



Fixture Design for D-78 Stator Machining Process

TEAM MEMBERS



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ABSTRACT

This project aims to provide CIATEQ with fixture proposal devices for a CNC machining operation on a stator which is part of an engine D -78, performed in a horizontal milling machine.

The project involves the submission of the problem, conception of ideas, developing them to finally get two different proposals; such proposals must meet specific requirements proposed by CIATEQ, as inherent requirements due to the nature of the process.

This project meant then add value to the development and production of CM Industrial through CIATEQ technology center.

OBJECTIVE

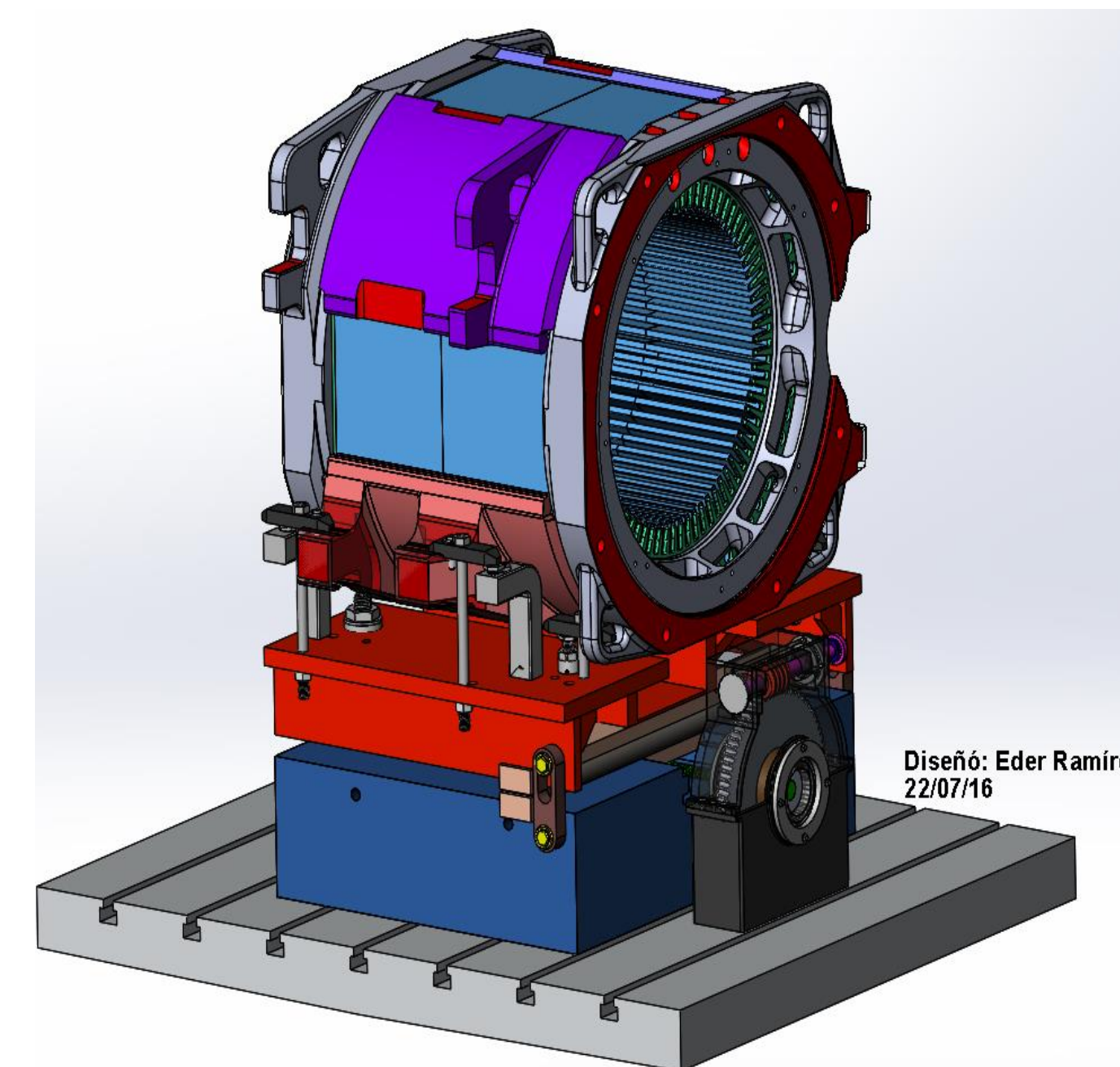
By July 29, 2016, provide CIATEQ two proposals of fixture devices for the machining process on the D-78 stator.

BACKGROUND

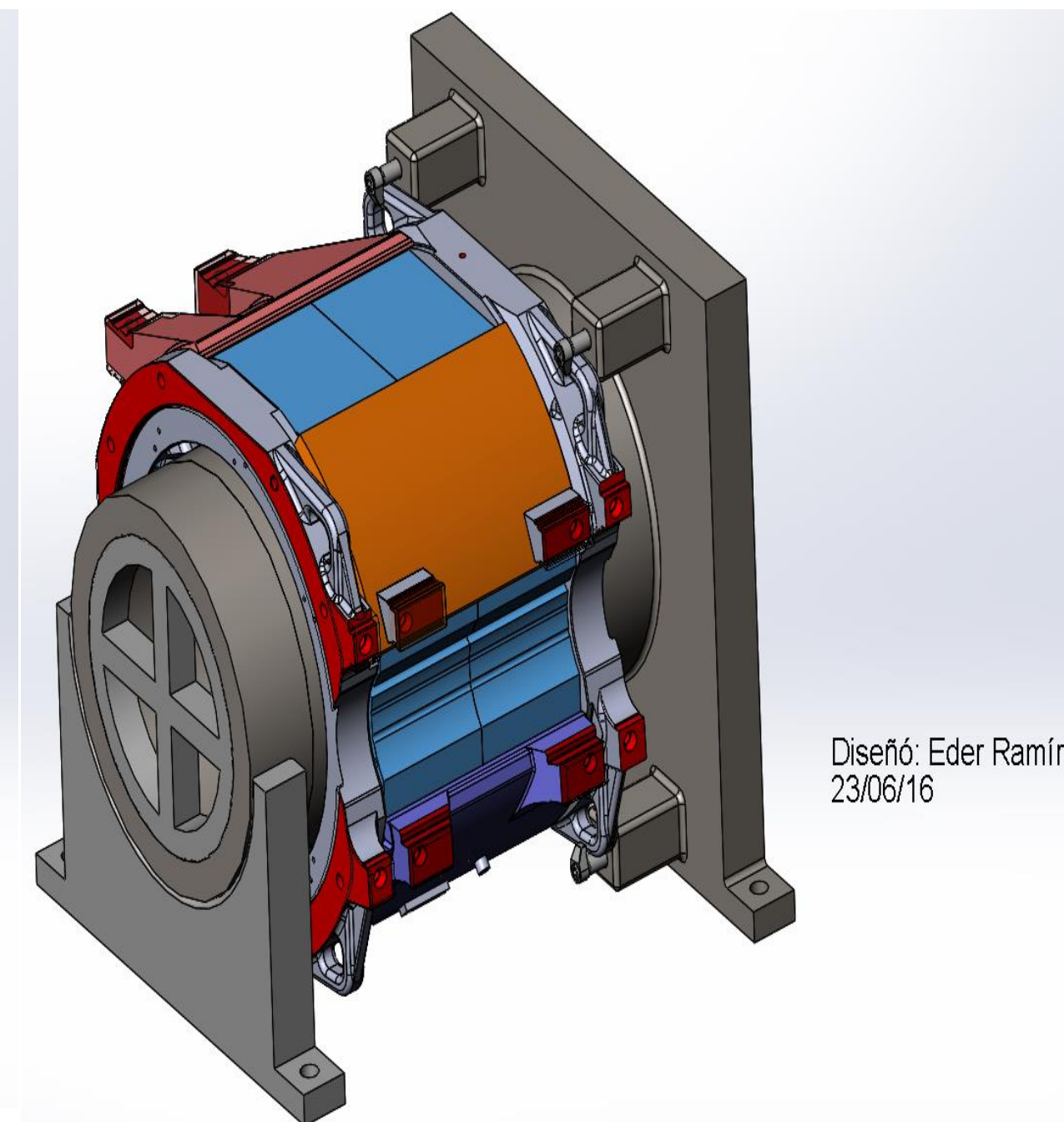
Currently CM Industrial, performs a unorthodox process to manufacture their product, which requires much time, effort and operator fatigue to tune the clamping system for machining process. Then they have to perform the same procedure for a new machining process in a different surface, resulting in loss of time and money for CM Industrial, therefore this project will provide an alternative to streamlining the process, saving time for the clamping process and reducing operations performed in the machining process.

METHODS

- **“Sine Table”** consist in an angular adjustable top plate which is able to lift the stator precisely and easy due to a worm gear system.
- **“Shaft fixture”** consist in a rectify tube which holds the stator with four hydraulic clamps, also is provided with a support structure to release stress in the tube base.
- **Angular measurement**
 - Camera CCD
 - Laser as reference point to find position and then angular deviation.



Diseño: Eder Ramirez 22/07/16



Diseño: Eder Ramirez 23/06/16

Fig.1. Fixture Proposal “Sine Table” Fig.2. Fixture Proposal “Shaft”

RESULTS

- As result from the deformation analysis, both designs are safety and meet the maximum deformation of 0.01mm.
- Also meets the circular specification thanks to the cylindrical bearings and the high reduction worm gear box.

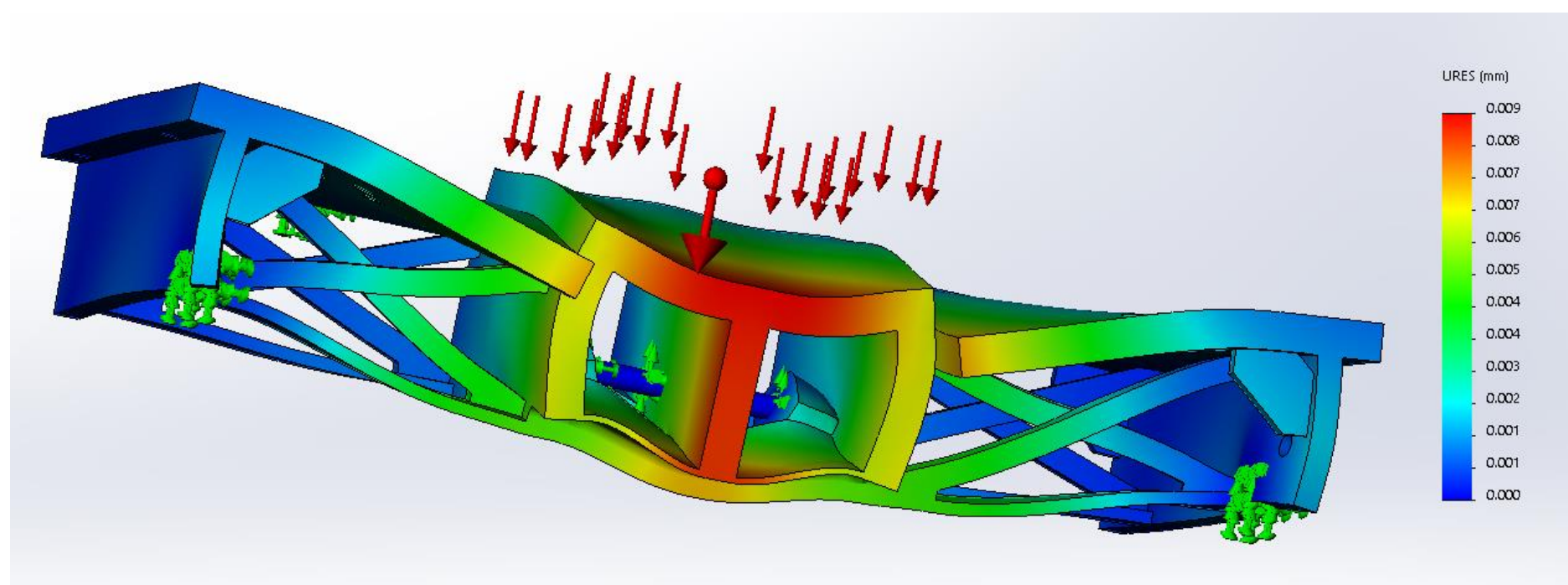


Fig.3. Sine Table Fixture Deformation analysis. (Max. Deformation 0.009mm)

CONCLUSIONS

As output from a process flow diagram between the current method performed by the customer, and the two designs developed in this project, we got a reduction of eight operations for the Sine Plate design and a reduction of five operations for the Shaft Fixture, in the CNC machining process. There fore is recommended to use the Sine Plate design, because the entire process can be accomplished with only **one setup process**, and provides a **precisely angular adjustment**. Also the this design provides a **clamping system** that avoids **vibration** while the machining process is performed, and **absorb deflection** thanks to the spherical gripper of the contact surface. For the angular measurement, the method of triangulation, was chosen because the accuracy, repeatability.

Event	Current Method	Sine Plate	Sine Plate Reduction	Shaft Fixture	Shaft Fixture Reduction
Operation	18	12	6	15	3
Transport	4	2	2	2	2
Delay	0	0	0	0	0
Inspection	1	1	0	1	0
Store	1	1	0	1	0
Total	24	16	8	19	5

Tab.1. Process Flow Chart Summary

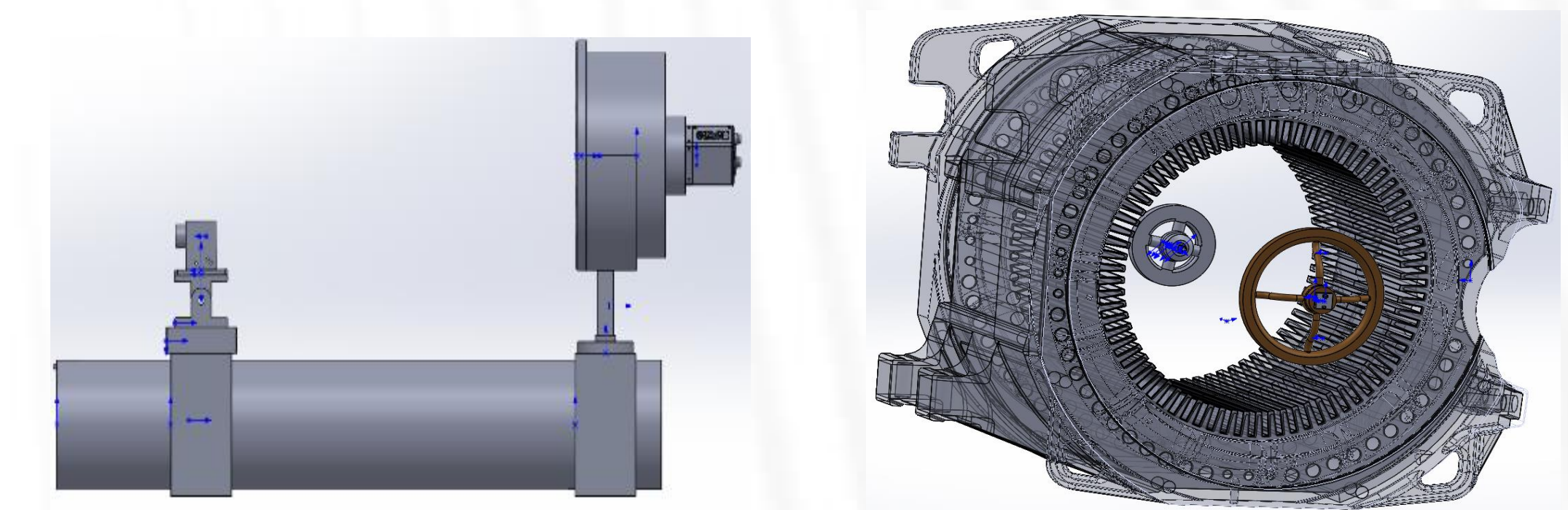


Fig.4. Triangulation System

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