



Use of 3D White Light Analysis Technology to Optimise Casting Weight



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ABSTRACT

It is practically not possible to check specified dimensions on Components (complicated shapes, intersected zones, radius, profiles and inaccessible zones) due to limitation of checking instrument (checking probes). Traditional layout inspection method consumes lot of time hence a faster measurement technique was essential to reduce the overall inspection time. In traditional layout, it is not possible to check all dimensions even for once due to lack of facilities available.

Various Casting components when weighed found to have their weights more than expected (Table-1). This was revealed when castings weights were compared with 3D model casting weights.

Table-1

Part Name	3D CAD Weight Kg	Actual Part Weight Kg	Difference:Weight more Kg
Transmission Case	A	a	10 %
Rear Axle Carrier	C	c	9 %
Clutch housing	B	b	7 %
Variable Transfer Unit	D	d	7 %
Crankcase	E	e	7 %

By adopting the 3D White Light Analysis Technology, areas which were as of today totally inaccessible to the conventional checking instrument could be measured.

INTRODUCTION

3D White Light Analysis Technology

3D White Light Technology is 3D scanning process using non-contact optical scanning device which uses white light source to project fringes on the part being scanned.

The sensor of the scanner which is equipped with two cameras take several images of the part during the measurement. These images are then sent to a high end PC where advanced image software calculates point co-ordination throughout the visible area of the part under scan.

Casting for Case Study

The captions of the Figs. 1 -3 are self-explanatory.

By using the technology and the related software, it becomes easy to super impose the 3D model on the scanned results to get a quick & easy understandable output for improvement.

Results of 3D Scanning

After superimposing, Scanned with Actual 3D model.

ANALYSIS

The areas of concern in the castings is revealed in Red colour, this reveals that material is in excess. The amount of deviation of material is shown in millimeter (mm). Yellow colour and light Blue colour reveals nearness to actual dimensions. Green is within acceptable dimensions and Dark Blue color is with negative

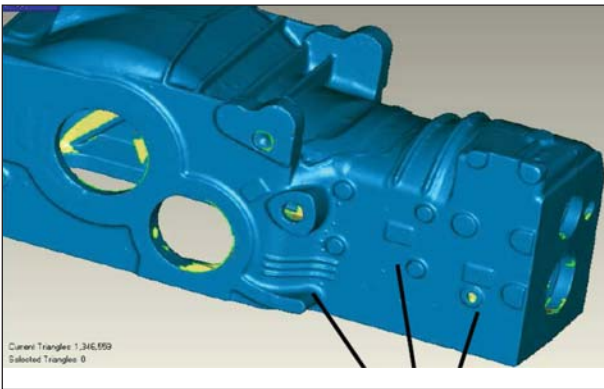


Fig. 1: Image of casting with 3D White Light scanner device.

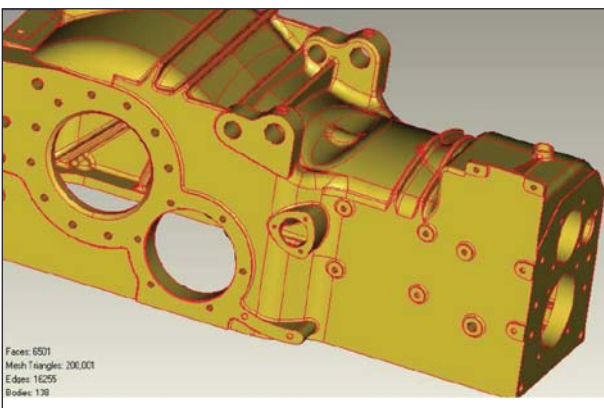


Fig. 2: Casting 3D model (Machined).

dimensions. All these get reflected through appropriate software.

Innovative Features and Uniqueness of the 3D White Light Technique

Use of this technique reveals areas of deviations in dimensions and shapes of actual vs. 3D model which otherwise is not possible.

Fast Data Capturing and processing (inspection takes only 2 days for part like Transmission case)

High resolution scan data does not ignore any feature on part.

The colour shades helps in faster diagnose of the part.

CASE STUDY

Approach / Process Followed

The castings were selected for white light analysis based on following 3 criteria

- 1) Wherein casting weight difference found to be more with respect to 3D model weight.
- 2) Complexity of the Castings with respect to profiles, shapes and difficult to probe.

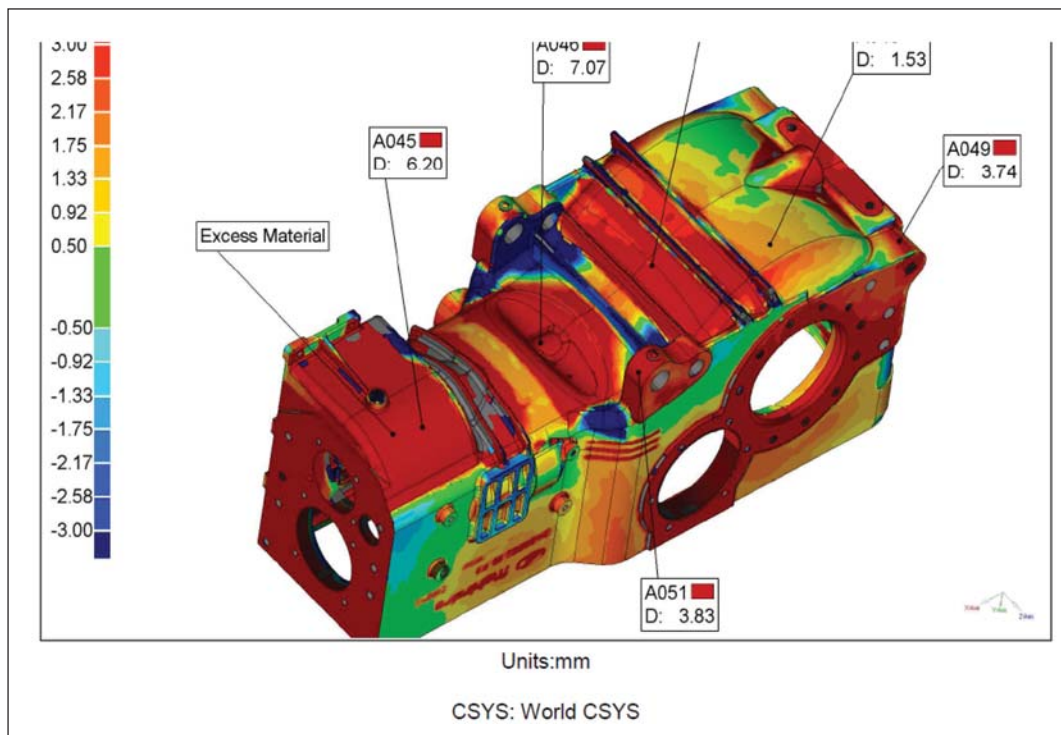


Fig. 3: Scanned Casting superimposed with Casting 3D Model.



3) High volume.

The prioritised castings were scanned using 3D white light technology available. The scanned image was then super imposed on 3D model of the cast Component using the software available. The software helped in identifying areas of deviations of all the dimensions of the component with respect to 3D model.

The Cast component Suppliers were involved for discussion to eliminate the areas of deviations through feasibility study looking at the process and Tooling involved in manufacturing the said component. Without affecting the regular production, suppliers were instructed to make new Tooling and make cast Component as per 3D model.

With new Tooling sample castings were made. The specified dimensions and all critical dimensions checked and verified. The castings were sectioned and verified for dimensions. The sample castings

were weighed and compared with 3D model weights. The difference in casting weights and that of 3D CAD model weights were found to be very less compared to earlier. The parts were machined and tested on test rigs and in field and found to be OK.

Challenges

Collecting data on raw, finished and 3D model cast component weights by actual / physical measurement (heavy and difficult to handle on weighing scale) , cutting them to get the actual sections as per drawing & sending to external agency (Pune) to carry out 3D scanning were difficult.

Benefits

By using 3D White Light technology, it was possible to capture fast data and process the same to detect the irregularities in integrated shaped components which otherwise were difficult or was not possible to detect. ■