

The Concept of Equivalence Criteria

41st TF TA
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JAPAN AUTOMOBILE STANDARDS INTERNATIONALIZATION CENTER

- ◆ As a premise, we believe measures should be introduced not for the sake of test methods themselves, but rather those deemed necessary to technically evaluate the capabilities of test center.

- ◆ Correlation between both test method was confirmed.
The MA test results contained outliers, making the correlation between the two test methods seem low, but this was due to the variability of both methods. The occurrence of outliers can be reduced by controlling the variability factors, which is expected to improve the correlation between the test methods.

- ◆ A scheme requiring each test center to demonstrate test method correlation is unnecessary. Furthermore, test results contain variation and may not represent the true value, making it difficult to achieve complete alignment with test results from other test centers, which themselves may not represent the true value.
(How can control be achieved when the true value is not known?)
 - ➔ By appropriately managing the test condition factors that cause outliers in both the vehicle test method and the drum test method, the accuracy of each test can be improved, enabling equivalent test results to be obtained.

- ◆ Ensuring test accuracy is crucial to avoid producing outlier test results. It would be beneficial to introduce procedures for verifying test accuracy at each test center. For example...
 - For vehicle test method:

Vehicle test method specifies the permissible abrasion level for reference tyres to test centers, taking into account temperature dependency.

In addition to this, define requirements such as verifying the equivalence of abrasion levels for each vehicle by conducting test with equipping reference tyres on all vehicles in a convoy under conditions which ensuring input of each cycles within tolerance.
 - For drum test method:

Define requirements such as verifying the equivalence of abrasion level across two positions by testing the reference tyre under conditions where the third body flow rate per cycle is maintained within tolerance.

A procedure will be introduced to determine the combination of surface, third body and flow rate at each drum based on the SRTT abrasion level.

JASIC propose a concept for managing test conditions that test centers should control and for evaluating the results of their verification.

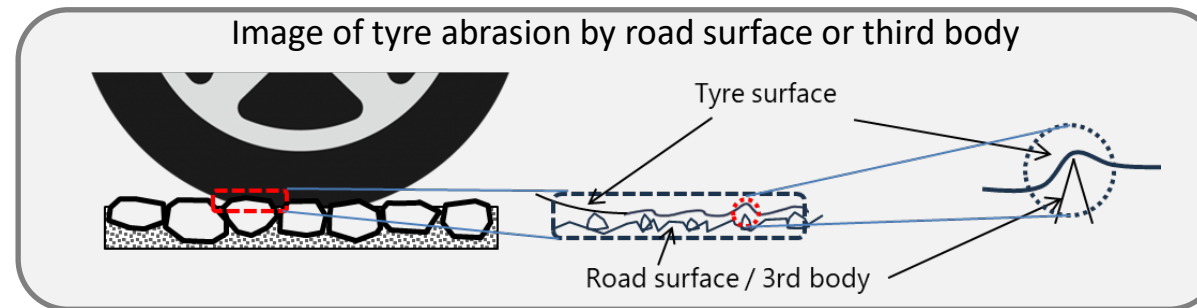
- ◆ The primary objective is to enhance reproducibility within and across test centres (correlation with actual vehicles is the next phase).
- ◆ To enhance reproducibility, testing under identical conditions (same severity) is essential.
- ◆ However, testing facilities differ between TCs, making testing under completely identical conditions unfeasible.
- ◆ Therefore, we propose narrowing the abrasion level range of the SRTT to effectively establish testing under ‘same severity’ conditions.
- ◆ If the narrowed SRTT abrasion level range becomes closer to that of the vehicle test method, it will be possible to state that both test methods are testing under the ‘same severity’ condition, making correlation between them easier to establish.
Furthermore, testing under this same severity condition could serve as an indicator to ensure equivalence with the vehicle test method.
- ◆ Proposal for establishing guidelines for recommended conditions and/or establishing procedures to control the SRTT abrasion level
 - Indicate the factors influencing SRTT abrasion levels (and their interactions).
 - The final selection of surface and third body shall be at the discretion of the testing facility within the broad framework.

Background

- ◆ Passenger car tyres operate on dusty roads.
- ◆ A car tyre is an example of a situation where abrasion occurs both against a solid, rough abradant—the road—and against a free-flowing abradant in the form of grit particles.

Role of Road Surface (Solid Abradant) and third body (Loose Abradant) in indoor drum test

- ◆ Role of Road Surface : A rough road surface has a stronger abrasive effect on tyres, while a smooth surface has a weaker abrasive effect.
- ◆ Role of third body :
 - To prevent gumming, a certain minimum amount of powder is necessary (if too little is used, gumming can occur and tyre abrasion is suppressed).
 - If the third body is soft, it tends to break down easily and has a weak abrasive effect on rubber. If too much is used, the rubber slips on the powder and does not wear (e.g., talc).
 - If the third body is hard, it has a strong abrasive effect on the rubber. Increasing the amount accelerates rubber wear (e.g., silica).



By adjusting the road surface, third body type, flow rate, and powder distribution system, it is possible to simulate real-world conditions (dusty roads) and achieve similar tyre abrasion states in testing, enabling robust evaluation.