A&D Technology, Inc.

Tire Testing

TEST CELL AUTOMATION | LABORATORY MANAGEMENT | COMBUSTION ANALYSIS | SIMULATION | EMISSIONS

ENGINE | TRANSMISSION | ELECTRIC MOTOR | BATTERY/EV SYSTEMS | VEHICLE DYNAMICS

Tire Testing – Why?

Performance and Durability

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Tire Testing – Why?

Sidewall Failure

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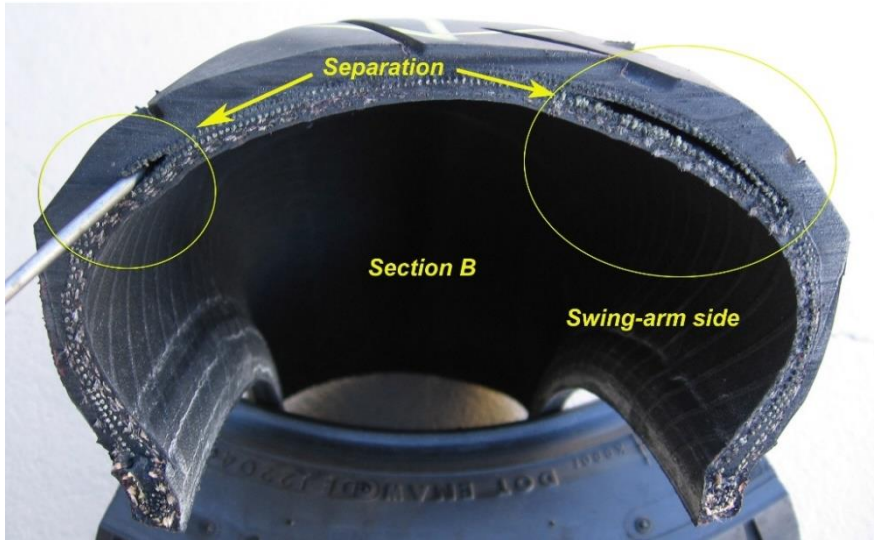
Tire Testing – Why?

Delamination



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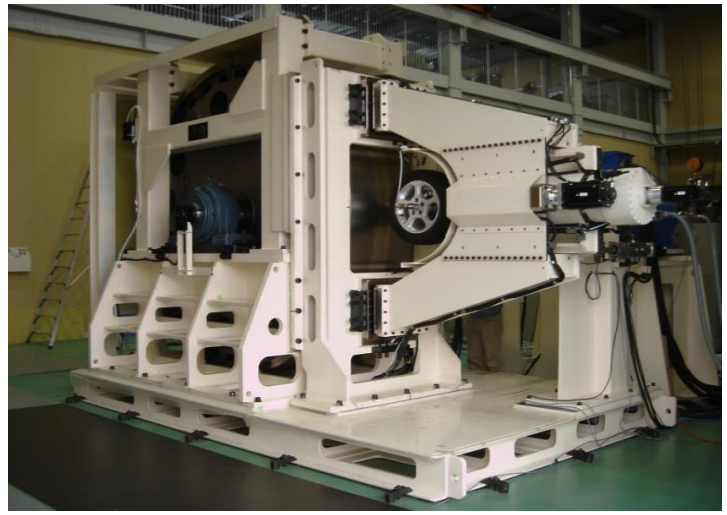
Tire Testing – A&D Solution

A&D Tire Test solutions allow the tire development team to make a determination on tire wear and tread design in a fraction of the time it normally would take on the track.



Drum Testing

Rolling Resistance Measurement

Belt Testing - Tire

Belt Testing - Vehicle

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Tire Testing – Rolling Resistance Test Rig

Built with consideration for ease of use, maintenance and calibration, it offers automated and manual test scheduling along with a user-friendly operator interface. The RRTR is available in a variety of configurations and sizes for passenger car (PC) and truck and bus (TB) tires, so that customers choose the machine that best fits their needs.

Features:

- High accuracy and robust measurement (Embedded MBS)
  - Rolling resistance: PC ≤ ± 0.3N TB ≤ ± 0.5N
  - Measurement Reproducibility: σ ≤ 0.005 N/KN
- Test standards compliance
- Fully automated
- Energy saving from aluminum cast drum (about 30% compared to steel drum)
- Optional temperature controlled chamber

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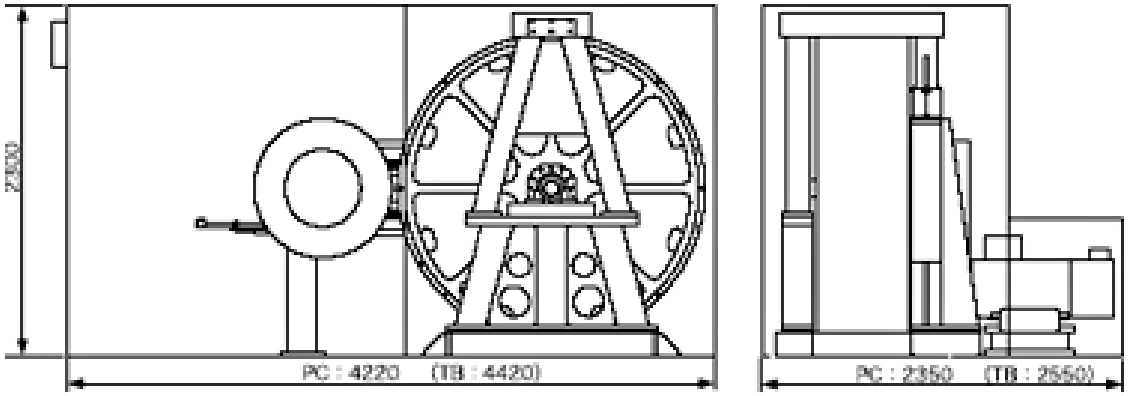
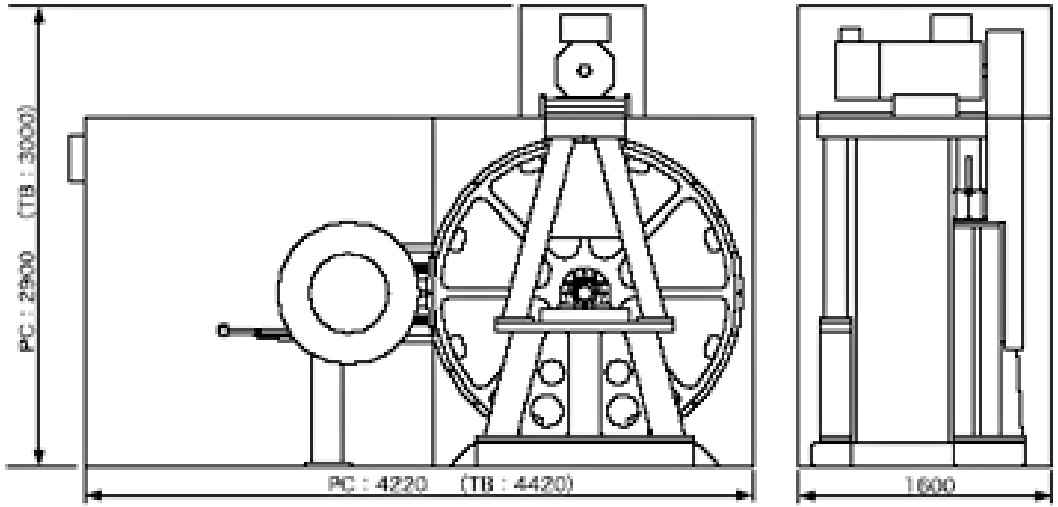
Tire Testing – RRTR Flexibility

Layout options

- When installing the testing machine, space may be limited. However, the position of driving motor can be selected, which provides flexibility when installing the testing machine.
- There is also the option of having one or two tire positions on the test rig.



Rear Motor Location



Top Motor Location

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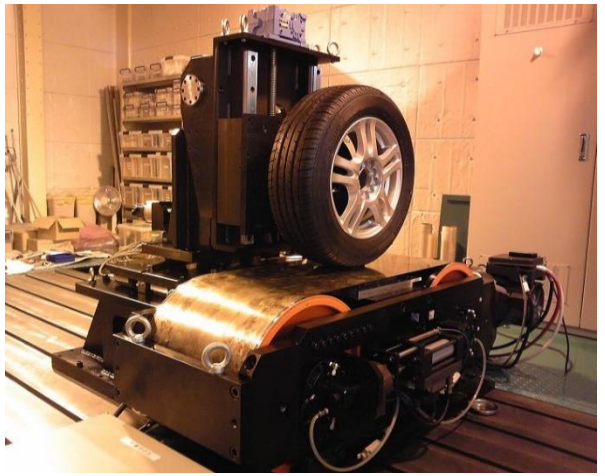
Steel Belt Testing Solutions

A&D produces large size steel belt for wind tunnel application to specific steel belt system for Tire testing applications.

Large size single belt system for model wind tunnel application

Five belt system for full scale wind tunnel application



Flat belt Tire testing rig for PC tires

Flat belt road simulator with vertical vibration features for Vehicle testing application.

High load Flat Belt Tire testing rig for TB tires

Dynamic Flat Belt Tire testing rig for PC/LT tires.

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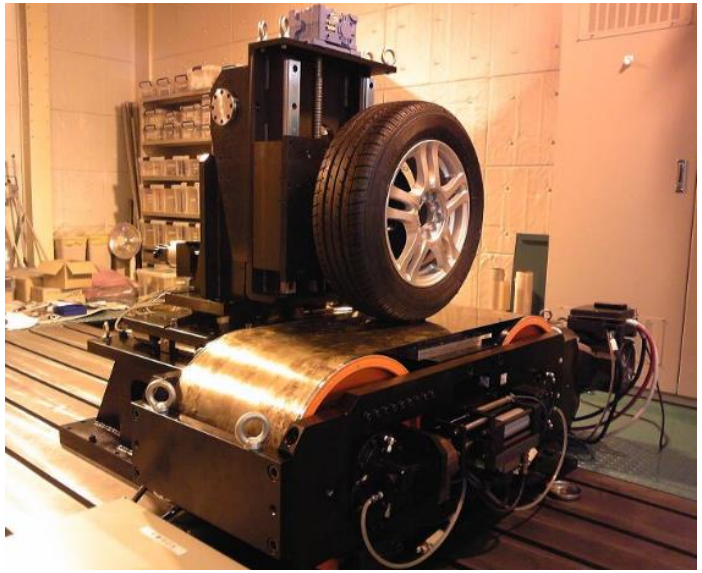
Tire Testing - FBTR

The A&D Flat Belt Tire Test Machine is an indoor tire force and moment testing machine. It allows the tire to be tested against a flat surface under dynamic conditions. The flat surface is emulated by an electrically controlled belt-pulley assembly while the tire load is supported by an air bearing (for passenger cars loads) or a water bearing (for higher loads) that is present under the belt.



- Six degrees of freedom enable various tire setups
- Vertical movement (option)
- Belt and Tire are fully driven by electronic motors
- Accurate steel belt control reproduces realistic road condition
- Precise force measurement with the Model Based Sensor
- Belt crack detection sensors ensure safety operation
- Compact size
- Optional Shaker Simulation

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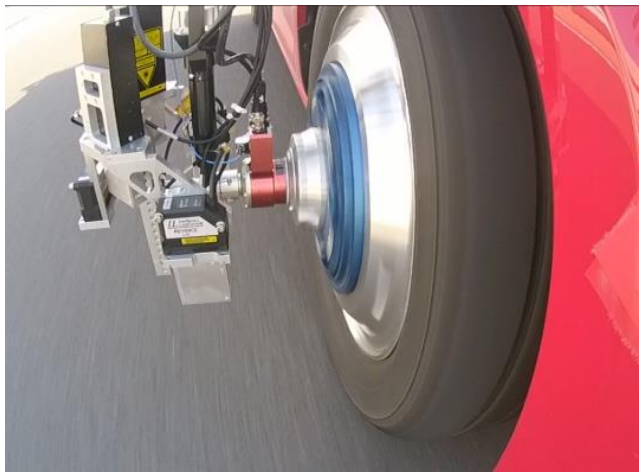
FBTR – Video Time

FBTR – Road Simulation

Application 1: Road Data Playback on Test Rig

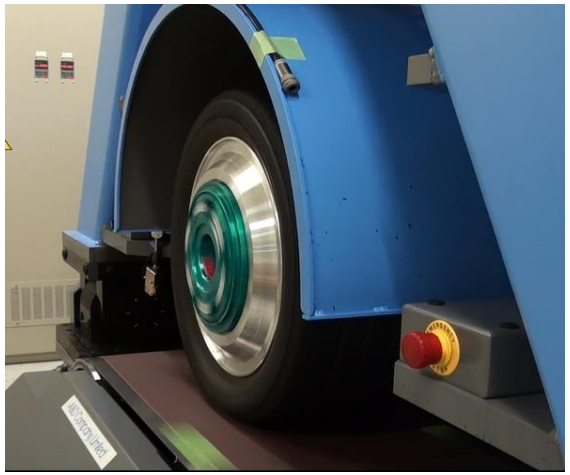
Real vehicle is tested at real road and driving maneuver data such as vehicle load, alignment data against real road are taken with VMS. Acquired vehicle maneuver data is reproduced at the Flat Belt Testing Rig. This test is to compare 6 component force data at the Real Vehicle and at the Test rig and confirm how accurate the Test rig can reproduce Real Road condition.



VMS Recorded Data

Tire load and alignment data against the road

Generated 6 component force and wheel posture data comparison



Playback on FBTR

FBTR – Video Time

Application 1: Road Data Playback on Test Rig

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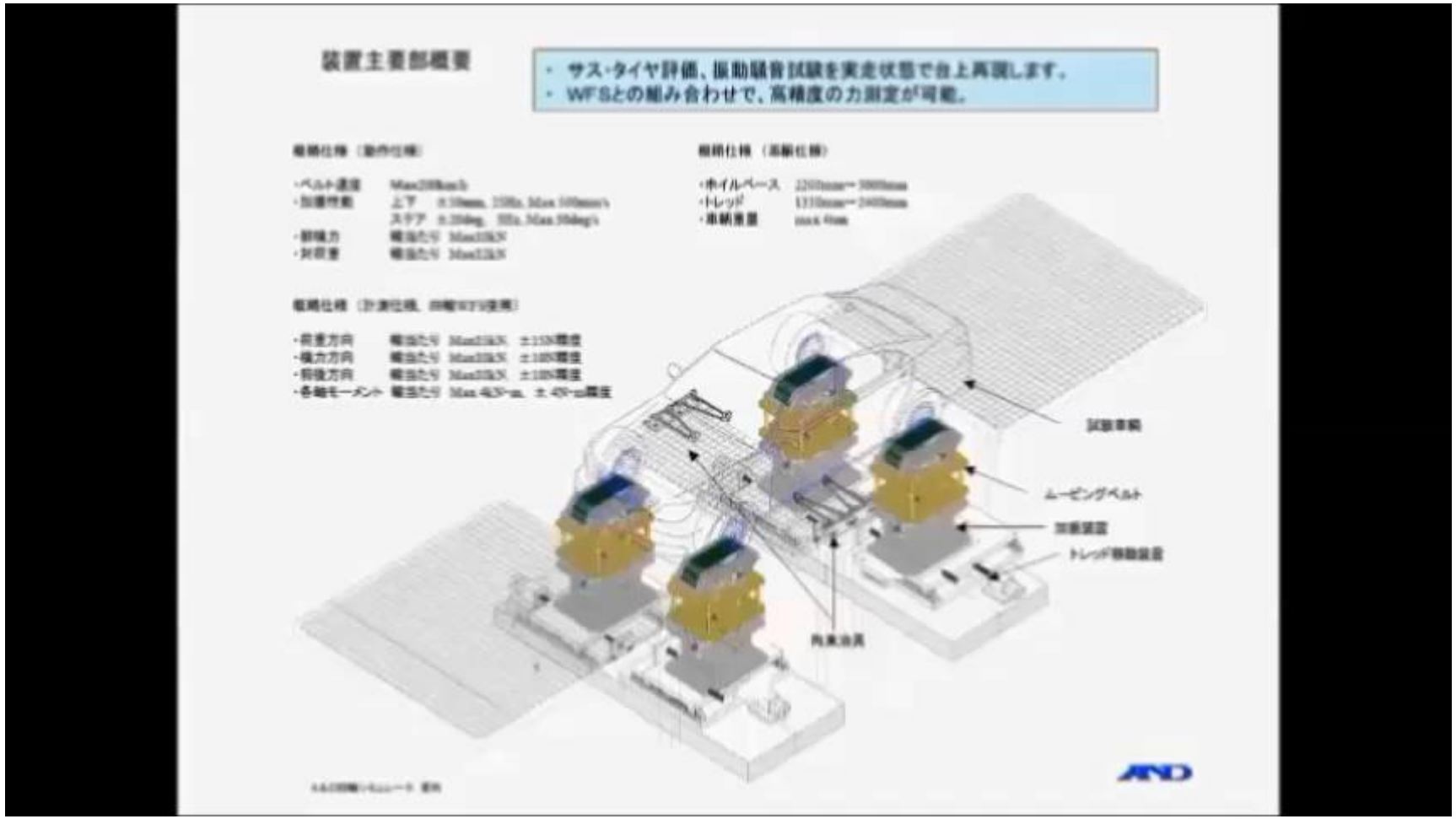
FBCR – Video Time

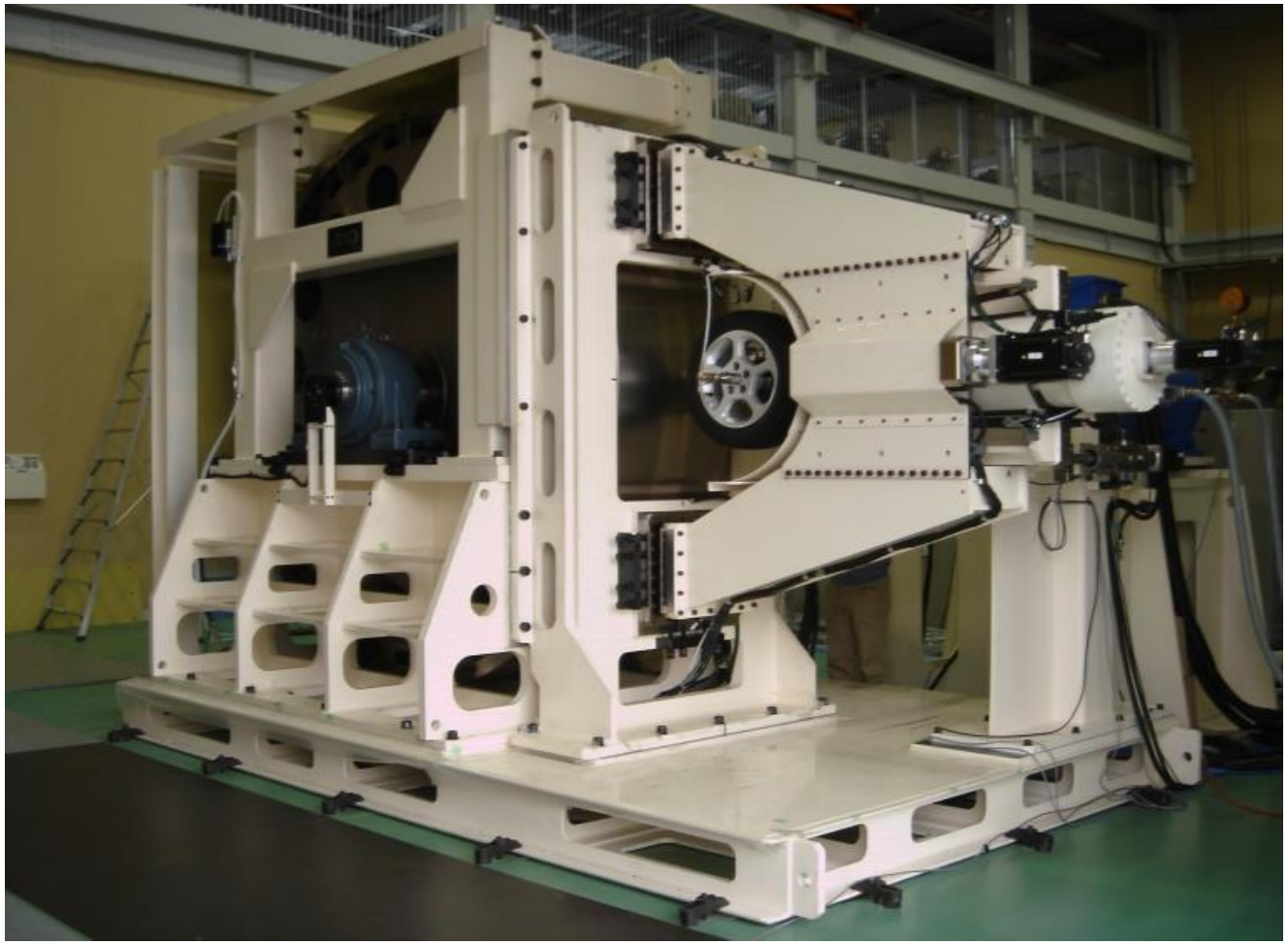
Application 2: Flat Belt Chassis Rig Simulation Video



Dynamic Patch Test Rig

- 3.2 m Dia. Drum Tire Test Machine with Embedded Force Matrix System
- Passenger Car and Light Duty Truck Tire Testing
- Tire Adjustments include:
  - Road Force Fz
  - Camber Angle
  - Slip Angle
  - Tire Speed
  - Tire Pressure
- 18’ Tall x 24’ Wide x 18’ Deep
- Approximately 45,000 lbs.
- Tire speed up to 200 kph
- Precision control due to Embedded MBS

“Mother of all Machines”



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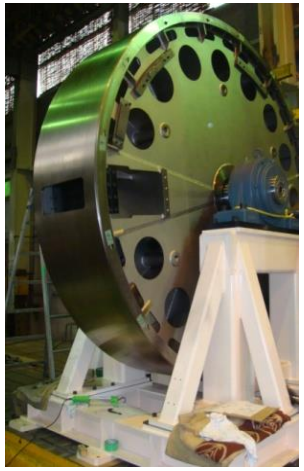
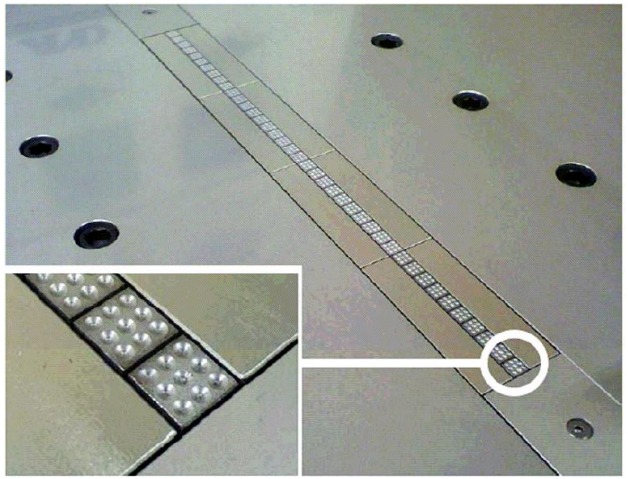
DPTR – Advantage

FMS Sensor Embedded into ϕ3.2m Drum

System will acquire data from drum and tire rotation signal and creates complete tire patch force distribution as well as the entire tread force distribution.





4mm x 4mm, 3 component force sensor arrays are lined up at the sensor plate.

When the tire runs over the sensor, the sensor will acquire time change of 3 component force throughout the process of the tire going over the sensor.

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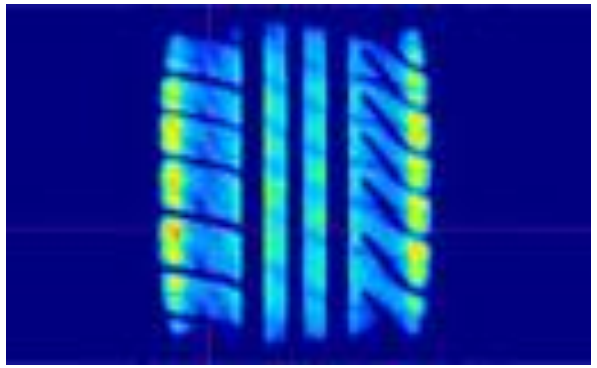
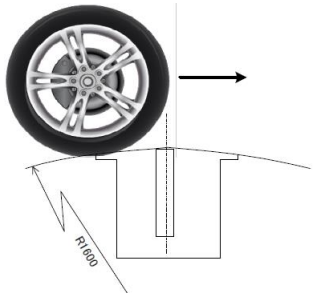
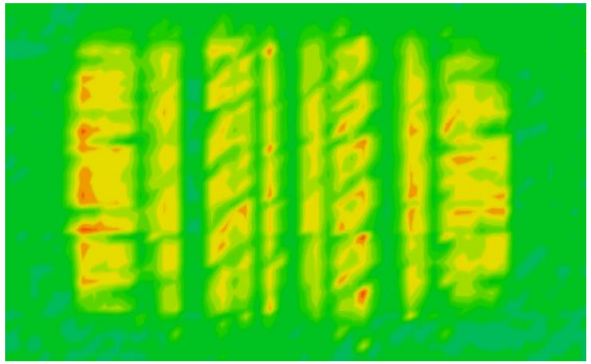
DPTR– Advantage

3.2 m Diameter Drum

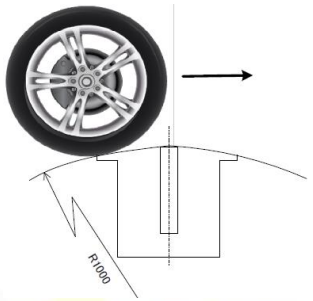


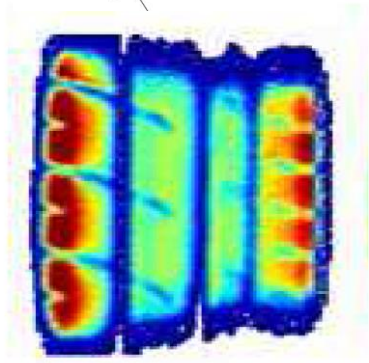
Static patch measurement (Flat surface with pressure array sensor)





Dynamic tire patch measurement @ 90 kph (ϕ3.2m Drum with FMS sensor)





Dynamic tire patch measurement (ϕ2m with needle sensor)

This shows that tire patch condition is much closer to real flat ground with ϕ3.2m drum than ϕ2m drum. Fundamentally, ϕ3.2m drum can measure more realistic tire data.

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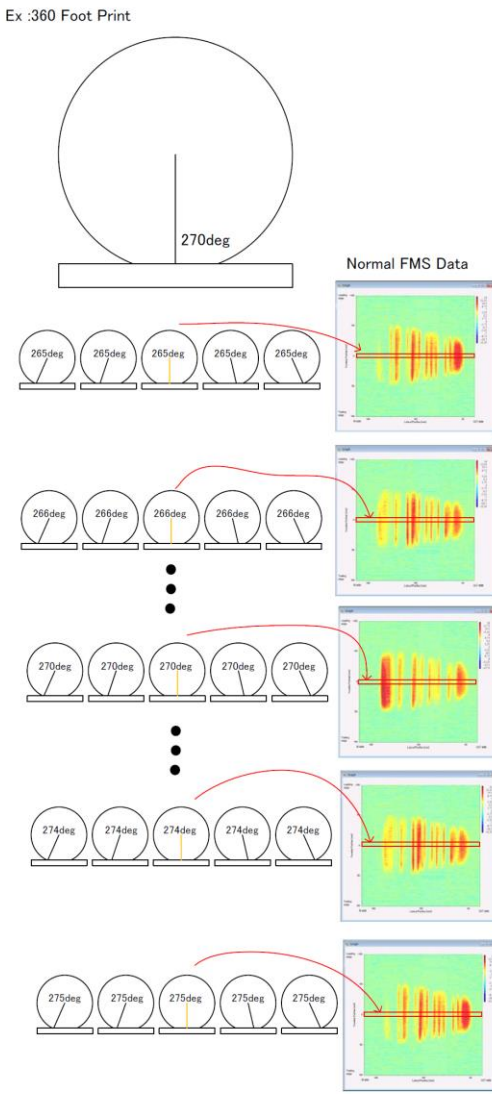
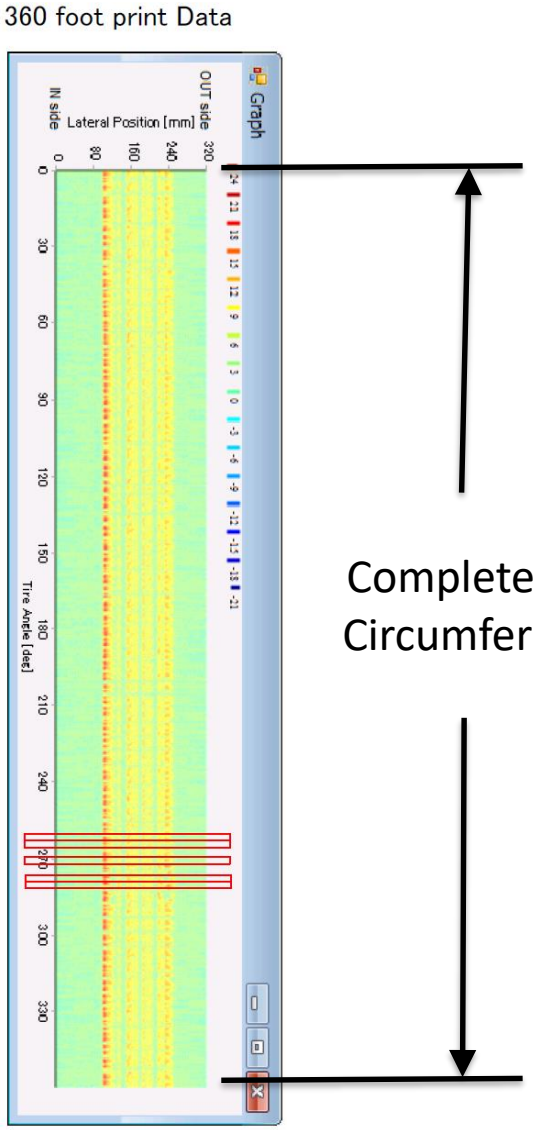
DPTR – Results in Lab





Complete Tire Circumference

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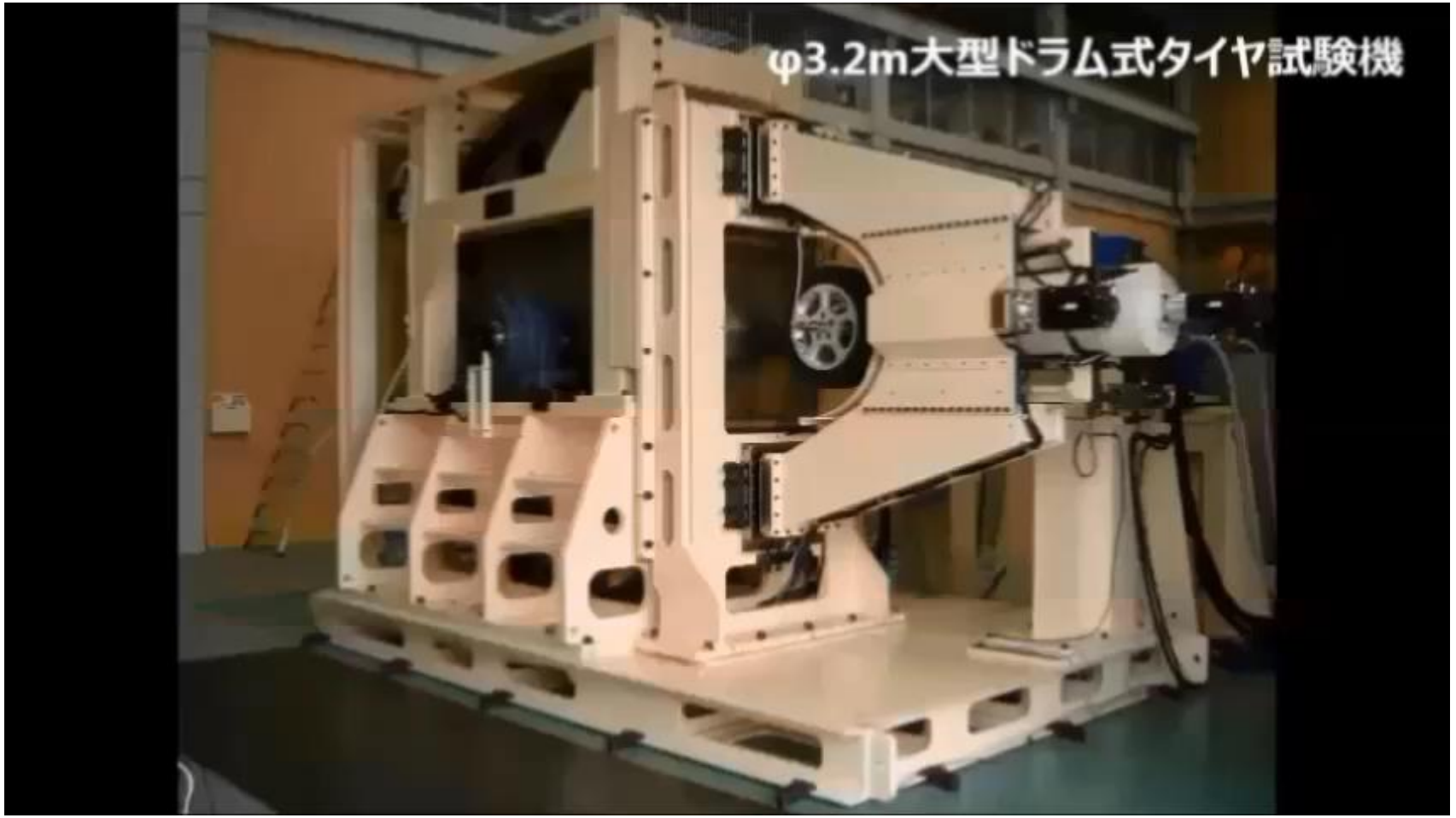
DPTR – Fun Video

In Use at customer Technical Center in Japan



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