Subjective Assessment for Wet Track Design: an Innovative Approach to Vehicle and Driving Simulation

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Solutions for your journey

“Bridgestone Essence” as guide

Serving Society with Superior Quality

In 2019 Bridgestone started a project to renew the wet handling track with the aim to…

…TEST HIGH-VALUE PRODUCTS

- ✓ All tire categories…
- ✓ …for all car segments and motorbikes

…BUILD ECOSYSTEM

- ✓ Strengthen relationship with Customers…
- ✓ …while attracting new OEMs and Magazines

…PROVIDE OPTIMAL CONDITIONS

- ✓ Enable challenging performance tests…
- ✓ …providing a state-of-the-art wet facility

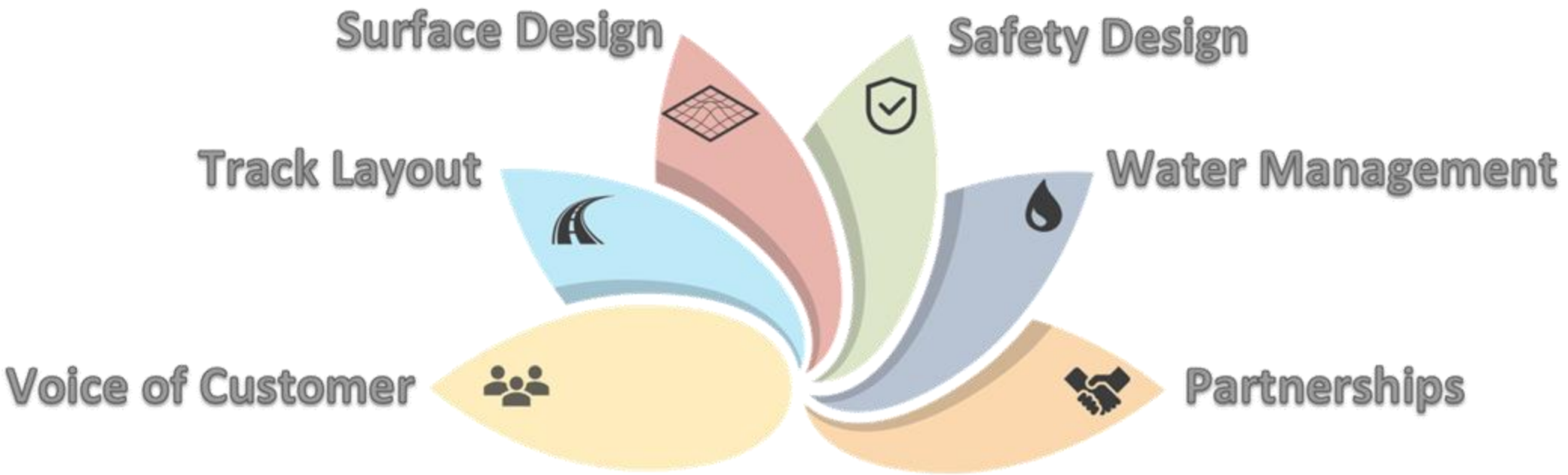
…ENSURE DATA QUALITY

- ✓ Reduce seasonality effects…
- ✓ …while ensuring conditions uniformity and stability

Purpose of the project was to design and build the ultimate wet handling track

Cross-functional Project

Several aspects considered since the beginning



The project exploited the expertise of Bridgestone EMIA Technical Center

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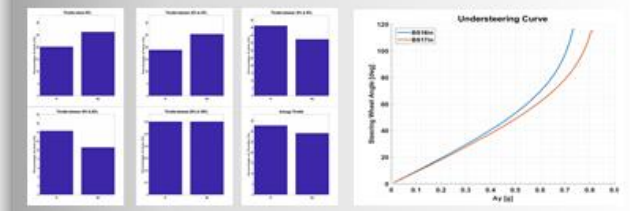
Design of the new layout

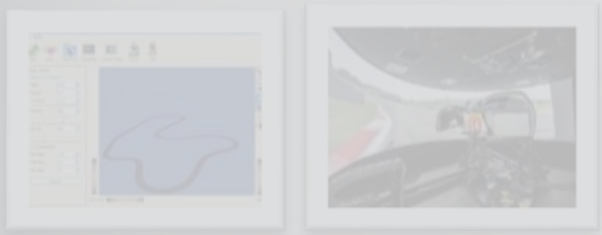
Vehicle Simulations have been essential in the process

Obj Characterization



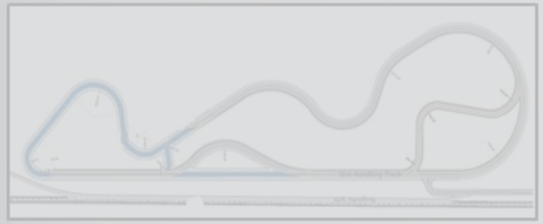
- Obj metrics
- Subjective correlation
- Benchmark external track

Simulation Activity



- Track options concept
- Track virtual modeling
- Evaluate tracks on simulator

New layout definition



- Consolidate objective data
- Integrate simulation outcome
- Fix final layout

Three preparatory steps were adopted to define the optimal design

Objective characterization

Benchmarking EUPG vs. alternatives

EUPG

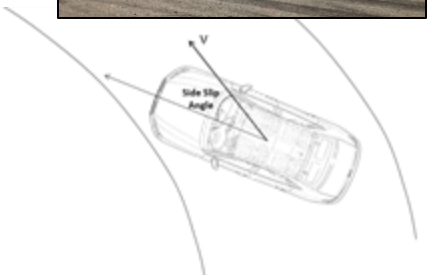
vs. *Benchmark*

EUPG was benchmarked with alternative tracks

Different vehicles equipped with VD measurement chain

Two main KPIs were considered:

→ Distribution of Throttle usage



→ Side Slip Gradient

Requirement was to enable throttle on-off usage, while allowing a more stable rear axle

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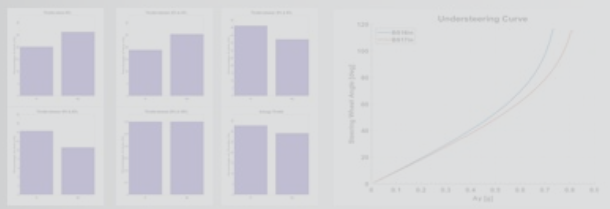

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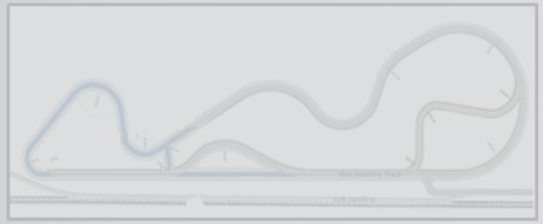

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Vehicle Simulations Activity

Implementation of the environment

MODELLING THE DRIVER

→ MaxPerformance adopted as virtual driver

MODELLING THE VEHICLE

→ Vehicle model previously validated with open loop maneuvers on dry surface

MODELLING THE TRACK

→ Virtual replica of old layout was reproduced together with actual reference path acquired on track

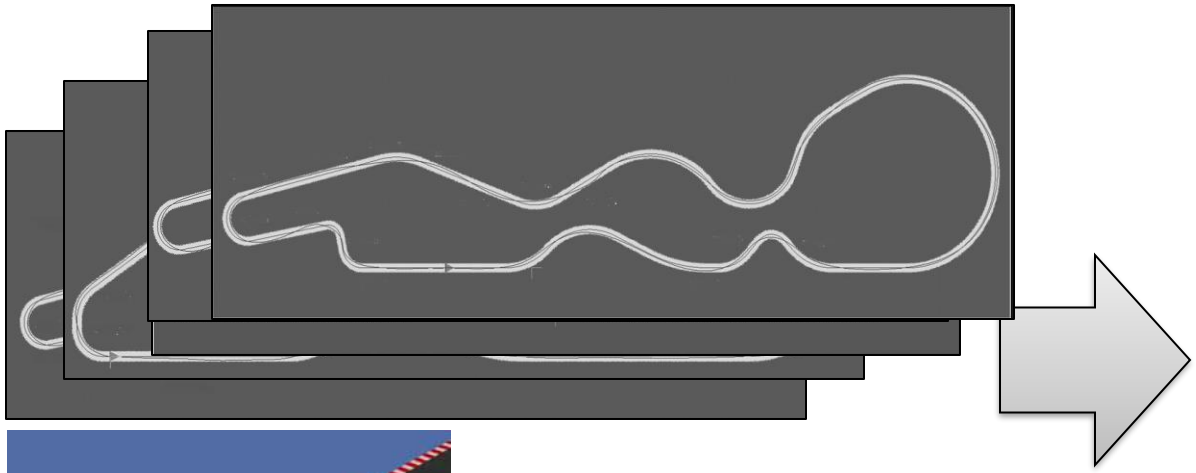
MODELLING THE TIRE

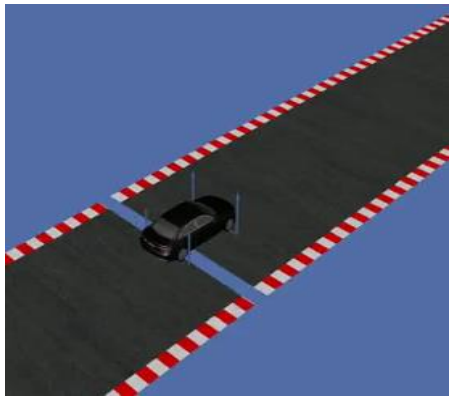
→ Tire was modelled through a Pacejka MF specifically tuned for the purpose

Bridgestone experience in Vehicle Simulations was key to complete the activity

Simulation Activity

Off-line vehicle simulations



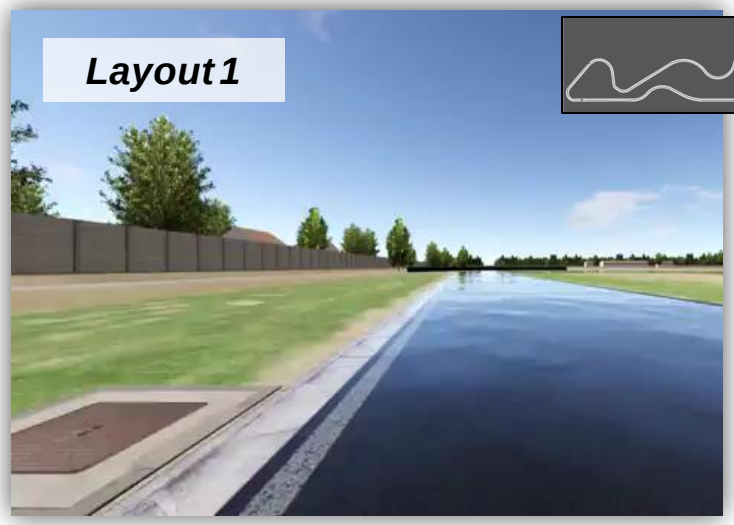


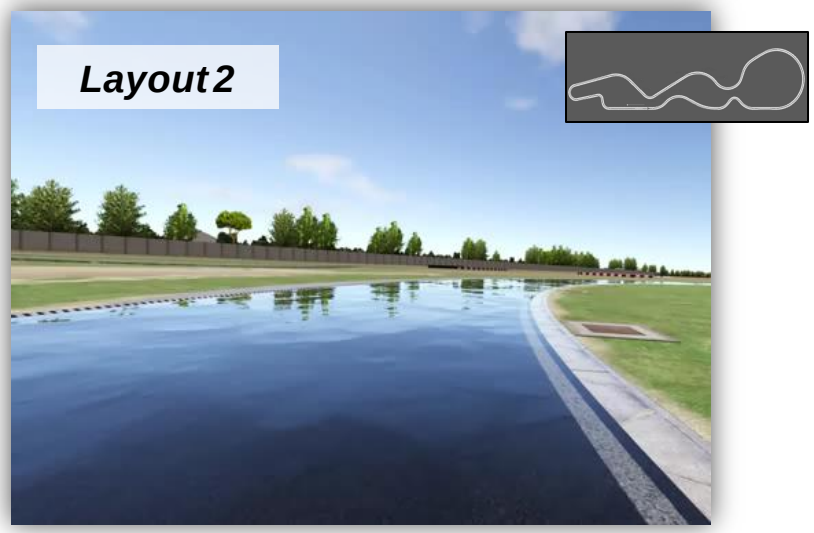
- Side Slip Gradient assessment to improve US/OS evaluation
- Verification of vehicle stabilization before approaching next corner
- Identification of Throttle on-off forced by low enough speeds in corners

More than 10 different layout proposals were screened through off-line simulations

Driver In the Loop activity

Final subjective assessment





Bridgestone professional drivers were involved to select the final layout prior to starting construction

Innovative approach for wet track design

The advantages of vehicle and driving simulation

- Professional Drivers – involved since the early stage of the project – had the possibility to subjectively assess the best layouts in advance, after optimization performed with off-line vehicle simulations
- Adoption of vehicle and driving simulations allowed to minimize the investment risk, allowing to start construction only after the best layout was defined and validated
- The evaluation of so many different options would not have been possible without simulations, unless facing important costs for any modification that could have been deemed necessary

- More corners that force on-off throttle usage
- Sections of the track designed to emphasize transition from understeering to oversteering

Inaugurated in January 2022, the new wet handling track aims to be an all-encompassing testing facility