CASE STUDY

ROBOTS ON THE MOVE

OPTIMIZING THE WORLD'S FIRST ROBOTIC CAR STORAGE SERVICE

Background Information

The vehicle logistics industry is an unrecognized but major sector within the transportation sector. It consists of the logistical flux of either new or old cars that go from manufacturing plants and storage platforms to vehicle dealers and other handlers by means of trucks, trains, and boats.

To meet the automotive industry's requirements, car storage compounds are expected to accept, move, store, and retrieve cars in the most efficient ways possible. The companies that run these compounds employ people to move cars rapidly and demand a fast pace so they can meet customer demands and reduce the space needed by storage without reducing retrieval efficiency. This is repetitive work for employees, and many companies have wondered if they could develop an algorithm that could power autonomous robots to do this work faster and more efficiently.

About the Customer

Stanley Robotics is a deep tech company founded in 2015 by Clement Boussard and Aurélien Cord. Their original idea was to move cars via an intelligent robot instead of automating the cars and give them the ability to park themselves. Indeed, even as more new cars today have automated parking features, there are still plenty of older cars that don't, and it will likely be decades before automated parking is the industry norm. In the meantime, this gives autonomous valet robots a niche to address these challenges.

After analyzing the market for long-duration parking in airports, Stanley Robotics realized its product was perfect for the car logistics industry. Their outdoor robots can move cars up to 2600kg and deposit them to their parking slot with the help of a central intelligence hub that manages the fleet, cars, and parking activities.

REDUCED MECHANICAL PART MASS BY UP TO

30% ▼

REDUCED MECHANICAL PART COST BY UP TO

20% ▼

ENSURED

10-YEAR

SERVICE LIFE STANDARD

Their Challenge

To meet the demands of the car logistics industry, the robot must be fast, reliable, and efficient. Until recently, these robots weren't designed with much consideration for mechanical optimization. To compete with the car logistics companies, it was vital for Stanley Robotics to demonstrate that its robot is designed to fit their market. For example, the company must prove that its robotic vehicle can achieve a considerable amount of moves per year. That's why it's important to perform the mechanical sizing of the robot and calculate its durability.

To show clients that their product is reliable and durable, Stanley Robotics needed a partner who could accompany them to develop two objectives within a tight schedule. One was a digital twin of their robot, intended to calculate all the demands placed upon it. The other was a way to validate their product through durability calculations. Altair proposed a variety of solutions for mechanical simulation software, including Altair® Inspire™, which allows users to make rapid calculations without sacrificing precision. These capabilities, along with Altair's long history of providing excellent support, a licensing business model designed for startups, and Altair's reputation, encouraged Stanley Robotics to choose Altair as its engineering simulation software supplier.

Our Solution

Stanley Robotics used Inspire Motion to enable the robot multi-body model to be used for pre-sizing. The model was completed with Altair® MotionSolve® to enable advanced functions, including performing 3D road definition, longitudinal and lateral tire forces (to simulate handling and durability) and dedicated simulation scenarios (for simulating durability events at constant speeds, during braking or acceleration, and either in a straight line or in turns).

> **"Previously, we tended to be conservative. Now, by using Altair's technology, we understand much better and earlier how our robotic vehicles will behave, and we have been able to increase the speed of our robots without fear of shortening their lifespan."**
>
> Mathieu Lips, vice president of engineering, Stanley Robotics

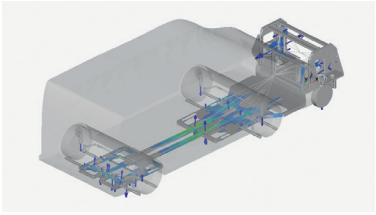
The Stanley team refined the model by representing key components as flexible bodies to capture the deformations and vibrations of the robot's chassis when exposed to standardized vehicle durability events. With the loads these key components experienced under realistic operating conditions the Stanley engineers determined the fatigue life of the robotic vehicle. With the complete CAE process in place, it is now possible to investigate the robot's sensitivity and robustness, and to identify optimal design characteristics.

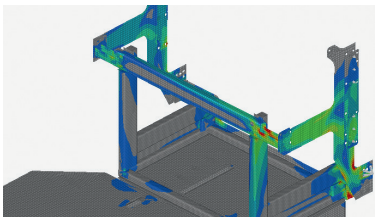
Results

Altair has enabled Stanley Robotics to achieve its two key objectives. In less than a year, Stanley Robotics developed a digital twin that allows it to understand its product better, while also slashing computation time. Leveraging this digital twin and Altair's solutions will allow Stanley Robotics to validate its robotic vehicle's parts and systems quicker, and more efficiently.

Stanley now uses this virtual validation process to design its robotic vehicle so it has less mass and lower production and maintenance costs. Moreover, it allows their designers to innovate since designers know this process will flag flaws and suggest remedies in new designs. As such, they can try new, experimental design characteristics while ensuring all robots meet durability standards. As a result, Altair's solutions allow Stanley Robotics to meet and exceed the expectations of the car logistics industry.

To learn more about MotionSolve, please visit altair.com/motionsolve-applications





TOP: Accurate vehicle load calculations obtained from an Altair® MotionSolve® multibody system model **BOTTOM:** Stresses on parts are easily visualized with MotionSolve, using flexible bodies and vehicle loads