HARWiN

Adding Robustness to Industrial Hardware via Backpotting

There will be a certain level of holding force keeping contacts in the connector housing once assembled, but this is limited. Complex and repetitive movements, such as the ones industrial robots and factory automation equipment continuously execute, expose connectors/cabling to numerous mechanical stresses over their operational life.

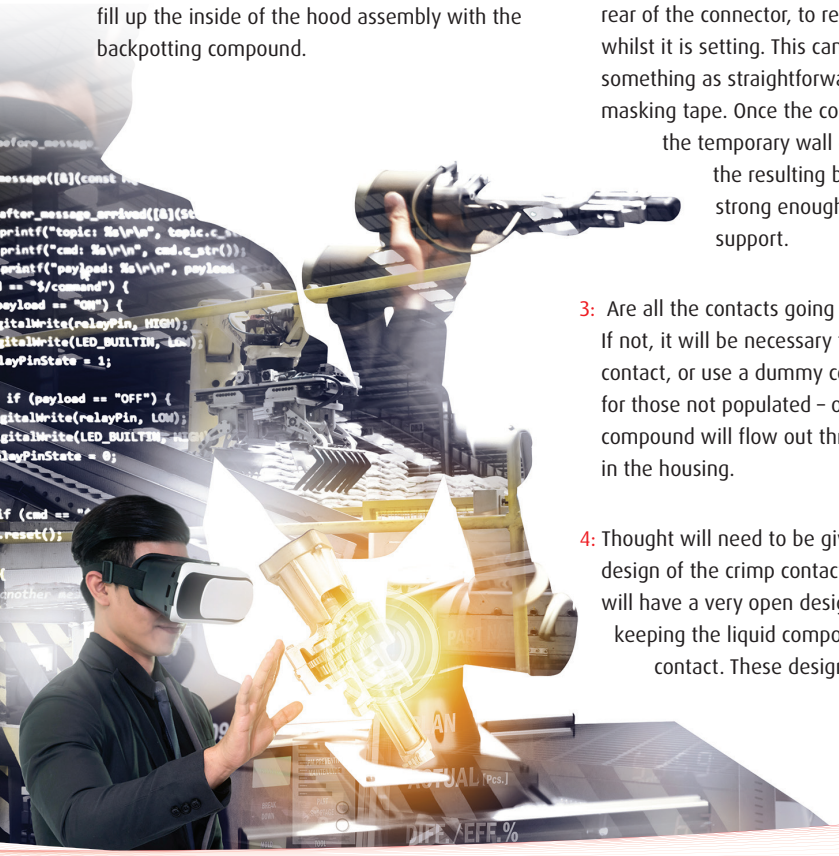
Consequently, adequate strain relief must be provided to mitigate the effects of torsion, etc. Backpotting is regularly employed in heavy-duty designs (including robotics) for strain relief purposes. Here a potting compound (normally an epoxy resin) fills the area at the rear of the cable connector to bring extra robustness to the assembly.

Scenarios Where Backpotting is Advisable

Backpotting can be used on many different cable connectors, once the cable assembly has been completed. However, it is easier to backpot when there is a specific area with a retaining wall that will contain the liquid whilst it sets. The following points should be taken into consideration:

1: Firstly it should be determined if there is a retaining wall on the rear of the connector. If so, no extra tooling will be required to retain the compound whilst it is in a liquid form.

If there is no retaining wall, then can some sort of hood or backshell be fitted? It might be possible to fit the hood, and then completely fill up the inside of the hood assembly with the backpotting compound.



This will depend on the hood design, whether it has any holes or is a close fit to the connector, and if the potting might interfere with jackscrews or other mechanical elements.

2: If there is no wall, nor a hood, then it will be necessary to build a temporary wall around the rear of the connector, to retain the compound whilst it is setting. This can be achieved with something as straightforward as standard masking tape. Once the compound has solidified, the temporary wall can be removed and the resulting backpotting will be strong enough to not require further support.

3: Are all the contacts going to be wired up? If not, it will be necessary to populate every contact, or use a dummy contact arrangement for those not populated – otherwise the liquid compound will flow out through empty holes in the housing.

4: Thought will need to be given to the actual design of the crimp contacts, as some contacts will have a very open design with no means of keeping the liquid compound at the rear of the contact. These designs are more common with open crimps on basic PCB connectors, and are thus not suitable for backpotting.

5: Once the backpotting has been applied, and it is in the process of setting, it is vital to keep the connector mated to another connector, so that the contacts are properly aligned within the housing when the compound hardens and they can no longer move. Cable contacts have a certain amount of float whilst being assembled, and there is a risk of contacts getting permanently fixed at an angle. This will make wear more acute in a particular spot and increase the required insertion force – potentially leading to early failure arising.

Backpotting Procedure

When using epoxy resins, it is important to have a clean working area (and not to get resin on things you don't want it on). Most epoxy resins are a two-part compound or a resin and a hardener, which stays liquid before mixing. Each compound has its own detailed instructions on mixing, application and drying times, but here is the basic step-by-step process that is generally applicable:

1. Create a potting wall if required.
2. Use a fixture to hold the connector steady. The simplest fixture is to glue a mating connector to a rigid board, and mate the connector being potted. Alternatively the connector could be held in a small vice – it is recommended that the connector is still mated in these methods.
3. Mix the epoxy compounds (resin and hardener) to the manufacturer's specification – not too vigorously, to minimise the presence of air bubbles.
4. Load the mixed epoxy into a syringe or dispensing system, with the appropriate nozzle size. In situations where a small applicator nozzle is employed, a powered dispensing system may be needed.
5. Dispense the amount needed to fill the area.
6. If required, use a vacuum environment to de-gas the dispensed fluid – thereby removing trapped air bubbles.
7. Place the assembly somewhere safe whilst the epoxy compound sets. For some resins, heat curing may be necessary.
8. Once the assembly is set, remove any material used to create a temporary potting wall and inspect the completed product.