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Overview of Suzuki's sv650

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1 Introduction

Aim 1.1

This technical report aims to provide a comprehensive overview of the Suzuki SV 650 , a popular middleweight motorcycle, that has been in production since 1999 in this report I will look into how the motorcycle has changed over the years and models . The report will cover various aspects of the motorcycle's design and performance, including its materials, manufacturing process, aerodynamics, emissions, control systems, and engine design.

Objective 1.2

Overall, the objective of this technical report is to provide understanding of the Suzuki SV 650's design and performance, with a focus on the technical details that make it a popular choice among motorcycle enthusiasts.

2 Materials

The materials used in the construction of the SV650 are carefully selected to provide the necessary strength, durability, and performance required for a high-performance motorcycle.

The frame of the SV650 is made from aluminium. aluminium is a lightweight and strong material that provides excellent rigidity and structural integrity. The alloy used in the frame construction are chosen to meet specific requirements for strength, weight, and corrosion resistance. (Suzuki 2023)

The engine block of the SV650 is typically made from aluminium this is an excellent material for engine blocks due to its high strength-to-weight ratio, good thermal conductivity, and corrosion resistance. (Suzuki 2023). The wheels are also made from aluminium for the same reasons as the engine as the strength to weight ratio is ideal for a motorcycle.

The fairings of the SV650 are typically made from plastic materials such as ABS (acrylonitrile butadiene styrene) or polycarbonate. These materials are chosen for their excellent impact resistance, flexibility, durability, and ability to be easily moulded into complex shapes.

3 Engine design

The Suzuki SV650 is equipped with a liquid-cooled, four-stroke, 90-degree V-twin engine. The engine has a displacement of 645cc and is paired with a six-speed transmission system. The V-twin engine configuration provides a balance of power and torque, allowing for quick acceleration and high-speed cruising. (Suzuki 2023)

The engine of the Suzuki SV650 has undergone significant changes throughout its various generations. In the first generation, the engine featured a 90-degree V-twin design with a DOHC (double overhead camshaft) setup. This engine is capable of producing 69 horsepower updated fuel injection system from carburettors and changing the shafts and valves the camshaft profiles and valve lift, a 10% increase in crankshaft inertia' (Suzuki 2023) resulting in an output of 73 horsepower and 47lb-ft of torque, as well as dual spark technology, which improved ignition performance and enhanced combustion efficiency. (Suzuki 2023)

Overall, the engine design of the Suzuki SV650 has undergone significant improvements over the years, resulting in better performance, increased fuel efficiency, and reduced emissions.

4 Aerodynamics

The aerodynamics of the Suzuki SV650 play a crucial role in determining its top speed and overall performance. The naked bike and full fairing versions of the SV650 differ significantly in their aerodynamic design, resulting in different top speeds.

The naked bike version of the SV650 has minimal bodywork, resulting in a relatively high drag coefficient. The high drag coefficient reduces the motorcycle's top speed by increasing the air resistance and slowing down the motorcycle.

In contrast, the full fairing version of the SV650 is designed with a streamlined fairing that reduces the drag coefficient and improves the motorcycle's top speed. The fairing's design reduces air resistance and creates a smooth airflow around the motorcycle.

The differences in aerodynamics between the naked bike and full fairing versions of the SV650 result in significant differences in top speed. The naked bike version of the SV650 has a top speed of around 124 mph (Suzuki 2023), while the full fairing version can reach speeds of up to 135 mph. (Suzuki 2023)

Other factors such as rider position and riding conditions can also affect the motorcycle's aerodynamics and top speed due to the effect it can have on primarily frontal area and secondly drag coefficient as the formula is – $F_D = \frac{1}{2} \rho v^2 C_D A$ if either of these are increase so is the drag

Overall, the aerodynamics of the Suzuki SV650 are critical in determining its performance and top speed. The streamlined design of the full fairing version of the motorcycle significantly improves its aerodynamics, resulting in a higher top speed than the naked bike version.

5 Emissions

Emissions regulations play a significant role in the development of modern motorcycles, and the Suzuki SV650 is no exception. The Euro 4 emissions standards, introduced in 2016, have had a significant impact on the SV650's engine design, fuelling, and overall performance.

'Under Euro 4, a motorcycle could emit no more than 1140 mg/km of carbon monoxide. The limit for nitrogen oxide is 60 mg/km, and a new measure of a maximum of 68 mg/km of non-methane hydrocarbons has been introduced for the first time with Euro 5.' (Honda 2023)

The Euro 4 standards set strict limits on emissions of pollutants such as nitrogen oxides, carbon monoxide, and hydrocarbons. (European union 2023) To meet these regulations, Suzuki redesigned the SV650's engine and exhaust system, resulting in a cleaner-burning engine with reduced emissions.

The SV650 also received a revised fuel injection system to meet Euro 4 standards. The fuel injection system was adjusted to provide more precise fuel delivery, resulting in better combustion efficiency and reduced emissions. Suzuki also introduced a twin-spark ignition system on the SV650. This system uses two spark plugs per cylinder instead of the traditional single spark plug. The twin-spark ignition system allows for more efficient combustion of the air-fuel mixture, which reduces emissions and improves fuel efficiency. (American Chemical Society2022)

Looking to the future, it's likely that emissions regulations will become even stricter, leading to further changes in motorcycle design and fuelling. One potential solution to reducing emissions further is the increased use of alternative fuels, such as ethanol or hydrogen. Additionally, Suzuki's newest model has demonstrated a reduction of two decibels in its maximum noise level, which suggests the addition of soundproofing, possibly due to the use of a larger catalytic converter required to meet Euro 5 emission standards. The most recent emissions regulations, and it seems that the focus of these updates is primarily on the exhaust system and the engine's tuning.

6 Control systems and data

The sv650 is equipped with a variety of sensors that collect data on everything from engine temperature to wheel speed. This data can be used to monitor the motorcycle's performance, identify potential problems, and adjust optimize performance.

One example of a control system on the SV650 is the Dual Throttle Valve system. This system uses two throttle valves to improve throttle response and provide smoother power delivery (Kawasaki 2023). Another example is the Suzuki Easy Start System, which makes it easier to start the motorcycle by automatically adjusting the ignition timing and fuel injection.

Data analysis on the SV650 can be performed using various aftermarket tools such as diagnostic software and data loggers, for example 2D logger. These tools allow technicians to monitor various performance metrics and identify potential problems before they become serious. For example, data analysis can be used to monitor engine temperature and identify potential overheating issues before they cause damage. (2D 2023)

Control systems and data analysis are crucial components of the Suzuki SV650's performance and safety. These systems work together to provide a smooth and responsive riding experience while also ensuring that the motorcycle is operating at peak performance. By leveraging the latest technology, riders and technicians can optimize the performance of the SV650 and keep it running smoothly for years to come.

7 Manufacturing processes

The manufacturing process for the SV650 is a complex and precise process that involves various manufacturing technologies and techniques.

The frame of the SV650 is made from aluminium. The second-generation SV650 introduced a new pressure-cast aluminium frame that was even lighter and stronger than the aluminium tubular frame used in the first generation. The new frame was designed to be even stiffer than the previous frame, which helped to further improve the bike's handling and performance. The new frame was also designed to be more aesthetically pleasing than the previous frame, with cleaner lines and a more modern appearance. The move from the aluminium tubular frame in the first generation to the pressure-cast aluminium frame in the second generation was a significant improvement for the SV650. The extrusion process involves pushing the aluminium through a die to create a desired cross-sectional shape. This process is used to create the frame's main beams, which are then welded together to form the final frame. (Suzuki 2023)

The engine of the SV650 is typically made using a combination of casting and machining processes. The engine block is typically cast using a sand casting or die casting process. In the sand-casting process, a mould is created using sand, and molten metal is poured into the mould to create the engine block. In the die casting process, a mould is created using metal, and molten metal is injected into the mould to create the engine block. Once the engine block is cast, it is machined to precise tolerances using a combination of CNC milling and turning processes.

The wheels of the SV650 are typically made using a combination of casting and machining processes. The wheel rims are typically cast using a low-pressure casting process, which involves injecting molten aluminium into a mould under low pressure. Once the rims are cast, they are machined to precise tolerances using a combination of CNC milling and turning processes. The spokes and hubs of the wheels are typically made using forging or machining processes. (Blackburn Wheels 2020)

These manufacturing processes are carefully controlled and monitored to ensure that each component is created to precise tolerances and meets strict quality standards. The use of advanced manufacturing technologies and techniques ensures that each SV650 is a high-quality and reliable motorcycle.

8 Conclusion

In conclusion, the Suzuki SV650 is a highly regarded motorcycle model that has undergone significant changes and improvements throughout its production history. The SV650's design, materials, aerodynamics, engine, and manufacturing processes are carefully crafted and optimized to provide riders with an enjoyable, reliable, and efficient experience.

The SV650's innovative design features a sleek and lightweight frame that contributes to the bike's agility and manoeuvrability. Its aerodynamics have been carefully crafted to reduce wind resistance and improve performance. The engine of the SV650 is designed for maximum power, efficiency, and compliance with emissions standards.

In summary, the Suzuki SV650 is a motorcycle that has earned its place in the hearts of riders around the world. It is a testament to the power of innovation, precision engineering, and a commitment to excellence in design, manufacturing, and performance.

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