



Empowering automation in production

Innovative adhesive tapes enable the transition to smart manufacturing in the automotive industry

Today's cars are packed with computers, sensors and displays. Every new design brings more electronic tech into the vehicle. Wires make those popular extras possible by moving power and data around the car – with a typical vehicle containing up to 60 kilograms of cables and connectors stretching across more than eight kilometers. Wire harnesses hold that mass together. And adhesive tapes keep the harnesses fixed in place and safe, so they don't get damaged or make noise.

Currently, 90 percent of the wire harness assembly process involves manual work. The switch to automated processes has been a hot topic in this sector for many years. Now, innovative solutions are enabling that transition – and unlocking more cost-efficient applications that achieve higher levels of precision.

Wire harnesses can consist of up to 700 connectors and 3,000 wires with different diameters.

What's happening to wire harnesses?

More electric vehicles (EVs) and self-driving cars are hitting the road. Drivers have new and interconnected options for customizing their experience behind the wheel. That means more wires. And that creates big challenges.



Major trends are revolutionizing the automotive sector. The shift to electric drivetrains and driverless vehicles is gathering momentum. Buyers also have endless possibilities to add touchscreens, speakers, heated seats, parking assistance and more. It's an exciting moment for mobility. But digital tech is a matter of life-and-death in modern vehicles with autonomous or semi-autonomous driving functions – so the wiring must offer outstanding reliability.

Modern features and functions need connections to carry power and data. That's a lot of wire and it brings a lot of weight, which is a challenge for automotive OEMs who want lighter vehicles to compensate for bigger battery packs that offer increased driving range. Already, batteries are making it difficult for carmakers to keep their kilogram-count under control. Smaller wires and connectors are one possible way of saving weight and space. However, this increases

complexity because miniature parts are challenging for employees to deal with during manual assembly.

90 percent of wire harnesses are assembled by manual workers. That's an unusual approach in today's highly automated world. Taping the harness accounts for 25 to 30 percent of the total assembly time. This is a completely manual process because each harness has a unique configuration based on the buyer's selected features. And every minute and second carries a cost.

Assembling wire harnesses is a complex task that requires workers with significant skill and precision. Suitable employees are increasingly hard to find on the labor market and the cost of labor is rising too, even in low-wage economies. To avoid those rising labor costs, some automotive OEMs are already relocating their production facilities to areas where wages are even lower. However, this carries business risks related to long supply chains and unstable political conditions in some regions.

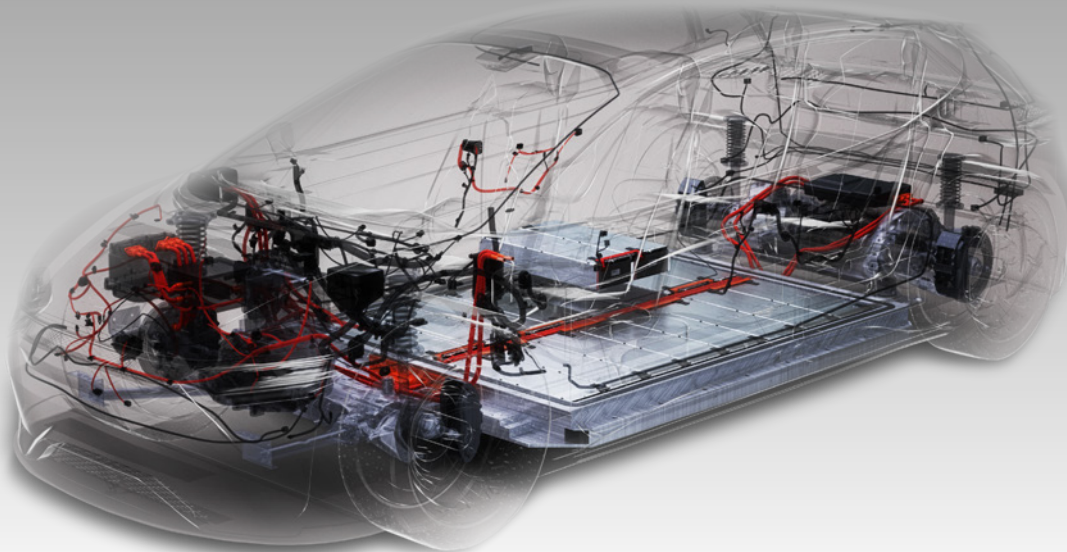
Something needs to change...

Up to 30 percent of assembly time for wire harnesses is devoted to manual tape wrapping.

Advantages of automated wire harness production for electric vehicles (EVs)

Battery-powered cars are gaining popularity worldwide – and this trend creates a fresh set of challenges for wire harness producers. Switching to automated processes can boost safety, save costs and turn this mega trend into a mega opportunity.

- Product recalls for EVs are increasing: More precise applications with automated equipment can minimize the risk of defects that generate high costs and reputational damage.
- Development cycles for EVs are getting shorter: Digitalized and automated processes are more adaptable and can be altered easily if errors or risks are identified.
- Components are shrinking: OEMs aim to save weight and space by using miniaturized parts that are challenging for workers to handle and bring higher risks of damage during assembly.
- Traceability is expected: Automation makes the full process traceable, which enables better root-cause analysis when risks or defects are discovered – to boost safety and accountability.



Transformative tapes for automated wire harness production

The latest innovations in adhesive tapes and robotic applications are now making it possible to automate the processes for wrapping and securing wire harnesses.

Automotive suppliers worldwide are embracing state-of-the-art solutions to these challenges in wire harness manufacturing. This involves a powerful combination of advanced machinery and innovative adhesive tapes. This portfolio of tapes includes options for semi-automated and fully-automated processes. These products are designed to optimize the specific production step – such as spot taping, continuous taping or taping by robots. Spools of tape from tesa® can be up to 3,000 meters long, which boosts efficiency by enabling manufacturers to reduce downtime for switching the material. They are also specially engineered to deliver a consistent and stable unwinding force without fraying. Every tesa® tape in this portfolio meets the expectations of the DIN 72036 standard for automated wire harness production.

tesa® Routing Tape, for example, is an adhesive tape that supports automation for wire harness manufacturers and OEMs when packaging the wire harness or assembling it within the vehicle body. It is activated and cured via Ultra Violet (UV) light, which can be integrated into the application equipment. The wrapping tape provides best-fit geometry for wire bundles because it holds its shape and follows the specific routing dimensions involved.

Advantages compared to manual wrapping include:

- Up to five times more efficiency.
- Material savings from more precise application with consistent tape overlap.
- Traceability via data from digital equipment.
- Opportunities for cost-efficient wire harness assembly at locations geographically closer to OEMs.

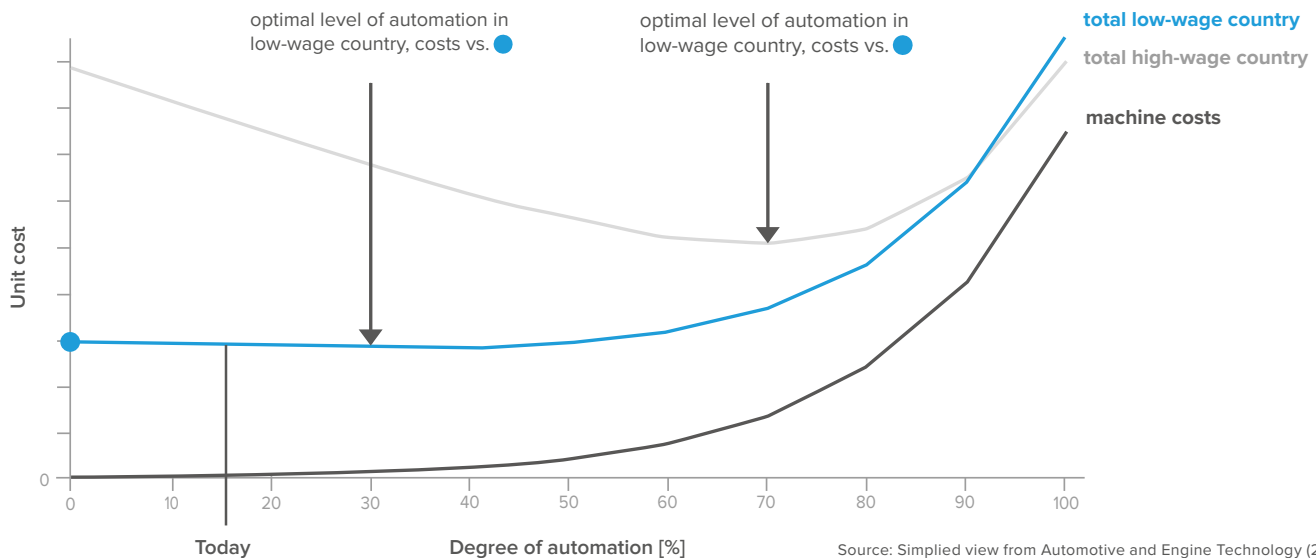
Automation steps	Assistant tape processing	Semi-automated tape processing		Full automated tape processing		
Machine applications	Tape dispensing	Spot taping	Continuous taping	Integrated taping	Robot taping	
Products	 <p>tesa® Standard rolls sleeves</p>	 <p>tesa® Long rolls > 50m</p>	 <p>tesa® Spools > 500m</p>	 <p>tesa® Long rolls > 50m</p>	 <p>tesa® Spools > 500m</p>	 <p>tesa® Routing tape</p>

Summary and outlook

Wire harnesses are the biggest and heaviest bought-in-sub-systems in modern cars. They play a key role in supporting all of the other major trends that are transforming the automotive sector.

Considering increasing labor costs in low-wage countries, the optimal level of automation will increase step by step which is already visible. Forward-looking OEMs and suppliers have started on their path to fully automate their production by re-designing harness architectures and implementing new automation concepts. That is driving progress toward more cost-efficient and reliable wire harnesses.

In close partnership with its customers, tesa® is supporting this transition by providing not only product expertise but also know-how in application processes and automation concepts based on a team of experts in tesa's Customer Solution Centers worldwide.





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