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Studies on the Executionof Models Used in Iron Foundry From Epoxidic Resins

The epoxidic resins are materials frequently used in the execution of the models used in iron foundry. This materials can replace casily wood or aluminium in the execution of the models needed in series productions, having better resistance properties and the high dimensional precision. The properties of these resins are obtained from the completion of the epoxibifunctional molecules with supplements. This paper establishes the result of mixing the two components, as well as the supplements used to improve the mechanic and the technological properties.

1. Introduction

The sets of models used in iron foundries obtained from epoxidic resins, may be introduced in the category of the models obtained from plastic, with high resistance, even if in the end, the product obtained is non-plastic.

The epoxidic resins are materials that behave very well during the process of hardening. The hardening of these epoxidic resins may be achieved at room temperature and under the effect of external heat, not high. As a result of the chemical reactions that produce the hardening of the epoxidic resins, there are no gases formed and the hardened product does not suffer any size modification as a result of the contraction after hardening and cooling. The hardened material may under take some mechanical challenges determined by the mechanical processing by splitering and it is resistant to the action of some chemical agents. In conclusion, the epoxidic resins may be used in the making of the models used in the making of the sets of models used in iron foundries.

The execution of some sets of models, with a highprecision, in iron foundries, is based on the mixig of two components:

- proper epoxidic resins, composed mainly of: difenylol propanol and epichlorhydrin;

- basic and acid hardeners (monoamines, primary, secondary and third polymines) which in organic form, contain: nitrogen or acids (carbonic anhydrides).

2. Experimental results

The properties of the epoxidic resins are a result of the chemical reactions of completion of the epoxifunctional molecules with the hardeners. By poliadition of elements in the resins or hardeners, a substantial improvement of the specific weight of the material and an acceleration of the buiding process of the models are achieved. Thus, the properties of the epoxidic resins can be efficiently modified by complex additions of: quartz flour, chalk flour, slate flour, china flour, quartz sand, mica powder, kaolin, mineral talk, aluminum hydrate ($Al_2O_3 \cdot 3H_2O$) etc.

The mixing report between the epoxidic resins and the hardeners are:
- epoxidic resins : basic hardeners = 100% : 1…30%;
- epoxidic resins : acid hardeners = 100% : 25…30%.

The quantity of hardeners needed is established by three technological methods. These being:
a. In general, from epoxidic resins we can make parts of the models used in iron foundries. These components af the models are made from plastic materials, composed from epoxidic resins, hardeners and a small quantity of supplements.
b. The casting of resins in blocs, followed by the processing by slitering, in order to obtain component parts of the sets of models.
c. The casting of the epoxidic resins directly on the "props". The props used are executed, in most cases, from wood of poor quality, from non-ferrous alloys and from plastic masses (obtained from cheaper plastic materials). Unlike the anterior cases, on the active surfaces of the parts of the models a thin layer of wear is poured, composed of pure epoxidic resins and hardener. This mix is also used for the repairing of some parts of the models that represent surface flaws (pores, gaps etc.).

The active surfaces of the models made from epoxidic resins, especially those that come into direct contact with the processing materials, are covered with a layer protective paint (based on resins or oil).

In Table 1 we can observe the thermic and technological parameters in processing the sets of models from epoxidic models and in Table 2, the properties of the epoxidic resins.

Table 1

The thermo-technological parameters used in the processing of the sets of models in iron foundries from epoxidic resins

No.	The main components of the resins	Casting temperature [^{0}C]	Casting time [s]	Hardening time [h]	Storage period [years]
1.	A-bisfenol	20	25…35	24…60	1
2.	Polyuretane	20	5…10	10…12	1

Table 2

Features of the epoxidic resins used in the casting of models

Nr. crt.	σ_i [N/mm^2]	σ_c [N/mm^2]	KCU [KJ/m^2]	E [N/mm^2]	Duritate Brinell [HB]	T_l [^{0}C]
1.	70…85	90…110	7…9	4000…5000	85…90	70…80
2.	85…90	80…85	6…8	4200…5000	80…85	50…60

Notes: σ_i - Flexure resistance; σ_r - Breaking resistance; KCU - Resilience; E - Elasticity module; T_l - Temperature used.

3. Conclusions

Concerning the properties of the epoxidic resins used in processing of the sets of models in iron foundries, the next properties can be mentioned:

* The pure epoxidic resins are thermo-plastic materials which can be transformed by chemical mechanisms of hardening, obtaining a non-plastic hard material.
* They are used in various applications: casting, impregnation, covering.
* They may be used in casting the models at room temperature and also at high temperature.
* It presents a good fluidity in casting.
* They can be used in pure state and mixed with the different adding.
* Their viscosity is growing according to the quantity of supplements used.
* The heat produced during the reaction of solidification is properly evacuated from the system the supplements; it results that it is almost impossible to form residual tensions in the models, after the solidification and the cooling of the epoxidic resins.
* The purity degree, the granulation and the method of preparing the supplements are of great importance concering the properties of epoxidic resins.
* The aeration of the two components of the epoxidic resins have a great influence on the removal on the execution possibilities of the flaws of casting the models.
* During the solidification reaction a small quantity of heat is released.

* The easy processing of the materials casted from epoxidic resins; they can be processed by splitering by machines-tools, also used in processing wood.
* The high resistance to the corrosive action of the casting materials.
* Resistance characteristics of the models under mechanical and thermic shokes.
* The proper correlation of the processing time of the epoxidic resins on the props with the type of hardener used.
* High durability in keeping the sets of models.

4. References

[1] * * * Revue Brown Boveri, no. 8/august 1965.
[2] * * * Revue Brown Boveri, nr. 11/november 1987.
[3] * * * Revue Brown Boveri, nr. 11/november 1989.

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