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TECHNOLOGIES OF UTILIZATION OF CIRCULATING CASTINGS WASTES ARE IN PRODUCTIONS OF THE TITANIC SHAPED CASTING AND BARS

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The characteristics of titanium foundry wastes are given and the methods of preparation of wastes and their involvement in the charge for shaped titanium casting by manufacturing waste electrodes from the waste and loading them directly into the crucible before melting heat, and types of furnaces for producing shaped castings from titanium alloys are examined. The economic efficiency of waste utilization in the production of titanium shaped castings is estimated.

Keywords: titanium waste, shaped casting, consumable electrode, melting plants, ingot smelting

Description of titanic castings wastes. By typical titanic wastes, appearing in a shaped-casting production [1] there are central ingrates, gates and in feeders. Their quantity in general balance of castings wastes of workshop (or area) makes about 75-80 %. To castings wastes bits there are concern also and pieces of metal belong in receiving-sending trays in melting furnaces, and also scar of out-of-commission crucibles.

At cutting and growing of wastes there is shallow additional impurity of their surface in the places of cutting. So, in the area of oxy-acetylene cutting appear different type of connection of titanium with oxygen, nitrogen, carbon and hydrogen. At the anodic-mechanical cutting the surface of metal is satiated by products of cooperation of molten metal with liquid glass and atmospheric gases on a depth a to 0.2 mm and more. Industrial skill shows that for the cycle of melting and inundation an increase of content in the metal of oxygen and nitrogen due to accumulating (in the case of melting at accumulating less or equal to possible) is 0.003-0.005 %.

Preparation of wastes. Because of enhanceable content of admixtures in castings wastes (oxygen, nitrogen, hydrogen, carbon and etc.) introduction of them to the charge results in impurity of fusion. Before cleaning wastes growing to the sizes, providing their compact piling at remelt.

For growing of wastes it is apply cutting by rubber circles, mechanical, anodic - mechanical, plasma and oxy-acetylene cutting. In work [2] it is suggested for growing of castings standard wastes (elements of the gate-feeding system of founding's) to use a local hydrogen attack. Growing of the thin-walled wastes can be produced under a press in the reserved chamber.

With the purpose of moving away of superficial muddy layers of wastes, and also pieces of material of casting form from their surface, there are apply the mechan-

ical and chemical cleaning. The mechanical cleaning is produced in rattle drums, on shot-blast and shot casting apparatuses, in shot casting drums and on shot-blast apparatuses with the revolved bell [3].

After the mechanical cleaning produce there are making light of the oxidized superficial layers of wastes in solutions of next compositions, g/ℓ: 600-650 *NaOH*; 200-250 $NaNO_3$ and 50-60 $NaNO_2$ or 500-700 *NaOH* and 150-250 $NaNO_2$. Temperature of solution – 130-145 °C, time of treatment – from 20-30 mines to 2 hours.

After it wastes are washed in warm and cold water, and then expose to the etch in acid solution of composition, mℓ/ℓ: 60-70 H_2SO_4 and 60-140 *HF*.

Engaging of wastes in a charge. Entry of wastes to the charge for the shaped casting can be produced by two basic methods: by making from wastes of consutrodes and by loading of wastes in skull crucible before realization of melting. At melting in skull furnaces to 15-20 % casting standard scrap is re-fused directly in crucible, other is used for making of construed by loading of the billets in mould with their subsequent inundation a liquid metal [4].

Construes' from one waste make welding in an inert medium, laying pieces so that the got electrode had a more or less regular geometrical shape. The weld-fabricated guy-sutures execute comparatively large section in order to avoid destruction of electrode in the process of melting.

For the use in vacuum-arc castings furnaces the combined consutrodes in the complement of which the barbell and cylindrical billets pressed from spongy titanium enter from the gate system [5] can be applied. The shaped founding's got with the use of such electrodes corresponded to the technical requirements.

For the making of high-quality billets (electrodes) from titanic wastes with the subsequent making from them casting priority is observance of technological parameters of heating of mould, and also rational percent correlation of wastes to the volume of mould [6].

On OAJ «Motor Sich» (Zaporozhe) there are use the next methods of making of the shaped titanic founding's: casting on the smelted models, casting in shill mold and casting in thecal forms [7]. As consutrodes for a remelt in the vacuum-arc melting aggregates VDL-4 apply titanic twig billets by diameter a 360 mm from the alloy of VT1-0 and also Billets of own production with the use of a 50 % spongy titanium of brand of TG-120 (ZTMC) and 50 % twig charge billet from the alloy of VT1-0. More economical, than utilization of wastes for making of consutrodes, there is engaging of them in a charge by loading in crucible before melting, because here realization of operations on making of electrodes and application of additional equipment is not required. A maximal quantity of wastes, which can be high-usage in crucible, is 30-35 % from mass of melting. Increasing power of the melting apparatus and corresponding change of the modes of melting is thus required.

Application of technology of the induction melting in cold crucible for the shaped casting of titanic alloys creates high economic efficiency and provides availability of this type of haft-finishes products for wide consumer needs [8].

A big-volume crow-bar and wastes of shaped-casting production can be used and for making of bars.

From wastes of alloys of PT-3B and TL-3 on apparatus UE-108 there were got bars by a diameter a to 0.55 m and long a to 1.0 m by the method of fusing and drawing out from copper communicating crystallizer [9].

Conclusion. Circulating castings wastes of titanic alloys, geared-up to the standard state, use for making from them consutrodes or directly engage in a charge for the making of the shaped casting by a meltback in skull and induction furnaces. Utilization of wastes allows considerably to reduce the cost of the titanic shaped founding's.

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