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agenda item 3(b))

Chinese suggestions on Sub-categories of commercial vehicles

China Automotive Technology and Research Center

Summary

- The largest bus company in the world is Yutong Group Co., Ltd of China.
- China manufactures more than 1/3 medium and heavy commercial vehicles of the world in 2012.
- In the truck area, China always uses smaller engine power to drive heavier trucks than Europe.
- In the bus area, the main product is from 8 to 12 meters, and China has more buses between 8 to 10 meters than Europe.

N2 category

- Chinese N2 category vehicles contain the light-truck and medium truck；
- The light truck always has GVW 3.5t-7.5t, vehicle length shorter than 7 meters, two axles, and with the engine power nearly 35-80 kW (the vehicles use the Japanese or American engines always have higher engine power nearly 80-110kW), it’s kind of transition vehicle type between mini-truck and medium truck;
- The medium truck always has GVW 7.5t-12.0t, vehicle length shorter than 12 meters, two axles, and with the engine power between 80-140kW, it’s a kind of transition vehicle type between the light truck and heavy truck and also between N2 and N3 categories.
- There are nearly no N2 category trucks found in China with the engine power higher than 135 kW.

N2 category

- The engine power is not the only sub-category guide line. Use the guide line of 135kW is not appropriate for China, and set only a limit value for all N2 category is also not appropriate, and it’s big problem for China to set an appropriate sub-categories.

Two examples of N2 category

Engine displacement (ml)	Power (kW)	Torque (N.m)	S (r/min)	Length (m)	GVW (kg)	Test result (dB(A))
2800	110	360	3200	6	4500	77.3
4500	103	450	2500	8	8500	79.0

- Vehicle A is a light-truck arrangement and vehicle B is a medium truck arrangement, and in actually use vehicle B can take nearly two times goods as vehicle A, and have louder voice.
- The engine power is just a parameter of engine and power train system, like the example showing, the borderline only considering the engine power is not enough or not right.

N2 category

- China suggests using the border line of GVW 7 or 8 tones. And if you insist using the engine power, we hope it's 75kW or 80-90kW like the 02 series, cause the technology developed more slowly in the commercial vehicle area than the passenger car area. The product characteristics of China has changed a little the past ten years.
- China will not support to use the border line of 135kW, and we hope that the ECE can reconsider the sub-categories of N2 category. And it will be a disaster for Chinese manufacturers, the limit value 77 dB(A) is too hard for our medium trucks to fulfill, cause the characteristics of engines between Chinese N2 categories and European N2 categories are so different.

Sub-categories China considered

Category Vehicle		Noise limit values	
		Phase1st	Phase 2nd
N2	Pn≤75kW	78	77
	Pn ＞75kW	79	78

1. **Increased by 1 dB(A) for All vehicle categories with more than one drive axle;**
2. **Increased by 1 dB(A) for All vehicle categories with more than two axles.**

Sub-categories China considered

Category Vehicle		Noise limit values	
		Phase1st	Phase 2nd
N2	GVM≤7.5t	78	77
	GVM＞7.5t	79	78

1. **Increased by 1 dB(A) for All vehicle categories with more than one drive axle;**
2. **Increased by 1 dB(A) for All vehicle categories with more than two axles.**

N3 category

- The N3 category of China always have the maximum mass between 12t-31t, but in actual use the GVW of heavy trucks can reached more than 100t, and the overload conditions always exist.
- And there are 6 main sub-categories of N3 category.

N3 category

- 4*2 truck, always has GVW lower than 17 tones.

N3 category

- 4*2 tractor, always has GVW lower than 18 tones.

N3 category

- 6*2 truck, always has GVW 16 t-26t.

N3 category

- 6*4 truck, always has GVW 16 t-26t.

N3 category

- 6*4 tractor, always has GVW lower than 25t.

N3 category

- 8*4 truck, always has GVW 24 t-31t.

N3 category

The data base of China shows that:

- The vehicle with more than two axles of N3 category has average 2.4 dB(A) higher than two axles N3 category.
- We should not only consider the Pn, but also the axle numbers and drive axle numbers.
- Maybe the axle number has more influence to the final result than engine power.

Two examples of N3 category

- The tractor (A) and truck (B) use the engines from the same factory.
- Vehicle A has engine power 275 and vehicle B has engine power 195, but vehicle B have 3dB(A) louder voice than vehicle A.

Sub-categories China has considered

- We also want to show our support to the research report of OICA finished by TUV NORD and UTAC with consideration of axle numbers when making the sub-categories for N3 category.

Category	Subcategory		Equivalent limit values in dB(A)	
			On Road	Off Road [1)]
M1	M1-1	pmr <125 kW/t	72	74
	M1-2	125 kW/t < pmr <= 150 kW/t	73	74
	M1-3	pmr > 150 kW/t	75	75
N1/M2-A	N1/M2-A1	GVM <= 2500 kg	72	74
	N1/M2-A2	GVM > 2500 kg	74	75
N2/M2-B	N2/M2-B1	rated speed > 3000 min^{-1}	76	77
	N2/M2-B2	rated speed <= 3000 min^{-1}	78	79
N3	N3-1	2 axles, Pn <= 180 kW	79	80
	N3-2	2 axles, 180 kW < Pn <= 250 kW	81	82
	N3-3	2 axles, Pn > 250 kW	82	83
	N3-4	> 2 axles	84	85
M3	M3-1	Pn < 180 kW	76	77
	M3-2	180 kW < Pn <= 250 kW	78	79
	M3-3	Pn > 250 kW	80	81

- See ECE-TRANS-WP29-GRB-53-inf05e
- Analysis of the Monitoring Data/Impact assessment of the revised Regulation No. 51 Transmitted by OICA

Sub-categories China has considered

Category Vehicle		Noise limit values	
		Phase1st	Phase 2nd
N3	GVM≤17t	81	80
	GVM＞17t	82	81

1. **Increased by 1 dB(A) for All vehicle categories with more than one drive axle;**
2. **Increased by 1 dB(A) for All vehicle categories with more than two axles.**

For the additional items, China will not support to use the definition of G category in R51, we think we are making a regulation for noise but not for gradeability or trafficability. We should choose the main characteristics from the definition of G category related to noise and make an easier solution.

Sub-categories China has considered

Category Vehicle		Noise limit values	
		Phase1st	Phase 2nd
N3	Pn≤225kW	81	80
	Pn＞225kW	82	81

1. **Increased by 1 dB(A) for All vehicle categories with more than one drive axle;**
2. **Increased by 1 dB(A) for All vehicle categories with more than two axles.**

Sub-categories China has considered

- We also want to show our support to the research report of OICA finished by TUV NORD and UTAC with consideration of axle numbers when making the sub-categories for limit values.

Category	Subcategory		Equivalent limit values in dB(A)	
			On Road	Off Road [1)]
M1	M1-1	pmr <125 kW/t	72	74
	M1-2	125 kW/t < pmr <= 150 kW/t	73	74
	M1-3	pmr > 150 kW/t	75	75
N1/M2-A	N1/M2-A1	GVM <= 2500 kg	72	74
	N1/M2-A2	GVM > 2500 kg	74	75
N2/M2-B	N2/M2-B1	rated speed > 3000 min^{-1}	76	77
	N2/M2-B2	rated speed <= 3000 min^{-1}	78	79
N3	N3-1	2 axles, Pn <= 180 kW	79	80
	N3-2	2 axles, 180 kW < Pn <= 250 kW	81	82
	N3-3	2 axles, Pn > 250 kW	82	83
	N3-4	> 2 axles	84	85
M3	M3-1	Pn < 180 kW	76	77
	M3-2	180 kW < Pn <= 250 kW	78	79
	M3-3	Pn > 250 kW	80	81

- See ECE-TRANS-WP29-GRB-53-inf05e
- Analysis of the Monitoring Data/Impact assessment of the revised Regulation No. 51 Transmitted by OICA

M3 category

- The products distributing between China and Europe are different.
- In Europe nearly all the buses and coaches are equal to or longer than 12 meters, for example in the website of **MAN truck and bus (including NEOPLAN)** you can find no buses or coaches with the length shorter than 12 meters.
- And in Europe another kind of small bus is found like **IVECO**, **TOYOTA** Coaster with the length shorter than 7.5 meters.
- And there are few numbers of buses and coaches with the length between 8 and 11meters.

M3 category from Europe

M3 category of China

- The road condition is more complicated, and in China the IVECO, COASTER and NEOPLAN are also popular, but we have many products which have the dimensions between them.
- As the development of high speed railway, the buses longer than 12 meters and the coach sleepers are not popular now and there is nearly no buses and only small numbers of coaches with engine power higher than 250kW.

M3 category market in China

- Like in 2010, China sold nearly 200,000 buses and coaches, including 54,000 small bus (with the length ≤7meters, 27% market share), 72,000 medium bus (with the length between 7 and 10 meters, 37% market share), and 71,000 heavy bus (with the length＞10 meters, 36% market share).
- In the big city like Beijing and Shanghai, the 11-12 meters buses is always used in the main roads, and use the 9-10 meters in the feeder roads.
- In the second and third class city, the 11-12 meters, 8-10 meters and 6-7.5 meters buses are all used.
- With the factories moving to suburb, the 10 meters coaches are popular now.
- And in the rural area of China the 6-7.5 meters small buses and coaches are still popular.

China doesn't agree with the sub-categories of Germany

M3	P ≤ 180 kW	76	-	74	-	73
	180 < P ≤ 250 kW	78	-	78	-	76
	P > 250 kW	80	-	78	-	76

- The sub-categories using 180 and 250kW is not fit for the condition of China. Maybe 180 kW is a proper border line between the small bus and heavy bus of Europe.
- But if we sub-categories is passed, the requirement for 7 meters light buses 76 dB(A) will control the 10 meters or 11meters buses and coaches of China, cause the 10-11meters buses or coaches will use engine power 160-180kW. It's not proper.
- And also China has nearly no buses and coaches with the engine powr higher than 250kW.

The sub-categories China has considered

- In China, the 6-7.5 meters buses will use the engine power 85-110kW；
- The 7.5-10meters buses will use the engine power 95-180kW；
- The 10-12meters buses will use the engine power 160-225kW, and small numbers of coaches 12 meters will use 247 or 275kW；
- 13-14 meters coaches (only 0.8% market share of buses market) will use engine power 247-300kW

The sub-categories China has considered

Category Vehicle		Noise limit values	
		Phase1st	Phase 2nd
M3	Pn≤110kW	78	77
	110＜Pn≤180kW	80	79
	Pn ＞180kW	81	80

- The question is maybe the vehicles of Germany with the engine power between 110-180kW don’t need a limit value 79 or 80.

The sub-categories China has considered

The question of using kW as the borderline of sub-categories:

- Some small buses with high engine speed may have higher engine power, and some heavy buses will have lower engine power.
- The question of Compressed natural gas buses and hybrid buses is difficult to solve, cause the engine power characteristics are different.
- We repeat our opinion: **engine power is not everything! We should find some common solutions, but not only put all our focus on one parameter of engine! Please forget the engine power!**

The sub-categories China has considered

Category Vehicle		Noise limit values	
		Phase1st	Phase 2nd
M3	length ≤7.5m	78	77
	7.5< length ≤10m	80	79
	length >10m	81	80

1. **Increased by 1 dB(A) for All vehicle categories with more than one drive axle;**
2. **Increased by 1 dB(A) for All vehicle categories with more than two axles.**

- Why the borderline is 7.5 meters and 10 meters?
- The 6- 7 meters bus like Coaster and IVECO always has GVW 5t-6t, but the 8-10 meters bus has GVW nearly 10t-14t, and 11-12 meters bus has GVW 18t, that's so different.

The imagination for the future

- Is it possible we use the torque of engine for the sub-categories in the future？
- The torque is related to the acceleration directly and the engine speed related to the maximum torque is more close to the engine speed during the noise test.

The imagination for the future

- Generally speaking we are making limit values for complete vehicles, and if we set the sub-categories just use one parameter of engines (kW), maybe it will lead a technical discrimination to the engine manufacturers.
- So the best solution is use the M1 N1 M2 N2 M3 N3 categories and the parameters of vehicles like the arrangement of vehicle, the structures of vehicle, the weight and dimensions of vehicle and so on.