A REVIEW ON OPTIMIZATION OF ROTARY TABLE PALLETS

Pradip Vasantrao Kadam  
P.G.Student of Design Engg, PVPIT  
Sangli - Vita Road, Budhgaon, Sangli, Maharashtra 416304

N.V.Hargude  
Asso.Professor, Mech. Engineering Dept, PVPIT  
Sangli - Vita Road, Budhgaon, Sangli, Maharashtra 416304

ABSTRACT

An Optimization of pallet weight is an key point to be considered for lean manufacturing, cost reduction & effective operations. An effort for optimization of pallets has been carried out by many researchers using various methods considering static & dynamic loading conditions. The maximum deflection & stress developed within the permissible limits. This paper is an attempt to focus on efforts for review of optimization of weight of pallet & strain in pallet arm.  
Key words - Rotary, Pallet, Lean, optimization.

I. INTRODUCTION

An automatic moveable table that supports a workpiece and slides or pivots into and out of the machining center. Multiple pallets allow an operator to set up a part while another is being machined. In the CNC machines, fixtures are still required to locate and hold the work pieces while machining. The work holding devices should have the following uniqueness:
(a) Work holding devices must have required accuracy and must have matching reference surfaces with the reference system.
(b) Work holding devices are allowed to perform a number of operations on different faces in a single setting.
(c) Work holding devices must enable quick loading and unloading.
(d) Work holding devices must be fool-proofing to avoid incorrect loading of the job.
(e) Work holding devices must be sufficient rigidity to fully withstand the cutting forces.
(f) Work holding devices must be safe in use and loading and unloading.
(g) Work holding devices must have a sufficient clamping force for use of full roughing cuts.
(h) Work holding devices must be simple in construction maximum as possible.

Automatic pallet change over systems is used in modern CNC machines. These pallets simply move for interchanging their positions on the machine table. While machining is being done on a job kept on one pallet, the other pallets are accessible to the operator for clamping and unclamping raw material or finished product. This saves a lot of material handling and set up time, resulting in higher productivity.

The numerical control allows a variety of operations and settings to be structured in continuous cycles, making machining centers adaptable to both small series and medium to large series production. For this purpose, machining centers are equipped with a tool magazine, an automatic tool changing mechanism, and a palletizing system.

![Fig.1](image13)

II. RELEVANCE

Rotary tables are mostly used for index parts in defined, angular increments. They can be machined, worked in multiple operations. It consists of a circular steel plate, spindles, a drive system, and pins that hold parts in proper place. Rotary tables have fixed or adjustable indexing angles. The table stops for a specified period of time so that an operation can be performed at each station during every revolution. The supporting bearings of rotary tables determine both the load capacity and accuracy. Recirculating ball bearings are cheaper than Angular contact bearings. But angular contact bearings provide better load capacity and axial stiffness. Cross-roller bearings are also used. For a large sized table with high load capacity, the hydrostatic bearings are also used. Selection of rotary tables requires an analysis of specifications and features. It contains maximum indexing increment, rotational speed, torque obtained at the table top, maximum axial load, maximum applicable machining force, maximum radial load, work table diameter. A variety of features are available. Some table surfaces can be raised or lowered at a controlled angle. Others have more than one rotating work surface. Computer numerically controlled (CNC) devices provide greater accuracy and repeatability. Position encoders are often used to relay the position of the table surface.

III. LITERATURE REVIEW

Fred M plus et al [1], this paper which describes the pallet loading conditions and pallet operation for the IBM R 8/1 are developed and also a systematic algorithm is invented.

Michael wang, sureshsethi et al [2], this paper represents the computational complexity of the problem of minimizing 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. Hence it is prove that
the problem is NP-hard in the strong sense for \( m > 2 \) and \( K > 3 \), and for, \( m > 3 \) and \( K > 2 \), where \( m \) is the number of machines and \( K \) is the number of pallets in the system.

**Terry D. Gerhardt et al.** [3]. This paper focuses on the effect of notches on the on pallet stringers such as stiffness and strength of pallet by changing the notch depth and radius of the stringers of pallet and also developed the design equations for conventional double notched oak pallet stringers by using the experimental method and finite element approach.

**H. Weule1, J. Fleischer1 W et al.** [4]. In this paper which explained the topology method for optimizing the machine tools by using numerical methods such as finite element method (FEM) and multi-body simulation (MBS) and coupled each other, for this critical workspace positions, loading conditions are considered.

**Carsten Daub et al.** [5]. In this a cast model is developed to enhance the effectiveness of machining centers with multi pallet changers, further a heuristic scheduling algorithm is developed to minimize the total weighted tardiness.

**Juan Pablo Leiva, Brian C et al.** [6], this paper which explains the difference between the topology and topometry methods when employed to the structural components such as what element types are available for each method and what types of analysis and responses can be used for each method are presented in the genesis program also explained the concepts that help solve larger problems in a reduced number of cycles.

**LubomírNovotný, JiříMarek et al.** [7]. In this paper a detail study on pallet of size 800 mm is studied which covers the modeling of the. Component then the loading carrying capacity (deformation) is checked by using numerical methods considering load, machining operations and high speed of 600 min–1.

**ParagVichare, AydinNassehi et al.** [8]. In this a detail study is done on the fixture used in the universal vises, chucks, pallets, auxiliary rotary tables when used in CNC machining center for Unified Manufacturing Resource Model.

**S. Pellegrinellia, A. Valentea et al.** [9], this research work proposes an integrated methodology and a software infrastructure to support the process planning and pallet configuration solutions whose major goal is to minimizing production costs – including costs for energy consumption and cutting tool wear - while maximizing the number of finished work pieces per pallet.

**Abdullah Waseem, Ahmad Nawaz et al.** [10]. In this a PVC made pallet are developed and analyzed for the uniformly distributed static load on pallet by using the Pro-E and ANSYS packages further deformation and stress developed in the pallet are compared with the other material pallet.

**Mohit Law, Yusuf Altintas** [11]. In this optimization of machine tools is carried out by using the position-dependent stability. For this identified weak machine component is modified based on reduced model sub structural synthesis and the complete dynamics are rapidly analyzed by virtually re-assembling the machine using reduced order models.

**S. Pellegrinellia, T.Tolio** , [12]. This paper studied the pallet sequencing based on the network part program logic. Part program of non-production movements for each possible sequence of two operations are automatically generated at the shop floor level are simulated to obtain the non-production time.

**IV. CONCLUDING REMARK**

This shows that many authors have reported the pallet design for rotary table and automatic pallet changer and also analyzed the pallet for different loading and working conditions. But still there doesn’t exist any focus on designing the pallet which can suit both rotary table and pallet changer.
V. PROPOSED WORK

The proposed work aims at developing a pallet design which is suitable for pallet rotary table as well as for pallet changer & at the same time reduction of the hydraulic forces required to lift the pallet by optimizing the weight & thereby reducing the deflection in the pallet changer arm.

VI. REFERENCES

7. Lubomír Novotny, JiříMarek “Numerical And Analytical Modelling Of A Pallet Used At A Machining Centre At High Speed Numerical and analytical modelling” June 2008 12/13