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Design and Fabrication of Deburring Machine

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ABSTRACT: An *engine block*that contains burrs is flawed. *Burrs* compromise the functionality, lifespan and safety of the engine block.

Deburring removes these defects to create a safer, more functional and more aesthetically appealing part. Mechanical deburring with a machine also eliminates the need for hand sanding and grinding. It increases productivity, decreases material consumption and improves finished results.

After the engine block finishes ***drilling, boring, milling operations***, many metalworkers will manually deburr it while waiting for the next engine block to finish. The problem with this approach is that no human can match the pace or consistency of an ***Automated Deburring System***.

If you're looking to maximize the efficiency, consistency and safety of your deburring processes, then we recommend that you consider automated deburring. ***Automatic deburring machines*** can finish metal parts substantially faster than hand grinding systems while also ensuring a smooth, uniform finish on every engine block.

I. INTRODUCTION

Burr formation is a major concern in the surface and edge finishing of engine block, which eventually leads to reduced work parts resistance, tool life and productivity rate. Therefore, it is necessary to limit the burr formation, otherwise the use of secondary operations known as Deburring becomes essential. Throughout intensive research works during the last decades, the mechanisms of burr formation are very well understood and comprehensive and integrated strategies for burr prevention and minimization were introduced. However, particular attention should to be paid to deburring operations, which are in fact expensive, time consuming, non-productive and non-value added processes. The main critical factors on deburring complexity are burr location, length and number of edges to be deburred and burr size. In fact, the secondary finishing operations are difficult to automate, therefore they may become a bottleneck in production lines.

The engine block contains mainly three oil galleries which are MOG(Main Oil Gallery), COG(Cross Oil Gallery) and LINEAR HOLES . For each holes there are three different operations which are MOG deburring, COG deburring and Linear Bore deburring which are operated automatically by the pneumatics and motors and connected to PLC circuits for automated operations.

The machine specifically designed for John Deere India Pvt. Ltd and usually deburrs their engine blocks only. The Deburring Machine was manufactured at Bright Tech Automations Pune.

II. MATERIALS AND METHODS

BOLT TYPES

1) **Anchor bolt** - Bolt designed to allow objects to be attached to concrete. The bolt head is usually placed in concrete before it has cured or placed before the concrete is poured, leaving the threaded end exposed.
2) **Arbor bolt -** Bolt with a washer permanently attached and reversed threading. Designed for use in miter saw and other tools to auto tighten during use to prevent blade fall out.
3) **Carriage bolt** - Bolt with a smooth rounded head and a square section to prevent turning followed with a threaded section for a nut.
4) **Elevator bolt** - Bolt with a large flat head used in conveyor system setups.
5) **Hanger bolt** - Bolt that has no head, machine threaded body followed by a wood threaded screw tip. Allow nuts to be attached to what is really a screw.

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6) **Hex bolt** - Bolt with a hexagonal head and threaded body. Section immediately under head may or may not be threaded.
7) **J bolt** - Bolt shaped like the letter J. Used for tie downs. Only the non curved section is threaded for a nut to be attached.
8) **Lag bolt** - Also known as **lag screw**. Not a true bolt. Hex bolt head with thread screw tip for use in wood.
9) **Rock bolt** - Used in tunnel construction to stabilize walls.
10) **Sex bolt or Chicago Bolt** - Bolt that has a male and female part with interior threads and bolt heads on either end. Commonly used in paper binding.
11) **Shoulder bolt** or Stripper bolt - Bolt with a broad smooth shoulder and small threaded end used to create a pivot or attachment point.
12) **U-Bolt** - Bolt shaped like the letter U where the two straight sections are threaded. A straight metal plate with two bolt holes is used with nuts to hold pipes or other round objects to the U-bolt.

COLLET USED AS BRUSH TIGHTENING

COLLET- Collets are used to hold a tool in a central position as it rotates. As the tool is inserted into the collet, the device expands and provides uniform pressure that holds the tool in place.

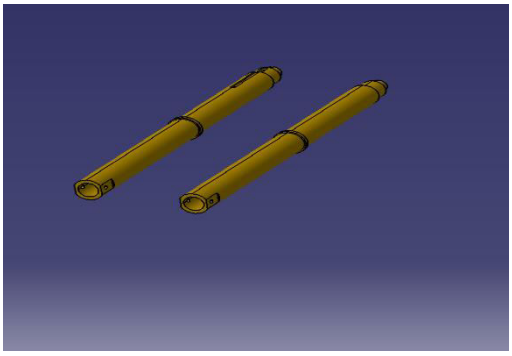

Fig.1 : Colletused in Machine

LM RAIL:

LM RAIL- It is a Linear rail are linear assemblies that have twin parallel tracks containing load supporting ball or roller. The backbone of many industrial application they provide low-frication guidance and high stiffness for load that can range from just a few grams to thousand of kilograms.

The LM Guide (Linear Motion Guide) is our main product, incorporating a part with a linear rolling motion into practical usage for the first time in the world. It realizes the development of high-precision, high-rigidity, energy-saving, high-speed machines with long service lives. The rail is of 20mm in l

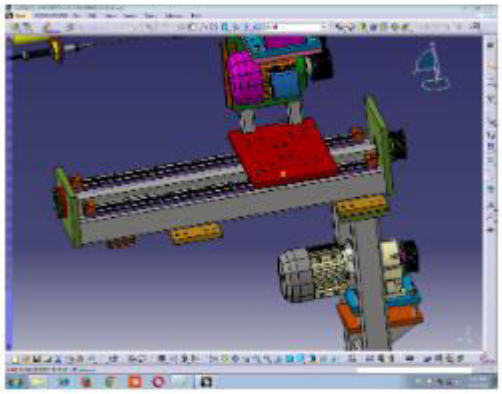

Fig.2 : LM Rail

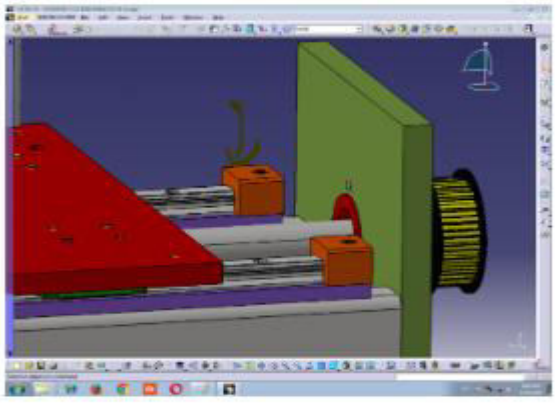

Fig.3: LM Guide

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HELICAL SPRING

The helical spring, in which wire is wrapped in a coil that resembles a screw thread, is probably the most commonly used mechanical spring. It can be designed to carry, pull, or push loads.

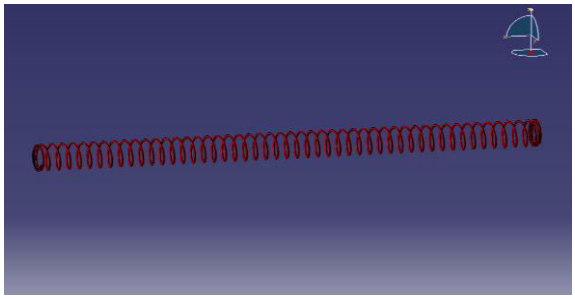

Fig.4: Helical Spring

UHMW BUSH GARDENING

Polyethylene PE1000 sheet commonly referred to as ultra-high-molecular-weight, UHMW, or UHMWPE, is one of our most popular engineering plastics. It provides excellent resistance to abrasion, chemicals, impact and wear, and offers very low co-efficient of friction. UHMW is also non-toxic, odorless, and is highly resistant to moisture.

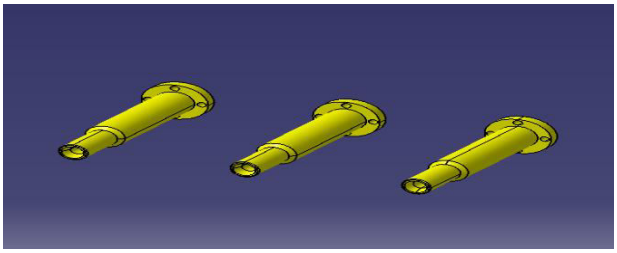

Fig.5: UHMW BUSH

PNEUMATIC CIRCUIT

Pneumatic systems use this compressed air to create mechanical motion and power applications to 'do work' in factory automation systems.

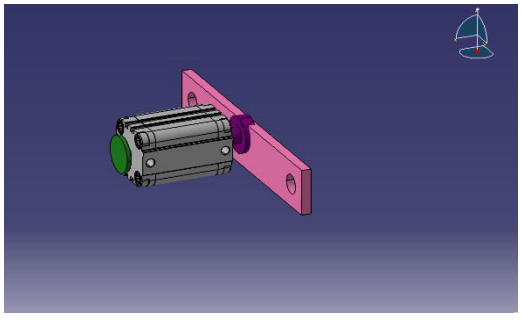

Fig.6: PNEUMATIC CIRCUIT

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III. RESULTS

ANALYSIS OF STRESS ON TURN TABLE

Turn Table is the part which holds the engine block until the whole operation of MOG, COG and LINEAR BORE is performed so it may develop stresses so analysis of the turn table was done on the Ansys software. Below are the results of the Ansys software

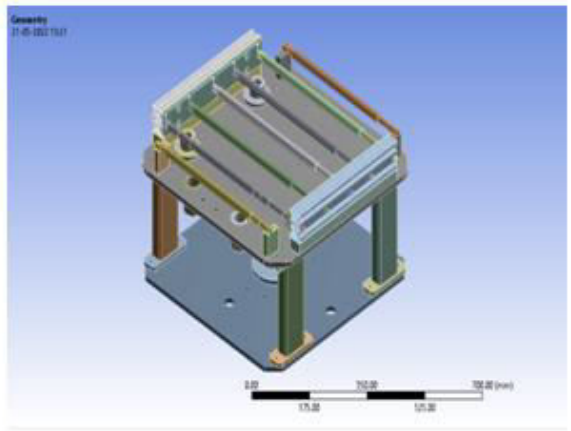

Fig.7: Geometry on Ansys

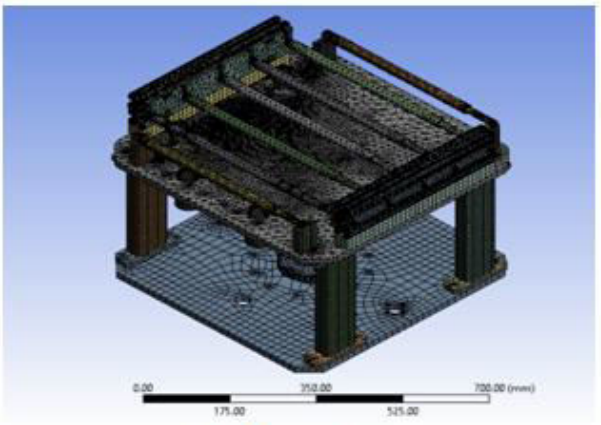

Fig.8: Mesh of Turn Table

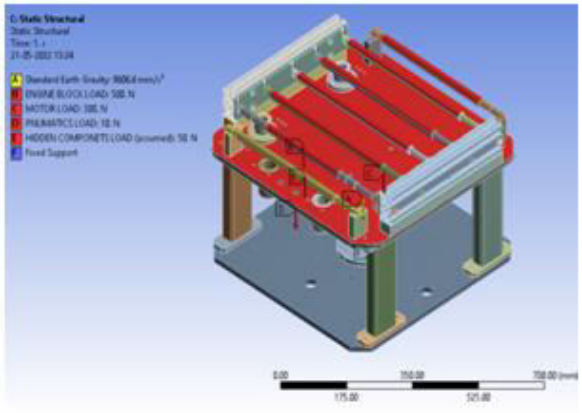

Fig.9:Load Analysis on Ansys

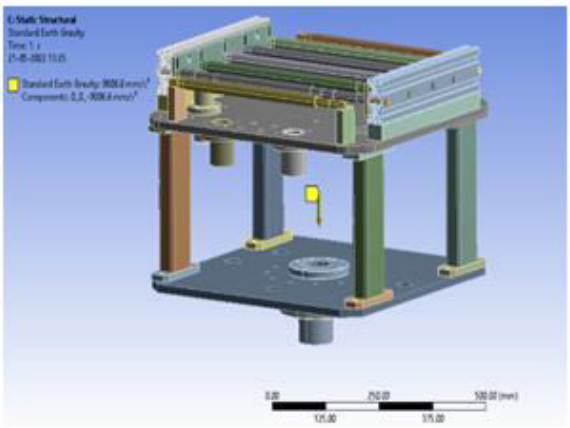

Fig.10: Ansys of Gravitational Load

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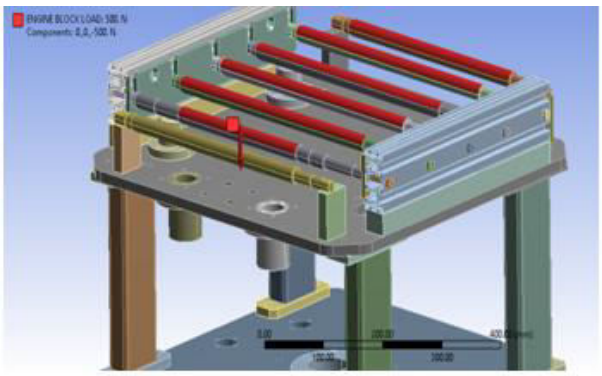

Fig.11: Ansys of Engine Block Load on

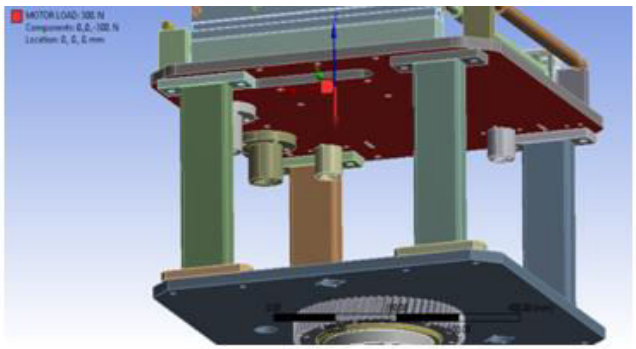

Fig.12: Ansys of Motor Load

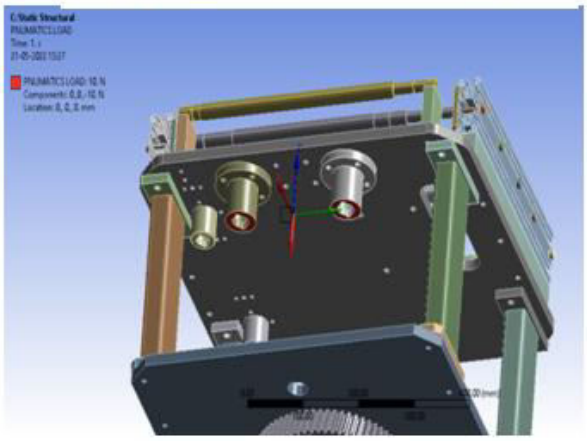

Fig.13: Ansys of Pneumatic Load

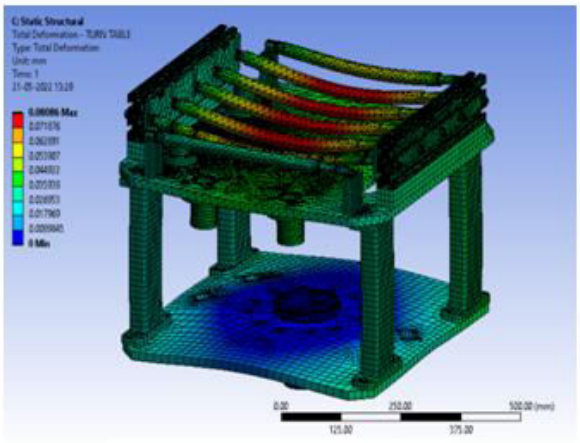

Fig.14: Total Deformation

IV. COCLUSION

As we know that MOG and COG machine are already available in the market, but they take too much of time (its time consuming). So we have designed a DEBURRING machine in which MOG and COG are performed simultaneously and additional to it we have added LINEAR BORE operation to it.

Due to which the process of removing burr has become faster, and the process of deburring has become faster and it is time saving process and it is Automated as well as manual process.

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