

A REVIEW ON OPTIMIZATION OF SG IRON PALLET USED IN ROTARY TABLE

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ABSTRACT

An Optimization of pallet weight using SG Iron is an key point to be considered for lean manufacturing, cost reduction & effective operations like machining, casting,. An effort for optimization of pallets has been carried out by many researchers using various methods With consideration to static and dynamic loading conditions. The maximum deflection and stress developed were the main parameters under consideration and attempted to maintain within the allowable limits. This paper is an attempt to focus on efforts made by researchers for optimization of weight of SG Iron pallet, to enhance casting properties and also to reduce machining complexity with changing the geometry of pallet

Key words: Rotary, Pallet, Lean, optimization, SG Iron, RPMF.

I. INTRODUCTION

An automatic table supports the workpiece and slides or pivots and other accessories. Multiple pallets allow an operator to load and unload the part while another is being machined. In the CNC machines, fixtures are indispensable and are needed for locating and securing the work piece in the desired position during machining. Work holding pallets require accuracy and must have matching reference surfaces with the reference system. Pallets are allowed to perform a number of operations on different faces in a single setting, must enable quick loading and unloading. Pallets vices must be fool-proofing to avoid incorrect loading of the job. Pallets must be sufficient rigidity to fully withstand the cutting forces. Pallets must be safe in use and loading and unloading.



Fig.1 Pallet

SG iron has high plasticity and good toughness, the tensile strength of ductile iron is 414 Mpa and the yield strength of SG Iron is 276 Mpa, it can be comparable to carbon steel in strength. So it is often used for applications which require high strength, toughness and complex shapes. It is preferred over steel, as the cast

performance is much superior, and used to manufacture machine parts with mechanical complexity and a larger load. RPFM the reduced pressure frozen mold casting process known as a recycling-based casting method which has several advantages, such as improvement of the work environment, industrial waste reduction and significant improvement in the yield. This method utilizes only water and silica sand for making mold, which further rapidly frozen at -40°C , then molten metal is poured into it. In the present investigation, properties, especially the fatigue strength, were reported. As a result, it is significant to note that cast iron made by the reduced pressure frozen mold casting process has a sufficient strength as compared to conventional casting methods. RPFM process yields almost the same mechanical properties Viz. tensile strength, hardness, and Charpy impact value etc. as that of the conventional methods. The high strength and high elastic modulus of ductile iron properties can reduce the weight of the casting of pallet. Due to spheroidal graphite machinability increases. The following Fig. 2 shows the various microstructures .

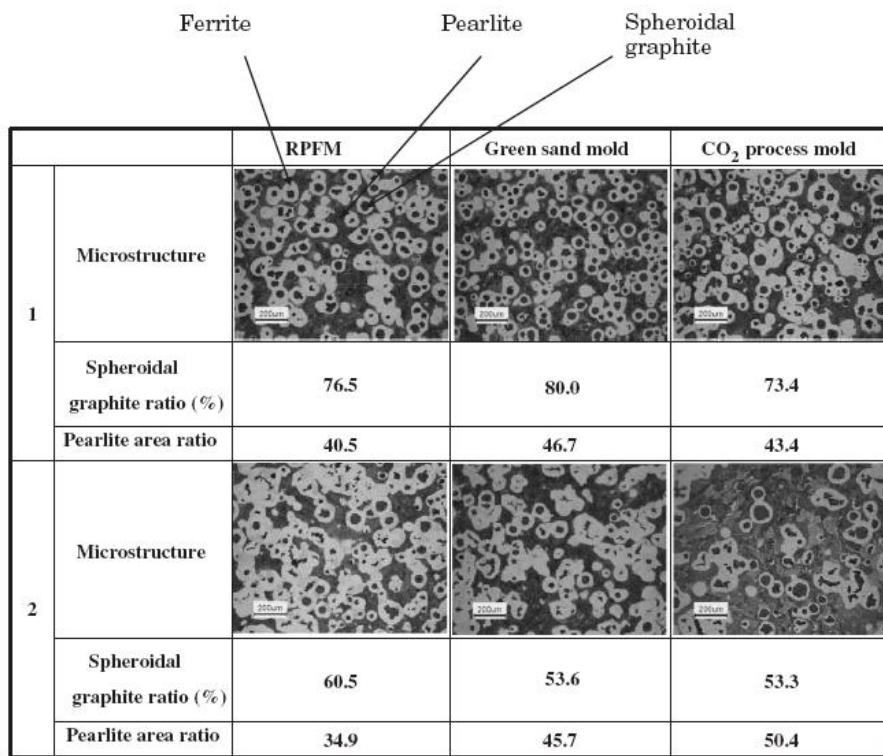


Fig. 2 Comparison of RPFM, with green sand moulding and CO₂ Moulding

II. RELEVANCE

Rotary tables are used for index parts in defined, angular increments. They can be machined, worked in multiple operations. It consists of many parts like circular steel plate, spindles, a drive system, and pins that hold parts in proper place. For Rotary tables the indexing angles. Can be fixed or adjusted as per need. The adjustable indexing enables the table to stop at each station during every revolution for a specified period of time so that an operation can be performed.. The supporting bearings of rotary tables determine both the load capacity and accuracy.

Selection of rotary tables requires an analysis of specifications and features. The major parameters to be considered are listed as under;

- Maximum indexing increment.
- Rotational speed.
- Torque obtained at the table top.
- Maximum axial load.
- Maximum applicable machining force.
- Maximum radial load.
- Work table diameter etc.

A variety of features are available. For Some table surfaces only upward and downward movements are there at a controlled angle. Others have more than one rotating work surface. For greater accuracy and repeatability Computer numerically controlled (CNC) devices are used. Position encoders are often used for positioning of the table surface with reference to datum.

III. LITERATURE REVIEW

Pradip V.Kadam, Prof. N.V Hargude[1], this paper describes optimization of pallet for FG300 material.

Kazumichi Shimizu1, Yaer Xinba1, Masahito Tanaka2 and Hideki Shudai,[02] Improved Mechanical Properties & machinability of Spheroidal Graphite Cast Iron Made by Reduced Pressure Frozen Mold Casting Process.

Vikram Avhad, N.S Biradar, B. Anantharama,[03], this paper focuses on the reduction of the weight of the pallet with change in external geometry .

S. Pellegrinellia, A. Valentea et al [04], In this research work a blend of integrated methodology and a software back-up to support the process planning and pallet configuration solutions is done whose major goal is to optimize production costs – including costs for energy consumption and cutting tool wear - for maximizing the production rate per pallet.

ParagVichare, AydinNassehi et al [05],In this exhaustive study a consideration is given on the fixture used for the universal vises, chucks, pallets, auxiliary rotary tables as applied in CNC machining center for Unified Manufacturing Resource Model.

Juan Pablo Leiva, Brian C at al [06], have made efforts to distinguish between the topology and topometry methods made applicable to the structural components on the basis of element types and methods of analysis and responses were recorded for each method and are presented in the genesis program. They have also explained the concepts which help for solving larger problems of similar types at reduced number of cycles.

Mohit Law, Yusuf Altintas[07],In this optimization of machine tools is carried out by using the position-dependent stability. For this purpose the weak machine component were identified and modified based on reduced model sub structural synthesis and the complete dynamics is rapidly analyzed with the help of reduced order models by virtually re-assembling the machine.

Abdullah Waseem, Ahmad Nawaz et al [08] Have developed and analyzed a PVC pallet for the uniformly distributed static load on pallet using the Pro-E and ANSYS software's. The deformation and stress developed in the pallet were the study parameters which were compared with the other material pallet.

S. Pellegrinella, n, T.Tolio , [09], studied the pallet sequencing based on the network part program logic. Part program of idle movements for each possible sequence of two operations are automatically generated.. The non-production time at the shop floor level was estimated by simulation.

Lubomír Novotný, Jiri Marek et al [10], in this paper a detail study on pallet of size 800 mm is done which covers the modeling of the Component. The max. load carrying capacity is checked by using numerical methods considering load, machining operations and high speed of 600 min⁻¹ .

Carsten Daub et al [11], in this a cast model is developed to enhance the effectiveness of machining centers with multi pallet changers, further a scheduling algorithm is developed using heuristics to minimize the total weighted tardiness.

Terry D. Gerhardt et al [12], This paper detailed study of on pallet stringers such as stiffness and strength of pallet is done by focusing on the effect of notches by changing the notch depth and radius of the stringers of pallet and also the design equations for conventional double notched oak pallet stringers was determined and validated using the finite element approach. And relevant experimentation.

Fred M plus et al [13], have made investigations and also developed a systematic algorithm on the pallet loading conditions and pallet operation for the IBM R 8/1

H. Weule1, J. Fleischer1 W et al [14], have explained the topology for optimization of the machine tools by using a combined numerical methods such as finite element method (FEM) and multi-body simulation (MBS) . Considering the critical workspace positions and various loading conditions.

Michael wang, sureshsethi et al [15], this paper represents the computational complexity of the problem of optimization of make span in a flow shop, where each jobs requires a pallet the entire time, from the start of its first operation until the completion of the last operation.

IV. CONCLUDING REMARK

This shows that many authors [1-15] have reported the pallet design for rotary table and also analyzed the pallet for different loading and working conditions. But still there doesn't exist any focus on SG Iron material selection with changes in external geometry of while designing for the rotary table.

V. PROPOSED WORK

The proposed work aims at developing a pallet design which is suitable for rotary table, optimizing the weight & there by selecting SG Iron material for better mechanical properties , for good casting & machinability without lowering its strength.

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