TECHNICAL UNIVERSITY OF KOŠICE

FACULTY OF MANUFACTURING TECHNOLOGIES WITH A SEAT IN PREŠOV

TECHNOLOGICAL FACTORS OF DIE CASTING

by

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2014

Abstract

The monograph points out a current state of knowledge in the sphere of production technology of aluminium castings by die casting and it describes the cornerstone of die casting technology, the die casting machines and basic technological factors of die casting. At the same time, on the basis of long-term selected experimental results of the authors the analysis has been performed related to the influence of technological factors of die casting upon the values of mechanical properties of aluminium castings as well as structural analysis of Al-Si alloys and assessed has been the analysis of casting defects in close connection with their effect upon the casting quality. On the basis of the experiments performed under operation conditions and pursuant to evaluation of the results under laboratory conditions the measurements for industrial practice have been proposed from the viewpoint of achievement of the utmost efficiency and quality level of production of aluminium castings by die casting technology.

The monograph is intended predominantly for students, Ph.D. students and pedagogues at technical universities and colleges as well as for wide scientific and professional public, technologists and workers of foundry plants.

Key words: *die casting, technological factors, mechanical properties, quality of cast*

Reviewers: Dr.h.c. Prof. Vladimír Kročko, M.Sc., PhD.
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Edition of Scientific and Technical Literature

ISBN 978-3-942303-25-5

CONTENTS

INTRODUCTION

Pursuant to STN 04 6509 standard die casting represents a method of precise casting process in case of which a mould is filled with the melt at high pressure.

The aforementioned is the type of production of castings using the die casting machines by means of which the molten metal is forced into a permanent mould at high speed (10 - 100 m. s^{-1}) at high pressure. Since its development the technology of die casting has overcome a complicated process bound to the applied alloys. Die casting was invented in 1838 for printing type production and since 1894 it has been employed in engineering machinery. Initially, the hot-chamber die casting machines were used in case of which a filling chamber is dipped into the melt in the holding furnace or is warmed up by other method. The machines cast low-melting alloys on the basis of tin, lead, and zinc. Former Czechoslovakia ranked among the pioneers of die casting both in the production of die casting machines as well as in utilization of die casting technology in case of which a principally up-to-date casting technology was invented by Ing. Polák during the 20s of the last century. According to Polák's patent a melting-pot containing the melt got detached from the machine and the melt was cast into a filling chamber by a spoon being then forced into a mold cavity. Thus the first die casting machines with cold filling chamber occurred that allowed casting of non-ferrous metals with higher melting point, chiefly of alloys of aluminium, magnesium, and copper. In 1928 and 1938 the machines of the Polák´s system invaded the entire world and Czechoslovakia became a traditional country of die casting. Until 2004 the up-to-date die casting machines had been produced in the company of Vihorlat in Snina. In the Czech Republic the company of TOS Rakovník is engaged in the production of die casting machines and of auxiliary equipment. The world well-known producers include the following: Bühler (Switzerland), Frech (Germany), Müller Weingarten (Germany), Italpresse (Italy), Dynacast (USA), Techmire (Canada), Toshiba (Japan), Ube (Japan).

Higher input costs in case of die casting are calculated for high number of products in the series which allows utilization of solutions assuring dimensions and shapes of castings almost identical with final components practically with top surface quality, casting complexity, and with minimum thickness of the wall and with rather extensive castings. Minor or zero machining allowances decrease the material costs, number of operations, and overall labour consumption. The outcome rests in low weight, component price cutting, high productivity, and high competitiveness of technology.