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A REVIEW ON CONCENTRICITY MEASUREMENT OF SHAFT BY NON-DESTRUCTIVE TESTING

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ABSTRACT:
The paper reviews the literature to replace destructive testing of shaft by non-destructive testing. Almost in all industries the concentricity checking of hollow shaft is carried out by destructive test so to overcome this there is a need to implement the design "concentricity measurement of shaft by non-destructive testing. There is also need of intervention in design for more accurately measurement of concentricity.

INTRODUCTION:
Concentricity is complicated tolerance accustomed establish a tolerance zone for the median points of a cylindrical or spherical half. As a live of the constancy of the wall thickness of a tube or pipe, circularity controls a central axis that's derived from the median points of the part, measured in cross sections. If circularity were "perfect," then the wall thickness between the OD and therefore the ID would be identical in each cross section, at every point around the diameter of the tube. Concentricity typically referred to as coaxially, is a tolerance that controls the central axis of the referenced feature, to a datum axis. The axes for the data point and documented feature square measure derived from the median points of the half or feature. Concentricity could be a terribly complicated feature as a result of it depends on measurements from a derived axis as opposed tangible surface or feature. Tubing concentricity may be a complicated feature as a result of it depends on measurements from a derived axis as hostile a tangible surface making a theoretical 3D cylindrical tolerance zone into that all the derived median points of the tube should fall. That is precisely why concentricity is sometimes reserved for high precision elements wherever there's a crucial have to be compelled to management those median points.
When we have variations in a tube's wall thickness, you have an eccentric tube one in which the centre of the circle formed by the OD is at a different point from the centre of the circle formed by the ID. (In alternative words, the 2 circles don't seem to be concentric.) Eccentricity is measured by looking at a cross section to determine a tube's minimum and maximum wall Dimensions, and then calculating the difference between the minimum and maximum thicknesses, and dividing that figure in half.

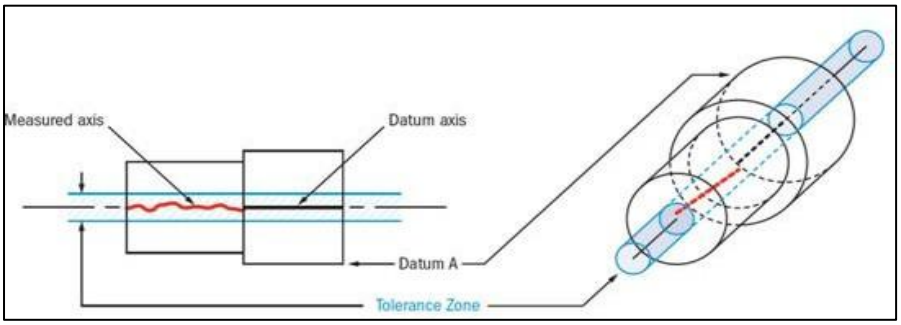

Fig.1 concentricity tolerance zone Complexities of Measuring Concentricity

Concentricity is taken into account one amongst the foremost tough GD&T symbols to live for because of its problem in establishing the middle points of the feature. First you must establish a datum axis which to measure, Once the datum axis is established you must now take measure many a series of cross sections (however many is realistic). Once the cross sections square measure taken and therefore the precise plot of the surface is obtained, the median points of those cross sections should be determined. Then these series of points should be premeditated to ascertain if they fall among the cylindrical tolerance zone.

It also requires taking many measurements across a series of cross sections (however many is realistic), and exactly mapping out the surface and determining the median points of these cross sections. Then these series of points must be plotted to see if they fall within the cylindrical tolerance zone. This can only be done on a coordinate measuring machine (CMM) or other computer measurement device and is quite time-consuming — which of course means added cost.

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Destructive and non destructive testing:

- It is defined as during testing the metal component is not damage or due to which it cannot be reuse again.
- Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components of the part or system.

LITERATURE REVIEW:

Egawa et al provided a method for measuring the concentricity of a work piece, which is placed approximately in the center of a measuring table, by automatically correcting the residual inclination substantially produced at the mounting of the work piece and displaying the concentricity when the reference axis of the work piece is brought into alignment exactly with the rotation axis of a measuring system

Ayumu Furukawa et al demonstrated that a concentricity measuring apparatus for measuring concentricity of two holes in a cylindrical member, the cylindrical member having the two holes at both ends and a partition wall between the two holes comprises: a rotation unit configured to support the cylindrical member and to rotate.

Partic L et al says aspect of the disclosure, a tool for determining concentricity between a sleeve and a rod to be arranged within the sleeve includes a body portion having a major axis and housing an array of elements constrained for linear motion there along, a nose portion configured for insertion into the bore of the sleeve and including extendable probe pins for engaging the inner surface of the sleeve, the probe pins being arranged normal to one another and being movable into a first extended position in which the free end of each pin is engaged with the sleeve inner surface, each probe pin being movable into the first position by movement of a respective array of elements in the body portion in a first direction parallel with the major axis, locking elements carried by the housing body, each locking element being engagable with one element of each array of elements for locking the array and hence the pins in an extended position, and a measuring mechanism for measuring the distance that the pins have been extended from a zero extension position.

Jimme D associated to a gauge or tool for determining the concentricity of a bore in a work piece about a desired axis, and more particularly to a tool of this type which may simply and accurately determine when such a bore is off-center or eccentric and in the direction in which the axis of the bore is off-set.

Jabir Z et al, in measured the concentricity, circularity, circular run out and total run out of job. Precise measurement can be achieved quickly for outer circle and inner circle of shaft of work piece having constant cross section. Standard accuracy of 0.01 mm can be achieved by using lever dial gauge.

Wang et al studied the diameter measurement of coaxial holes. The paper describes a multi-layer measuring rod that installs a single laser displacement detector (LDS) on every layer. This technique is simple to implement by rotating the measuring rod, and immune from detecting the measuring rod's rotation angles, so all diameters of coaxial holes can be calculated by sensors' values.

Jun, J.W et al studied coaxial holes conformation with circular holes widely distributed on an equivalent axis. The most common of those components are aircraft wing hinges, internal combustion engine crankshaft holes, etc.

Sanches, F.D et al concluded that for the work piece, the matching accuracy of the holes and shaft is one of the important properties, which is directly linked to performance and durability, so to the measurement of diameters is important for axial holes

GAO, Y et al observed that in the machining of parts with coaxial holes, the accuracy of the hole's diameter is sensitive to the stiffness of the mandrel. All of this result in a significant impact on machining dimension accuracy of coaxial holes

Dell-Era, G et al concluded that the confused structure of coaxial hole parts, the contact probes cannot get all coordinates of measured points in some deep holes. Pneumatic gauging has the benefits of non-contact and high preciseness

Shiraishi, M. et al observed that excessive air tightness limits the measurement clearance to less than one hundred μm, which results in a small redundancy space for measuring operations. For different sizes of components, the medication cost of the measuring tool is high. As a non-contact probe, laser displacement sensors (LDS) are widely utilized in geometric measurement.

OBJECTIVES:

1. To isolate human error and external vibration while measuring or influential tolerances
2. To achieve a high precision work job
3. To replace conventional Destructive testing
4. To minimize Cycle time for measurement
5. To have less operations to measurement

SUMMARY:

The review of literature has provided a basis for research work to be carried out on Concentricity Measurement of Shaft by Non-Destructive Testing. That can be summarized as. It has provided more assurance on measurement than characteristic measurement gauge. The measurement data can be worn for investigation & will facilitate for precautionary action. By means of newly developed gauge user can obtain suitable data for analysis. By doing examination on measured facts it will relieve to plan remedial & precautionary action for process holder This division measurement is significant, as if wall thickness get abridged in one face, shaft may find breaks in engine & it will entitle for field breakdown which is very hard to expediency any supply to customer. At last rejection cost will get decrease.

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