

Press release

Guinea pigs – made of plastic!

Crash test dummies: key players in vehicle development /
Improved sensor technology drives road safety ahead

Stunned pigs and self-experimentation with showers of glass splinters – life in the early days of vehicle occupant testing was certainly an adventure! But nowadays, all that has changed thanks to crash test dummies: high-tech models of human beings that provide critical input for modern vehicle safety. Inside these plastic research assistants, hundreds of sensors capture the accelerations and forces that occur during collisions. Kistler, the measurement technology specialist, is building the latest generation of frontal dummies that can even reproduce the facial injuries caused when a vehicle occupant is hurled into an airbag.

Until the middle of the 20th century, it was taken for granted that the human body was no match for the forces generated during car accidents. There was general acceptance that road accidents would inevitably cause deaths – and back then, there was no shortage of reasons for this assumption: hard, sharp-edged metal fittings and the general absence of safety belts, to name but two. Then in the early 1950s, this widely-held belief prompted researchers to carry out the first accident tests. They had no hesitation in strapping human corpses into cockpits to study typical injuries, both internal and external. These experiments were followed by tests where volunteers were exposed to emergency braking, or even showers of glass splinters. But the pain threshold was soon reached – quite literally! – so the engineers went on to place stunned pigs, bears or monkeys behind the wheel for the more brutal tests.

Sensors to the rescue

Humans and animals were eventually spared from these perils by the arrival of Sierra Sam, the world's first crash test dummy. Developed for the United States Air Force back in 1949, Sierra Sam was the prototype for subsequent dummy models that were put to use for road crash tests just a few years later. To replicate reality as closely as possible, dummies came in all shapes and sizes: male and female, short and tall, young and old. However, what really revolutionized crash testing was not so much the variety of versions that were available, but the integration of technology into the dummies.

This trend began in the early 1970s when the Hybrid I to III series of models from General Motors were fitted with the first sensors to measure force and acceleration in their heads, torsos and thighs. As technology improved, engineers equipped the models with additional sensors in parts of the body

where injuries could prove fatal, such as the neck or the spinal column. Angular rate sensors also made it possible to measure bending of the limbs due to a collision.

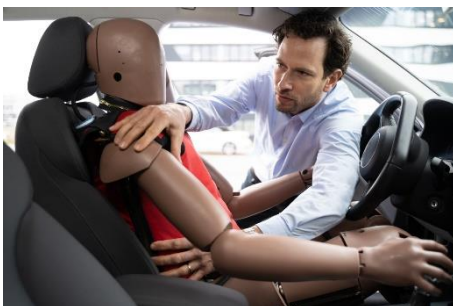
Dummies get smart

For many years, the Hybrid III was regarded as the universal standard in the industry – until THOR pushed it out of the driver's seat. THOR – the Test Device for Human Occupant Restraint – differs from its predecessor in many ways: with the help of extra facial sensors, for example, it achieves better resolution of the distributed forces that are generated when an occupant is flung into an airbag. THOR represents an average adult male, weighing in at 77 kilograms and with a height of 1.76 meters.

To prepare this latest-generation crash dummy for real use, the measurement experts at Kistler equipped it with data acquisition capacity for up to 288 measuring channels. Data is speedily exported from the wreck via one single Ethernet cable in the dummy's thorax. By contrast, THOR's forerunners with their tangle of wires looked more like puppets on many strings. Since 2018, Kistler has carried out the complete production process for THOR dummies at its Heidelberg site.

Despite this impressive progress, dummy development has certainly not reached the end of the road yet: these "accident dolls" will become even smarter as time goes on, and further improvements such as more realistic replication of injuries to internal organs will become possible. Long ago, people believed that a car accident meant certain death – but thanks to crash dummies, that era is now well and truly over.

Image material (please name the Kistler Group as picture source)



Kistler offers high-precision sensor technology and integrated data acquisition solutions for dummies of every type – and now, the portfolio also includes a proprietary THOR dummy that features flexible instrumentation.



Unlike its predecessors, THOR – the Test Device for Human Occupant Restraint – has extra facial sensors to achieve better resolution of the distributed forces that are generated when an occupant is flung into an airbag. THOR represents an average adult male, weighing in at 77 kilograms and with a height of 1.76 meters.



Just one single cable in the dummy's thorax is needed to configure the sensors, transmit and synchronize the measurement data, and supply power – for as many as 288 channels. By contrast, THOR's forerunners with their tangle of wires looked more like puppets on many strings.

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About the Kistler Group

Kistler is the global market leader for dynamic pressure, force, torque and acceleration measurement technology. Cutting-edge technologies provide the basis for Kistler's modular solutions. Customers in industry and scientific research benefit from Kistler's experience as a development partner, enabling them to optimize their products and processes so as to secure sustainable competitive edge. Unique sensor technology from this owner-managed Swiss corporation helps to shape future innovations not only in automotive development and industrial automation but also in many newly emerging sectors. Drawing on our extensive application expertise, and always with an absolute commitment to quality, Kistler plays a key part in the ongoing development of the latest megatrends. The focus is on issues such as electrified drive technology, autonomous driving, emission reduction and Industry 4.0. Some 2,200 employees at more than 60 facilities across the globe are dedicated to the development of new solutions, and they offer application-specific services at the local level. Ever since it was founded in 1959, the Kistler Group has grown hand-in-hand with its customers and in 2019, it posted sales of CHF 466 million. About 7% of this figure is reinvested in research and technology – with the aim of delivering better results for every customer.