SENSING CORE Technology Future Concept Press Event

April 22, 2022

Today's Agenda

- Opening Remarks
- SENSING CORE Business Future Concept
- SENSING CORE Test Drive & Demos
- Closing Remarks

Opening Remarks

Our Original Technologies to Respond to the Needs of CASE

SUMITOMO RUBBER GROUP

SENSING CORE

SENSING CORE

DUNLOP
e.SPORTMAXX

EV Tires

SILENT CORE
(Specialized Noise-Absorbing Sponges)

※IMS for SILENT CORE
(Emergency Puncture Repair Kit)

※Instant Mobility System

Value Provided by SENSING CORE

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■ Visualizing CO_2 Emissions
■ Improving Fuel (Energy) Efficiency

■ Preventing Overload & Unbalanced Loads
■ Preventing Overturn Accidents

■ Detecting Warning Signs of Wheel Detachment

Tire Pressure

Road Conditions

SENSING CORE

Tire Load

Tire Wear

5th Pillar

6th Pillar

7th Pillar

・・・ (Expanded Functionality)

■ Road Slip Hazard Map

■ Automating Tire Inspections
■ Improving Tire Life by Automating Wear Management

Sensing Core Business Future Concept

Future Roadmap of Our SENSING CORE Business

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Our latest tire pressure and temperature management service is already demonstrating the value that we can provide through data.
With a SENSING CORE Proof of Concept ongoing from 2022, we aim to make this technology available to our customers in the year 2024.

Providing Value for Vehicles & Value Chains

Providing Value for Tires

Step 1: Launch of Tire Pressure/Temperature Management Service

Cloud

DUNLOP

FALKEN

Step 2: SENSING CORE Proof of Concept

SENSING CORE

Step 3: SENSING CORE Business

SENSING CORE

Cloud

2024 Launch

Proof of Concept from 2022

Demonstrating Value Provided through Data Available to General Customers from 2021

Conventional Tire Sales Business

Linking to Sustainable Value Ring

Step 1: Customer Comments

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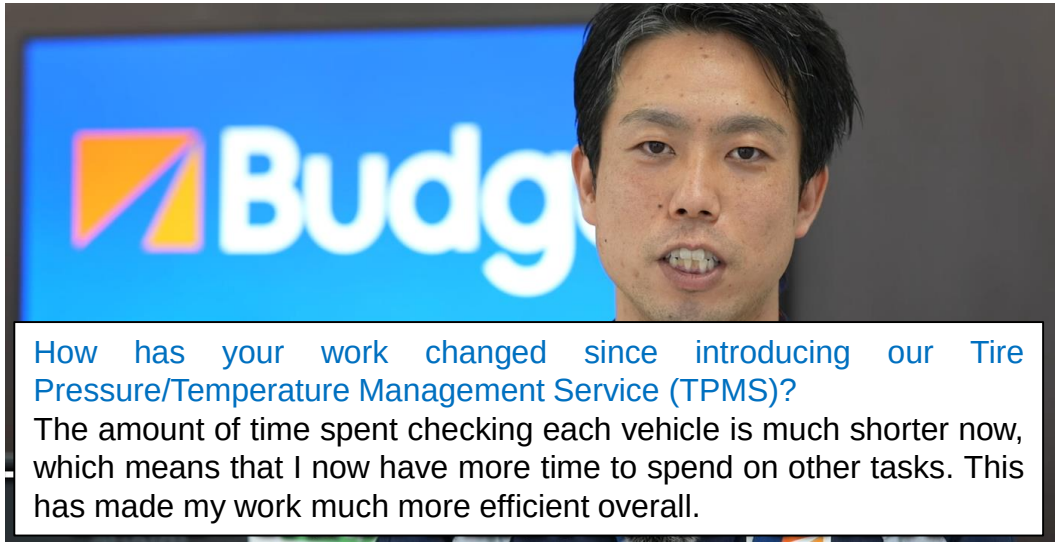
Customers who took part in our proof of concept were quite happy with this new service, remarking that it improved operational efficiency and reduced the physical strain of their work.



How has your work changed since introducing our Tire Pressure/Temperature Management Service (TPMS)?
The amount of time spent checking each vehicle is much shorter now, which means that I now have more time to spend on other tasks. This has made my work much more efficient overall.

Quicker Tire Pressure Checks

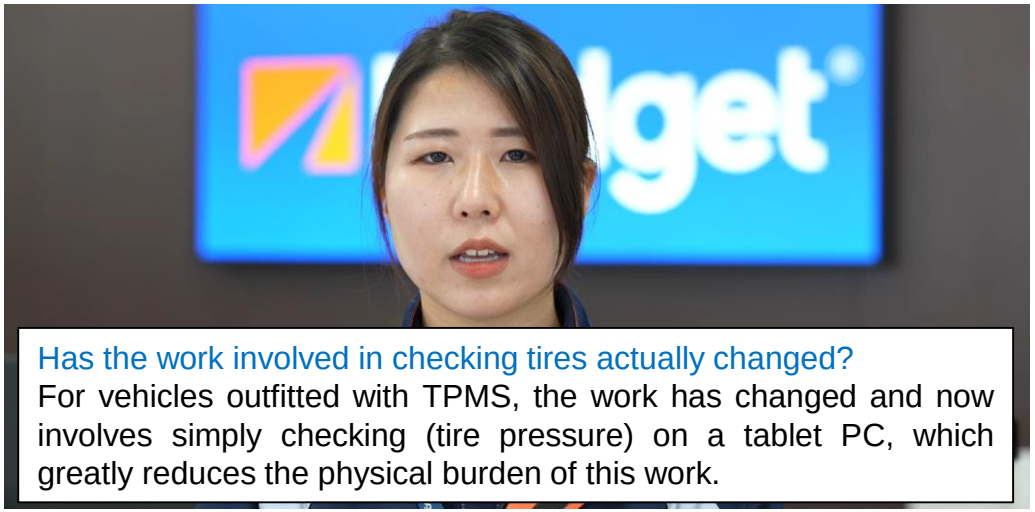
Before TPMS:
Average Tire Pressure Check Time per Vehicle: 103s

After TPMS:
Average Tire Pressure Check Time per Vehicle: 54s

Less Physical Strain

Before TPMS:
Inflating Tires While Kneeling Down to Manually Check the Pressure of Each

After TPMS:
Inflating Only Tires with Low Pressure After Checking Pressure on a Tablet PC



Has the work involved in checking tires actually changed?
For vehicles outfitted with TPMS, the work has changed and now involves simply checking (tire pressure) on a tablet PC, which greatly reduces the physical burden of this work.

What is SENSING CORE Technology?

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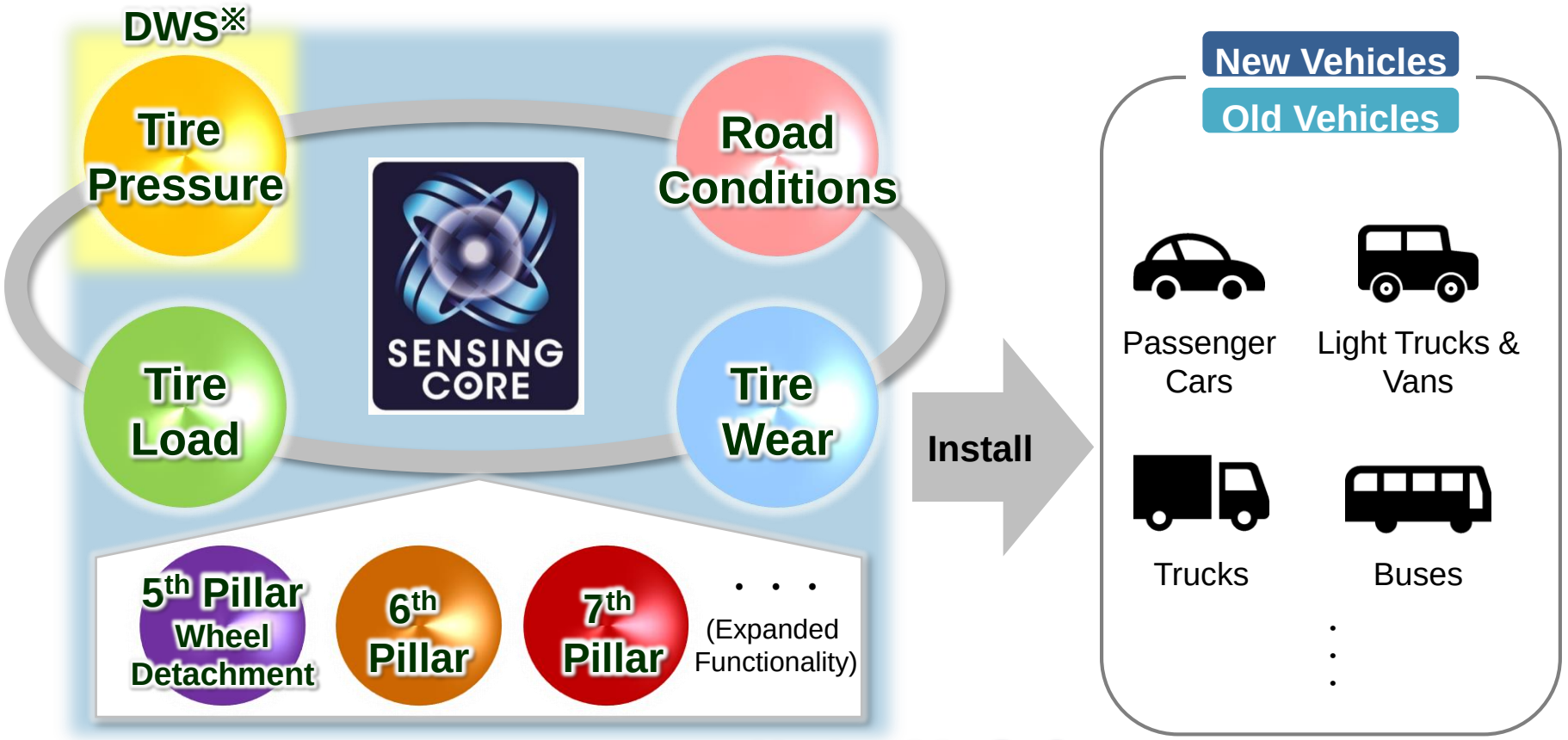
- Software Able to Detect Tire Pressure, Load, Wear, Road Conditions, etc.
- Maintenance-Free: Requiring No Additional Sensors or Replacement Batteries, etc.
- Installed in Onboard Vehicle Computer: Compatible with All Types of Vehicles & Tires
- Expandable Detection Functionality through Software Updates
- Based on Proprietary Analysis Technology Cultivated through DWS



※Deflation Warning System

What is DWS (Deflation Warning System)?

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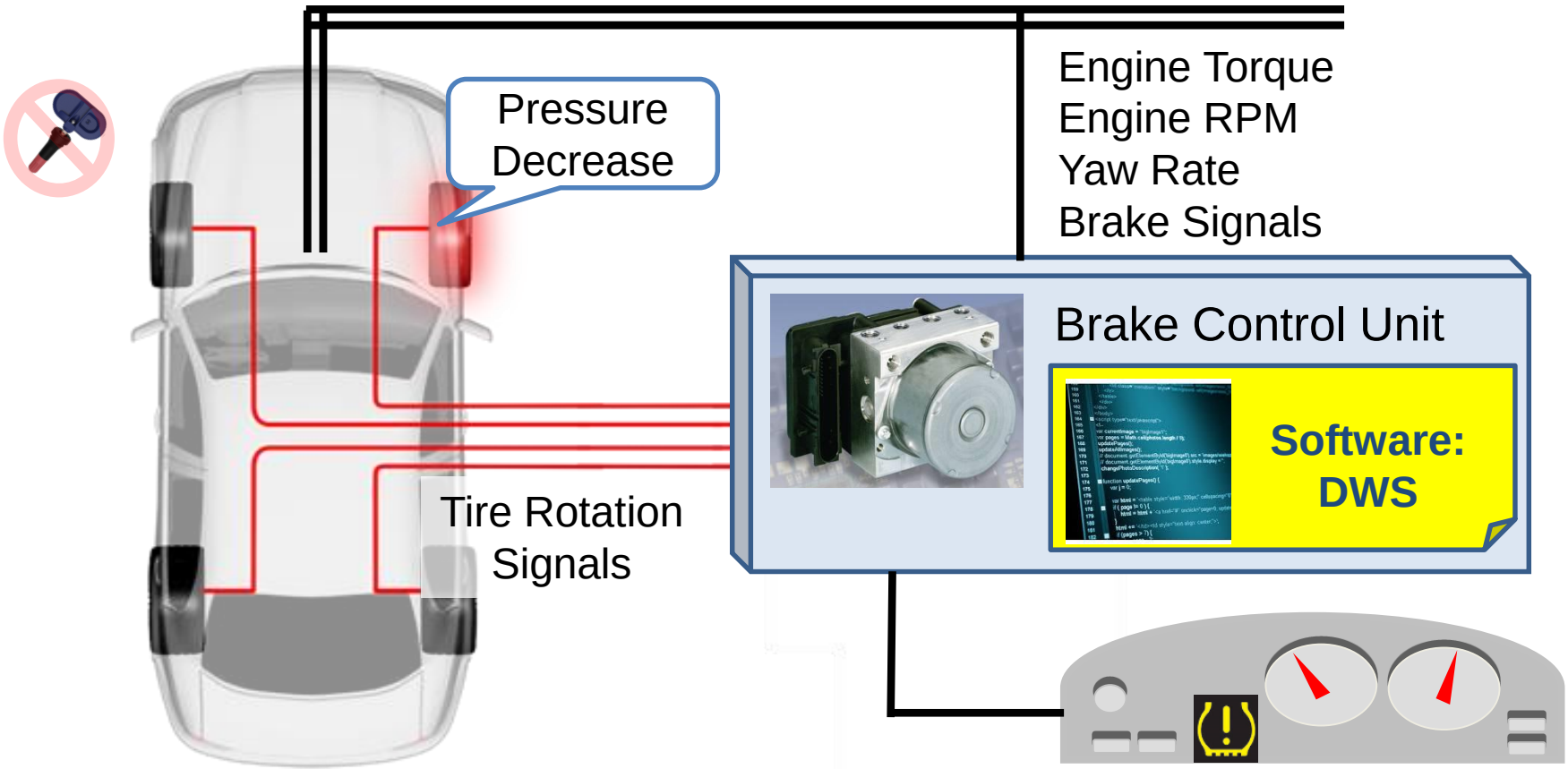
- **Software Able to Detect a Decrease in Tire Pressure by Analyzing Tire Rotation Signals & Engine Data (Without Requiring TPMS Sensors)**
- **SENSING CORE = Expanding DWS Functionality to Detect Tire Load, Wear & Road Conditions as Well**



DWS Track Record

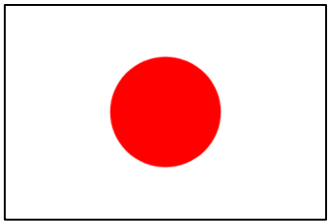
- **Installed in 46M New Vehicles Made by 15 OE Automakers in Japan, Europe, China & India Over the Past 25 Years (1997 – 2021)**
- **Installed in 4.26M New Vehicles in 2021 Alone**
- **25+ Years of Development Experience + Track Record of Installation in Over 46M Vehicles to Date = A Testament to the High Performance & Quality of DWS**

2021

4.26M Vehicles

To Date (1997~2021)

46M Vehicles



5 OE Automakers

4 OE Automakers

5 OE Automakers

1 OE Automaker

Value Provided by SENSING CORE

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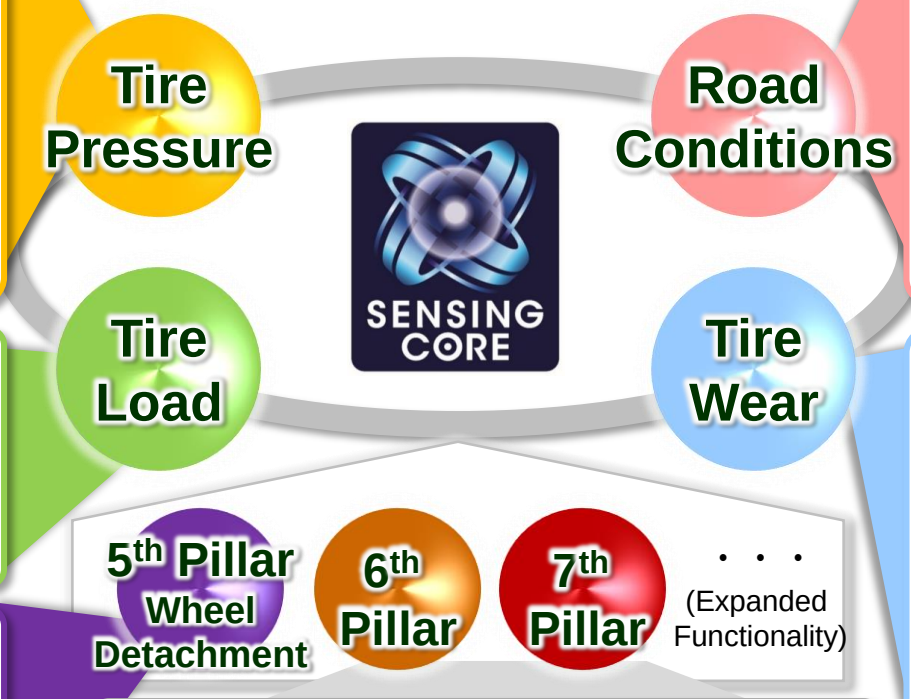
SENSING CORE provides extensive value by detecting Tire Pressure, Load, Wear and Road Conditions, etc. We are now working on developing a 5th Pillar to detect warning signs of wheel detachment.

■ Visualizing CO_2 Emissions
■ Improving Fuel (Energy) Efficiency
■ Automating Tire Inspections
■ Preventing Tire Trouble
■ Improving Fuel (Energy) Efficiency

■ Preventing Overload & Unbalanced Loads
■ Preventing Overturn Accidents

■ Detecting Warning Signs of Wheel Detachment



■ Responding to the Needs of Sports Cars & Other High-Performance Vehicles
■ Responding to the Needs of CASE: Detecting Tire Damage (for Heavier EV)

■ Detecting Upcoming Patches of Slippery Road

■ Automating Tire Inspections
■ Managing Tire Maintenance Timing
■ Improving Tire Life & Promoting Retreading

SENSING CORE Principles (Tire Pressure & Load)

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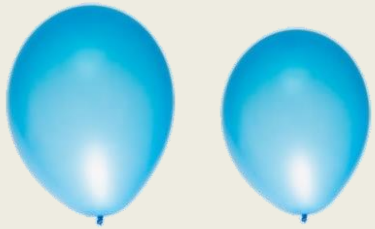
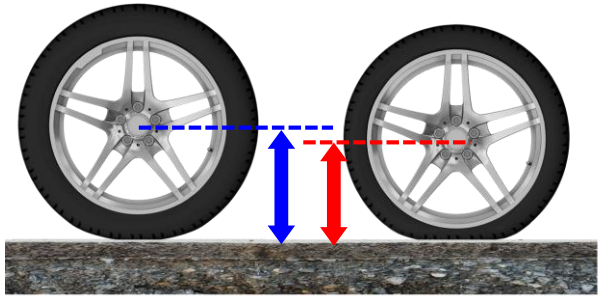
High-Precision Detection: Made possible thanks to our advanced technology and extensive knowhow based on years of working to understand the relationship between tire characteristics and pressure/load.

Dynamic Loaded Radius



Less Air → Smaller Balloon



Decreased Tire Pressure

▼

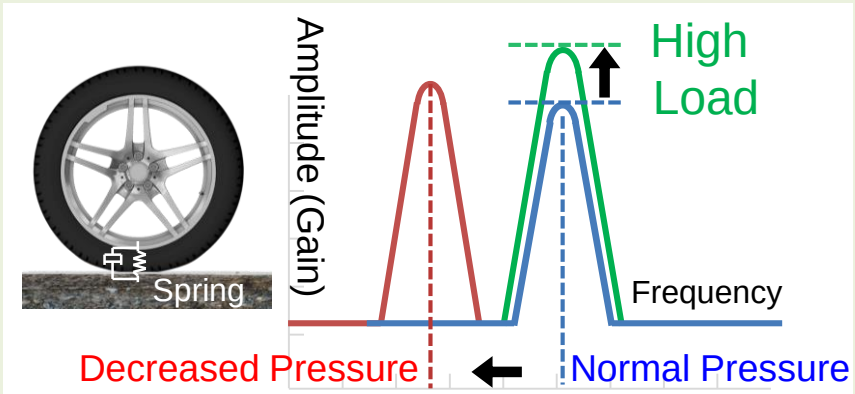
Smaller Dynamic Loaded Radius

▼

Increased Wheel Speed

Torsional Resonance

String Tautness Affects Sound



Decreased Pressure／Increased Load

▼

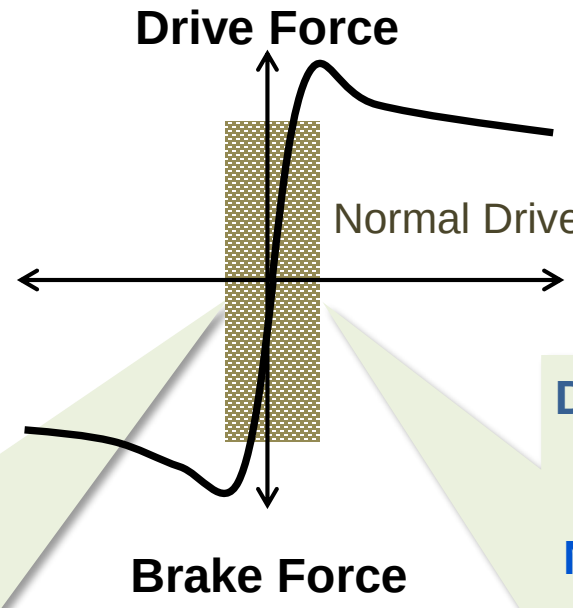
Decreased Stiffness／Increased Flex

▼

Lower Resonance Frequency／Higher Amplitude

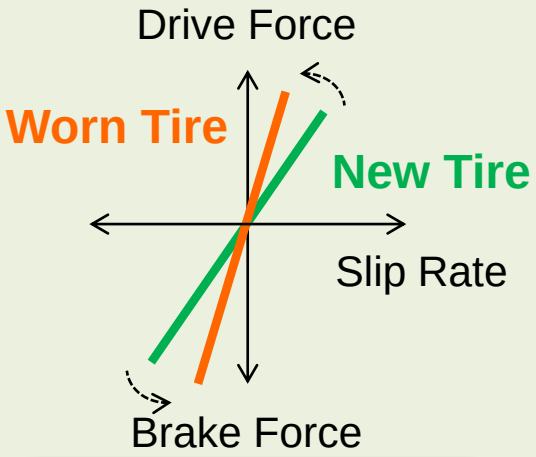
Cultivated over 25 years of DWS development, our advanced data filtering technology removes data noise to allow for high-precision detection of wear and road conditions.

Tire Slipperiness



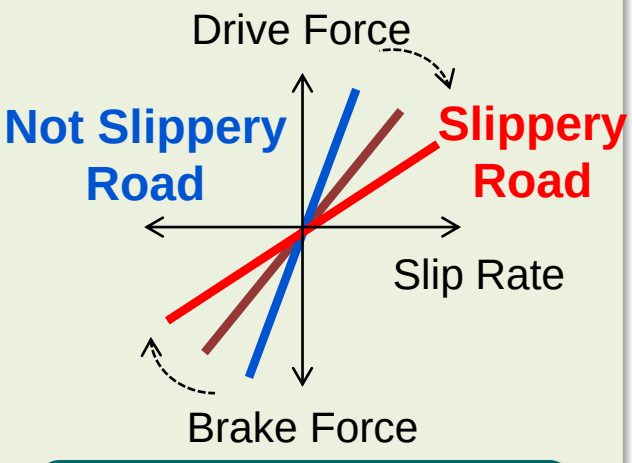
$$\text{Slip Rate} = \frac{\text{Tire RPM} - \text{Vehicle Speed}}{\text{Vehicle Speed}}$$

Detecting Tire Wear



Wear Causes the "Incline" to Shift

Detecting Road Conditions



Road Conditions Cause the "Incline" to Shift

SENSING CORE Business Concept

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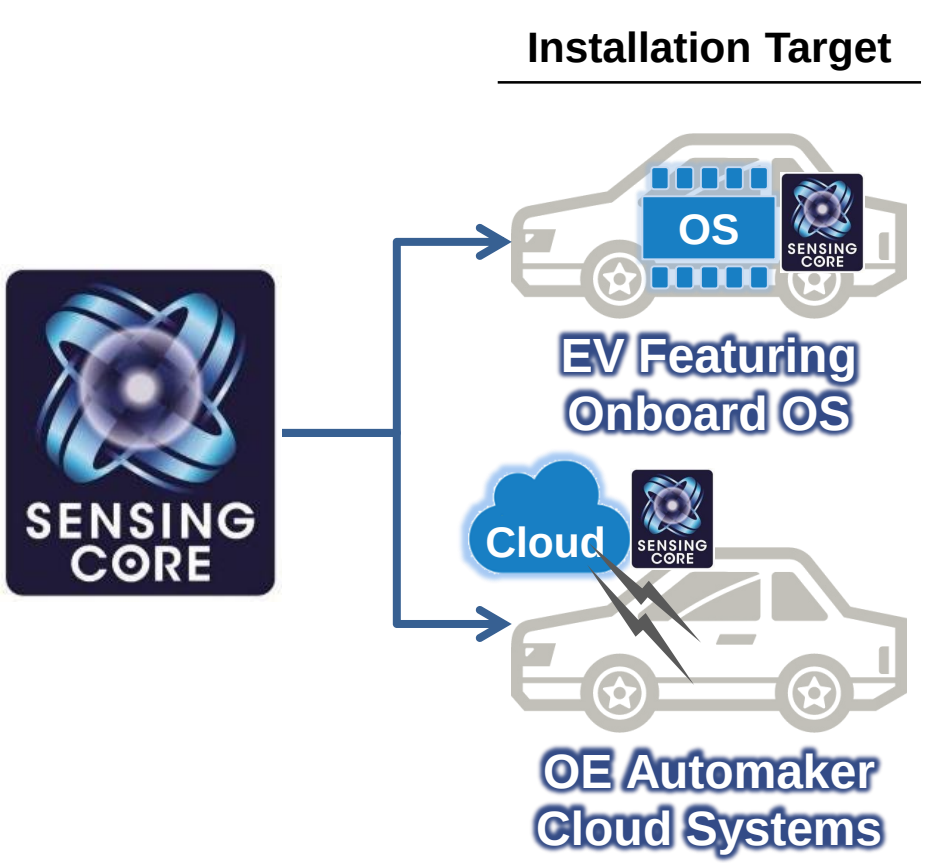
① Development & License Sales Focusing on Next-Gen EV Featuring Onboard OS

② In Addition: License Sales for Installation on OE Automaker Cloud Systems

- In addition to SENSING CORE, we will also continue to develop and sell EV Tires, SILENT CORE, Specialized IMS and other technologies to respond to the needs of CASE.



Today's First-Hand Value Experience Demos

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In a few moments, you will have a chance to see and experience first-hand the value that SENSING CORE provides by detecting road conditions (upcoming hazards), automating tire inspections, visualizing CO_2 emissions and detecting warning signs of wheel detachment.

Detecting Upcoming Patches of Slippery Road

Automating Tire Inspections

Visualizing CO_2 Emissions

Detecting Warning Signs of Wheel Detachment

Image of Today's First-Hand Value Experience Demos

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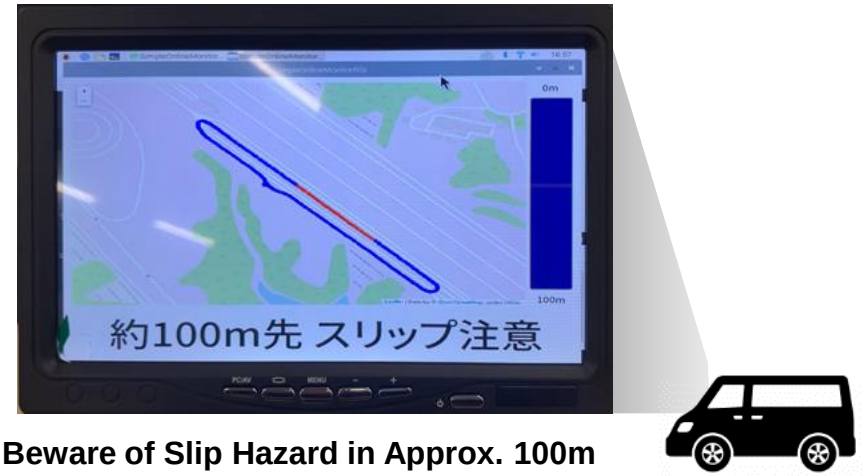
Road Conditions

Tire Pressure

Tire Wear

Detecting Upcoming Patches of Slippery Road

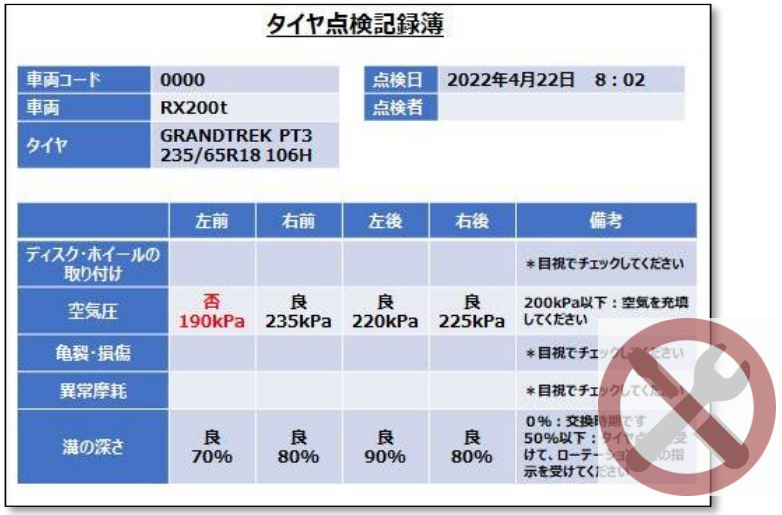
Detecting & Warning the Driver of Upcoming Patches of Slippery Road



Beware of Slip Hazard in Approx. 100m

Automating Tire Inspections

Automating Tire (Pressure/Wear) Inspections for Reduced Workloads



タイヤ点検記録簿

車両コード	0000	点検日	2022年4月22日 8：02
車両	RX200t	点検者	
タイヤ	GRANDTREK PT3 235/65R18 106H		

	左前	右前	左後	右後	備考
ディスク・ホイールの取り付け					＊目視でチェックしてください
空気圧	否 190kPa	良 235kPa	良 220kPa	良 225kPa	200kPa以下：空気を充填してください
亀裂・損傷					＊目視でチェックしてください
異常摩耗					＊目視でチェックしてください
溝の深さ	良 70%	良 80%	良 90%	良 80%	0%：交換時期です 50%以下：タイヤを受けて、ローテーションの指示を受けてください

Tire Pressure

Visualizing CO_2 Emissions

Visualizing CO_2 Emissions Based on Varying Pressure Levels

5th Pillar Wheel Detachment

Detecting Warning Signs of Wheel Detachment

Warning the Driver of Loose Nuts (Hard for the Driver to Sense) & Urging the Suspension of Driving

Value Provided by SENSING CORE (Pressure/Load/Wear)

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Various Other Types of Value in the Works (Beyond Today's Demos)

Tire Pressure	Puncture Detection & Trouble Prevention	■ Detects a decrease in tire pressure and promptly alerts the driver of a puncture or other tire trouble.
Tire Pressure	Improving Fuel (Energy) Efficiency	■ Contributes to improved fuel (energy) efficiency by promoting proper tire inflation (pressure).
Tire Load	Preventing Overload & Unbalanced Loads	■ Promotes appropriate loading by notifying the driver when a vehicle is overloaded or unbalanced.
Tire Load	Preventing Overturn Accidents	■ Monitors tire load and warns the driver of risky driving that can cause a vehicle to tip over.
Tire Wear	Managing Tire Maintenance Timing	■ Provides advice on the timing of tire maintenance based on remaining groove depth.
Tire Wear	Improving Tire Life & Promoting Retreading	■ Contributes to improved tire life by promoting retreading at optimal timing.

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Rubber and Beyond, Driving Our Future

SUMITOMO
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