

AN ANALYTIC VIEW ON PRECISION CASTING

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Abstract: The casting of liquid metal into a mould is a convenient way of making many types of components. Many times the casting process is the only suitable method to fulfill both practical and economical exactingnesses. Among main casting methods there are some of them which ensure close dimensional tolerances and with a good surface finish named generically high precision casting. In this paper are presented some broad considerations on the perspectives of the precision casting.

Keywords: industrial competition, shell casting, gasification-able models, lost wax casting, dimensional precision.

1. INTRODUCTION

The selection of materials and manufacturing route is an integral part of design procedure. The shapes required vary broadly, both in size and complexity. The properties of the materials are influenced by the type of shaping manufacturing and the process employed. Each process has advantages and limitations. Conditions during melting and casting determine the subsequent quality of metallic materials. In this paper are presented some considerations concerning the high precision casting, including its production and perspectives.

2. THE PRODUCTION OF PRECISION CASTS

The production of casts by the precision casting using gasification-able models or lost wax models is characterized by obtaining of such a great precision that after blasting, the casts may be used at assemblage. The method to produce high precision casts is a technologic process more complicated, longer and, consequently, more expensive. Nevertheless, the method is extremely favorable in the case of casts of small dimensions and weights, with very complex internal and external geometry, cast, especially, from expensive iron and non-iron alloys.

As a proof that the precision casting is extremely favorable is the fact that this method is employed, especially, in industrial very developed countries (USA, UK, Japan, France, Germany etc), countries where the precision casting has a continuous and increasing trend.

In the up-to-date stage, the world repartition of the main producers of precision casts is presented in figures 1...5 and in table 1.

In Japan, in France and in Czech Republic, a great consumer of precision casts is, for example, the automotive industry.

Even the casts production is found preeminently in the case of small parts, from high or special steels, a weight greater and greater have the casts from light non-iron alloys and, more recently, casts from copper or copper alloys. From these alloys may be cast complicated parts with thin walls, with good thermal conductivity, with a special good quality of the surface, using ceramic cores for obtaining the internal configuration (cavity).

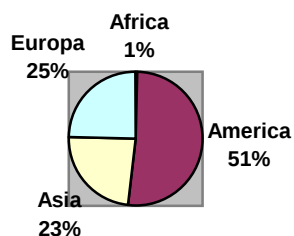


Fig.1. World production of precision casts in 2005

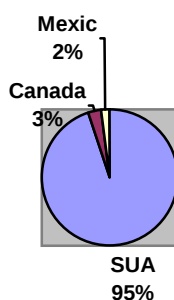


Fig.2. Production of precision casts in 2005 in American continent

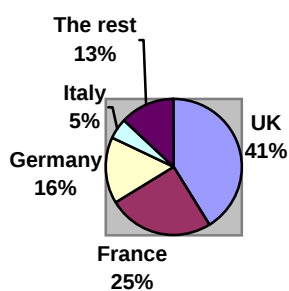


Fig.3. Production of precision casts in 2005 in European continent

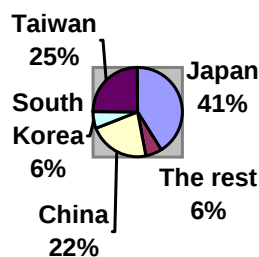


Fig.4. Production of precision casts in 2005 in Asian continent



Fig.5. Production of precision casts in 2005 in African continent

Table 1

Continent	Total value of production x 10 ⁶ \$	%	Country	Total value of production x 10 ⁶ \$	%
Africa	30	1	South Africa	27	90
			The rest of countries	3	10
America	2600	51	USA	2500	96
			Canada	60	3
			Mexico	40	2
Asia	1191	23	Japan	500	41
			Taiwan	300	25
			China	200	22
			South Korea	60	6
			The rest of countries	60	6
Europe	1257	25	UK	517	41
			France	315	25
			Germany	205	16
			Italy	70	5
			The rest of countries	150	13

Besides the high weight of production of precision casts, in highly developed countries the dimensional precision of the casts is superior to that of other countries. So, for example, in the USA the dimensional deviation is between the limits -0.005 and $+0.005\%$, but in UK is between the limits -0.002 and $+0.002\%$. In our country,

the dimensional precision of casts is between the limits -0.07 and $+0.07\%$, which is many times smaller than in USA or UK.

The high precision casts have a large use in the top industries like aerospace (Table 2), electronics, automotive, petrol-chemistry, medicine.

Table 2.

Country	Aerospace %	Other industries %
USA	60	40
UK	70	30
Western countries	55	45
Japan	15	85

The quality and the dimensional precision of casts may be realized by a continuous effort to respect, on one hand, all the parameters of technological process, and, in other hand, keeping the quality of materials used in production.

In order to realize these desires it is necessary to accord a great attention to the training of the executive and managerial staff working in the field of precision casting.

3. CONCLUSIONS

As it was seeing in the figures and tables, the precision casting is still a method of great actuality and of great perspectives.

Despite the precision casting has an increasing trend, it is confronting with different competitors, as for example:

- competition with other materials (plastics, polymers);
- competition with other metallurgical technologies (powder metallurgy, forging, stamping in semi-liquid state);
- competition with other casting methods (pressure casting, aspiration casting).

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