Design and development of Gear geometrical fault detection and Gear separation machine by using MATLAB

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Abstract **- Gears are one of the most common mechanisms for transmitting power and motion. Error in gears causes two main problems, increased acoustic noise in operation and increased wear, both of which are sufficiently troublesome to cause concern. Hence, we developed a system which can identify a gear as well as finding wrong gear geometry by using image processing using MATLAB program. Also design of machine for company application to minimization of shorting time and error finding.**

Index Terms **- Gear testing, MATLAB, Image processing, SPM.**

I.INTRODUCTION

Mostly in motion and power transmission gears are used they also important for development of any mechanical machine, so efficiency of gear is directly and high impact on efficiency of any mechanical machine. Therefore, product quality must be tested and controlled rigorously in the manufacturing process of gears. Gear geometry is very complex in shape because of the complex geometric shape of the gear itself, developed an accurate process to read all gear and its faults is very difficult. Now a day in industry 3D measurement machine is used for gear geometry measurement but this machine taking much time to predict gear geometry. In this system machine cost is very high and all gear manufacturing company not able to purchase this machine. Now a day's industry growing fast, so requirements of fast testing system and also require to test each and every part by using testing facility. So we required fast testing and quality testing facility available at production flower its self to check all production material. New non-destructive testing a Computer vision technology has most useful and fast way to control and check a product quality and geometry. Showing promise in gear measuring technology. If we can compared computer technology with traditional technology of gear testing we found that use of computer technology is very fast and easy way to test a gear with non contact type testing way. Due to non contact type of testing methods by using image processing to reduce time of testing and improve the efficiency of testing is a main advantage of system. It's also improving accuracy of testing.

Computer vision-based methods typically need to determine the coordinate of the centre of the gear as a benchmark, so the accuracy of centre detection directly affects the precision of the measurement of gear parameters. Among the traditional methods of image detection, the centre detection algorithm generally requires an edge detection method to determine the edge of the gear, and then uses the gravity method, the median method, and the Hough transform method to determine the centre of the gear. The first two algorithms require more evenly distributed images; otherwise, they will lead to considerable errors. The latter algorithm requires voting point-by-point and requires more time to record, yet the accuracy is not high enough for industrial standards. To resolve these issues, we propose a program based on the automatic analysis of gear parameters, using the mathematical morphology method. That is, we input a gear image into the computer and then extract gear features through an image processing algorithm. This isolates the gear from a variety of complex backgrounds, allowing automatic counting and size measurement of the gear teeth. Using this method, we achieve good results in the production application.

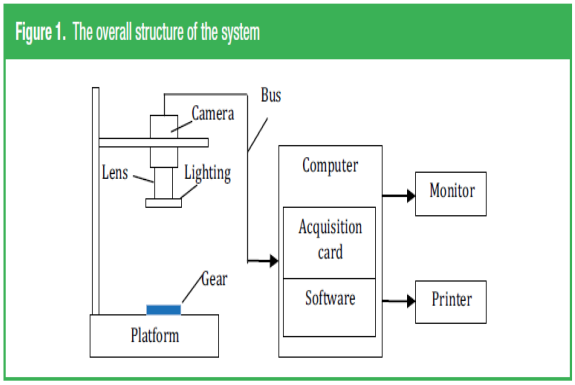

Fig.1 Basic layout of MATLAB base gear testing system

II. OBJECTIVE

The main objective of this research is to find mechanism of automating the process of mechanical component quality assurance.

The objective of this project is to develop setup which can help us test and select spur gear with required dimensions. System also consists of arrangement which can reject spur gear. This whole process is to be made automated, accurate and fast image processing system which could identify defects of gear. A system for identifying surface defects on gear was designed, based on analyzing images acquired from top of the gear.

III. PROBLEM STATEMENT

Gears have a wide variety of uses in mechanical and electrical industries and need to be perfect and flawless. Different features such as number of teeth, pitch circle diameter, module, addendum, duodenum, face width define the correctness and application in sense where these gears are to be used. This task of checking and classifying gears are done by humans but have limitations of speed and accuracy. This responsibility of classification of items can be accelerated and made more accurate by the use of imaging technology and computers aided by some mechanical devices.

In this project we are detecting various parameters of spur gear from which we can compare it with standard dimensions to find the errors in gear. This is going to be done with the help of MATLAB.

IV. 3D MODEL OF MACHINE

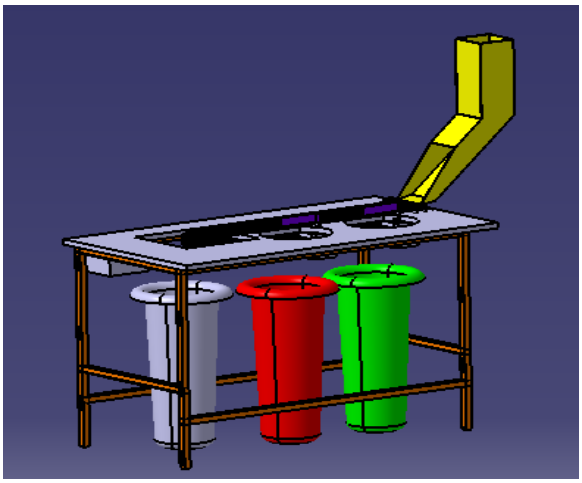

Fig.2 Proposed 3D model of Gear testing SPM

V. PART LIST

Sr.No.	Part Name	Description	Qty
1	BASE FRAME	MS tube Structure	1
2	Servo Motor	STD	2
3	Gear Motor	STD	1
4	Belt	150mmWidth	1
5	Roller	MS Roller	2
6	Bearing HSG	MS	4
7	Ball Bearing	6204	4
8	Hopper	Metal Hopper as per requirement	1
9	Collection bin	Plastic	3
10	Computer	STD	1
11	Camera	STD	1

Table 1. Part list of Gear testing machine

VI. METHDOLOGY

1. Start a machine with start of computer system
2. When gear passes through the conveyor it can scan by using camera.
3. Image send to MATLAB program and image processing done in MATLAB.
4. If gear having type A then 1st servo motor ON and due to lever gear is send to 1st collecting bin.
5. If gear having type B then 2nd servo motor ON and due to lever gear is send to 2nd collecting bin.
6. If gear geometry having any error or wrong gear is there then no any servo motor ON hence gear is send to 3rd collecting bin place at the other end of belt conveyor.

VII. TESTING RESULT OF MATLAB PROGRAM

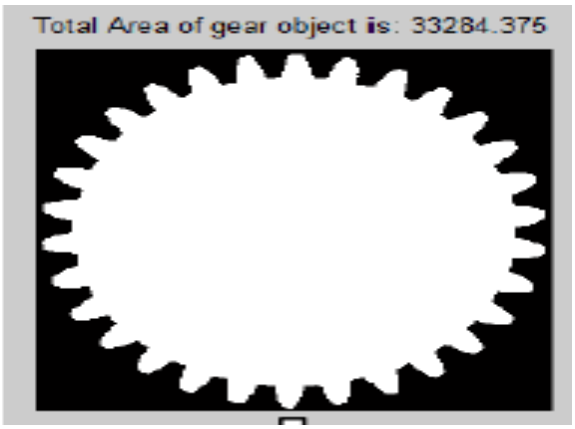

Fig. 3 Import gear model and convert it in gray scale model

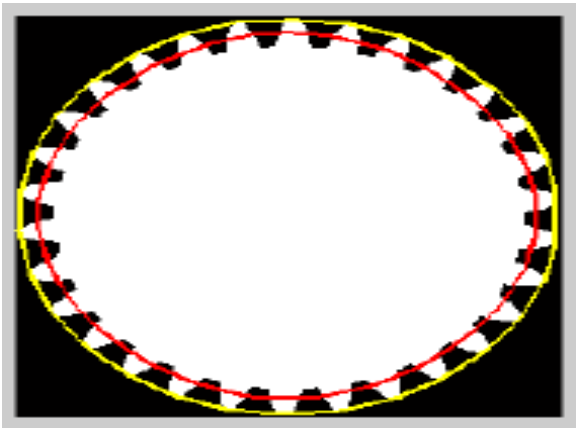

Fig. 4 High light the important area in gear model

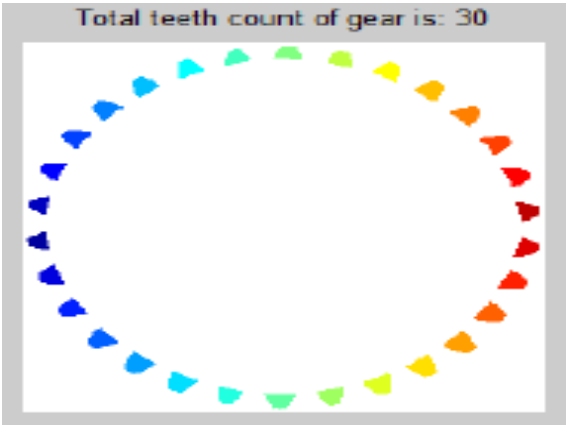

Fig. 5 Count a number of tooth and display result

VI. CONCLUSION

The gear Area detected and total number of teeth counted by using MATLAB tool. This paper having the two gear image objects which are processed from developed MATLAB code, both gear image objects found having different value of varying teeth with another. These have been measured through the same developed MATLAB code. In this paper each experimental work figure of different gear objects measured with the help of MATLAB tool by using image processing which shows different steps as given methodology.

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