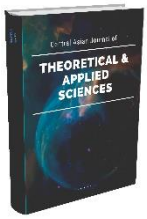

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Methods of Manufacturing Models From Polystyrene Foam.

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Abstract: *This article discusses methods for manufacturing models from expanded polystyrene, in a foundryproduction. An analysis is made of the advantages and disadvantages of each method, taking into account the overall dimensions, types of production, and the quality of the resulting castings.*

Key words: *casting, expanded polystyrene, molds, flasks, burnt out models, thermal destruction, evacuation, ferromagnetic material.*

Methods for manufacturing models from polystyrene foam in foundry production are associated with the improvement of existing technological processes and the development of fundamentally new special casting methods.One of the most important issues is the choice of the optimal casting manufacturing technology. It is necessary to pay attention not only to ensuring special requirements for the quality of the resulting castings, high physical, mechanical and operational properties, but also to the technical and economic indicators of the technology for manufacturing castings, including machining.

A model made of polystyrene can be made in molds, as well as cut out of polystyrene foam. In the manufacture of models in molds, expandable polystyrene is used as the starting material, which is supplied in granular form. For foundry production, special grades of foundry polystyrene foam are produced. Under the influence of heat, the granules foam, increasing in volume by 5...7 times. The calculated amount of granulated polystyrene is poured into the mold and steam is supplied. Polystyrene foams, increasing in size, and occupies the volume of the mold. Machines are made for the production of models from expandable polystyrene. This technology for obtaining models is acceptable in the mass production of castings. But it is possible to produce casting according to burnt-out models in a single production. In this case, the model must be made from foam by cutting, and the mold must be made in flasks using conventional sand. To improve the quality of the surface of the future casting, the model is painted.

In this way it is possible to obtain castings without cores, without slopes, without bays and seams with tighter dimensional tolerances and with reduced machining allowances compared to sand casting on wooden or metal models.

The method of casting on burnt-out models allows the use of dry sand for the mold, which reduces the complexity of the process. In this case, vacuum molding can be used, which ensures the retention of sand and the removal of thermal degradation products.

The use of bulk ferromagnetic material, shot or metal sand instead of dry sand allows the use of a magnetic field to hold the mold during the pouring of metal. However, the interaction of the molten metal with the destruction products of the material of the model often leads to the appearance of specific defects in castings: surface shells (due to the deposition of solid carbon); gas sinks; waviness of the surface of castings, etc. The quality of the surface of castings essentially depends on the properties of the material of the model, in particular, its specific gravity. With a decrease in the specific gravity of the material, the amount of degradation products decreases, but the rigidity and strength of the model decrease, which increases the likelihood of deformation when using compacted sand-clay mixtures.

The possibility of obtaining castings in molds from dry sand without a binder is explained by various researchers in different ways. On the one hand, it is believed that the form of dry sand acquires strength due to the binding action of the products of evaporation of expanded polystyrene condensed in the pores of the form, which are formed during its gasification. On the other hand, the binding effect of condensation products is denied and it is argued that the stability of dry sand molds and the possibility of forming castings in them is explained by the replacement of the model by the melt. However, a number of researchers have found that a gap between the model and the melt is formed, and its value depends on the temperature of the melt, pouring speed, hydrostatic head, and other factors. It is believed that the main factor that keeps the sand in a stable position is the action of the filtration forces of the gas flow, which is formed as a result of the interaction of the model material and the melt.

In the manufacture of castings in molds from dry quartz sand without a binder, due to the discrepancy between the dimensions of the casting and the model, sand blockages are formed. A significant number of castings are rejected. The application of a strong and gas-permeable paint to the polystyrene foam model, which stabilizes the molds from bulk material until the formation of a hardened casting crust, made it possible to reduce the production of defective castings.

The method of casting into magnetic molds for burnt models. The polystyrene foam model is covered with a ferromagnetic molding material, on which a magnetic field is applied. Under the action of a magnetic field, the particles of a ferromagnetic material are bound into a single whole. Filling is carried out as usual. After the magnetic field is removed, the molding material is poured out of the flask. This method of obtaining castings retains the main advantages of casting into molds from dry quartz sand and at the same time eliminates their main disadvantage - the formation of blockages. However, this method has found application for producing castings of relatively small mass and simple configuration. The greatest compaction is received by the mold material located at the walls, which extend along the magnetic lines. Therefore, for casting massive and complex castings, a high magnetic field strength is required, which requires very large magnets to create.

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