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MANUFACTURING PROCESS FLOW OF VEHICLE (TRUCK) WIRINGHARNESS

Mrs. Shivani Kumari, Student, B.Tech. Mechanical and Automobile Engineering (Evening), School ofmechanical Engineering, Lingayas Vidapeeth, Faridabad, Haryana.

❖ ***Abstract:-***

This paper introduces the process of the vehicle wiring harness. The wiring harnesses in a vehicle used to connect various electrical and electronics components for power supply and communications are bulky and expensive. Wiring Harnesses are a combination of control and communication wires. Reducingthem can reduce the weight and hence the fuel consumption of vehicles.

The process of producing harness wire consists in precise connection of cables with terminals and insulating elements in a way that allows current to flow from one point to another. Th s process may include connecting wires with connectors, soldering, gluing, crimping or using other methods of connecting wires.

❖ ***Introduction:-***

This report describes the manufacture and assembly process for an automotive wiring harness. The main function of a harness is to transmit power to the different components and modules in the automotive. The range of complexity for a wiring harness depends by the quantity of wires and components required for complete its assembly. We will use a medium size harness.

❖ ***What is Wiring Harness?***

A wiring harness is the complete electrical wiring system of a vehicle that connects all electrical and electronic components in the automotive vehicles.

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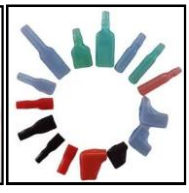


❖ ***Different Types of Wiring Harness:-***

1. Main Wire
2. Engine
3. Tail
4. SCR Dosing
5. Maxi Fuse
6. Dash frame & Front
7. World Truck
8. 5L Engine

❖ ***Manufacturing Process Of Wire Harness:-***

The manufacturing process of wiring harnesses involves several steps to ensure the assembly of high-quality electrical systems. Here's a typical overview of the process:

Design: - Engineers design the wiring harness according to the specifications provided for thevehicle or appliance it will be used in as well as customer requirement.

Material selection: - Selecting appropriate wires, connectors, terminals, and other components based on factors like conductivity, insulation, and durability.

Cutting and stripping: - Cutting wires to specified lengths with the help of wire cutting machine like kodera, AC-90 M/C and stripping the insulation from the ends to expose the conductive material.

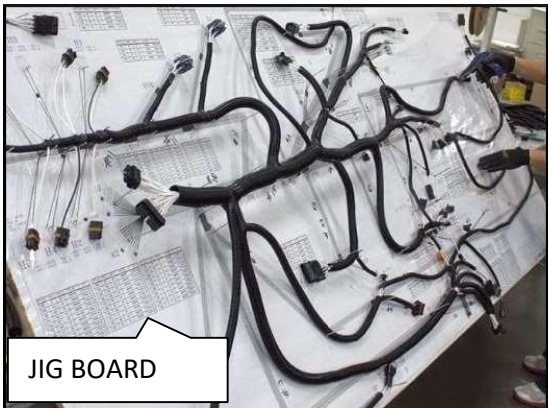
Rubber Seal Insertion:- To insert the rubber seal in the cutting wire for protecting the leakage & Vibration also it's help to eliminating the loosed connection between terminal and wires.

Crimping or soldering: - Attaching terminals or thimble to the stripped ends of wires using crimping tools & Crimping Machine or soldering irons.

Routing and bundling: - Arranging the wires into the desired configuration and bundling them together using tape, zip ties, or plastic conduits.

Sub Assembly Process:- All the cutting wires are assembled in the connector and prepared for sub assembly process.

Main Assembly Process:- The wires are taken from the Sub assembly trolley (Junkan) and go to the assembly stations. And each operator is given 5 assembly or 6 assembly. Harness assembly is an operator dependent process and the goal is to reduce this and increase automation. Here all the components of a wiring harness are assembly to complete the part. the number of assemblies done by the operator for a given product number is called sub assembly. After the completion of sub assembly, the no. of assemblies done on the sub assembly goes for the lay outing on the jig board, insertion is done on the jig board. A rotary assembly line consists of Jig boards, conveyor rotary and off-line equipment. Jig boards are mounted on top of the conveyor rotary chain, which moves the Jig boards in a horizontal flow rotating around the conveyor. The Jig boards is the harness assembly tool and is made of wood or perforate steel to hold the wiring harness during its assembly. It serves as an aid in getting the correct dimensions, orientations and provides ease in taping, coting ,branching .The jigs are individually mounted on a jig car, which are hooked to the rotary conveyor chain.The jig is a board with an overlay sheet pasted on the surface and covered with a plastic protection. The overlay is the drawing representation of the part and indicates position for the jig components such as holding fixtures for connectors and clips, brackets forks and indicators. The jig components assist in holding connectors and circuits, routing bundles, taping and clip presentation. Rotary conveyors consist of 10-foot sections and 2 end sections together with a variable high-speed torque motor. It provides the circular transfer motion of the boards during assembly operations. The rotary is designed for continuous motion at a set speed necessary for the line to catch up with the production schedule. The rotary line is designed to produce a specific number of harnesses per rotation The production output is controlled by the speed of the conveyor. The assembly starts at one point of the rotary (first end), is partially assembly in the different workstations, and is completed as the rotary conveyor is transferring it from one station to another. The harness is taken off in the other end of the rotary when it is complete.



GROMMET:- The harness is fitted with the grommet at selected areas according to the customer requirement .grommet is used for harness protection from the surface preventing harness from mechanical injuries and cutting

Electrical Testing:- After the last operation affecting continuity, all wiring assemblies shall be electrically tested 100%. The electrical test must check for crossed circuits, opens and shorts. The test is conducted sequentially, testing each circuit and each branch of each circuit. This test includes the functionality of electronic components as diodes or relays. Connector's assemblies that use a secondary terminal lock component such a wedge or bar are also tested to verify the presence and correct position of this Secondary lock component. All wire assembly harness is subject to the continuity test. It is required re-testing all positions if any connector fails to have every position successful tested. Once the test is successful complete, the test board provides the operator with a "success signal" and releases the locking mechanism on the fixtures that hold the Connectors.

HARNESS CHECKER

Visual Inspection:- The harness is labeled or specified with stickers to the connectors like for ex. Blinker ,wiper, engine .after labeling the harness it is visualized for the connectors that all has its secondary lock ,caps clip, boots ,dummy seals ,taping. The concern person will strike the harness so that for the identification of harness is complete free from defects.

Dispatch:- The harness is dispatched according to the SO and Purchase order by the customer.

❖ ***Results :-***

The Results from the processes of creating a vehicle wiring harness can vary depending on the simulation and testing methods used during design, manufacturing, and performance analysis. Overall, resulting and simulation tools play a crucial role in the manufacturing of wiring harnesses by facilitating design validation, process optimization, quality assurance, cost reduction, and risk mitigation. By leveraging these tools effectively, manufacturers can produce high-quality wiring harnesses that meet the demands of their customers and industry standard

❖ ***Conclusion :-***

The vehicle wiring harness is a critical component that plays a pivotal role in the proper functioning of automobiles by providing power and control signals to various vehicle systems. Through this research, we have explored the design, manufacturing, materials, and testing processes associated with wiring harnesses, as well as the challenges and solutions that arise in this field.

Modern advancements in technology have paved the way for innovations in wiring harness design, including the use of lightweight and sustainable materials, improved manufacturing techniques, and the integration of smart systems. These advancements not only enhance the efficiency and safety of harnesses but also contribute to the overall performance of vehicles.

Despite the progress made, challenges such as electromagnetic interference and space constraints remain areas that require ongoing attention and development. Future research should focus on addressing these challenges through novel materials and innovative design strategies.

As the automotive industry continues to evolve towards electric and autonomous vehicles, the importance of high-quality and reliable wiring harnesses will only increase. Collaborative efforts between researchers, manufacturers, and industry experts will be essential in shaping the future of wiring harness technology.

In conclusion, the vehicle wiring harness process is an ever-evolving field that holds significant potential for further advancements. Continued research and development in this area will lead to more efficient, safe, and sustainable vehicles, ultimately benefiting both the industry and consumers alike.

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