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DESIGN & OPTIMIZATION OF RELATION GAUGE FOR TVS HANDLE HOLDER

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Abstract : Gauges are tools used to assess the size, shape, and relative positions of various parts but do not have graduated adjustable members. Gauges are interchangeable and play an important role in any quantity manufacturing system. The numerous types of inspection processes use a CMM (coordinate measuring machine) and various gauges. A gauge is a tool or device used to measure and compare components. Gauges are defined as single-size, fixed-type measuring equipment. This initiative focuses on item inspection. A relationship gauge is a gauge with an interior measuring surface for determining the size and counter of the male portion. The gauge is designed in accordance with standards that ensure the dimensions are accurate. Gauges are commonly used in manufacturing industries for inspecting dimensions during mass production. It significantly reduces time spent verifying product authenticity within specified dimensional tolerances. The gauges are intended to replace the frequent usage of expensive measurement instruments.

Index Terms **– Accuracy, Fits, Gauge, Inspection, Optimization**

I. INTRODUCTION

Gauges are generally used to examine dimensions and geometry; plug gauges check internal dimensions, while ring gauges check external dimensions and geometry. Plug gauges are available in two types: plain cylindrical and thread, as well as various common forms such as reversible, progressive, taper lock, and tri-lock. The gauge size is usually what determines the style. Ring gauges are also available in basic cylindrical and thread type gauges. Gauges typically have a total tolerance of no more than 10% of the part tolerance, which is supported by statistical reasoning.

Go - No Go gauges are manual mechanical measurement equipment used in manufacturing lines to ensure that machining has occurred and is completed appropriately. They differ depending on the type of surface examination performed, such as geometry or dimension. Limits refer to the two extreme permitted sizes of a part that contain the actual size. A fit refers to the relationship that exists between two parts that are to be assembled in terms of their size difference prior to assembly. Tolerance is defined as the maximum allowable variance in a size. It represents the difference between the maximum and minimum size limits.

II. LITERATURE REVIEW

Paper 1

[1]"Design and Manufacturing of Inspection Gauge" by Rohit R. Hadbe, Rahul S. Narode, Ganesh V. Siral & Sanjay M. Deshmukh.

Gauges are tools used in a variety of industries to assess the shape and size of components that do not meet the permissible geometrical or size tolerance. Component inspection methods include CMM (Coordinate Measuring Machine) and numerous gauge kinds. This project will focus on developing an inspection gauge for Koeastartor motor components.(Name of the Manufacturer)By producing an inspection gauge, we must verify the internal holes of the components that are within the tolerance amount specified. An inspection swiftly determines whether the dimensions of the checking parts are within the required limits.

The Inspection Gauge allows workers to inspect components of interior holes without using plug gauges. Inspection gauges are used in industries that involve bulk production to inspect specific jobs. In this inspection gauge, sliding pins play a vital part in evaluating internal holes. The sliding pin has specified bilateral tolerances. Nesting plates are also created to support components. When a component is kept in a nesting plate and sliding pins pass through holes, it has been thoroughly inspected. They check a component on an inspection gauge and conclude that the gauge works correctly and with more precision. When sliding pins go within holes, the component is acceptable; if they do not go inside internal holes, the component is rejected. The gauge may increase the productivity. It is a one type of go no gauges.

Paper 2

[2]"Design and development of industrial receiver gauge in coordinate measuring machine for reducing inspection time''by Alagu Sundara Pandian, Irudhayaraj R., Suresh K., Johnstephen R. and Palani S.

A coordinate measuring machine (CMM) is a mechanical device that moves a measuring probe to calculate the coordinates of points on the surface of a workpiece. The CMM consists of the machine itself, the measuring probe, the control system, and the measuring software. CMM is an invaluable quality control tool in production; its precision and repeatability must be greater than the tolerance condition of the part being inspected. The primary goal of our study is to shorten the inspection time of a CMM utilizing a receiver gauge. It is the process of expanding the pin diameter of a receiver gauge. A receiver gauge is an assessment tool used to ensure that a workpiece is within its approved tolerances. The pin diameter in the receiver gauge will grow based on position.

They perform some calculations to increase the pin diameter by decreasing the location tolerance from 100% to 50%. As a result, each pin in the receiver gauge has a larger diameter. All pins' mathematical computations are based on position tolerance. As a result, the inspection time of the coordinate measuring machine is lowered by expanding the diameter of the receiver gauge based on the position tolerance.

Paper 3

[3]"Design and manufacturing of receiving gauge" by Shubham Koparde, Maruti Nandgadkar, Prasad Mahind, Shekhar Sawant, Prashant Mulik.

Various sorts of inspection procedures are used in various industries to determine the quality of any given product. The numerous types of inspection processes use a CMM (coordinate measuring machine) and various gauges. Gauges are tools used to assess the size, shape, and relative positions of various parts but do not have graduated adjustable members. Gauges are thus defined as fixed-type measurement equipment of a particular size. This initiative focuses on item inspections. A receiving gauge is a gauge with an internal measuring surface for determining the size and counter of the male portion. The gauge is designed in accordance with standards that ensure the dimensions are accurate.

In science and engineering, a gauge or gage is a device that is used to take measurements or to show specific information, such as time. A wide range of tools exist to perform such activities, ranging from simple pieces of material against which sizes can be measured to complicated pieces of machinery. A gauge, depending on its application, can be defined as a device for measuring a physical quantity, such as thickness, space gap, or material diameter. We conclude that inspecting the project on the receiving gauge is a time-saving and cost-effective inspection method. Additionally, it checks ovality, diameter, depth, and coordinates all at once.

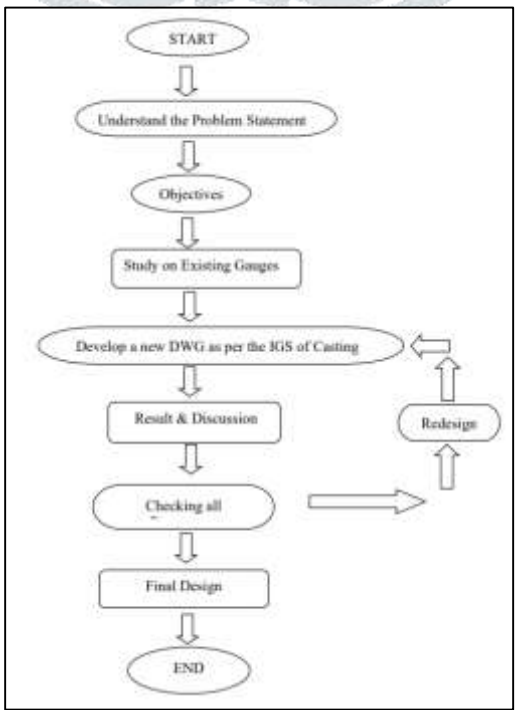
III. PROBLEM STATEMENT

In existing case we measure diameters only, does not check center distance & time by time traditional gauges starts to wear & tear. So that quality of components starts to decreasing as well as it reduces accuracy.

IV. OBJECTIVES

1.To understand the existing gauges
2.To improve the quality of inspection
3.To measure the more than one dimension at one time
4.To reduce overall inspection time to checking the handle holder

V. METHODOLOGY



VI. EXISTING GAUGES USED IN INDUSTRY

Fits

When two pieces are to be assembled, the relationship formed by the size difference between them prior to assembly is referred to as a fit. The fit denotes the range of tightness or looseness that can arise from the use of a certain mix of allowances and tolerances in the design of mating components. In engineering jargon, the "fit" is the clearance between two mating components, and the magnitude of this clearance determines whether the parts may move or rotate independently from one another, or if they are temporarily or permanently linked.

There are three types of fits-

1.Clearance Fit
2.Interference Fit
3.Transition Fit

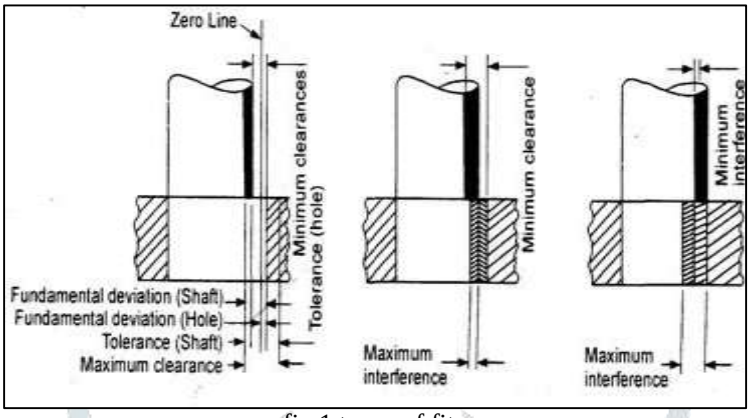


fig 1 types of fits

VII. PURPOSE OF RELATION GAUGE

- For accuracy, reliability and repeatability with strong focus on ergonomics.
- To reduce measuring time and its cost.
- For accurate and precise inspection.
- Increase production rate.
- Initial cost low.
- Requires less cycle time.
- Coordinate measurement.
- No need of skilled worker.

VIII. DESIGN DATA

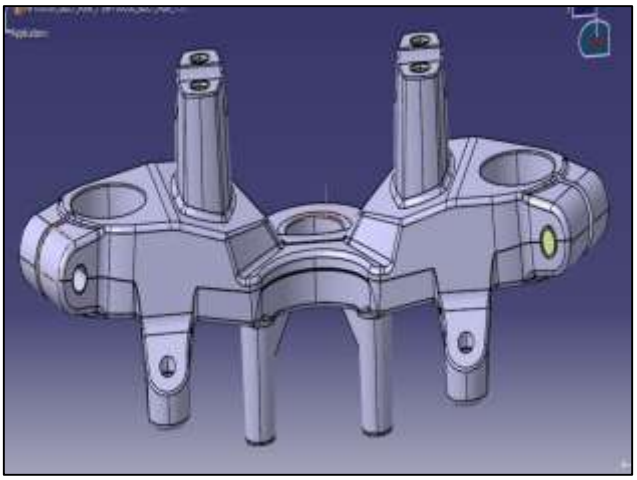


fig 2 side view of handle holder

REF.	X	Y	Diameter
A	-91	-30	33
B	-91	-30	29
C	0	10	25.5
D	0	10	21.5
E	91	-30	33
F	91	-30	29
G	-49	-1	8
H	-49	-1	6
I	-49	-35	8
J	-49	-35	6
K	49	-1	8
L	49	-1	6
M	49	-35	8
N	49	-35	6

Table 1 dimensions of handle holder

Materials & is's properties

1. *H13 material properties*

High hardenability, excellent wear resistance and hot toughness.H13 has good thermal shock resistance and will tolerate some water cooling in service .Nitriding improves hardness , but can diminish shock resistance if hardened layer is too thick.

2. *C40 material properties*

C40 is the EN chemical designation. It has a moderately low thermal conductivity among wrought carbon or non-alloy steels. In addition, it has a moderately low ductility and a moderately high tensile strength.

IX. MANUFACTURING STAGES

Stage (1) Raw Material –
a) Required steel plate = 300mm x 200mm x 30mm
b) Required steel rod = 80mm x 400mm
Stage (2) Machining –
a) On plate milling operation is done (Tolerance is in 25 microns)
b) On plate turning operation is done (Tolerance is in 25 microns)
Stage (3) Heat Treatment –
Hardening is done till 50-55 HRC for both plate and rod
Stage (4) Grinding –
a) On plate surface grinding is done and it is maintain in 15 micron
b) For rod between center grinding is done and it is maintain in 10 micron
Stage (5) Assembly –
a) Surface plate is heated upto 80 to 90° C
b) Rod is deposited into liquid nitrogen(-210 C)
Stage (6) Fitment –
Rod is immersed into the plate and leave upto 24 hours in normal room temperature

X. DESIGN OF RELATION GAUGE

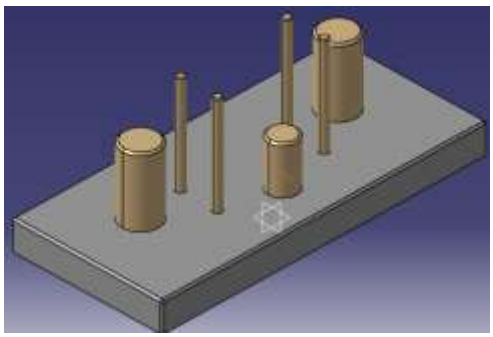


Fig 3 isometric view of relation gauge

XI. Analysis Of Relation Gauge

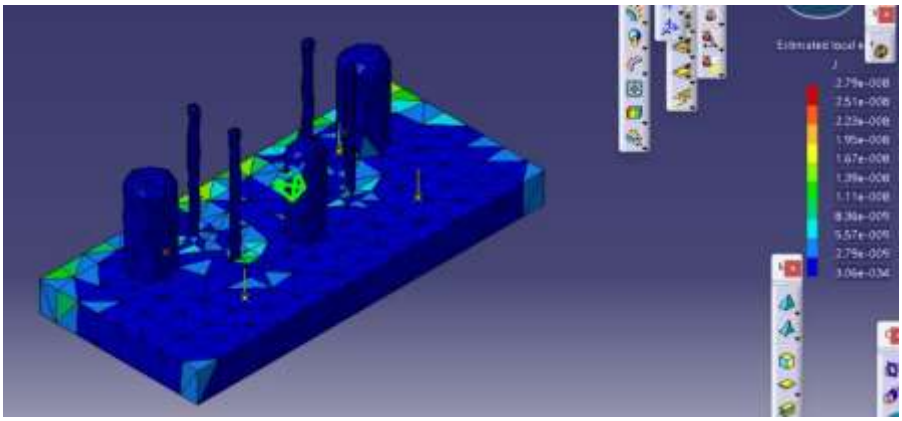


Fig 4 Von Mises Stress Analysis Result

We applied 1000N load on relation gauge and we found this above result .and also from this result we can say that our design is safe.

XII. Conclusion

We can conclude that the usage of relation gauges boosts job productivity while also optimizing examination time. Another purpose is for the unskilled worker to check the job using this gauge. Another benefit is improved inspection accuracy.

XIII. References

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