



HOW VACUUM IMPREGNATION ENABLES OVER MOLDED MANUFACTURING

A Godfrey & Wing customer is a tier 1 mechatronics supplier for an automotive OEM manufacturer's electric control units (ECU) for transmissions. This company produced a new over molded electronic control unit used to control an electric motor that maintains transmission oil pressure.

The Challenge

The parts need to be sealed so that transmission fluid does not leak into the ECU, and lubricants in the ECU do not leak into the transmission fluid. Because of this, the OEM required that 100% of the parts to be sealed. In addition, the OEM required a leak rate of zero and tight cleanliness requirements.

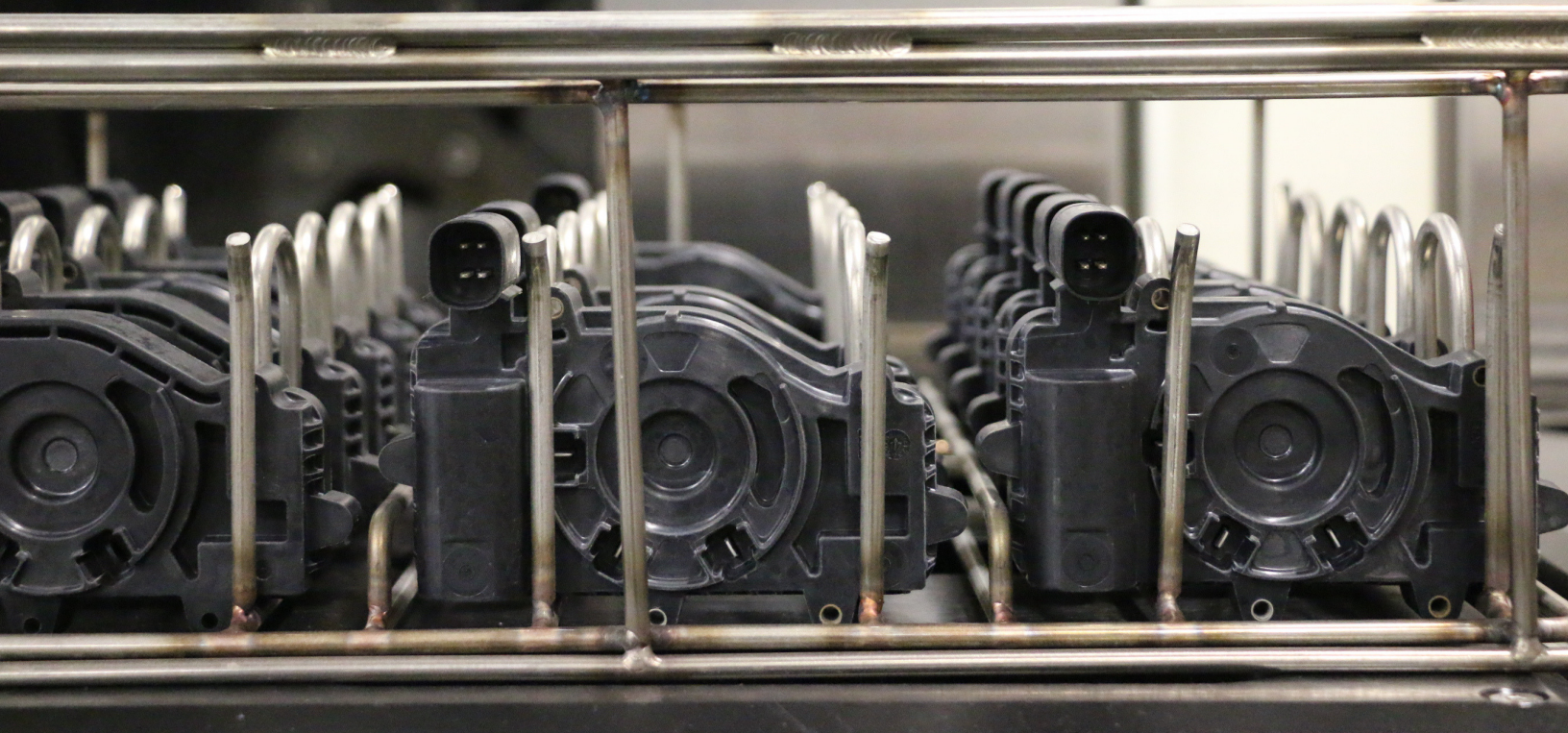
The main feature of the unit that connects to the transmission has a complex design for sealing. The design of the feature increases the risk of sealant contamination since it is difficult for the sealant to be washed.

This tier 1 supplier previously used potting to seal similar overmolded electronics. Potting is a process of filling a complete electronic assembly with a thermosetting plastic or silicone rubber for resistance to shock and vibration, and for exclusion of moisture and corrosive agents.

Potting was not a viable for this new part because:

1. Potting will not meet the OEM's leak rate and cleanliness requirements.
2. The intricate design would increase the lead time in potting, and inhibit the customer from meeting the OEM's production demands.
3. The high expense of potting equipment would prolong the capital recovery.





Fixtures were designed to allow maximum parts per cycle, flush sealant from the blind holes, and protect critical over molded features.

It was realized that potting would not meet the production or quality requirements for this new product. The OEM determined that vacuum impregnation would be a viable solution.

The Solution

Based off the over molded part's two materials and the part geometry, extensive work needed to be done to determine the best process and sealant. Godfrey & Wing needed to better understand the size of the leak path in order to determine the best impregnation process and sealant to use. Godfrey & Wing conducted a Design of Experiment (DoE) which resulted in the discovery of a small leak path between the over molded plastic and metal pins. Multiple processes and sealants were then tested to determine the best seal rates. Godfrey & Wing's research determined that the best process and sealant are:

1. Dry Vacuum (DV)-Compared to the Wet Vacuum (WV) process, the DV process eliminates the resistance of sealant when the vacuum is applied.

2. Elecflex 440 Sealant-Elecflex 440 has the appropriate amount of flexibility and adhesion, and conforms to the stress of multiple materials that expand and contract at different rates.

Based upon the customer's requirements and DoE, Godfrey & Wing proposed the lean, front loading EcoSeal vacuum impregnation system. The system would be designed to address the customer's challenges:

1. The centrifuge was designed to rotate clockwise and counterclockwise to remove excess sealant. This enables the system to recover residual sealant, reduce sealant carryover to the wash, maintain sealant purity, and preserve part cleanliness.
2. Fixtures were designed to impregnate multiple parts per cycle. This approach allows for the maximum parts per cycle, the ability to flush sealant from the blind holes, and protect critical over molded features.
3. With a small footprint of 66 square feet, the EcoSeal would integrate within the production cell without infrastructure changes.





The cost of the EcoSeal is approximately 66% less than a new potting system. This enables the customer a faster capital expense recovery .

The Results

The EcoSeal is making a significant impact by answering the following challenges:

1. Achieve leak rate and cleanliness requirements-The DV process pushes the Elecflex 440 sealant deep into the leak path, improving sealing efficiency. This results in a meaningful improvement in meeting the OEM's leak rate and cleanliness requirements.

2. Attain production volume-The system is integrated with the customer's injection mold presses and pressure testing, allowing for continuous production flow. The system seals 300 parts per hour, and operates 24 hours per day, 5 days per week.

3. Lower cost per unit-The cost of the EcoSeal is approximately 66% less than a new potting system. This enables the customer a faster capital expense recovery.

In Summary

As companies continue their search for ways to meet quality and production demands, it will be necessary to challenge old paradigms. Godfrey & Wing's frontloading EcoSeal, DV process, and Elecflex 440 sealant, collectively, is the best and most economical option to meet the OEM's quality and production demands.

About Godfrey & Wing

Godfrey & Wing is a privately held, global leader in vacuum impregnation products and services serving the aerospace, automotive, and general manufacturing industries worldwide. Headquartered in Cleveland, Ohio since 1948, Godfrey & Wing operates manufacturing and production facilities in North America, Europe and Asia.

For more information, visit www.godfreywing.com or call +1 330 562 1440.



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