PROFESSIONAL MOTORSPORT WORLD

pmw

MARCH-JUNE 2014

## Wagons roll
Honda brings estate cars and VTEC to the BTCC

## Sand speeders
*Series Focus* on the challenge of the Dakar Rally

## Shaken and stirred
Martini's racing stripes return with Williams

# Flowtime

**The CFD advances that will unlock greater fidelity from digital aero testing**

***Interviews***

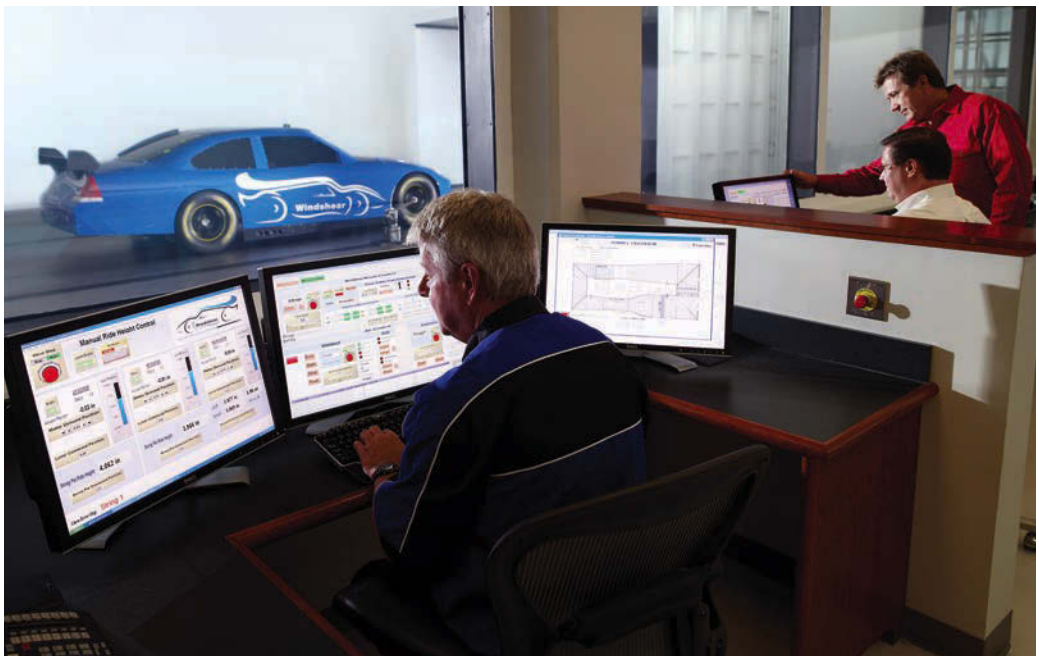
**Mark Kent**
Director of racing, Chevrolet

**Mark Preston**
Team principal, Super Aguri Formula E

THE MAGAZINE FOR THOSE IN THE BUSINESS OF GOING MOTOR RACING

CHASSIS P.11, TRACK TEST P.16, BUSINESS VIEW P.18, COMMUNICATIONS P.24, I REMEMBER P.64

WWW.PMW-MAGAZINE.COM



# CONTINUOUS MOTION

## Jacobs is assisting race teams and OEMs in acquiring data from continuous-motion wind tunnel testing, championed under the principle of 'getting more for less'

Historically, wind tunnel testing has used a move-pause-acquire test methodology. For example, a typical motorsport test run might consist of a ride height and/or yaw sweep, stopping at each test position to acquire a steady-state datapoint. Many reasons exist as to why this form of testing has been popular, such as allowing the 'physics' to somewhat stabilize – most importantly the aerodynamic forces. Additionally, this method also provides data acquisition systems with the necessary time to acquire and process data while giving multiple motion systems the time for coordinated alignment for the test point.

Modern advances in test technology render some of these factors obsolete, thus enabling test personnel to use technology to achieve more for less. Continuous testing is being used more frequently in automotive development. This is particularly relevant to the Formula 1 community, where new regulations further limit wind-on testing time. However, it is also relevant for testing in commercial wind tunnels where motorsport customers pay for time used.

*Jacobs manages the 180mph Windshear wind tunnel in Concord, North Carolina*

"CONTINUOUS TESTING IS BEING USED MORE FREQUENTLY IN AUTOMOTIVE DEVELOPMENT. THIS IS PARTICULARLY RELEVANT TO THE F1 COMMUNITY"

Early adopters of continuous testing have mainly focused on increasing the speed of the test condition, setting control systems (e.g., model motion speed) and increasing the data acquisition rate. However, many subtle variables are easily overlooked. One of the most common is variable time lags (response times) of the involved measurements and controls.

The most tangible example is pressure lag. Pressure is often measured through pneumatic tubes that stimulate diaphragms and generate electrical signals for digitization – creating time lags. Contrast this with strain gauges, where the lags are much smaller. If the rate of change for the continuous motion is much greater than the time lags, measurement to measurement skews or misalignments in time occur, misleading the analyst as to the relationship between the variables being analyzed.

Jacobs' experience in motorsport, automotive and aerospace testing has afforded the company the ability to appreciate these problem areas. As such, the latest version of Jacobs' test automation software, Test SLATE, now includes powerful tools to assist researchers in compensating for many of the issues created by increasing test article motion and acquisition system speeds.

Test SLATE relies on time-based synchronization methods to align data from multiple sources, at various data rates, and has the capability to filter data. Each data measurement may be assigned multiple filter algorithms to be applied during processing. Available algorithms include Chebyshev, Bessel, Butterworth, and 2nd Order Autoregressive. Users may also define and add algorithms.

Test SLATE also allows for 'time shifting', where the time stamp for each measurement may be shifted in either the positive (future) or negative (past) direction. This allows corrections to be applied on a per measurement basis for delays induced by hardware limitations, long air pressure hoses, filters, etc. In addition to the ability to move the time stamp, time alignment and resampling is also possible. Measurement and control systems may have different acquisition rates, potentially causing different time stamps within each individual data file. Time alignment and resampling matches the time-shifted data between multiple data files to align data to a user-defined sample interval, providing a single integrated file for later analysis.

For organizations currently employing continuous motion testing techniques, or those moving to this testing method, Test SLATE includes features that provide an ideal solution for ensuring that test results capture accurate performance data during wind tunnel testing. <

FREE Reader Enquiry Service

**Jacobs Technology Inc**
To learn about this advertiser, visit www.ukipme.com/info/pmw

004 READER ENQUIRY REFERENCE