

Recycling Car Tires with the Help of 3D

What actually happens to car tires that need to be disposed of? In Europe alone, around 3.4 million tons of used tires accumulate every year. The Bavarian company TireTech recently developed a tire inspection system in combination with 3D sensor technology from AT to check the condition of tires and recycle them.

From Nina Claaßen

There are currently around 49 million cars registered in Germany, all of which require new tires at regular intervals. This leaves around 600,000 tons of used tires per year, and this figure rises to 3.4 million tons across Europe. However, as the disposal of used tires is associated with some costs and not every used tire actually has to be disposed of directly, the company TireTech GmbH from Friedberg in Bavaria, together with the component manufacturer AT - Automation Technology GmbH and the system integrator aku.automation GmbH, has developed a very special tire inspection system at great expense. The goal: With the help of this system, the customer can decide whether the tire can be recycled for automotive use or whether it is processed into granulate, which is then used for the production of new tires. The benefits: The customer can process used tires sustainably, does not bear any costs for tire waste and, thanks to the innovative reuse of the rubber material, also makes an effective contribution to reducing the environmental impact.

Inspection system requires 10 seconds for classification

But how exactly does the tire inspection system work? The machine takes around ten seconds to inspect each tire, which is guided to the center of the system by a conveyor belt and positioned horizontally for the scanning process. Three modular 3D 2040 compact sensors from the new C6 series from the North German technology company AT - Automation Technology then scan the rotating tire using the laser triangulation method. This gives the customer a complete overview of the condition of the object by providing precise data in the form of a 3D point cloud on features such as the depth of the tread, the contour of the tire and its height, shape and volume. And based on precisely these characteristics, it is also possible to classify the tire according to manufacturer, summer/winter tire, tire size (width, cross-section, diameter), DOT identification, ContiSeal + ContiSilent and original equipment identification (AO,MO,TO,NO,AR,MOE).

Modular sensor principle from AT Sensors enables optimum application customization

"We were recommended the sensors by AT and were immediately impressed by the modular principle of the product range. We were able to configure the sensors exactly to our requirements like a modular system and thus, for example, put together both the triangulation angle and the required laser power ourselves. We were also impressed by the 2040-3D sensors due to their large field of view and their accuracy," explains Marcel Staudinger, developer and sales manager at TireTech. AT's Senior Sales Manager Armin Jehle adds: "With the modular 3D compact sensors, AT - Automation Technology overcomes for the first time the problem that triangulation sensors have always been associated with high NRE costs and long development times due to the resolution, speed and flexibility requirements in terms of sensor configuration. Based on the MCS concept, AT can supply the optimally tailored sensor for every application as an individual solution with the reliability of a series product - without additional costs for customer-specific developments, without minimum order quantities and without long delivery times."

Image processing software from aku.automation GmbH rounds off the application

The data is then evaluated by the aku.automation image processing software called aku.visionManager® using AI-supported deep learning algorithms that have been trained in advance on the basis of thousands of tire images. Incidentally, the aku.visionManager® can be connected to the hardware without much programming effort thanks to the GenICam standard interfaces of the AT sensors. "When we produced the first prototype of this system together in 2019, the only option for us was to work with AT products. We have been working together for years and are aware of both the reliability of the sensors and their longevity," reports Christian Merten, Key Account Manager at aku.automation. Just like the AT sensors, the image processing software from aku.automation is also tailor-made and enables the tire inspection system to identify and classify a large number of features on the tire thanks to its large image database. Furthermore, the aku.visionManager® includes numerous statistics modules so that the customer can keep himself constantly informed about the efficiency of his tire inspection by means of daily and monthly reports.

Petrol station visit led to development idea

Incidentally, the idea for the development of the tire inspection system was born in 2019 when the current CEO and founder of TireTech, Bernhard Brain, observed the disposal of tires at a petrol station. After discovering that manual tire disposal takes an average of two minutes per tire, the mechanical engineer, together with his business partner and co-founder Karl Staudinger, came up with a visionary approach to significantly optimize this obviously inefficient process with the help of a tire inspection system. "My father spent years developing machines and special systems for the automotive industry and I was able to contribute my expertise from my mechanical engineering studies. So we complemented each other perfectly," says Marcel Staudinger, who is now working on this project together with a team of ten.

Tire classification was one of the biggest hurdles

However, reading alphanumeric information and the wide variety of tires posed a particular challenge during development. Many tire manufacturers always place the tire information, such as the DOT number, in different places on the tire, so that the tire inspection had to be flexible. In addition, another time-consuming task in advance was to build up a comprehensive database for all tire classifications to be tested in order to be able to determine the final object in as much detail as possible. In addition to profile, size and brand, TireTech can also assess, for example, whether the tire has a reinforced sidewall or whether its rubber contains a specific adhesive. If the latter is the case, the tire must not be further processed into granulate, as the adhesive could interfere with the shredding shears and cause a fire hazard.

Mobile inspection system already in planning

So far, TireTech has already delivered three systems in Germany and the Netherlands, with a further five planned for 2023. A compact inspection station with AI support is planned next, which is aimed at smaller businesses such as garages or tire dealers and is set to be launched on the market by the end of this year.