

## **Parameter: Regulated Pollutants**

---

### **Reference Document:**

EFV 07-03: Regulated Pollutants

The existing practices for approval of the vehicles include Type Approval (TA) and Conformity of Production (COP).

As per the suggestions received from the experts in the 7<sup>th</sup> IG EFV meeting, TA value demonstrates the capability of design. COP procedure demonstrates the fulfillment of production volumes to meet the limit values and in service conformity demonstrates the capability of maintaining the emission levels during normal usage. Therefore, at the first step of application of EFV concept, COP values should only be considered. The averaging of the values of the pollutants from the tested vehicle should be done and then average value is to be compared with the values in the table. E.g.: As per Bharat Stage-IV regulations in India, three vehicles should be tested for mass emissions. If three vehicles are tested as per COP procedure, the average of the corresponding pollutants from the three tests to be calculated, (such as Average CO, Average HC.... etc.), then that average is to be compared with the values in the table.

This assessment includes type of fuel, thereby the separate parameter type of fuel need not be considered. Here, the notion is not to just assess on meeting the current regulated norms, but additional marks are rewarded to the vehicle meeting the future norms. The approach suggested is in-line with the current and future legislative norms. So the vehicle meeting the future norms will definitely be given extra marks.

The Current European Test procedure should be followed for testing the Vehicles along with the New European Driving Cycle or the World Harmonized Driving Cycle and the Test procedure for the evaluation of passenger vehicle under WLTP can lead to common methodology for the measurement of Regulated Pollutants.

Maximum score for Petrol, Diesel, CNG, and LPG vehicle is 100. However for all categories of Hydrogen and Electric vehicles, 100% score is given. Hydrogen being the ideal fuel for vehicles with nearly zero emission. Electric vehicles are also rewarded with 100 marks irrespective of vehicle category because of its zero emissions from Tank to Wheel.

Only Tank to Wheel (TTW) emissions are considered for the regulated pollutants because the emission of pollutants during the vehicle manufacturing is very much less as compared to emissions emitted by vehicle during its use throughout the life. It is applicable to Hydrogen and electric vehicles, thereby comparing them with Gasoline and

Diesel vehicles on the same platform neglecting Well to Tank (WTT) CO, HC, Nox emissions. Otherwise, the regional differentiation for producing the vehicles, producing electricity and production of gasoline/diesel/hydrogen are so high that the concrete base for the comparison of different vehicles could not be framed.

Sr. No.	Fuel Type	Vehicle Type wrt Reference Mass	Emission standard For CO, HC, NO <sub>x</sub> , PM, PN SI Engine: Idling CO+ Evaporative Emissions CI Engine: Full load + Free Acceleration Smoke			
			Euro-III	Euro-IV	Euro-V	Euro-VI
1	Electric / Hydrogen	All	100			
2	CNG/LPG	RM ≤ 1305 1305 < RM ≤ 1760	25	50	75	100
3	Petrol / Blends	RM ≤ 1305	20	40	65	90
4	Petrol / Blends	1305 < RM ≤ 1760	15	35	55	85
5	Diesel /Biodiesel/Blends	RM ≤ 1305	20	40	65	90
6	Diesel /Biodiesel/Blends	1305 < RM ≤ 1760	15	35	55	85
7	Petrol / Blends of Petrol, LPG, CNG	RM > 1760	10	30	45	70
8	Diesel /Biodiesel/Blends	RM > 1760	10	30	45	70

The vehicle scoring 100 marks will be straightway called as Low Pollution vehicles. This is challenging for the passenger vehicle manufacturers to proceed towards achieving the future norms.

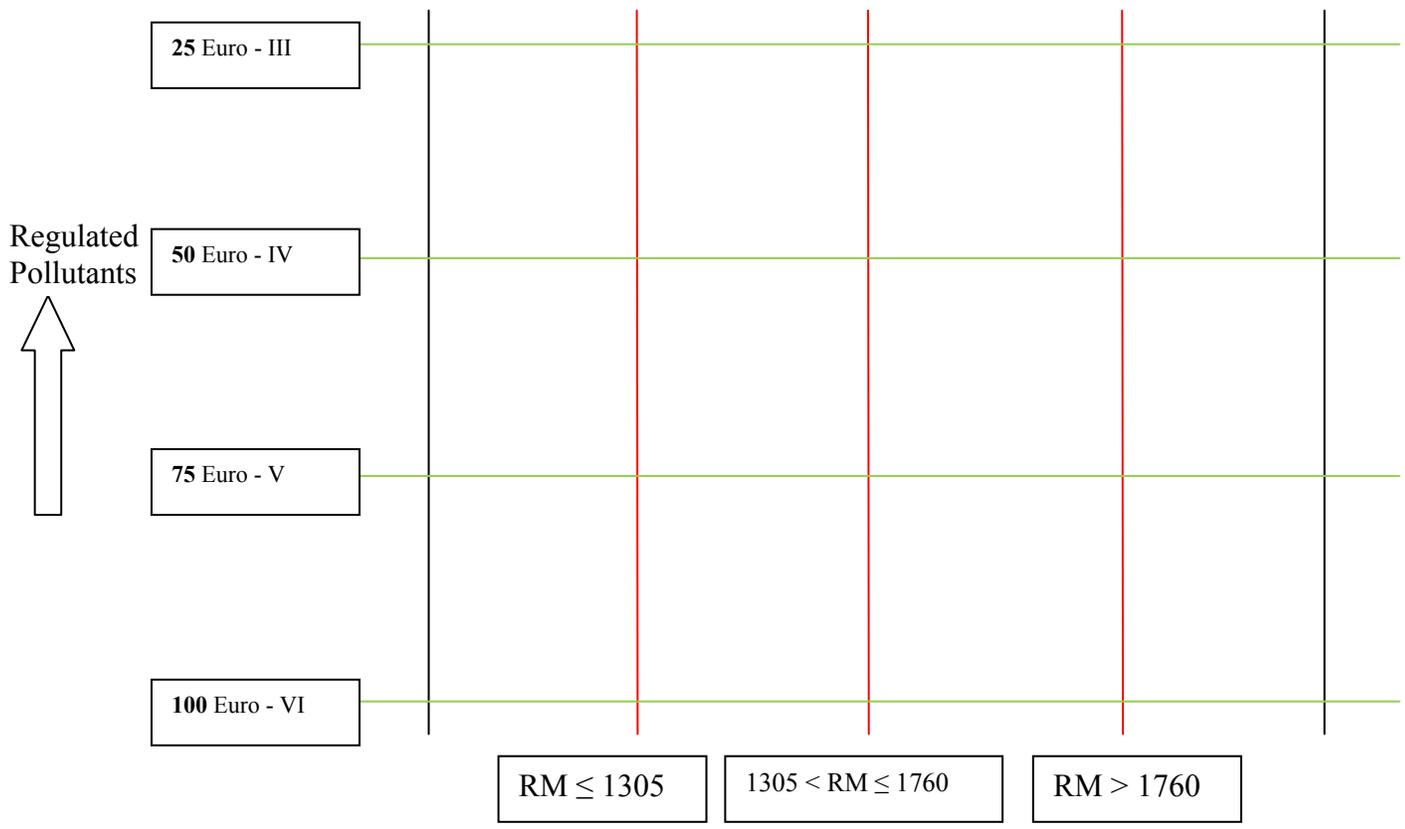
In the 7<sup>th</sup> Informal Group meeting, few experts suggested that the vehicle with the fitment of advanced emission control devices should be rewarded with High Scores. It is secondary to motivate them to use the 'After treatment devices' as the reductions in the pollutants can occur by mere optimization of the fuel injection system, ECU, combustion process, downsizing. Though, this is very difficult to achieve, it totally depends upon the manufacturer to use the After Treatment Devices or not, because it will surely increase the cost of vehicle. Also the disposal of these devices is very critical which will again add up in the cost of vehicle. Hence, it will not be appropriate to give the additional marks to the vehicle fitted with emission control devices.

From the above tables, it is clear that the Passenger cars following the lower norms are scoring fewer marks. While the vehicles following present norms are scoring nearby 50 % marks. This shows that the current norms and future norms are consolidated to define the rating criteria. The best vehicle in the world Toyota Prius has got the score of 55 for

regulated pollutants. The Present and future technology will be lying from the mid to the top ratings, while the older technology has been automatically shifted to lower ratings.

**Other Approach:**

This approach is purely based on the regulatory norms. The existing regulations as well as future regulations are consolidated to formulate the approach. The European regulatory norm Euro – III for passenger car is taken as a base line. Below this norm, no or zero score will be given to the vehicle. The Euro – VI has given the full 100 score.



The passenger car, irrespective of its reference mass and operating fuel has been weighted by the chart shown above. The passenger car complying Euro – VI norms will be rated as 100, Euro – V as 75, Euro – IV as 50% and Euro – III as 25 %. Below this norm, the weightage will be zero. From the above two approaches, the best suitable approach can be finalized and developed as a self-explanatory document.

The approaches stated above are technology neutral as the rating is totally based on the emission norms the vehicle is following. Present as well as future regulations are incorporated so as to make the rating not the complex one. The testing procedure as per the World Harmonized Test Cycles WLTP can be adopted for this evaluation which is based on common fuel quality.

\*\*\*\*\*