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WELDING SHOPS IN AUTOMOBILE PRODUCTION UZ AUTO: REVIEW, TECHNOLOGIES, CHALLENGES AND PROSPECTS

Jurayev Abdullajon Ibragimovich
Teacher Andijan State Technical Institute
E-mail: Uzdy_003@mail.ru,
ORSID 0009-0003-7334-5835

Abstract:
This review focuses on welding workshops in Uz Auto vehicle body production, which play a key role in ensuring the strength, safety, and durability of vehicles. The work examines various aspects, from the history and evolution of welding technologies used in automotive manufacturing to modern methods used in modern production processes. Robotic welding systems, their advantages, and challenges related to integration and maintenance are examined in detail. Special attention is paid to the quality of welded joints, quality control methods, and non-destructive testing used to detect defects.

Keywords: Welding, automotive, robotic welding, spot welding, arc welding, laser welding, friction welding with stirring, quality control, non-destructive testing, steel, automation

Introduction

The automotive industry is one of the largest sectors of the global economy, and welding plays a fundamental role in it. Every car, from a small city hatchback to a luxury SUV, consists of thousands of welded joints that ensure its structural integrity, safety, and durability. Welding workshops are the heart of production areas where the assembly of bodies, frames, chassis, and other key components of vehicles takes place. Continuous development of welding technologies, materials, and quality control methods is crucial for meeting the growing demands

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for vehicle safety, weight reduction, increased productivity, and reduced environmental impact.

Historical Context

The history of welding in the automotive industry is a history of continuous progress. At the beginning of the industry's development, cars were assembled mainly using bolts, rivets, and other mechanical connections. With the advent of steel and the development of welding technologies, welding quickly became the dominant method for joining metal parts. The first widely used methods were gas welding and arc welding with coated electrodes. These methods required highly skilled welders and were relatively slow.

During the 90s, the automotive industry in Uzbekistan was established due to the development of welding technologies. Mainly in car body welding, spot welding plays a crucial role. Invented at the beginning of the 20th century, spot welding became the cornerstone of mass car production, ensuring high assembly speed and reliable, strong joints. The development of automated welding lines and robotic systems has brought real improvements to UzAuto's automotive industry, significantly increasing productivity, reducing labor costs, and improving welding quality.

Uz-DaewooAuto produced cars under the Uz-Daewoo

Due to a change in name and owner, the model range has changed, although the company continued to produce cars under the Uz-Daewoo brand until 2015. Some models created on their basis are still sold as Chevrolet.GM Uzbekistan began production on November 27, 2008. The first car assembled on this day was the Chevrolet Lacetti, which also became the 1,000,000th car assembled at the UzAvtosanoat plant. Chevrolet manufactured Chevrolet Spark M300 in Asaka, a model currently only intended for export.

During the 90s, the automotive industry in Uzbekistan was established due to the development of welding technologies. Spot welding, invented at the beginning of the 20th century, became the cornerstone of mass production of automobiles, ensuring high assembly speed and reliable, strong joints. The development of automated welding lines and robotic systems has brought real improvements to

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Importance of welding in UzAuto welding shops

Currently, welding is an integral part of the automobile manufacturing process. It is used to connect practically all metal components of the body produced, frames, chassis, and other important subsystems. Body welding ensures:

- Strength and safety: Welded joints provide high strength and resistance to loads, which is necessary to ensure passenger safety in case of collision.
- Body rigidity: Welding creates a rigid body structure that improves vehicle control and reduces vibration.
- Weight reduction: Modern welding technologies allow for the creation of lightweight and durable structures, which contributes to fuel consumption and emission reduction.
- Aesthetics: High-quality welding allows for the creation of smooth and aesthetically pleasing body surfaces.
- Production efficiency: Automated welding processes optimize production cycles and reduce costs.

Types of welding used in automotive manufacturing

In the automotive industry, a wide range of welding technologies is used, each of which has its advantages and disadvantages depending on the specific requirements for application, materials, and production volumes.

Resistance Spot Welding (RSW)

Spot welding is the most common welding method in automobile manufacturing, especially for joining steel body parts. This method utilizes the heat generated by the resistance of the electric current passing through two metal parts pressed against each other by electrodes. As a result, a strong connection is formed at a specific point of contact.

- Benefits:
- High speed and efficiency of production.
- Suitable for mass production.
- Welding is performed on both sides of the part, which prevents deformation.

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- It's easy to automate.
- Disadvantages:
- Limited joint strength compared to other welding methods.
The thickness of the welded parts is limited.
Corrosion is possible in the welding area.
- Requires precise control of welding parameters.
Arc welding - AW
Arc welding involves using an electric arc to melt the metal in the welding area. There are several types of arc welding used in the automotive industry:
Arc welding with a melting electrode in a protective gas environment (Gas Metal Arc Welding - GMAW/MIG/MAG)
- This method uses a melting electrode, which is supplied to the welding zone through a burner, and a protective gas (argon, helium, or carbon dioxide), which protects the molten metal from oxidation.
- Benefits:
- High productivity.
- Universality for various materials.
- Good seam quality.
- Suitable for automation.
- Disadvantages:
- Requires highly skilled welders to achieve optimal seam quality.
- Slag formation is possible.
- It requires protection from wind and draft.
Arc welding with a tungsten electrode in a protective gas environment (Gas Tungsten Arc Welding - GTAW/TIG)
- In this method, a non-melting tungsten electrode is used, and a protective gas (argon, helium) is used to protect the molten metal. The additive metal is supplied manually or automatically.
- Benefits:
- High quality of seam.
- Precise control of welding parameters.
- Suitable for welding thin materials and various metals.
- Disadvantages:

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- Lower performance compared to GMAW.
- It requires highly qualified welders.
- Higher cost of equipment.

Laser welding (LW)

Laser welding uses a focused laser beam to melt the metal in the welding area. It has high accuracy, speed, and provides high quality of welded joints.

- Benefits:
- High welding speed.
- Small zone of thermal influence.
- High seam strength.
- The possibility of welding hard-to-reach places.
- Suitable for welding various materials.
- Disadvantages:
- High cost of equipment.
- Requires high qualification of operators.
- It is necessary to take measures to protect against laser radiation.

Conclusion

Welding workshops play a vital role in automobile manufacturing, ensuring the strength, safety, and durability of vehicles. Continuous development of welding technologies, materials, and quality control methods is crucial for meeting the growing requirements for safety, weight reduction, increased productivity, and reduced environmental impact. Modern trends such as laser welding, mixing friction welding, automation, and digitalization are opening up new opportunities to improve welding efficiency and quality.

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