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WASTE VALORISATION MANAGEMENT IN GLASS INDUSTRY

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Abstract: Waste management has the following main objectives: adequate valorisation through waste integration and maximum preservation of non-renewable resources. The paper describes the benefits of wasre valorisation management in glass industry, by applying recycling technologies and achieving a glass product. In glass industry waste valorisation management is made through “glass cullets” recycling. “Glass cullets” recycling, which identifies with glass industry waste, reduces the amount of waste and preserves raw materials used for getting glass. A special problem is given by the strictly economic aspects of waste recycling process from glass industry. It is of course necessary that the cost of a glass product achieved through recycling include the recycling crocks at a value equal to that of natural raw materials and replaced energies.

1. INTRODUCTION

Any country’s economic policy has to include and stipulate, for environmental protection, an organization based on managerial principles, with a solid legislative, institutional, administrative, technological and financial basis able to act both for fighting against and preventing pollution and for waste integration in the ecologic structure of the biosphere.
Waste management has a double purpose [1, 4]:

- adequate valorisation through waste integration, starting from the essential environmental protection objective
- neutralization of the negative effects upon the environment
- maximum preservation of non-renewable resources.

Waste valorisation is made on a managerial basis through a system of reliable measures, actions and activities, through long-term financially supported juridical and administrative means.
During the development stage that our country is going through, the need is felt for a legislative framework specific to waste recycling, that would allow trade companies and autonomous administrations to discuss waste within the context of market economy mechanisms, with prices liberalization according to demand and offer. According to these mechanisms action, notable effects are estimated in reducing the amount of waste through their recycling, in favour of material and energetic resources production and preservation.
The paper describes waste valorisation management in glass industry.

2. EXPERIMENTAL

Table 1 presents the oxide composition of glass.

Table 1 Glass oxide composition

Oxide (%)	% gravimetric
SiO_2	81
CaO	0,5
Na_2O	4,5
B_2O_3	12
Al_2O_3	2

Table 2 presents the oxide composition of raw materials.

Table 2. Oxide composition of raw materials

Raw material	Component oxides (% gravimetric)							
	SiO_2	CaO	Na_2O	B_2O_3	Al_2O_3	Fe_2O_3	Other components	PC
Sand	98,95	0,51	-	-	0,3	0,13	-	0,11
Limestone	1,47	53,9	-	-	-	0,10	0,63	43,9
Soda	-	-	57,2	-	-	-	0,3	42,5
Borax	-	-	16,23	83,77	-	-	-	43,55
Aluminium oxide	0,4	0,35	-	-	97,9	0,05	-	1,3

Table 3 presented the oxidic composition of white glass cullets, that are introduced in the mixture of raw materials in ratio of 35%, 40%, 45% and 55%.
The melting of raw materials was made in alumina crucibles in an electric oven at 1450^{0}C for 3 h, when fluid and homogeneous fluids may be obtained the melts were poured into metallic moulds and disk with a thickness of 5 mm were obtained, then they were rebaked at 500^{0}C, for 20 minutes, being cooled at the same time in the oven.
For the five glass samples the density was determined by the method of hydrostatic weighting using an electronic analytic balance. The glass samples were washed in distilled water and alcohol and finally dried.

Table 3. The oxidic composition of cullets

Glass type	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	SO_3
White glass cullets	72,92	1,656	0,044	9,89	0,28	15,48	0,01

3. RESULTS AND DISCUSSION
The glass samples obtained in the laboratory by the recovery of glass, cullets were weighted in air obtaining mass m_0 and in distilled water, obtaining mass m_a'.
The density of the glass (d_{st}) is calculated with the relation:

$$d_{st} = \frac{m_0 d_a}{m_0 - m_a} \ g/cm^3 \qquad (1)$$

where:
$m_a = m_a' - m_f$, m_f is the weight of the wire used for sample suspension;
d_a – the density of the distilled water at working temperature, that is 0,99723 g/cm^3 at 24^{0}C.
The obtained results are presented in table 4.

Table 4. The results of density determinations

Glass	Density
Glass obtained from raw materials	2,5030
Glass obtained from raw materials and glass cullets (35%)	2,5031
Glass obtained from raw materials and glass cullets (40%)	2,5041
Glass obtained from raw materials and glass cullets (45%)	2,5043
Glass obtained from raw materials and glass cullets (50%)	2,5144

Table 4 presents the value of the densities of the glasses obtained by cullets recovery, close to the value of the glass density obtained from raw materials, which is an advantage fo the domestic glass production.
Density is of interest for the industrial practice, because it allows the quick highlighting of possible modifications in the glass composition.
The glass cullets represent the readyprepared glass, having all oxidic compounds in the needed ratios and gathering a high energy quantity corresponding to the reactions and processes that took place during glass manufacturing.
The re-usage of glass cullets by reintroduction in the melting oven in order to obtain new products, leads to important savings in raw materials as well as energy.

4. CONCLUSIONS

In Romania, the industry of domestic glass is one of the few branches that, in the new conditions of market economy, adapted quickly and works efficiently. The results show the importance of the glass cullets recovery in industry. The glasses obtained by recovery of glass cullets may be used in industry, having density values close to those of the industrial glass.

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