

## RETROFITTING THE ARMATURE HVAC LINE



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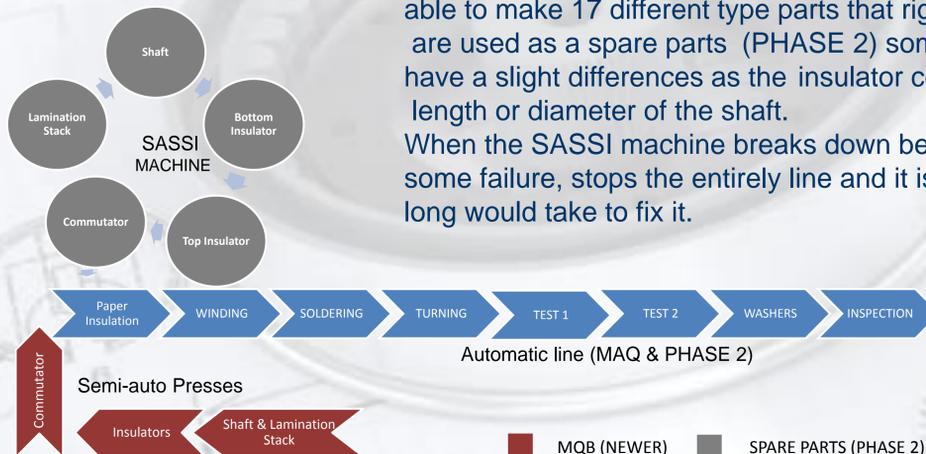
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### BACKGROUND

The SASSI machine and the Semi-Auto Presses perform the same processes in the armature assembly. The differences lie in the models that they made, the semi-auto presses assembly the first stage of new armature (MQB) while the SASSI Machine is able to make 17 different type parts that right now only are used as a spare parts (PHASE 2) some of them have a slight differences as the insulator color and the length or diameter of the shaft. When the SASSI machine breaks down because of some failure, stops the entirely line and it is unsure how long would take to fix it.



### ABSTRACT

The SASSI machine that assembles the first stage of an armature line is obsolete and unreliable. Three adjacent semi-automatic presses perform the same operations the SASSI machine does but for a different type of armature. Retrofitting these presses will increase the reliability of the line. Each press received new SMED pieces to make changing out the parts easier and any new sensors needed. The machines also received new programming so they can correctly make the new part types and detect if a defect occurs. The overall project was a success. The new pieces for the stations should work perfectly fine and the programming was finished to the percentage specified in the project goals.

### OBJECTIVE

To eliminate the SASSI machine and replace it by retrofitting an existing line.

### METHODS AND MATERIALS

- SMED Methodology
- Poka Yoke Design

D2 Steel with tempering  
(All the designs were manufactured at the tooling shop at brose)

### RESULTS

The new tooling worked correctly and they will consistently make armatures to spec and last for the life of the machine.

#### Mechanical

- All manufacturing tolerances are met by the parts
- Only minor adjustments were needed

#### Electrical

- All required new Sensors were installed.
- New Programming is almost complete

New Cabinet is nearly ready to implements

#### Project

- The presses were release to start production this Wednesday after the run & rate of some phase 2 models, and now they are producing parts without the SASSI Machine.

### CONCLUSIONS

The project was a success. All the new pieces needed to retrofit the machines were manufactured completely and are working as they should, as well as the sensors. The new programming is also working well even though it is not perfected.

With this project done at 100%, the next step is to remove the SASSI Machine and finish the Cabinet with the HMI that is going to replace the SASSI Machine as the brain of the line.

#### Recommendations

- Duplicate of all parts should be made to reduce downtime if they are damaged.
- New Safely elements for stations 2 and 3
- More Poka Yoke design elements if operator error becomes a problem.

### ACKNOWLEDGMENT

On behalf of the team, we want to thank to everyone involved on this project:

- The technicians at the tooling shop who manufactured the parts and helped us with design issues.
- The operators at HVAC Armature Line who gave us advice on how to improve the new fixtures.
- The setters on the HVAC Armature Line for supporting us with technical help and advice.
- The engineers and supervisors who mentored us, taught us, and shared with us their knowledge and experience.

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*Thank you BROSE, CONCYTEQ and Dr. Muciño for giving us this opportunity to live this unique and wonderful experience, and to be able to apply our theoretical knowledge on real life problems.*

### REFERENCES

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2. "Poka Yoke." *Wikipedia*. N.p., n.d. Web. 27 July 2016. <<https://en.wikipedia.org/wiki/Poka-yoke>>.
3. "Single-Minute Exchange of Die." *Wikipedia*. Wikipedia Foundation, n.d. Web. 27 July 2016. <[https://en.wikipedia.org/wiki/Single-Minute\\_Exchange\\_of\\_Die](https://en.wikipedia.org/wiki/Single-Minute_Exchange_of_Die)>.



Figure 1: Shaft Press (Station 1)



Figure 2: Shaft Press support



Figure 3: Shaft support with adjustments



Figure 4: Lamination Nest



Figure 5: Insulator Press (station 2)



Figure 6: Armature Support for Station 2



Figure 7: Bottom insulator support



Figure 8: Top Insulator Support



Figure 9: Color and Presence sensor



Figure 10: Commutator Press (Station 3)



Figure 11: Commutator Support



Figure 12: Armature support for station 3



Figure 13: Presence Sensor