Abstract: - The actual world is facing a dilemma: to have in present a great welfare without any care concerning the future and the natural environment or the acceptance of the opportunity cost generated by adopting clean, green technologies or of those which fundamentally contribute to the real time removal of pollutants. More and more individuals are suffering because of pollutants, so the problem is becoming a social one. The metallurgy, a fundamental industry, is one of the most dangerous pollutants for the natural environment: for example the small and powdery ferrous waste resulted from current manufacturing. The lack of reintroduction in the economical cycle of this pollutant flows as well as the ones deposited in dump sites or in lakes leads to the reduction of the pollution in the waste neighboring areas at water-air-soil level. One of the most important advantage of the recycling process consists of the fact that the spaces occupied by this type of waste is returned to the natural environment. The products and technologies proposed in this paper are relatively simple, do not require big investments and are easily implemented to the beneficiaries. Also, the implementation of technologies and the usage of materials proposed lead to the following benefits: intensification of siderurgical processes, recovery of useful elements from waste, raw material cost reduction, profit for processing plants and reduction of the pollution degree at water-air-soil level. So, it is crystal clear, the comparative economical analysis, to which economical problems oblige, establishes that the direct and implicit economical advantages are considerably significant.

Key-Words: - waste management, pollution, siderurgy, pulverous waste, recovery, products

1 Introduction

The metals industry is facing major problems that are not linked to a crisis of resources of raw materials and energy but stringent requirements for environmental protection.

Development of metallurgical industry is conditioned by resolving major problems arising from industry-environment relationship is strictly directed at pollution control and project of natural resources and energy.

Small and powdery waste, mainly from the iron and steel industry but also from the mining industry, due to the high energy content in iron, manganese, carbon and various oxides (relevant elements of the production process of pig iron or steel) should be named by-products and be considered as components of natural capital.

Development strategies of the steel industry are oriented in two directions:

- substantial emissions-reduction through application of modern technologies;
- increasing yields of recovery and recycling of by-products.

In the future it tends toward development of metal alloys in the so-called ideal plants *dream factory* involving any output can be used as input in the field of metallurgical or in other areas. Ecological concept applied to the development of steel industry involve production technological streams with closed loop in which no waste is not removed, all by-products are continually reused, no waste is not discharged into the environment.

In the literature this system is called "waste free steel industry" or "zero waste steel industry" [1, 2]. Finding solutions performing in economically and environmentally sound technological flows for from metallurgical is currently a major concern. An adequate management in terms of management and recovery of waste will result in protecting natural resources and the recovery of those consumed so may be reduced waste disposal costs and impact on the environment.
Concern over compliance with legislation on environmental protection and the necessity of harmonizing the processes of economic progress, with the rational management of resources, materials and energy, should lead to the recovery of waste by technologies that provide both economically and ecologically optimal solution.

The by-products (small and powdery waste) generated in the metallurgical industry, on the main sectors of technological flow from a combined integrated steel plant, are played in fig. 1 [1-3].

- reduction of the quantity and source of waste products, negative action;
- advanced recycling as waste resulting from their reintroduction in various stages of the technological flow, thereby ensuring the protection of the natural resources of raw materials;
- increase the usability of waste by processing their raw materials for other industries.

Waste resulting from all stages of steel production from the sectors of transport, storage and preparation of raw materials to the finishing of products in a furnace-flow agglomeration-converter-continuous casting-hot or electric arc-furnace casting continue – hot due to possibilities of recovery by means of recycling, reuse or/and enter in the category of by-products. By-products, with scrap as main sources of iron for metallurgical industry.

2 Problem Formulation

Integrated mills in approximately 450-500 by-products/tonne of crude steel; of this amount 375kg/t represents the slag and boiler dust around 65kg/t, scale and sludge.

Of the total quantity of solid by-products, most (70-80%) represents the dross is under construction, mainly in the cement industry and for the rehabilitation of soils in agriculture [3]. Compared with the practice and trends in terms of worldwide, register Romanian metallurgical last as a result, both in the areas of collection, transport and storage of all categories of waste, as well as in terms of solutions of recovery by recycling or/and use thereof. While worldwide, quantities of waste generated varies usually between 400-600kg/t crude steel, of which more than 80% are currently paid capitalized, Romanian siderurgy has, under some limited amount of waste products of approximately 500-700kg/t steel, a degree of recovery of approximately 40%. In the preparation of iron in the furnace with slag, and other waste products that result by exploiting the by-products category: dust agglomeration, furnace dust and sludge. Dust agglomeration is collected in the cottrell filters system of agglomeration. From the analysis of the situation worldwide result that most of this dust is in recirculation agglomeration plants [4].

Furnace dust and sludge separate from the processes of purification of gas furnace product during the process of elaboration of pig iron. The quantity of furnace dust resulting from the process of purging gas furnace brute is determined by the granulation cargo, its friability, the work of blast furnace and varies between 20-50kg/t iron. Large values correspond to the furnaces that work with
loads ware and loose and low pressure at the mouth of loading mouth. Recycling of dust directly into the furnace is limited by the dimensions of granulometric. In comparison with dust, sludge is less used, the constraints being granulation, humidity (20-35%) and chemical composition. In the steel mills with installations of agglomeration, furnace dust and sludge are being reintroduced into the area of preparation of ores and included in the loads for the agglomeration, with carbon-intensive fuel in the process. There is the possibility of recycling into the furnace or steel. To do this, mixtures of powdery waste with content of iron, alit oxides are first subjected to operations as well as in mechanics and thermal (pelleting, sintering, briquetting;...) followed by reduction operations in high ovens with tank or rotary kilns.

The development of steel in electric arc furnace or in cages, with slag, and other small waste arise and dust powdery: iron dust, dust and sludge converter. Depending on the quality of the metal used in the preparation of iron loads, quantities of dust and sludge are variables, saying it is an average of about 18 kg/t steel liquid [5]. Iron mills that have installations of agglomeration reuse almost entirely dust and sludge converter to produce crowded [6]. For such development, zinc content is limiting and depends on the chemical composition of steel scrap steel used in the preparation in the converter. Unlike dust converter, sludge has a high content of zinc which range from 1.8% to 7.8% zinc. When it comes from developing steel zinc-coated coils from scrap, cannot be introduced directly to the agglomeration but is subject to processing operations for the recovery of the zinc purification. Other compound, dust and sludge are briquetting to cold and then placed the steel in converter in replacing partially scrap cargo. Dust and sludge can be used for obtaining cement and as a colouring agent for concretes.

Dust iron result from treatment of fumes from the furnace, electric arc. The carbon-rich dust iron result in iron, zinc, lead and manganese while developing iron stainless powders generated, are rich in silica, iron, chromium, nickel. All the iron allied compositions specific brands of steels. Over 55% of the quantity of powdered iron is processed by various means (Wiłęz kiln, rotary kiln or flame). Recycling of dust aggregates of iron in steel preparation leads to an increase in time in zinc dust in iron and when it comes down to 30% zinc, it is directed by nonferrous for extracting zinc metallurgy. The main waste products of hot rolling and cold during training operations of LER are scale, sludge, worn from etching solutions, other powders. The main waste products of hot rolling and cold during training operations of surface are scale, sludge, worn from etching solutions, other powders. The scale results from the operations of heating and hot-rolled by the oxidation of steel during hot processing. Those coming from the weak allied iron and highly damaging elements that may contain pollution for long periods of time soil and underground waters. While accumulates large amounts of skims (20-50kg/t of product). Although you may provide iron and heat in the process, the main disadvantage of limited possibility of recycled scale it represents the content of the agglomeration of oil. Because of this will limit the content of scale oil that can be entered in the plant of agglomeration in 0,1 – 0,5%. Recycling in large quantities requires treatment to reduce oil content. The scale can be used for the preparation of the cargo and steel in electric ovens, as an oxidizer for completing requirements for the formation of slag and oxygen. Recycling sludge lamination is limited by the big oil content that varies from 1.5 to 30%. Also, the constraints for recycling are the dimensions of the particles and moisture. Large quantities are discharged into the environment slam and only small quantities are recycled in loads of agglomeration. The removal of oils can be achieved by mining in solvent. Incineration of oily sludge can be made of technically but not economically efficient.

In Hunedoara, as a consequence of the strong restructuring of the former steel and works factory (currently owned by Arcelor Mittal), the primary flow was completely dismantled: coal-carbonizing plant – agglomerating plant – blast-furnace – Siemens-Martin plant. Under these circumstances, small ferrous waste, ferrous slag, scale, scale slurry, agglomeration and furnace dust cannot be recycled anymore through the process of agglomeration.

For jelling some experimental technologies for the processing of the waste (agglomeration, pelletization, briquetting, exploitation through reduction without initial processing and exploitation through the CARBOFER method), we considered the main physical and material characteristics of the existent waste from this area [7, 8].

3 Problem Solution
For the exploitation of the waste and their reintroduction in the economic circuit, simple
technologies are proposed which do not involve high processing costs. The experimental technologies in the laboratory phase for determining the material solutions, compatible with the exploitation of the ferrous waste (pulverous and small) are: the briquettes production and obtaining the CARBOFER product (as mechanical mixture, micro pellets or pellets). To obtain these products, there are used a number of small and pulverous waste from the steel, energy and mining industry such as: the electrical steelworks dust, the agglomeration and furnace dust and slurry, scale and scale slurry, black band ore waste, steelworks slag (ferrous fraction), coal dust, coke dust, scrap electrodes (graphite), thermal power plant ash and lime dust.

The products obtained are shown in Fig. 2. The briquettes obtained can be used as raw material in the aggregates for reducing the iron oxides. The CARBOFER-mechanical mixture product can be instilled in the furnaces, the CARBOFER-micro pellets product can be used as a foaming agent for the slag from electric arc furnaces, without having an impact on the chemical composition of the steel or cast iron, and the CARBOFER-pellets product can be used at the development aggregates of the steel for influencing the slag system.

The results confirm the research validity and recommend their implementation in practice. The products obtained, used as raw or auxiliary material in the iron and steel processes, help reduce costs for ferrous raw materials and bring technological, economical and environmental benefits, such as: increasing productivity, reducing the specific energy consumption and increasing the degree of iron recovery.

Reintroducing the small and pulverous ferrous waste in the economic circuit, both those resulted from the current production flows and those disposed in hillock or ponds, leads to pollution reduction at the water-air-ground levels in areas surrounding the generators of such wastes. Moreover, it renders to the natural environment the spaces occupied as a result of their storage.

4 Conclusion
The Society puts considerable pressure on the industry to reduce the polluting emissions and recycle the largest possible amount of waste. Such simple procedures must be developed in order to recycle small and pulverous waste having the lowest level of pollution possible. In addition, the beneficiaries require improved properties and quality of the products supplied, secure terms and shipping conditions and yet competitive prices compared to other materials.

The deposition of the small and pulverous waste leads to both the pollution of the natural environment by diffuse emissions of harmful compounds and also the contamination of surface and groundwater, areas that go far beyond the perimeters of deposition. Waste recycling processes reduce the negative environmental impact of the deposition. Minimizing the amount of waste through internal processing or exploitation in various industrial sectors establishes itself also in other important objectives, not only ecologically. Environmental protection is provided both directly, waste being recycled at source and there will not be dumps, and also indirectly through the conservation of the natural resources.
References: