



Konrad Technologies Recognized for

2021

Product Leadership

Global Hardware-in-the-loop Test
Solutions for Automotive Industry

Excellence in Best Practices

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Konrad Technologies excels in many of the criteria in hardware-in-the-loop test solutions in the global automotive industry.

AWARD CRITERIA	
<i>Product Portfolio Attributes</i>	<i>Business Impact</i>
Match to Needs	Financial Performance
Reliability and Quality	Customer Acquisition
Product/Service Value	Operational Efficiency
Positioning	Growth Potential
Design	Human Capital

Match to Needs and Reliability

According to Frost & Sullivan, 40.8 million vehicles with advanced driver-assistance systems (ADAS) capability were shipped globally in 2019. This number of vehicles with ADAS capability is expected to grow at a compound annual growth rate (CAGR) of 9.1% from 2019 to 2030, reaching an expected unit shipment of 106.6 million by 2030. While most vehicles shipped in 2019 were levels 1 and 2

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As vehicles begin to enter autonomy levels higher than 2, they will require an innovative software intelligence platform, the electronic control unit (ECU), that can integrate the different levels of stimuli received from the sensors and then leverage the stimuli to steer the vehicle successfully and avoid a possible collision. As automotive original equipment

manufacturers (OEMs) shift toward this new paradigm of autonomous driving, they are challenged with testing new modules and sensors that would replace the traditional sub-components on the vehicle for it to reach higher levels of autonomy.

Traditional hardware-in-the-loop (HIL) solutions calibrate and then test the sensors in the lab environment individually before the actual drive test. As the vehicle's ADAS capability continues to grow to levels higher than 2, this type of testing is proving to be costly, time consuming, and inefficient.

Konrad Technologies' HIL testing solution conducts the test across sensors simultaneously and then sends feedback to the ECU to provide a more reliable output. The platform is easily scalable and can be customized based on testing requirements. In addition, Konrad Technologies' HIL testing solution can cost effectively provide a greater quality of test in the lab environment, thereby reducing the number of expensive drive tests as well.

Design and Positioning

Konrad Technologies partners extensively with National Instruments Corp (NI), a world-renowned PXI-based testing equipment supplier. The underlying hardware of Konrad Technologies' HIL test platform, therefore, includes modular-based PXI testing equipment, and the core engineering strength of its HIL test solution is the software that is built on the PXI testing equipment, which can connect with disparate test systems and bring them into the HIL system. This capability is becoming more apparent as the number of sensors continues to rise in the vehicle. According to Frost & Sullivan, the average sensor count in a vehicle is expected to rise to between 26 and 29 by 2030, from approximately 9 sensors in 2012. In addition, the sensors technology incorporated in 2030 will work in tandem with other sensors and will be unlike those incorporated in 2012, which operate independently from each other.

To test the new sensor technology, Konrad Technologies can simultaneously stimulate combinations of sensors, such as radar, camera, and LiDAR according to a single drive simulation scenario. The feedback from the different sensors is then fed to the ECU in the HIL system. For example, to test collision avoidance systems, key sensors that are tested would be a certain type of radar technology, in addition to the camera. By placing the camera in front of a high-definition multimedia interface (HDMI) screen and stimulating the correct object for the radar unit, Konrad Technologies' HIL testing platform can transmit the output from the individual sensors to the ECU in the loop, thereby validating the functionality of an ECU for the test scenario and also against a host of feedback from different sensors to which the ECU is connected.

As vehicles gain autonomy, sub-systems need to be tested in near real time; therefore, closed loop timing is becoming important as the level of autonomy in the vehicle continues to grow. Konrad Technologies has built its solution on NI's PXI platform and performs successive test iterations in steps of 5 microseconds, which are some of the fastest in the industry. Moreover, the HIL test platform is completely interoperable with third-party simulation software used by automotive OEMs and suppliers, making integrating with the entire testing supply chain easier.

Growth Potential and Customer Acquisition

Konrad Technologies continues to build on NI's underlying PXI hardware and offer custom solutions to a range of industry verticals, including automotive, medical, military, semiconductors, and aerospace and defense. In addition to partnering with NI, Konrad Technologies partners with other vendors, such as Virginia Panel Corporation and VI-grade, to enhance the HIL testing experience even further. Virginia Panel Corporation, for instance, offers best-in-class, interconnect solutions that are an essential piece of Konrad Technologies' HIL testing solution. Konrad Technologies' partnership with VI-grade has created a differentiated driver-in-the-loop testing with sensor fusion, which is the next phase of HIL testing. Konrad Technologies is also a founding member of the ADAS IIT consortium dedicated to ADAS test with its partners SET GmbH, SEA GmbH, and MeasX GmbH.

Through the years, Konrad Technologies has increased its focus on the automotive industry and delivers scalable solutions to test ADAS systems in vehicles. The company's HIL test systems are used more specifically in the lab. With the amount of research currently underway in the development of vehicles with levels 3 to 5 autonomy and with the degree of technology differentiation inherent in Konrad Technologies' HIL testing platform, Frost & Sullivan expects the use of this platform, which is built to validate the ADAS system, among end users to grow by double digits between 2020 and 2026.

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with government regulatory bodies, such as the US National Highway Traffic Safety Administration (NHTSA), the European New Car Assessment Programme (Euro NCAP), and the China New Car Assessment Programme (C-NCAP). These partnerships will be important as and when higher levels of vehicle autonomy are defined, regulated, and adopted in the automotive industry.

The scalability and interoperability inherent in its system has allowed Konrad Technologies to increase its customer base. For example, the HIL test system can be customized based on customer test requirements and different sensor combinations, which is important because of the high rate of change in testing requirements associated with new sensor technology, the level of reliability that OEMs require from the testing platform, and the ADAS implementation itself.

To enhance the traction that it has garnered from automotive end users, Konrad Technologies works

Conclusion

Research on autonomous vehicles is a high investment area within the automotive industry. As vehicles move onto higher ADAS capabilities, automotive OEMs are challenged with the lack of a HIL test solution that is standardized and that can cost effectively test the vehicle ADAS and safety functionality during the development phase.

Konrad Technologies' HIL testing solution is the first in the market that can cost effectively test combinations of sensors with the ECU in the hardware loop. The high degree of reliability and accuracy of Konrad Technologies' HIL test solution reduces the extent of expensive drive testing, thus further enhancing the cost effectiveness of the company's HIL test solution. By partnering with government regulatory bodies, such as NHTSA, Euro NCAP, and C-NCAP, end users can count on Konrad Technologies to offer a cost-effective testing solution that complies with the most important regional automotive markets worldwide.

With its strong overall performance, Konrad Technologies has earned Frost & Sullivan's 2021 Product Leadership Award for its HIL test solutions in the global automotive industry.

What You Need to Know about the Product Leadership Recognition

Frost & Sullivan's Product Leadership Award recognizes the company that offers a product or solution with attributes that deliver the best quality, reliability, and performance in the industry.

Best Practices Award Analysis

For the Product Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Product Portfolio Attributes

Match to Needs: Customer needs directly influence and inspire the product portfolio's design and positioning

Reliability and Quality: Products consistently meet or exceed customer expectations for performance and length of service

Product/Service Value: Products or services offer the best value for the price compared to similar market offerings

Positioning: Products serve a unique, unmet need that competitors cannot easily replicate

Design: Products feature innovative designs, enhancing both visual appeal and ease of use

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

