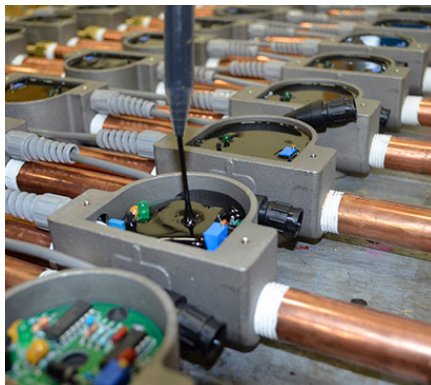
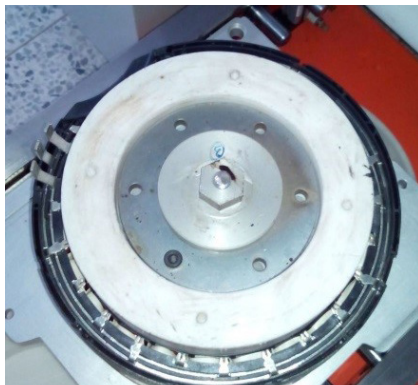




## VACUUM ENCAPSULATION OF AUTOMOTIVE HYBRID DRIVE MOTORS



### APPLICATION:

Hybrid power is an important direction with new electric automobiles. In hybrid powered automobiles a driving motor is one of the most critical parts. The motor is installed in the fuel engine compartment in a confined space and in very demanding conditions. To ensure good performance of the motor in different operating conditions, motor stator coils are typically filled with a sealant treatment to meet operational requirements concerning heat dissipation, weather resistance, and installation sizes. Among the hybrid power cars available in the market, most use motors that are filled with two component epoxy sealant cured at high temperatures.

### PRODUCT SUPPLIED:

- 1450 SA Metering and Proportioning System
- Vacuum Chamber

### CHALLENGE:

Customer requirements included vacuum degassing treatment of a two component high temperature epoxy sealant in vacuum conditions and mixed with an exact mix ratio. Next, fill it to the gap of stator coils under atmospheric pressure. The final step is to heat and complete a solid cure of the epoxy. The system provided must deliver the right mix ration and deliver the

needed volume of sealant at the needed speed while eliminating all air holes on the product surface and inside the part. One of the challenges with a high-temperature epoxy sealant and is that it contains two components (A and B) with very different viscosities. To meet thermal conductivity requirements, component A contains a high proportion of abrasive filler, which means good fluidity/flow of the adhesive can only be maintained in a heated condition. Settling of the filler should also be prevented as the filler leads to the need for high wear resistance of the metering mechanisms in the system. In addition, to ensure favorable TG temperature value (related to stability at high temperature) after cure, the mixing proportion must be strictly controlled. A deviation beyond 5% may result in a TG value that is out of the limit and consequently leads to rejection of the whole part. The biggest challenge with the system lies in the need to dispense the sealant into the product in a vacuum environment. Achieving this will enable the sealant to completely fill gaps and eliminate air bubbles. The system must also meet the customer's requirements concerning productivity.

### SOLUTION:

The EXACT solution is the 1450 SA metering and proportioning system plus the online vacuum chamber system. This solution includes the vacuum degassing preparation step, then the 1450



## VACUUM ENCAPSULATION OF AUTOMOTIVE HYBRID DRIVE MOTORS

SA metering and proportioning system, and finally the online vacuum dispense station. The vacuum chamber with embedded rotation disc can accommodate a few dozens work pieces at a time. The encapsulation process can be completed once and for all after vacuuming, providing a vacuum level of 5 m bar in compliance with the customer process requirements. As a result of rotation sealant filling, the sealant penetration speed in the coils has been made much faster, and the sealant filling speed is also faster. With improved overall process efficiency, the customer's expectation for higher productivity is met.

### OVERALL SOLUTION DIAGRAM:

Online vacuum chamber with two embedded servo drive rotation tables.

