Technical Report

Aquaplaning tests with CORREVIT® Optical Sensors

CORRSYS DATRON Sensorsysteme GmbH

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VT-TR-002		L-400	

On behalf of:

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Title: **Aquaplaning tests with CORREVIT® Optical Sensors**

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CORREVIT® Optical Sensors from CORRSYS-DATRON are widely considered as the standard for accuracy in dynamic speed and distance measurement. CORREVIT® sensors are used by virtually every major auto and auto-related manufacturer in the world for testing of chassis and suspension set-up, tire performance, ABS and ESP braking performance, and driving behavior.

Methodology

In aquaplaning tests recently conducted by a major tire manufacturer in Italy, a CORREVIT® L-400 Single-Axis Optical Sensor was used to measure vehicle speed and distance traveled.

The tests:

1. The vehicle starts from standstill and accelerates on dry track (Fig. 1).
2. After exiting a right-hand curve, vehicle brakes are applied on a straightaway flooded with water to a depth of 10mm (Fig. 2).
3. The vehicle is accelerated after leaving the flooded section.

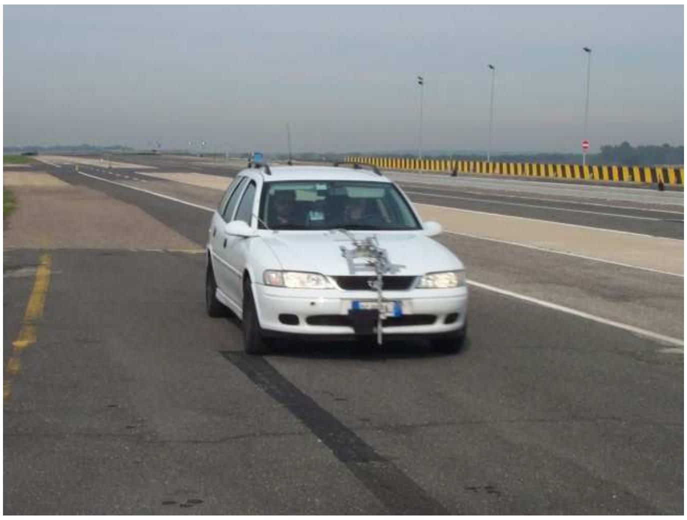

Fig. 1: In recent tests conducted by a major tire manufacturer, the CORREVIT® L-400 Sensor was chosen for accuracy and reliability.

Fig. 2: Configured as shown, the small amount of spray entering the sensor field of view has no effect on measurement accuracy.

Although complete results are proprietary, two points are apparent in the data (Fig. 3):

1. The measurement signal is never lost or interrupted.
2. There is no distortion of measurement values acquired by the CORREVIT® L-400 Sensor.

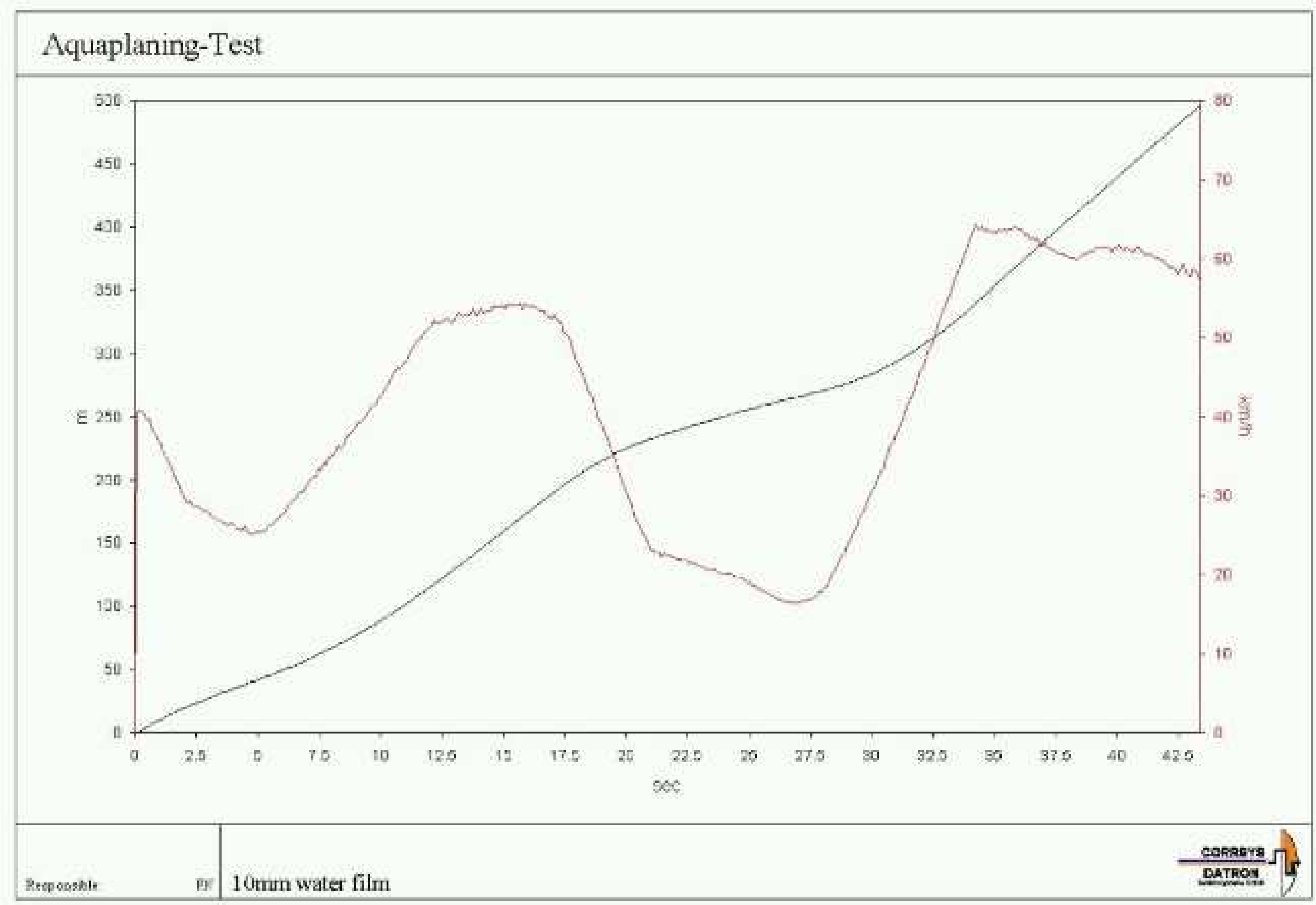

Fig. 3: As shown is this test plot, CORREVIT® L-400 Sensor provides accurate, distortion-free data.

Optimizing accuracy

In any scientific endeavor, it is essential that the user understand the operating characteristics of the applied instrumentation. As is true for all optics-based instruments (cameras, microscopes, etc.), optical sensors achieve optimum performance when operated within a specified range. Objects either too close to, or too far from the objective lens will not be in focus.

Additionally, the sensor must be mounted to prevent extraneous moving objects or surfaces from entering the field of view. One such surface – sometimes overlooked – is that of the vehicle tire in motion. Improperly positioned, the sensor will acquire tire motion, rather than (or in addition to) the motion of the sensor moving relative to the track. Given the wide range of available mounting options, avoiding this undesired effect is simple.

The only remaining point is the potential of concentrated water spray to act as acquired motion. Knowing that the concentration of water spray is greatest behind, and to the sides of the tires, the test engineers mounted the sensor at the front -enter of the vehicle. As can be seen in Fig. 2, virtually none of the spray enters the sensor field of view. In reviewing the test data (Fig. 3), it is apparent that this small amount of spray had no effect on measurement accuracy.

Further considerations
When testing on sprinkled tracks, these few, simple guidelines can help to assure accurate results with minimum effort.

1. If the track is sprinkled from single-side only, mount the sensor facing away from the sprinkler system. If sprinklers are present on both sides, mount the sensor at the front-center of the vehicle.

2. Some sprinkler systems can be briefly interrupted as the vehicle passes. This short interruption, controlled by light barrier, will not invalidate test results.

3. Older sprinkler systems can cause uneven (and therefore unquantified) flooding. Many newer systems provide defined, sideward flooding to ensure precisely controlled water depths. Such systems are preferred for their ability to precisely replicate test conditions over multiple tests and sessions.

Ongoing development
CORREVIT® Non-Contact Optical Sensors consistently prove to be accurate in applications such as the tests described above. Committed to extending the capacity of the CORREVIT® principle, CORRSYS-DATRON continues to enhance each generation of optical sensors. New illumination techniques are among the latest developments to be implemented.

Because water can form a mirror-like boundary over the test surface, it can reflect a portion of the available illumination energy, making it unavailable to the measurement process. To prevent this, most CORREVIT® Sensors are now equipped with a pair of newly developed halogen lamps configured to produce an exceptionally tight radiation angle.

This new generation of CORREVIT® Halogen Lamps benefits from a special vapor-deposition process that enables use of the infrared component present in halogen light. In comprehensive testing, the near-infrared (NIR) component is proven to increase measurement accuracy, due to the fact that NIR is absorbed – rather than reflected – by water.

Ultimately, test results provide ample evidence of the effectiveness of the CORREVIT® L-400 Sensor in aquaplaning tests. To learn more about testing on flooded surfaces, and a wide range of other dynamic testing applications, contact the experts at CORRSYS-DATRON today:

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