The 59th EPPR IWG

Status of Motorcycle Power Performance Assessment in Korea

30th. MAY. 2023

Korea Transportation Safety Authority
Korea Automobile Testing & Research Institute

Status of introduction and implementation of Motorcycle power determination

KMVSS (Korea Motor Vehicle Safety Standards)

- **Introduce Motorcycle power determination : 2012**
- **Enforce the rules in KMVSS and Conduct defect investigations : 2015**
  - Non-conformance occurred : Out of tolerance of the Tested Results
  - (Causes) Apply different testing methods

  ☞ Suggest research to clarify testing methods for motorcycle power determination

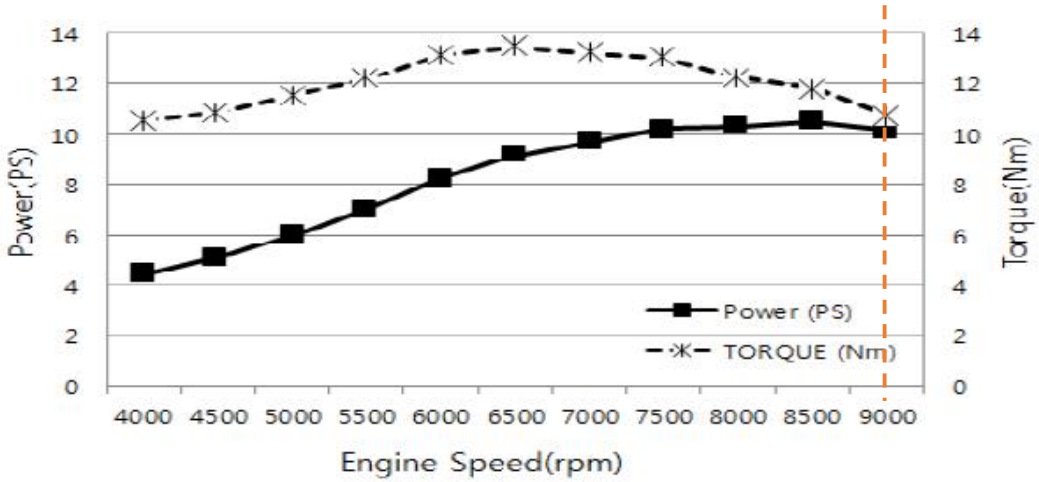
- **Comparison of Rule between KMVSS and EU No. 44/2014**
  - Criteria : Peak power 11kW or less: within ±10% / Peak power 11kW or more: within ±5%
  - Test Condition

	KMVSS	EU No.44/2014	ISO(Ref.)
Test Temperature (℃)	25	25	25
Temperature Range(℃)	15 ~ 35	10 ~ 45	15 ~ 35
Total atmospheric Pressure(kpa)	100	100	100
Dry Atmospheric Pressure(kpa)	99	99	99
Pressure Range	80 ~ 110		90 ~ 110
Humidity(%)	(30%)	(30%)	(30%)
Correction Factor	0.93 ~ 1.07	0.93 ~ 1.07	0.96 ~ 1.06

Non-conformance occurred (2015)

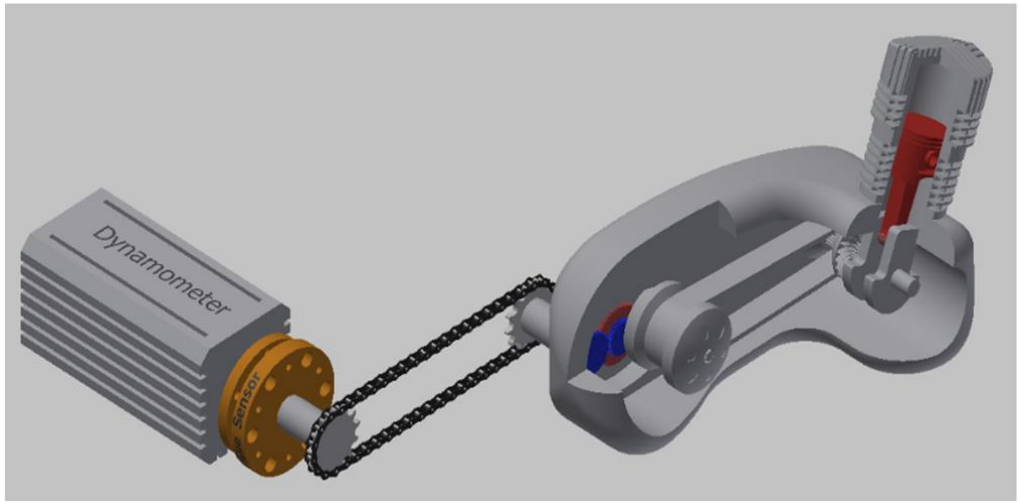
- **Direct link(KATRI)** vs. Gearbox(Manufacturer)
  - **Motorcycle Specification**
    - Capacity : 124.5cc (1 cylinder) / Transmission : CVT
    - Reported power performance 12.2PS/8750rpm (8.97kW/8750rpm) ☞ **[9.867 ~ 8.073kW]**
  - **Test Condition**
    - Fuel Specific Gravity : 0.753(24℃) / Lubricant : 10W-30 (Measurement Point Temperature : over 80 ℃)
  - **Test Result in KATRI**
    - Power performance 10.52PS/8750rpm (**7.4kW**/8750rpm)

    ☞ Out of tolerance : 3% (13% from the reported value)

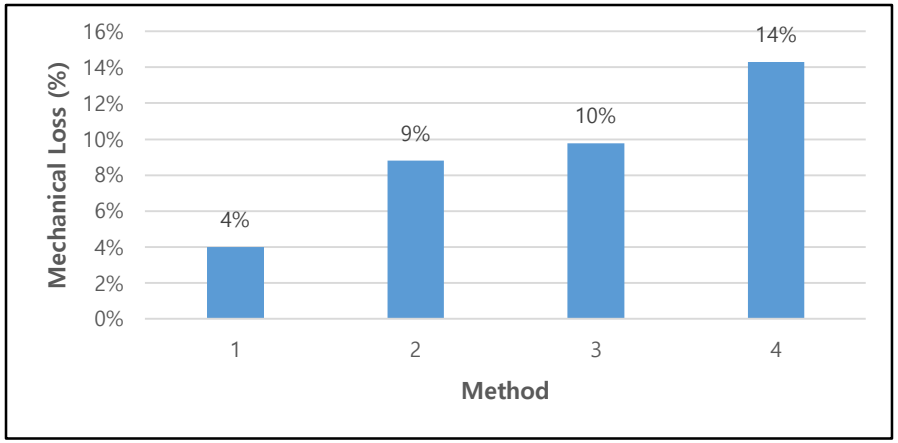


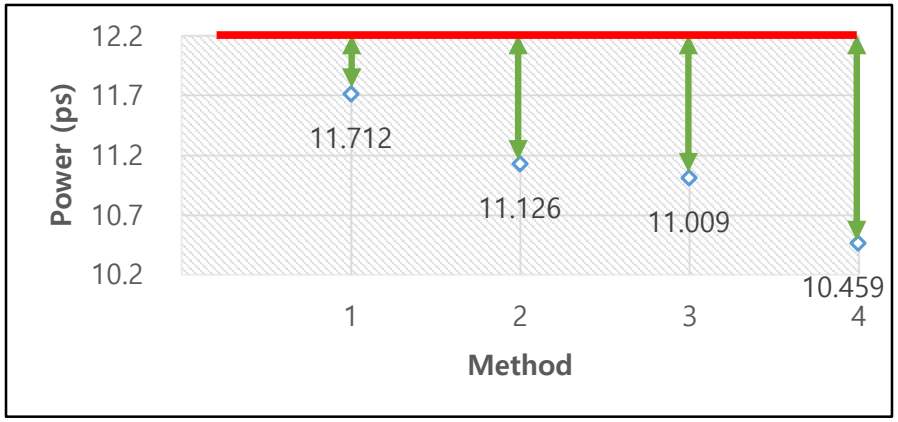
Changes correction factor of Gearbox

Calculation of Power Loss



			Method_1	Method_2	Method_3	Method_4
CVT Belt	toothed	0.95				
	V-belt	**0.94**			○	○
Final Gear	**spur**	**0.96**	○	○	○	○
	helical	0.97(EU) or 0.98(ISO)				
	bevel	0.96(EU) or 0.98(ISO)				
Dynamometer	**chain**	**0.95**		○		○
	silent	0.98				
Total efficiency			0.960	0.912	0.902	0.857





Test result on power loss(%) of a gearbox (1)

- **Test results on 3 type motorcycles**

Input Torque [1]	Output Torque [2]	Efficiency (%)	Power loss (%) [3]	Remarks [4] (Displacement)
5.29 Nm	5.05 Nm	95.46	4.54	(about 50cc)
12.49 Nm	12.09 Nm	96.80	3.20	(about 125cc)
19.85 Nm	19.36 Nm	97.53	2.47	(about 250cc)

1) Torque measured at Input shaft of a gearbox

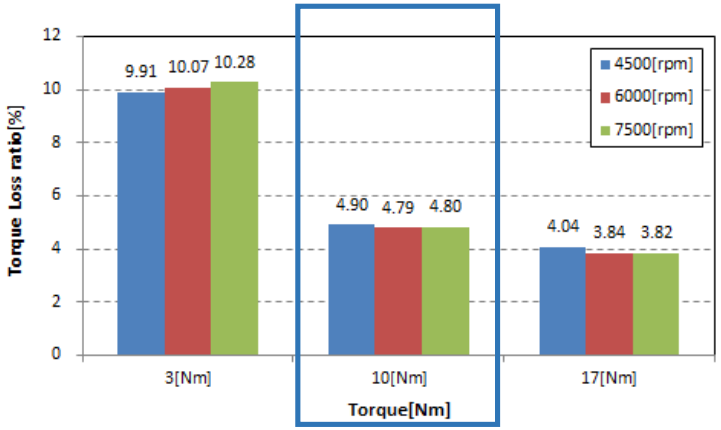
2) Torque measured at output shaft of a gearbox and divided by gear ratio

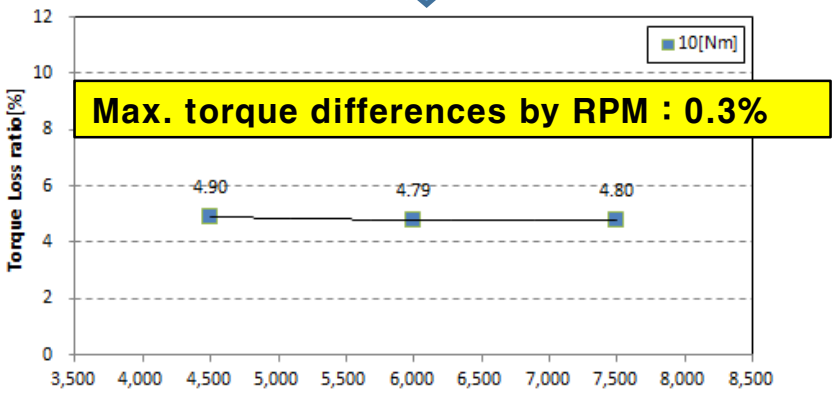
3) Power loss(%) = 100 – Transmission Efficiency (%)

4) Displacement corresponding to Max. Torque of motorcycles

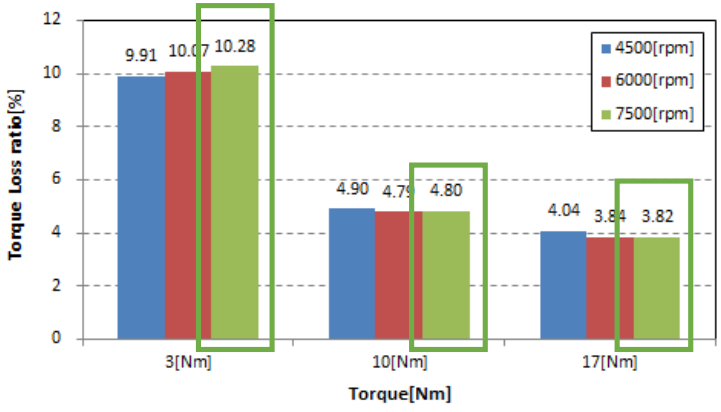
Test result on power loss(%) of a gearbox (2)

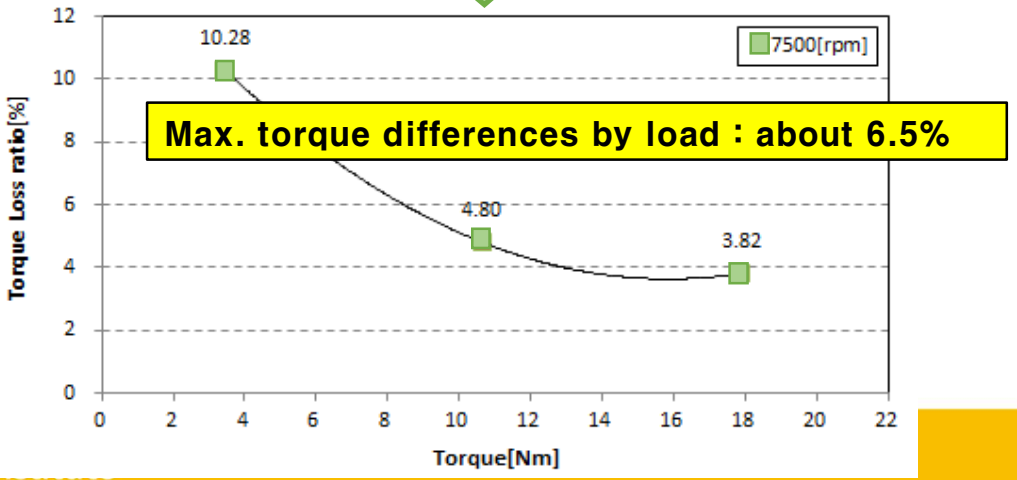
- **Test results on 3 type torques (3Nm, 10Nm, 17Nm) and 3 type rpm (4500, 6000, 7500) by motor**





Max. torque differences by RPM : 0.3%

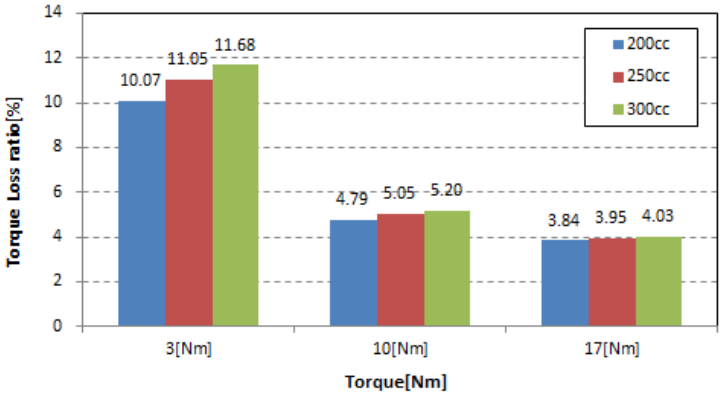


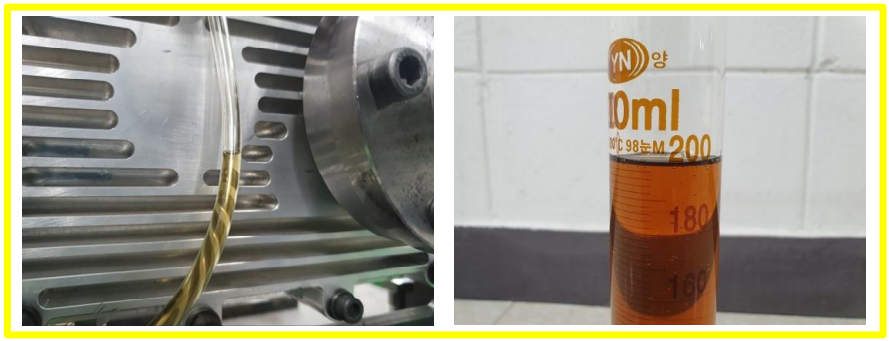


Max. torque differences by load : about 6.5%

Test result on power loss(%) of a gearbox (3) and Opinions

- **Test results on 3 type torques (3Nm, 10Nm, 17Nm) and 3 type oil inputs (200cc, 250cc, 300cc)**
  - **Measure power loss following changes of oil input**





- Reduction of power transmission efficiency following increased oil in the gearbox

☞ Shown the decrease the impact of ail input changes as the load increases

- **Opinions**
  - **Since 2015, 15 Motorcycles tested**

Current Status on test of motorcycle power measurement in Korean market

- **Tested 15 motorcycles from 2015**
  - **Test States**

Year	Combustion Engine Motorcycle	Electric Motorcycle
2015	1	-
2016	1	-
2017	1	-
2018	2	-
2019	1	-
2020	3	1
2021	-	3
2022	-	2

Next Step

- **Focus on establishing rules for electric motorcycles**
- **Consideration of how to contribute to generating rules**

Thank you very much ! !

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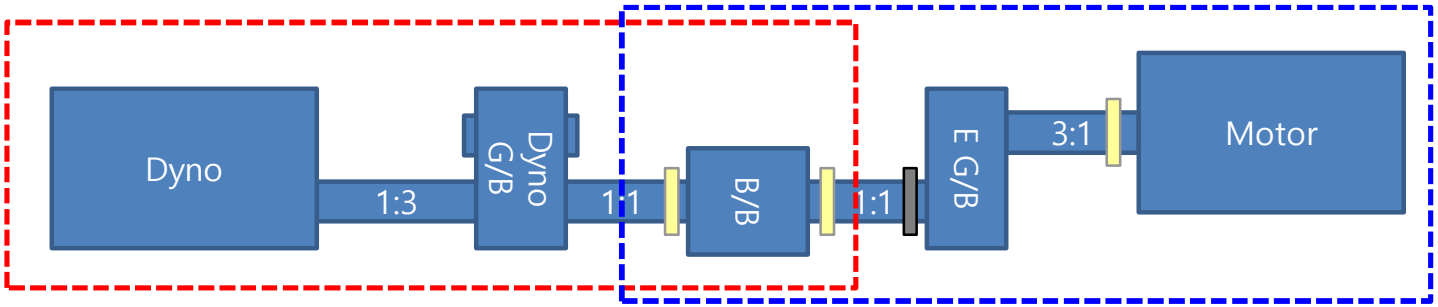
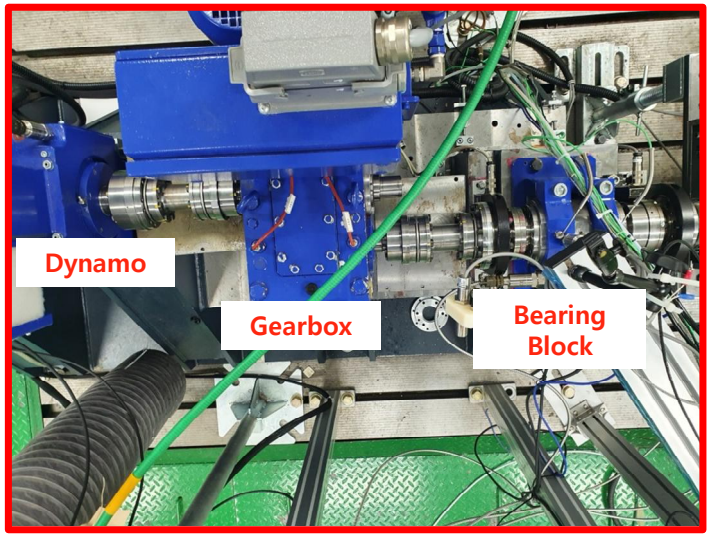
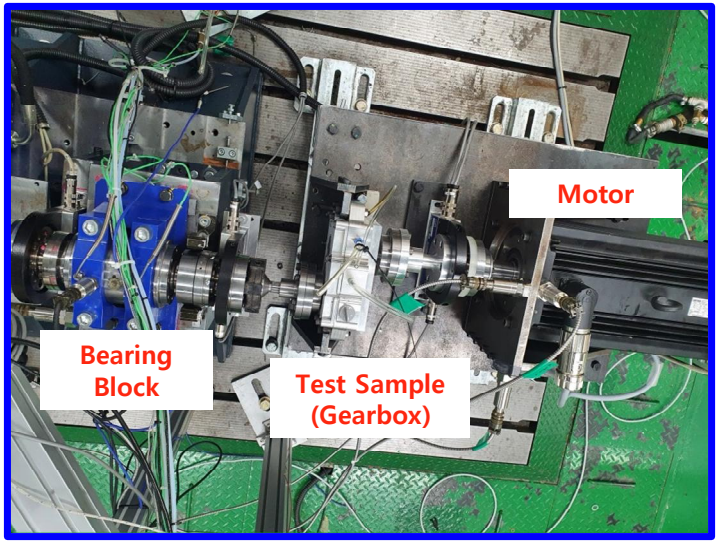
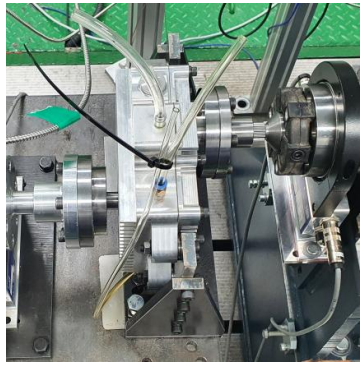
➢ Measurement System for Power Loss of Gearbox







Gearbox



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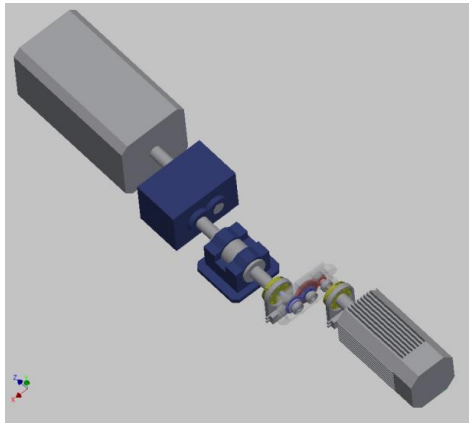

① (Motor) Generating Power (RPM and Torque)

② Measuring 1st torque (Gearbox Input)

③ Accelerating through Gearbox and Measuring 2nd torque (Gearbox Out)

④ After passing Bearing Block, Measuring 3rd torque

⑤ Decelerating through Dynamo and Measuring RPM

○ Motor Spec

- Input Voltage : 380V
- Rated Output : 20.3kW
- Max. RPM : 3530rpm
- Max. Torque : 55Nm

○ Torque Flange Spec

- Measurement Range : 0~100Nm
- Accuracy : 0.03%