

NEW ECOSYSTEM: GREEN TRANSFORMATION IN AUTOMOTIVE INDUSTRY

YAMAS continues “**Green Transformation in Automotive Sector Product-Dev. Project**”, which is supported by the T.C. Ministry of Industry and Trade and carried out by Uludağ Automotive Exporters’ Association (UIB). Aims of the project are to raise awareness of the new regulations, which will be introduced by the European Green Deal, to prepare companies for the Emissions Trading System and to adapt the circular economy through corporate sustainability studies.

With the European Green Deal, the European Union aims to make Europe the world’s first climate neutral continent by 2050. The “**Green Transformation Product-Dev. Project**”, a 3-year project carried out with the participation of 18 companies, also operates within this scope. While EU countries import and we export to EU countries, this obligation cannot be ignored.



AS YAMAS our activities completed in “**Green Transformation Product-Dev. Project**”, which is also a part of our 2023 strategy studies;

- Website Design
- Sustainable Finance Education
- ISO 14064-1 Carbon Footprint Calculation



- For the cluster formed by the companies involved in the Green Transformation Product-Dev. project; “**corporate identity creation (logo&slogan), website designs, catalogue, brochure publication**” were completed. January-May 2023.

www.ecofriendlyautomotivecluster.com

- “**Sustainable Finance Training**” was held. April 2023 Our Finance Department participated in the training given within the scope of “Developments in the world and

sustainability, Impact of EU legislation on financial management, determining sustainability goals in financial management, Sustainable profitability, Methods of finding resources and evaluation of resources”.

- **ISO 14064-1 Carbon Footprint Calculation Consultancy (for 2021)**

This project, which is an important part of the “**Green Transformation Product-Dev. Project**”, was carried out within the scope of the Consultancy and was completed between January-June 2023.

Following the completion of the “Data Collection Set”, the “Carbon Footprint data set was supported by review meetings”, culminating in a Yamas field visit by the consultant firm.



In accordance with ISO 14064-1:2018 standard, “Greenhouse Gas Inventory Report” was published and “**Yamas Unit Carbon Footprint**” was calculated in 2 different categories depending on the production amount and surface area of Yamas. Short-, medium- and long-term improvement actions have been reported by the consultant company to improve the carbon footprint.



Ongoing Projects:

- Training on State Grant Supports and Access to Funding Sources
- ISO 50001 Energy Management System Consultancy and Energy Audit Study
- Corporate Sustainability Reporting (GRI) Consultancy
- ISO 14064-1 Carbon Footprint Calculation Consultancy (2. study)

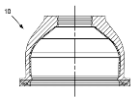
LITERATURE: COMPETITOR RESEARCH, LITERATURE REVIEW

In the study **Thermal Conductivity of Silicon Carbide and Magnetite Filled Polyamide 6 Composites (1)** published in August 2023, the thermal conductivity effect of silicon carbide and magnetite additive polyamide 6 composite materials was investigated.

Today, the need for polymer composites is increasing rapidly. Particularly, there is a notable interest in materials with higher thermal and electrical conductivity, such as heat sinks, new applications in radio frequency interference shielding or in electronic packaging. But as it is known, polymers are heat and electrical insulator materials. In order to overcome this disadvantage, highly conductive additives such as silicon carbide (SiC) which at the same time has a high impact resistance property can be used. Furthermore, other properties such as X-radiation absorption or electromagnetic shielding properties can also be improved using various fillers such as magnetite (Fe₃O₄) which is a hard material presenting at the same time a high thermal conductivity.

In this work, SiC and Fe₃O₄ filled polyamide 6 (PA6) hybrid composites were prepared in order to enhance the thermal conductivity of PA6. In this aim, PA6/SiC/Fe₃O₄ were prepared at different filler content at 1:1 filler ratio by extrusion method and compression molding to detect the optimum additive amount. All prepared composites were characterized through a thermal conductivity analyzer and a scanning electron microscope (SEM). From the results, an increase by 39% of the thermal conductivity was observed for 20 wt.% reinforced PA6/SiC/Fe₃O₄ composite representing the higher filler amount in this work.

Samples	k (W/m.K)	Standard Deviation
PA6	0.46	0.0016
PA6/SiC/Fe ₃ O ₄ _5	0.50	0.0018
PA6/SiC/Fe ₃ O ₄ _10	0.55	0.0036
PA6/SiC/Fe ₃ O ₄ _20	0.64	0.0016

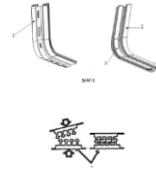


TEKNOROT applied to TURKPATENT in 2022 with its invention titled **A BLOWER STRUCTURE WITH INCREASED DURABILITY FOR USE IN VEHICLES (2)**.

According to patent application no. 2022/016815, the invention discloses a bellows consisting of at least 2 shell layers and characterized by each Shell being made of a different material.

In 2023, **OSKIM** applied to TURKPATENT with its invention titled **BUSHING TESTING SYSTEM (3)**. According to the patent application numbered 2023/004525, the invention is a complex system containing a torque sensor that enables the

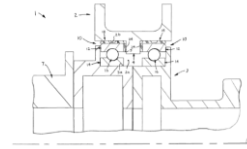
force transmission of the motion transmission elements within each other for dynamic and continuous testing of the bushings used in suspension systems in more than one axis with minimum loss.



MERCEDES-BENZ TÜRK ANONİM ŞİRKETİ applied to TURKPATENT in 2021 with the invention titled **NEW GENERATION RUBBER CONCEPT FOR FUEL TANK SYSTEM IN COMMERCIAL VEHICLES (4)**. According to the patent application numbered

2021/016440, the invention relates to a new generation rubber concept for the fuel tank system in commercial vehicles, which is used to prevent the console rubber sliding error caused by more acceleration in the z direction in vehicles by handling the console assembly used to fix the fuel tank.

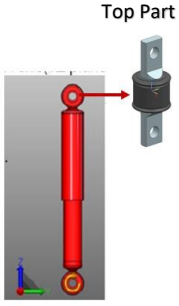
SKF applied to ESPACENET in 2021 with its invention named **VIBRATION DAMPENING FOR SCANNER BEARING (5)**. The invention, patent application no. US11649859B1, aims to optimize vibration reduction with annular dampers with 2 different thicknesses.



Bibliography

- 1-) https://tr.masjournal.co.uk/files/ugd/614b1f_81cd0c292bee460787147ba73c4c6ef5.pdf
- 2-) <https://www.turkpatent.gov.tr/arastirma-yap?form=patent¶ms=%257B%2522applicationOwner%2522%253A%2522erdem%2520kaya%2522%252C%2522inventionOwner%2522%253A%2522murat%2520arslano%25C4%259Flu%2522%257D&run=true>
- 3-) <https://worldwide.espacenet.com/patent/search/family/086333872/publication/US11649859B1?q=pn%3DUS11649859B1>
- 4) <https://portal.turkpatent.gov.tr/anonim/arastirma/patent/sonuc/dosya?patentAppNo=2023/004525&documentsType=all>
- 5-) <https://portal.turkpatent.gov.tr/anonim/arastirma/patent/sonuc/dosya?patentAppNo=2021/016440&documentsType=all>

R&D ACTIVITIES: Y23021-00 TEST ACTIVITIES



Y23021-00 is an OEM project of Arrival.



Durability Test Rig production stage



Durability Test Rig

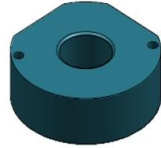
Third phase: It's planned to carry out the tests of the sample's products according to the design verification plan in internal and external sources.

The design verification plan of project includes Static (Radial, Axial, Cardanic, Torsional), Fastening-Detachment, Nonbonding Crushing (internal metal strength), Corrosion, Life tests.

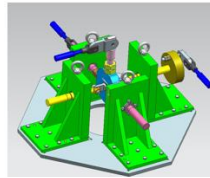
The apparatus required for the realization of the test studies, the devices to be used and the services to be outsourced have been determined.

Based on the discussions with the customer and the design verification plan, testing of the manufactured samples was carried out. The results of the tests were evaluated and shared with the customer.

First phase: Design studies were carried out as the apparatus to be used in the test studies were not available in our inventory. It was designed specifically for internal metal strength, fastening and life test. In addition, material selection and technical prepared after the analysis verification of the life test apparatus.



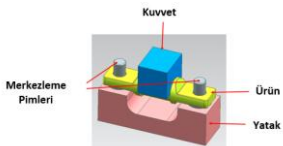
Static Test Apparatus



Durability Test Rig

made by Tooling Department. An evaluation meeting was held as a results of the life test apparatus. As

Second phase: Static test, internal metal strength and fastening apparatus were

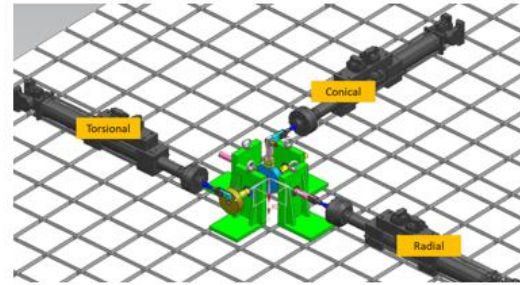


Internal Metal Strength



Assy. App.

the project team, manufacturability, design improvement and production process were discussed at the meeting.



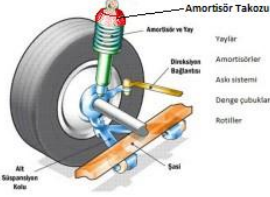
Durability Test Apparatus Layout

Company	Test Type	Test Machine
YAMAS	Static Test	Zwick Roell
	Push-Out Test	
	Non-Adhesion Test	Breaker Test Machine
External Source	Internal Metal Strength Test	Zwick Roell
External Source	Durability Test	-
External Source	Corrosion Test	-

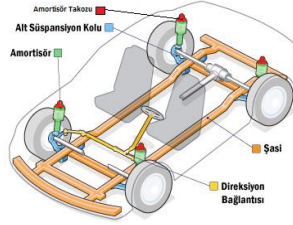
Forth phase: The planned internal and external tests were completed and the test results were reported. Three samples were sent for assembly trials. According to the feedback, life test and corrosion test will be carried out.

CURRENT WORKS: STRUT MOUNT

In vehicle, shock absorbers are an important part used to improve ride comfort by damping road waves, potholes and bumps. This part of the vehicle helps the driver and passengers to have a comfortable driving experience, while also extending the life of the tires. The shock absorber mount is an important part that helps support this part.



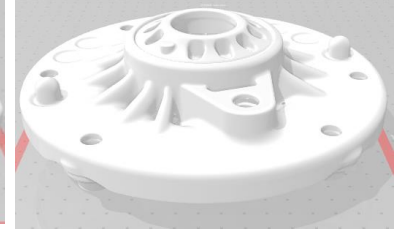
The shock absorber mount is used to fix the shock absorber to the body of the vehicle and is usually made of rubber or plastic material. The shock absorber mount allows the shock absorber to work effectively and absorbs vibrations that may occur during movement. This part connects the shock absorber to the chassis of the vehicle and absorbs vibrations, preventing the vehicle from shaking during the journey and providing driving comfort for passengers.



In short, the shock absorber mount is the connection between the shock absorber and the chassis. It serves as a mounting point for the upper part of the vehicle's strut assemblies to connect to the vehicle's chassis. It supports the vehicle weight, guides the spring support and prevents vibrations and noises from entering the chassis.

Our goal is to increase the variety of shock absorber mounts within YAMAS, to be the solution partner of OE companies in production and to be one of the most preferred companies in Europe after sales (aftermarket).

Examples of new projects to be included in the project plan;



As Yamas R&D department, we carried out many shock absorber mount feasibility studies with our partner MEYLE in the first half of 2023.

In our 2024 project strategic plan, we have placed the shock absorber chocks, for which we received nominations, on our project calendar.

Starting next year, with new projects, we believe that improving our product portfolio related to shock absorber mounts and increasing our knowledge level in the short and long term will make a significant contribution to Yamas.

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