

The benefits and challenges of overmoulding HVAC cables and wire harnesses

Overmoulding is an essential technique in the production of reliable and durable electrical components. It is widely used across various industries – especially in HVAC – where protection, mechanical strength, and aesthetics of cables, wire harnesses and connectors are crucial. This article provides an overview of the overmoulding process, highlights its advantages, and explains the key technical challenges and solutions associated with it.

What is overmoulding?

Overmoulding is a manufacturing process in which a cable, connector or cable harness is encapsulated in a protective plastic or rubber layer. Overmoulding offers many advantages:

- **Protection:** The plastic layer shields the connector from environmental factors such as dust, moisture, and mechanical stress, thus ensuring consistent performance.
- **Mechanical strength:** The process improves the mechanical robustness of the connection, increasing resistance to bending, pulling, and other mechanical forces.
- **Reliability:** Overmoulding reduces the risk of disconnection or damage, which enhances the overall reliability of the electrical system.
- **Aesthetics:** Overmoulding gives the cable, connector or cable harness a clean, professional and finished appearance.



Additionally, overmoulding can be used to create functional elements such as grommets. Grommets on cables and wire harnesses can serve as seals, feed-throughs, or strain reliefs, providing both mechanical protection and protection against environmental factors.

Technical Challenges in overmoulding HVAC cables and wire harnesses

While overmoulding offers numerous advantages, it also comes with specific technical challenges that require careful consideration. At WAAK Cable Assembly, we have the required expertise and technical solutions at our disposal to tackle.

1. Selection overmoulding material: soft or hard plastic?

A key decision in the process is whether you should use soft or hard plastic. When it comes to hard plastics, you have to make an additional choice between high-pressure and low-pressure moulding:

- **High-pressure moulding** allows for highly accurate dimensions, with tolerances down to hundredths of a millimetre. However, this process is significantly more expensive than low-pressure moulding.
- **Low-pressure moulding** typically achieves tolerances within tenths of a millimetre and is cost-effective but it may lack the dimensional precision of high-pressure moulding.

What option should you choose then? Material selection primarily depends on the mechanical and environmental

requirements of the final product. So, to make the right choice, it is important to consider all the relevant factors and seek expert advice.

2. Functional dimensions and mould design

To ensure that the overmoulded part meets the functional requirements, the dimensions must be carefully calculated, taking material shrinkage and tolerances into account.

At WAAK, we design our own moulds and, if necessary, we propose design adjustments to achieve the best possible result. This may require the creation of custom mould geometries, tailored to the specific application.

3. Risk of underfilling

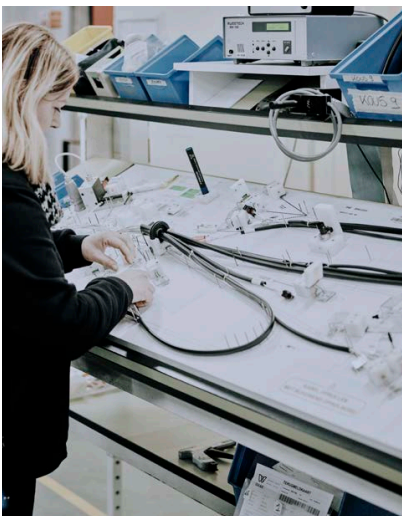
One of the most challenging aspects of overmoulding is ensuring a strong pulling force, particularly when there is no natural adhesion between the overmoulding material and the cable. For most applications, WAAK uses PA66 (polyamid 66), a high-performance thermoplastic polyamide specifically designed for low-pressure moulding. Its low viscosity allows the safe encapsulation of fragile components without damaging them. Additionally, it does not emit toxic fumes during processing and it offers excellent temperature resistance and adhesion to PVC cables.



When working with silicone cables however, you should take into account that they do not naturally adhere to PA66. So, we solve this by adding components to the cable to create a solid mechanical grip before overmoulding.

4. Achieving optimal pulling force

Quality is our number one priority, and is always at the core of what we do. We approach our processes with precision and efficiency. By breaking down complex tasks into more manageable sub-tasks and thanks to the support of advanced technologies, such as pick-to-light systems, camera recognition, on-screen instructions, and systematic sampling, we can ensure that our cables and cable harnesses meet the industry's zero-defect requirements. We were among the first companies to introduce LEAN and poka-yoke systems, which not only prevent errors but also optimise efficiency. By thoroughly analysing each assembly order, we ensure the shortest lead times while maintaining our high-quality standards and adhering to strict deadlines.



5. Preventing overspray?

Overspray occurs when the mould cavity is not fully sealed, causing molten plastic to leak out of the mould. To prevent this, WAAK designs custom-made sealing blocks that ensure a fully sealed mould cavity.

If the wire harness has a fixed geometry, you can use rigid sealing blocks. If the harness is more flexible however, you need another solutions. In the latter case, WAAK creates a flexible mould form, using specialised tape that fits perfectly within the sealing blocks, resulting in a clean and functional grommet.

6. Positioning and Orientation Accuracy

To guarantee that every grommet is in the correct position and orientation, WAAK develops custom-made calibres for precise cable insertion into the mould. This guarantees that each cable or cable harness is completely identical, ensuring optimal repeatability and product consistency.

Conclusion

Overmoulding is a process that improves the protection, strength, and appearance of connectors, cables and wire harnesses. However, it requires specific technical expertise to overcome the challenges associated with the process. From custom mould design to production and quality control, at WAAK we have the expertise you are looking for to create high-quality cables for your product. Our approach results in a product that is reliable and durable.



More info/contact:

Kristof Hots
Marketing & Sales Director

T: +32 56 36 34 34
E: kristof.hots@waak.be

