PROGRAMA BICULTURAL DE ALCANCE INDUSTRIAL, VERANO 2019

SBN Vibration Test on BM2010 Motors

TEAM MEMBERS

- Alec Lazarides (WVU)
- Juan Carlos Vela (UTSJR)
- Nahum Josué Ventura (UAQ)
- Jorge Aarón Barrientos (UPSRJ)

ABSTRACT

Brose assembles Windows Regulator Motors for BMW These motors are creating vast amounts of scrap due to excessive vibration that does not fit customer specifications. The vibration test occurs at the final stage of the assembly line, which means that the motor is fully assembled. The goal is to be able to develop a connector that will be able to preform the vibration test before the motor is completely assembled, thus reducing the scrap.

OBJECTIVES

- Reduce scrap's cost by running and testing the motors without electronic circuit boards.
- Design a universal connector for right and left motors.
- Not extend the cycle time, and have easy maintenance

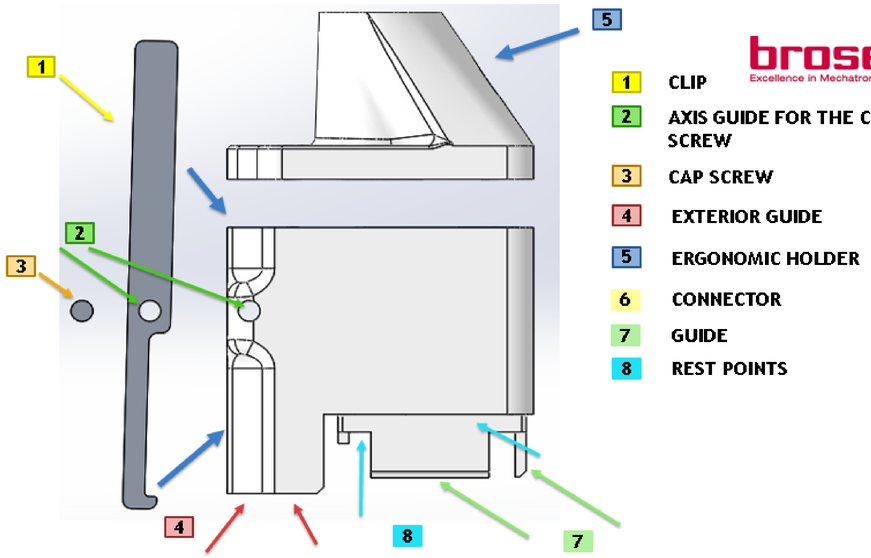
BACKGROUND

Currently the vibration test is just before the End Of Line (EOL), so if it fails the test the whole piece with the ECU is considered scrap.

- ECU: $3.00 USD
- Scrap motors per month: 950 motors
- 1.25% of all G05 motors have gone to scrap, which has costed Brose $1,099,553 MXN year to date

METHODS AND/OR APPROACH

- Currently Brose is testing the motors with the ECU installed, the test is made with a software that shows the frequency, decibels and volts.
- The connector was modeled in SolidWorks and then was manufactured in-house using a CNC Mill and Lathe.
- Were are able to deliver a universal connector already tested



Exploded view of connector

RESULTS

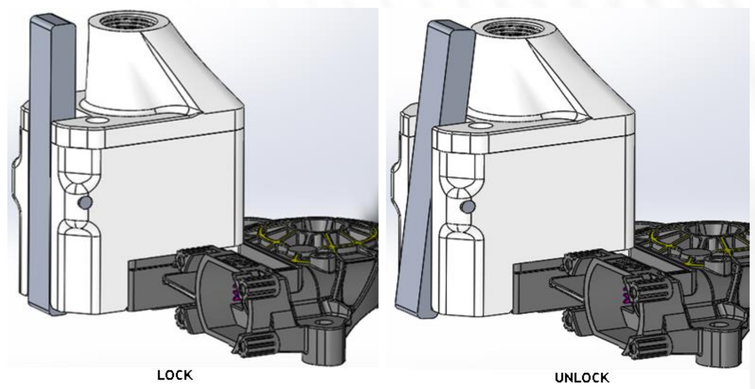
The connector was tested with right and left motors showing that we could find a correlation, this way, scrap will absorb only motors and save electronics.
If no ECU's are wasted, Brose will **save $34,200 USD per year.**

The team designed a connector that only test the mechanical components of the BM2010 motor.

- **No damage** to existing connection pins
- **Easy** and **low cost** maintenance

CONCLUSIONS

The connector provides a 91.27% of effectiveness reducing the costs and saving ECU parts, also this test provides a correlation of error giving us the opportunity to have an idea of how many motors are going to fail.
During the tests, we observe that the connector works with both motors right and left, protecting the ECU pins and is really easy to connect, due to its design friendliness with left-handed and right-handed people.



CAD images of connector on BM2010 Motor

REFERENCES

1. BM2010 Manuals
2. Design layouts
3. Electrical and Electronic Schematics

PROGRAMA BICULTURAL DE ALCANCE INDUSTRIAL, VERANO 2019

RIPPLE CURRENT CONDITIONER SIGNAL

TEAM MEMBERS

- Alec Lazarides (WVU)
- Juan Carlos Vela (UTSJR)
- Nahum Josué Ventura (UAQ)
- Jorge Aarón Barrientos (UPSRJ)

ABSTRACT

Brose wants to know the RPM of Window Regulator and Seat Motors made for quality purposes. The customer wants to know the parameters through an electrical sine signal which can be changed to a PWM with analogic devices.

OBJECTIVES

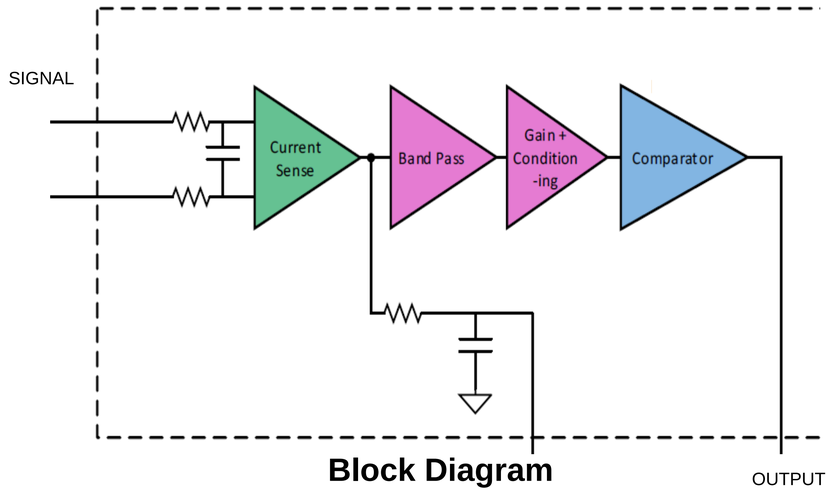
- Solution must be only hardware.
- Must be a mobile device, able to move from station to station
- Hardware must be compatible with all brose motors
- Have a Transistor-Transistor-Logic (TTL) output

BACKGROUND

Some Brose assembled motors don't have feedback as a HALL sensor and they need to consider the customer parameters, so the only way of measuring that is with the frequency of the ripple.

METHODS AND/OR APPROACH

- We will take the signal from the motor with a current clip that will be the input to the device, it will pass through an RC filter that will clean the sine signal, then it will pass through different configurations of the OPAMP, helping us to get the TTL final signal.
- During the design of the filters we are testing the motors that are going to be used in different situations. After testing the different motors for the frequency values, we selected the resistors and capacitors that will work with these specific motors.
- One of the most important configurations that we had is the Voltage Follower, to avoid losing the value of the signal.



Block Diagram

RESULTS

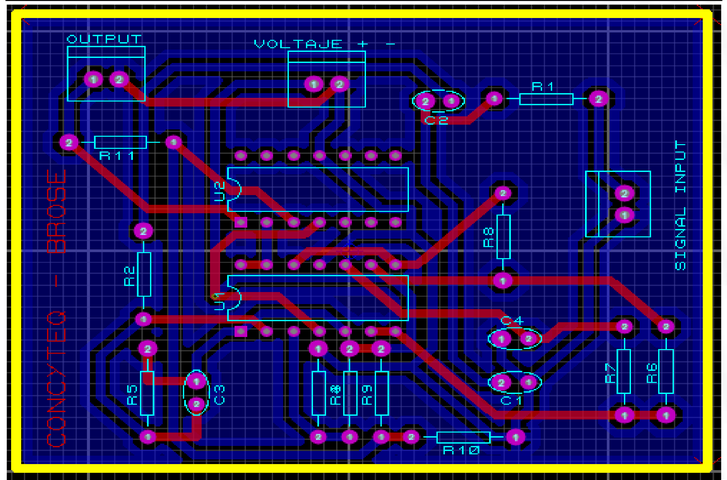
The hardware was completely designed with real data frequency values, to complete the process, we also added filters to avoid excessive peaks.

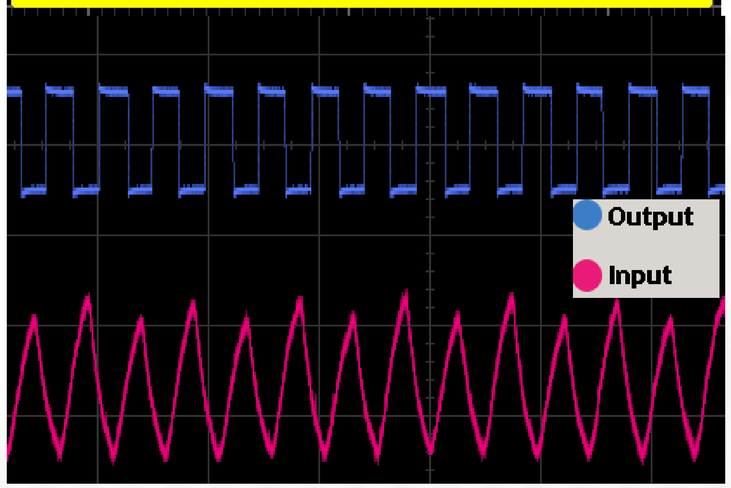
We decided to add to the deliverables a PCB with special electronics so it would be easier to move it in all the testing areas.

CONCLUSIONS

The device that we designed and built was very complete and is prepared for any circumstance, specially for electrical noise, we added a differential stage for being prepared and not losing any ripple to create a reliable reading and its completely hardware.

Also this project will save money due to the simplicity and the reason of not implementing a software





REFERENCES

1. WRM and Seat Motors Manuals
2. Electrical and Electronic Schematics
3. Theory and Datasheets for OPAMPS