

USING THE WASTES WITH CARBON CONTENT FOR PRODUCING CARBOFER

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ABSTRACT

The CARBOFER is a mechanic melt obtained out of different ferrous and non-ferrous a pulverous wastes or through grinding in the pulverous estate. Steel dust, tunder, throng and furnace dust and non-ferrous dust from coking works are used as pulverous ferrous wastes, and electrode wastes, as well as wastes from carbonic blocks are used as small pieces of coke.

The wastes contain enough elements like iron, calcium, carbon, useful for the various processes that take place in the metallurgy plants.

Obtaining the product involves the following steps:

- temporary stocking of each waste product;*
- sieving each waste product, so that the rough fraction is introduced in the process of grinding, and the thin fraction is stocked;*
- the proportional extraction of the components (according to the recipe) and melting them in the homogenizing drum;*
- delivering the product to the beneficiary up to the present moment on world level, the CARBOFER is used to produce cast in the furnace, being insulated with coal dust at the furnace wind mouth level, as well as the steel production, in the arch electric even, as an agent of the slag foaming.*

The experiments connected to the CARBOFER production have been oriented towards using it as a foaming agent in the electric steelworks.

In order to obtain the CARBOFER, we have used the following wastes for the experiments:

- blast furnace and sintering dust (50-70%);*
- electric steel plant dust (10-30%);*
- limestone dust (3-5%);*
- coal dust (10-20%).*

The CARBOFER has been injected in the arch electric oven on the melt metallic slag surface using a standard spear.

The results of the experiments show the following effects:

- retriving 45 – 75% of the iron existing in the injected material;*
- unmodifying the steel quality as well as the inexistence of a negative effect on the oven;*

- *decreasing the quantity of the pulverous wastes generated throughout the metallurgy processes;*
- *improving the quantity of styled and lead in the electric steel dust.*

Using the CARBOFER as a substitute for the normal slag foaming agents in the electric arch oven represents both ecological and economical aspects.

The ecological aspect is represented by the significant decreasing of environment pollution (increasing the degree of using the pulverous wastes, as well as reducing the stocking place of these wastes). The economical aspect is underlined by the transfer of the expenses related to stocking the wastes for other purposes.

KEY WORKS:

wastes, milling, scalp, steel plant, injected

1. INTRODUCTION

The CARBOFER is a mechanic melt obtained out of different ferrous and non-ferrous a pulverous wastes or through grinding in the pulverous estate. Steel dust, tunder, throng and furnace dust and non-ferrous dust from coking works are used as pulverous ferrous wastes, and electrode wastes, as well as wastes from carbonic blocks are used as small pieces of coke, thus the useful elements present in this offal's, the meaningful quantity which are in scoria yard and spoil dump, the continuous production, and also the most hard conditions as for medium justify to find solutions for the efficient capitalization.

Until now, in the world, CARBOFER is used to elaborate cast iron in furnace, is blow in mixture with coal dust and to elaborate steel in electric arc furnace, like frothed agent of slag too.

In this work we'll present the experiments made to the produce and using CARBOFER at electric steelworker like frother agent.

2. THE EXPERIMENT VIEW FOR CARBOFER PRODUCE

For CARBOFER produce we'll establish the qualitative characteristics of offal's and using materials, after what will provision and store to process it.

The obtain CARBOFER its necessary the next technological phases:

- the temporary store, separate to each offal's, respective material;
- the scalp of each offal's (respective material), big faction is reintroduce to milling, and the fine faction or to process or to temporary store;
- the proportioned measure of components concordant to used recipe and introduce them in tumbling mixer;
- the measure, packing and product deliver to beneficiary (accompany by quality certificate).

In frame of made experiments in CARBOFER obtain, we'll use the next offal's (table 1), concordant with technological tide present in figure 1:

- blast furnace and sintering dust;
- electric steel plant dust;
- limestone dust;
- coal dust.

If isn't sufficient coal dust, like offal's we'll use coal dust obtain from milling the coke, the electrode offal's or graphite block.

We'll make CARBOFER after 5 recipes (table 2).

All the used materials were well dry. The medium chemical composition of CARBOFER made after 5 recipes is in table 3. For each recipe is the intercede of 5 establish (5 charge / recipe).

TABLE 1. THE CHEMICAL COMPOSITION OF OFFAL'S

WASTES	BLAST FURNACE AND SINTERING DUST	ELECTRIC STEEL PLANT DUST	LIMESTONE DUST	COAL DUST
Fe _{tot}	30,40	55,67	-	2,25
FeO	8,84	2,98	-	-
Fe ₂ O ₃	33,61	73,37	0,50	4,37
SiO ₂	9,80	3,49	0,80	4,38
Al ₂ O ₃	8,33	1,07	0,45	3,05
CaO	10,47	5,11	96,30	0,57
MgO	2,47	2,34	1,30	0,16
MnO	0,89	4,80	0,35	0,09
S	1,38	0,34	0,10	1,85
P	0,13	0,74	0,20	0,005
C	22,04	-	-	84,74
Zn	-	0,84	-	-
Pb	-	1,40	-	-
Cr	-	0,10	-	-
Ni	-	0,05	-	-
PC	1,27	-	-	0,825
Other	-	4,92	-	-

TABLE 2. RECIPES

COMPONENT, %	RECIPES				
	1	2	3	4	5
BLAST FURNACE AND SINTERING DUST	50	55	60	70	70
ELECTRIC STEEL PLANT DUST	25	30	20	10	17
LIMESTONE DUST	5	3	4	5	3
COAL DUST	20	12	16	15	10

TABLE 3. THE CHEMICAL COMPOSITION OF OBTAINING CARBOFER IN ACCORDANCE WITH 1-5 RECIPES.

RECIPES	1	2	3	4	5
Fe _{tot}	29,56	33,69	29,73	27,18	30,96
FeO	5,16	5,05	5,9	6,48	6,69
Fe ₂ O ₃	35,04	41,03	34,55	30,54	36,25
SiO ₂	10,04	9,36	10,47	11,86	10,29
Al ₂ O ₃	5,06	5,28	5,71	6,41	6,33
CaO	10,44	10,14	11,24	11,74	11,14
MgO	1,85	2,11	2,02	2,05	2,18
MnO	1,68	1,95	1,52	1,13	1,45
S	1,15	1,08	1,19	1,28	1,21
P	0,26	0,3	0,23	0,17	0,22
C	27,96	22,29	26,08	27,13	22,9
Zn	0,21	0,25	0,16	0,08	0,14
Pb	0,35	0,42	0,28	0,14	0,23
Cr	0,02	0,03	0,02	0,01	0,01
Ni	0,012	0,015	0,01	0,005	0,008
PC	0,8	0,79	0,89	1,01	0,097

3. THE EXPERIMENTS LOOKING TO USE CARBOFER LIKE FOAMING AGENT OF SLAG AT ELECTRIC STEELWORK

The CARBOFER was inject at smelting interface steel – slag with a standard lance with next characteristics:

- oxygen debit 2400m³/h;
- oxygen pressure 12 bar;
- the orifice diameter for oxygen breath ϕ 20 mm;
- CARBOFER 100kg/min;
- breath agent for compress air, pressure 4-6 bar;
- interior diameter ϕ 50 mm.

The CARBOFER consumption altered between 600-800 kg/charge, blast duration 6-10min.

This parameters altered in function of scrap iron quality used, by elaborate steel mark and by work conditions of furnace.

The experiments were effected for 10 charges (2 charges / recipe), finding next:

- slag foaming correspond, is better at CARBOFER using, made after 4 and 5 recipe, what is explain in an adequate report between carbon and iron oxide;
- the quality of foaming agent breath parameters doesn't influence the steel and slag quality;
- the iron recover degree was high at charges where the foaming was more intense (the variation limits are presented in table 4);
- the growth of non-ferrous contain (Zn, Pb) on experiments, we mention that in 2 recipes composition we used dust from recipe 1, 3 and 2 experiments.

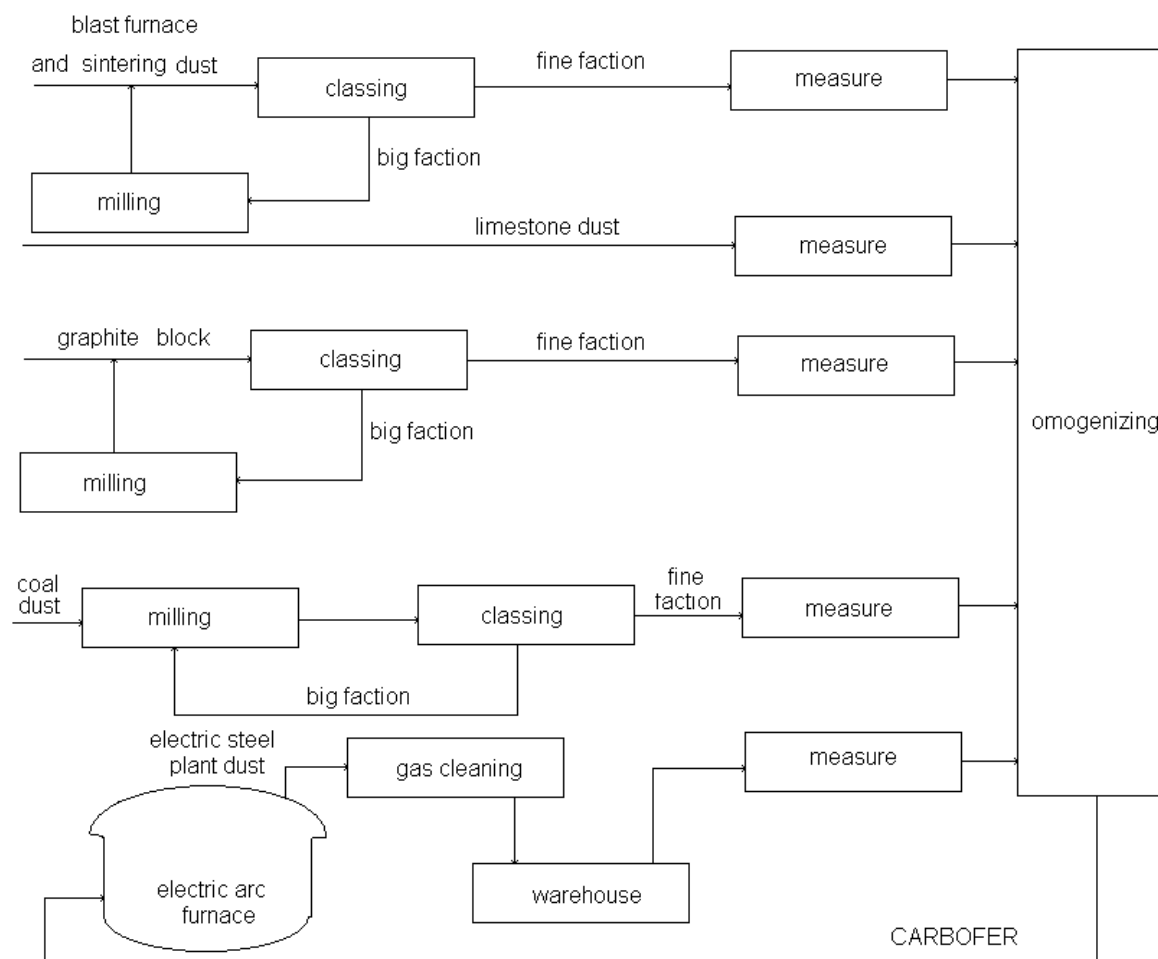


FIGURE 1. FLOW SHEET FOR PRODUCING CARBOFER.

TABLE 4.

Recipes	Iron valorification ratio %	Zn %	Pb %
1	72,13	0,96	0,50
2	54,67	1,07	0,59
3	61,82	1,21	0,71
4	78,29	1,36	0,84
5	74,21	1,52	0,97

4. CONCLUSIONS

From obtain result analysis at produce CARBOFER using after own recipes like foaming agent of slag at electric furnace EBT results the next conclusions:

- the produce CARBOFER after own recipes is using offal's resulted in iron and steel industry can be used like substitute of usually foaming agents (example graphite) without negative influence for the technological process and for the steel quality
- producing and using CARBOFER presents economics and ecological advantage

- the economic appearance comes out that in little prize with 20% present usual agent, on a way, and on the other way the expense reduction by storing which alter between 25-30euro/t offal's;
- the economics results from offal's store eliminate can be transferred in each other ecological goal;
- the ecological advantage result from store space reduction (scoria yard, spoil dump) and of medium pollution at level air – water – earth.

We'll mention that in Hunedoara area exist storehouses (scoria yard, spoil dump) with considerable quantity of offal's which can be capitalize in metallurgy (about 250000 tones of furnace dust and agglomerate, about 100000 tone of steelwork dust). Our staff is permanent engrossed to offal's capitalize and medium ecological in zone with iron and steel industry.

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