POLICY UPDATE

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PROPOSED FUEL-CONSUMPTION STANDARDS FOR TWO- AND THREE-WHEELERS IN CHINA

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SUMMARY

On October 28, 2016, the Chinese Ministry of Industry and Information Technology released, for public comments, proposed fuel-consumption standards[1] for two- and three-wheeled vehicles (motorcycles and mopeds). Upon approval, the new standards will come into effect beginning on July 1, 2018, for the new type-approval model and beginning on July 1, 2019, for all new vehicle sales and registrations.

The existing (and also the first) fuel-consumption standards for two- and three-wheelers were adopted in 2008 and implemented in 2009. In 2016, 16.8 million two- and three-wheelers were sold in China. This marks a 39% decrease compared with 2008 sales, although China is still one of the top markets in the world for two- and three-wheelers. Updating these standards is an important step in reducing fuel consumption of the two- and three-wheeler fleet.

SCOPE OF THE STANDARDS

The proposed standards apply to two- and three-wheeled motorcycles and mopeds powered by gasoline or diesel. The standards define *motorcycles* as two- or three-wheeled vehicles with engine displacement larger than 50 mL or maximum design speed of more than 50 km/h. Two-wheeled motorcycles with sidecars are regulated as two-wheeled motorcycles, with the sidecar taken off during testing. The standards define *mopeds* as two- or three-wheeled vehicles with engine displacement of no more than 50 mL and maximum design speed of 50 km/h.

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1 The limits and measurement methods of fuel consumption for motorcycles and mopeds. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057585/n3057589/c5326675/part/5326683.pdf (in Chinese)

TEST PROCEDURE

To certify a two-wheeled motorcycle, manufacturers need to conduct a Type I test, whereas three-wheeled motorcycles and mopeds need to conduct both Type I and Type II tests. The Type I test is chassis dynamometer test with a transient speed test procedure. The Type II test is a steady-speed test that can be conducted on a chassis dynamometer or on the road.

The proposed standards change the test cycle of the Type I test for two-wheeled motorcycles to maintain consistency with the new two- and three-wheeler emission standards released in August 2016.[2] Therefore, the test cycle for two-wheeled motorcycles changes from the ECE R40 to the Worldwide Harmonized Motorcycle Test Cycle (WMTC)[3] to better reflect real-world driving conditions. The WMTC test cycle consists of urban, suburban, and highway driving conditions. Because the WMTC can reflect fuel consumption at steady-speed driving, the Type II test is no longer required for testing the fuel consumption of two-wheeled motorcycles.

The test cycles of the Type I test for three-wheeled motorcycles and mopeds remain the same as in the 2008 standards—ECE R40[4] and ECE R47[5], respectively. The final fuel consumption value for three-wheeled motorcycles and mopeds is a weighted average of the Type I and Type II test results—60% and 40%, respectively.

The 2009 standards require a warm-up process for at least 15 minutes before the Type I test. The proposed standards change this provision and introduce cold-start tests for all Type I tests. The Type II test remains a warm-start test, by either carrying out the test immediately after the Type I test or after a minimum of 15 minutes of preheating. Table 1 shows the details of the test procedure changes.

Table 1. Test procedure comparison for two- and three-wheelers.

	2008	2016
Two-wheeled motorcycle	Type I (ECE R40*, warm) Type II (Steady speed)	Type I (WMTC, cold)
Three-wheeled motorcycle	Type I (ECE R40, warm) Type II (Steady speed)	Type I (ECE R40, cold) Type II (Steady speed)
Moped	Type I (ECE R47) Type II (Steady speed)	Type I (ECE R47, cold) Type II (Steady speed)

*The Type I test for 2-wheeled motorcycles with engine displacement of 150 mL or more also includes an additional extra urban drive cycle. The Type II test in ECE R40 and R47 is an idle test.

2 Limits and measurement methods for emissions from motorcycles (CHINA IV). Retrieved from http://kjs.mep.gov.cn/hjbhbz/bzwb/dqhjbh/dqydywrwpfbz/201608/t20160830_363269.shtml (in Chinese) Limits and measurement methods for emissions of pollutants from mopeds (CHINAIV). Retrieved from http://kjs.mep.gov.cn/hjbhbz/bzwb/dqhjbh/dqydywrwpfbz/201608/t20160830_363273.shtml

3 Requirements for two- and three-wheeled light motor vehicles with regard to tailpipe emissions after coldstart, tailpipe emissions at idle and free acceleration [durability of pollution control devices], and energy efficiency. Retrieved from https://www2.unece.org/wiki/download/attachments/15237473/EPPR-05-04e.docx?api=v2

4 Uniform provisions concerning the approval of motor cycles equipped with a positive-ignition engine with regard to the emission of gaseous pollutants by the engine. Retrieved from http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r040e.pdf

5 Uniform provisions concerning the approval of mopeds equipped with a positive-ignition engine with regard to the emission of gaseous pollutants by the engine. Retrieved from http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r047e.pdf

FUEL-CONSUMPTION TARGETS

The fuel-consumption targets in the proposed standards are the same as in the 2008 standards, with the values set for individual models based on engine displacement. However, the displacement segment intervals are changed (Table 2).

Table 2. Comparison of two- and three-wheeled motorcycles and mopeds fuel consumption standards.

Displacement (lower end)	2-wheeled				3-wheeled			
	2009 (Existing test procedure)	**2018 (Manual)**	**2018 (Automatic)**	Manual to automatic	2009 (Existing test procedure)	**2018 (Gasoline)**	**2018 (Diesel)**	Gasoline to diesel
≤ 50 (mopeds)	2	**1.8**	**1.8**	0%	2.3	**2.1**	**1.8**	-20%
> 50–100	2.3	**2**	**2.1**	5%	3.3	**3**	**2.5**	
≥ 100–125	2.5	**2.3**	**2.5**	9%	3.8	**3.5**	**2.9**	
≥ 125–150	2.9	**2.5**	**2.7**	8%		**3.8**	**3.2**	
≥ 150–200		**2.8**	**3**	7%	4.3	**4.3**	**3.6**	
≥ 200–250		**3.6**	**3.9**	8%		**5**	**4.2**	
≥ 250–300	3.4				5.1			
≥ 300–400		**4.3**	**4.6**	7%		**6**	**5.0**	
≥ 400–500	5.2	**4.8**	**5.1**	6%	7.8	**6.5**	**5.4**	
≥ 500–650		**5.3**	**5.6**	6%		**7**	**5.8**	
≥ 650–800	6.3	**5.6**	**5.9**	5%	9	**7.5**	**6.3**	
≥ 800–1000	6.3	**5.8**	**6.1**	5%		**8**	**6.7**	
≥ 1000–1250	7.2	**6**	**6.3**	5%				
≥ 1250–1500	8	**6.3**	**6.6**	5%				
≥ 1500		**6.5**	**6.8**	5%				

Existing standards started from July 1st, 2009; proposed standards start from July 1st, 2018

Different from the 2008 standards, the proposed standards set separate standards for two-wheeled motorcycles with automatic transmissions and three-wheeled motorcycles fueled by diesel. On average, the standards for two-wheeled motorcycles with automatic transmissions are 5%–9% less stringent than for those with manual transmissions. The standards for diesel three-wheeled motorcycles are 20% more stringent than for the counterpart gasoline vehicles (Figure 1).

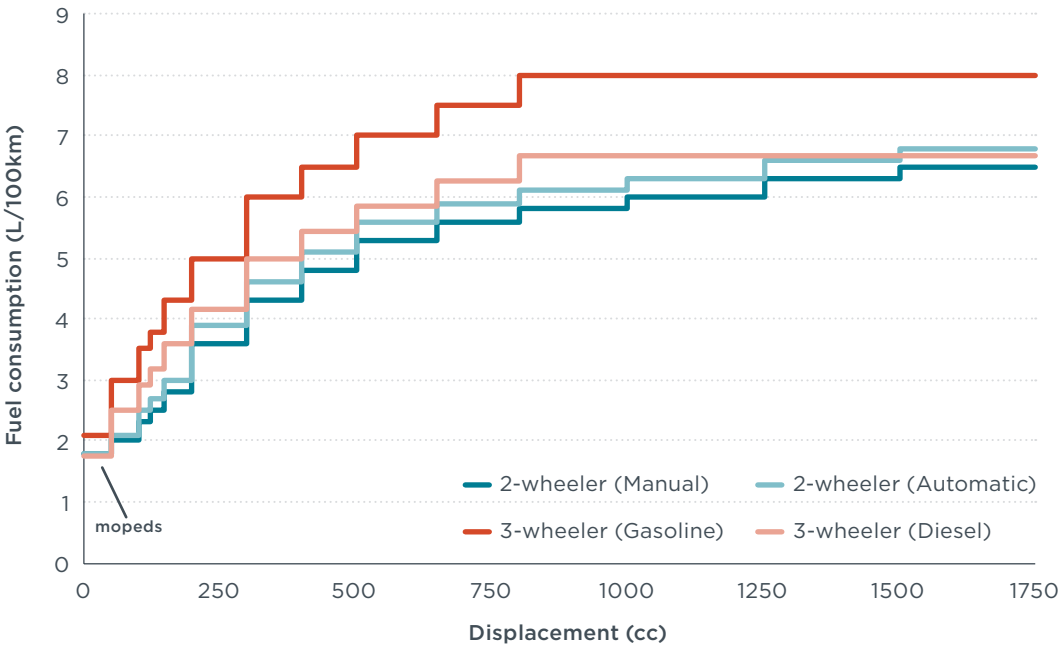

Figure 1. Two- and three-wheeled motorcycles and mopeds fuel-consumption standards.

For type-approval certification, the proposed standards add the definition of test family.[6] Vehicles belonging to the same family can report the same test results.

Because of the change of test procedure, the target value cannot be directly compared. Based on testing of three-wheeled motorcycles with engine displacement between 110 mL and 200 mL, the fuel consumption of those vehicles tested under R40 with a cold start is 6%–32% higher than those tested under ECE R40 with a warm start.

According to the proposed standards, the correlation between fuel consumption under the WMTC and combined test cycle (0.6*Type I ECE R40 cold start + 0.4*Type II) is as follows:

$$y = 1.0634x - 0.0017$$

Where:
y = fuel consumption under WMTC, and
x = fuel consumption under the combined test cycle (0.6*Type I ECE R40 cold start + 0.4*Type II)

This means that the same two- or three-wheeler tested under the WMTC consumes more fuel than under the combined test cycle, and it consumes more fuel under the ECE R40 cold start than under the ECE R40 warm start. The changes to test procedures make the proposed standards more stringent than the existing standards.

According to the explanatory document[7] released with the proposed standards, the standards for two-wheeled motorcycles would reduce fuel consumption by 447 million liters annually and generate economic benefits of 2.69 billion CNY annually (around 391 million USD). The impact of the standards for three-wheeled motorcycles was not calculated.

6 A test family consists of a group of two- or three-wheelers that have similar characteristics.

7 The explanatory document to mandatory national standards: The limits and measurement methods of fuel consumption for motorcycles and mopeds (for public comments). Retrieved from http://www.gov.cn/xinwen/2016-10/29/5125914/files/f8ddb075ea6d4083aee38dfe25fe567e.pdf (in Chinese)