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Review on Design Analysis and Development of Aluminium Handle for Window (Die Casting Die)

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ABSTRACT- In this Design, Analysis and development of aluminium handles we are doing some provisions to increase their strength and aesthetic appearance as per the client's requirement, these handles are widely used in windows, doors, cabinets and Almira. In this project, we are conducting static structural analysis to analyse the strength of the product, so our component withstands the required load, while we will use NX (Unigraphics) software for the development of the product. We are also designing Pressure die casting to produce the component. Die casting design is a very complex process for various parameters of die designing will be considered like overflows, gate position, gate size, injection pressure etc. For die designing we are using NX (Unigraphics) software.

Keywords- Strength, aesthetic appearance, structural analysis, NX (Unigraphics), Die casting.

I. INTRODUCTION

Die casting is a quick, reliable and cost-effective manufacturing process characterized by forcing molten metal under high pressure into a mould cavity. The mould cavity is made of steel and is uniquely designed for each project. Also known as tools or dies, mould cavities have a high degree of accuracy and are able to produce parts with tight tolerances. The pressure is maintained in the 'die' long enough to allow the metal to solidify, after which the die opens to permit the casting to be ejected. The die is then closed and prepared for the next shot as it is capable of being reused immediately. In this way, the die is able to produce thousands of castings in rapid succession. The die casting machine consists mainly of two heavy platens, one fixed and one moving, which accommodate the dies, these normally being fabricated in two halves. The whole design is massive enough to withstand the very high pressures used, typically thousands of pounds per square inch. It is essential to keep the dies well-lubricated to prevent the casting from adhering to them as well as to provide a better finish. Cleaning of the dies is also a necessary routine, especially to remove unwanted scraps of metal which might prevent the dies from closing on the next shot with resulting damage.

II. LITERATURE REVIEW

1 **Karve, Aniruddha Aji**t - . Dimensional control of die castings, the demand for net shape die castings, which require little or no machining, is steadily increasing. Stringent customer requirements are forcing die casters to deliver high-quality castings in increasingly short lead times. Dimensional conformance to customer specifications is an inherent part of die-casting quality. The dimensional attributes of a die casting are essentially dependent upon many factors--the quality of the die and the degree of control over the process variables being the two major sources of dimensional error in die castings. This study focused on investigating the nature and the causes of dimensional error in die castings. The two major components of dimensional error i.e., dimensional variability and die allowance were studied. The major effort of this study was to qualitatively and quantitatively study the effects of casting geometry and process variables on die-casting dimensional variability and die allowance. This was accomplished by detailed dimensional data collection at production die-casting sites. Robust feature characterization schemes were developed to describe complex casting geometry in quantitative terms. Empirical modelling was utilized to quantify the effects of the casting variables on dimensional variability and die allowance for die-casting features. A number of casting geometry and process variables were found to affect dimensional variability in die castings. The dimensional variability was evaluated by comparisons with current published dimensional tolerance standards. The casting geometry was found to play a significant role in influencing the die allowance of the features measured. The predictive models developed for dimensional variability and die allowance were evaluated to test their effectiveness. Finally, the relative impact of all the components of dimensional

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error in die castings was put into perspective, and general guidelines for effective dimensional control in the die-casting plant were laid out. The results of this study will contribute to the enhancement of dimensional quality and lead time compression in the die-casting industry, thus making it competitive with other net-shape manufacturing processes.

2. **Ibrahim, M. D, Rahman, M. R. A, .Khan, A. A. Mohamad, M. R, Suffian, M. S. Z. M. , Yunos, Y. S, Wong, L. K., Mohtar, M. Z -** Effect of mould designs on molten metal behaviour in high-pressure die casting, this paper presents a research study conducted by a local automotive component manufacturer that produces aluminium alloy steering housing in local and global markets. This study is to investigate the effect of design modification of mold in die casting to improve the production rate. Design modification is carried out on the casting shot of the mold. The computer flow

Simulation was carried out to study the flow of molten metal in the mold with respect to the mold design modification. The design parameters of injection speed, die temperature and clamping force has been included in the study. The result of the simulation showed that modifications of the casting shot give a significant impact towards the molten flow behaviour in the casting process. The capabilities and limitations of die-casting process simulation to conduct defect analysis have been optimized. This research will enhance the efficiency of the mass production of the industry of die casting with the understanding of defect analysis, which lies in the modification of the mold design, a way early in its stages of production.

III. PROBLEM IDENTIFICATION

1. The strength of the component is less due to which it will break easily when a little bit of high load is applied, as it is protruded straight.
2. Proper grip is not provided as per the ergonomics.
3. The aesthetic appearance is not good.

Figure :- Window handle

IV. OBJECTIVES

1. Design, Analysis and development of components.
2. Change of shape to increase strength.
3. Modification of gripping area.
4. Static analysis.
5. Core Cavity design.
6. Core cavity extraction.
7. Runner and gate design.
8. Die Design.
9. Identifying the critical locations in the component Modifications in the component without affecting its functionality to simplify the Die with the smooth flow of molten metal.

V. METHODOLOGY

The complete study of Design, Analysis and development will be done through the CAD Software NX 12 (Unigraphics). The following steps are involved for achieving the objectives of the project that can be enumerated as

1. Development of 3D model of component from existing component through reverse engineer method.
2. Study of component design with the perspective of a Die Designer.
3. Static analysis of model (Component).
4. Identification of the critical features that would call for special elements while designing the Die, such as critical dimensions, tolerances, surface finish, abrupt changes in thickness, undercuts.
5. Generation of core and cavity design.
6. Runner, Gates and spru spreader design.
7. Selection of ejector pin area.
8. Design validation of Die for cycle time optimization and required level of dimensional accuracy, surface finish and strength. Component overall cycle time is reduced which results in high productivity rate.

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