given back to the original unit to be used as raw materials. Interconnections such as the one above can become really complicated.

Examining recycling in relation to the environment, it can be noted that recycling protects the environment and reduces the use of the raw materials. As a result, in Germany, 70% of the need in antimony comes from recycling. At the same time, returning waste materials to the production stream, could contribute to less environmental impact. Negative impact as a result of waste caused by production and consumption can be highly hazardous. Scarcity in raw materials and their

price rise are two basic reasons why recycling is so compelling. Leaving speculation aside, future price increase remains an indisputable fact.

Furthermore, an equally important reason why industries should examine the potential of introducing recycling within the industrial unit is the public opinion. Also, the unit has to deal with the regulatory framework about sustainability and all the strict measures—current and future ones—imposed by the law. In case the unit does not comply with those measures, it faces penalties, which vary from fines to license revocation.

The technological potentials of recycling are not without limits. Recycling performance and rates can vary. In iron and steel industry, recycling rates are, for instance, 32%, while in textile industry reach 5%. Nevertheless, today's technology allows waste exploitation of solid, liquid and gas waste materials. For example, recycled plastic can make thermal insulation materials and new plastic objects, while from soap industry waste glycerin can be produced and refineries exhaust gas can be used to produce sulfuric acid. Waste heat exploitation and regeneration of radioactive rods in designated premises are also significant. Overestimation, however, of the recycling advantages could lead to wrong conclusions.

Thus, waste treatment and purification could give drinking water and result to less environmental damage from liquid waste, but the remaining material are still a danger for the environment [10].

## 7. Conclusion

As a conclusion, before deciding on adapting a particular recycling process, one should consider the environmental impact that the introduction of that specific method will bring in relation to how effectively that method protects the environment in practice.

The company's decision on which recycling method is the most effective relies upon the cost of the recycling method. Very briefly, the cost of recycling

should be compared to the cost that would arise from waste disposal and the cost of raw materials needed in production process, provided that the raw materials were original materials and not fed back to production.

The overall recycling cost is the sum of collection, segregation, preparation and processing of waste. Special attention must be given to the usually high segregation and transportations cost. Cost is primarily based on the geographic and time dispersal of the waste. Problems, usually serious, appear in the consumption sector, and more specifically in the waste sorting. Efforts are already being made to ensure that waste sorting happens inside the households (e.g. glass and aluminium object are placed in special bins).

In the field of inter-industrial recycling, waste "stock markets" are of great interest. These stock markets play a mediating role between waste seller and buyer and provide with the assistance of "information banks" plenty of useful information. It should be marked, that the company which uses recycling faces some further risks. Recycling as a method turns useless material into financial goods. This means that whoever has undertaken this task could potentially affect—at least to some extent—the prices of those goods.

During the discussions about recycling, the company should take into account the fact that the technical requirements regarding waste disposal will keep becoming stricter by the law. To meet these requirements, it is very likely that advanced technology must be used, a fact that could contribute to further rise of the waste disposal cost. Moreover, it must be taken into consideration that recycling premises generally function with satisfactory economy, while experience shows that recycling results to significant amounts of energy savings and resource conservation.

Finally, it must be mentioned that it is about time to took recycling seriously in Greece and Cyprus. The efforts should start from the industrial units, already at

the research and product development stages. The products must be made with as less non-recycling materials as possible.

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