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**STUDY ON**

# CORRELATION OF STATIONARY AND PASS-BY NOISE LEVELS
# &
# DEVELOPMENT OF NOISE STANDARDS FOR IN-USE VEHICLES

**by**

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# OBJECTIVE

- **To measure the stationary exhaust and engine noise levels as per IS:10399-1998/ISO:5130-1982 (E) and pass-by noise level as per IS:3028-1998 of different CMVR categories of road vehicles.**
- **To measure as above for in-use vehicles of different categories and vintages (not more than 10 years old).**
- **To analyze the data obtained from above with the aim of suggesting noise limits for different categories of in-use vehicles.**

**TABLE-I: CLASSIFICATION OF VEHICLES TAKEN UP FOR THE STUDY**

| Sl. No. | Vehicle Classification | No. of Vehicles | |
|---|---|---|---|
| | | New | In-use |
| 1 | 2 Wheelers (<80 cc / 80-175 cc / > 175 cc) | 25 (7/13/5) | 15 (4/9/2) |
| 2 | 3 Wheelers (< 175 cc / > 175 cc) | 10 (5/5) | 06 (3/3) |
| 3 | 4 Wheelers (M1) | 30 | 22 |
| 4 | 4 Wheelers (M2/N1 Vehicles with Max. Mass less than 2 tons) | Nil (vehicles of this type are not produced in India) | |
| 5 | 4 Wheelers (M2/N1 Vehicles with Max. Mass between 2 tons and 3.5 tons) | 5 (4/1) | 4 (4/--) |
| 6 | 4 Wheelers (M2/M3 Vehicles with Max. Mass more than 3.5 tons and engine power less than 150 kW) | 7 (1/6) | 7(3/4) |
| 7 | 4 Wheelers (M2/M3 Vehicles with Max. Mass more than 3.5 tons and engine power of 150 kW and above) | Nil (vehicles of this type are not produced in India) | |
| 8 | 4 Wheelers (N2/N3 Vehicles with Max. Mass more than 3.5 tons and engine power less than 75 kW) | 10 (10/--) | 1 (1/--) |
| 9 | 4 Wheelers (N2/N3 Vehicles with Max. Mass more than 3.5 tons and engine power of 75 kW and above but below 150 kW) | 4 (--/4) | 6 (--/6) |
| 10 | 4 Wheelers (N2/N3 Vehicles with Max. Mass more than 3.5 tons and engine power of 150 kW and above) | Nil (vehicles of this type are not produced in India) | |
| | **TOTAL** | **91** | **61** |

# STATIONARY ENGINE NOISE MEASUREMENT

## ISO:5130-1982

- Not included in the main body but as an Annexure.
- "because it requires instrumentation which is presently under development in different countries to avoid damage to the engine"
- Draft revision suggest deletion of this test.

## JAPAN

- Introduced in 1952
- Changed over in 1986 to proximity safety noise level test which is the same as stationary exhaust noise test

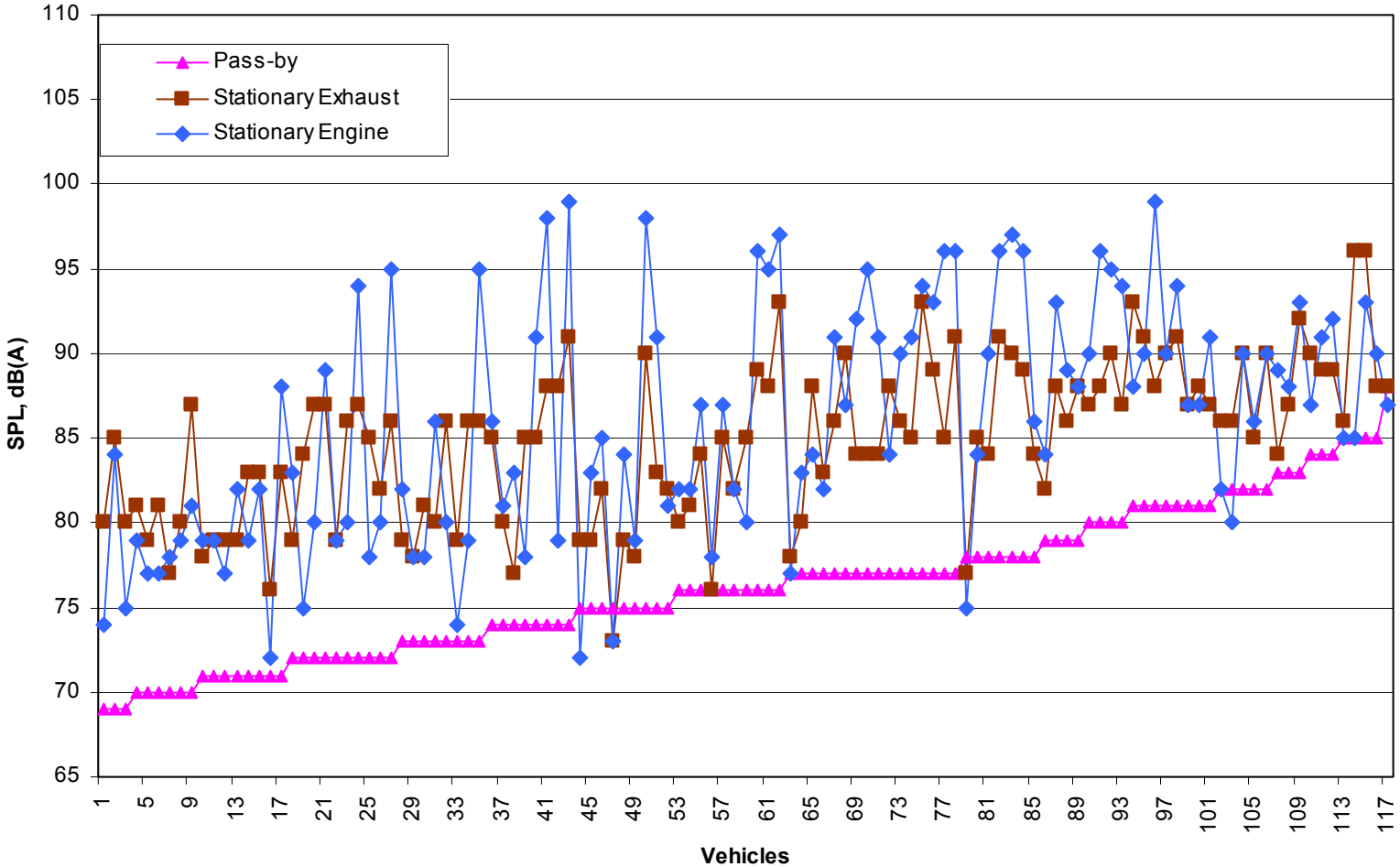


**Fig. 3 : Comparison of Pass-by vis-à-vis Stationary - Engine and Exhaust - Noise Levels**

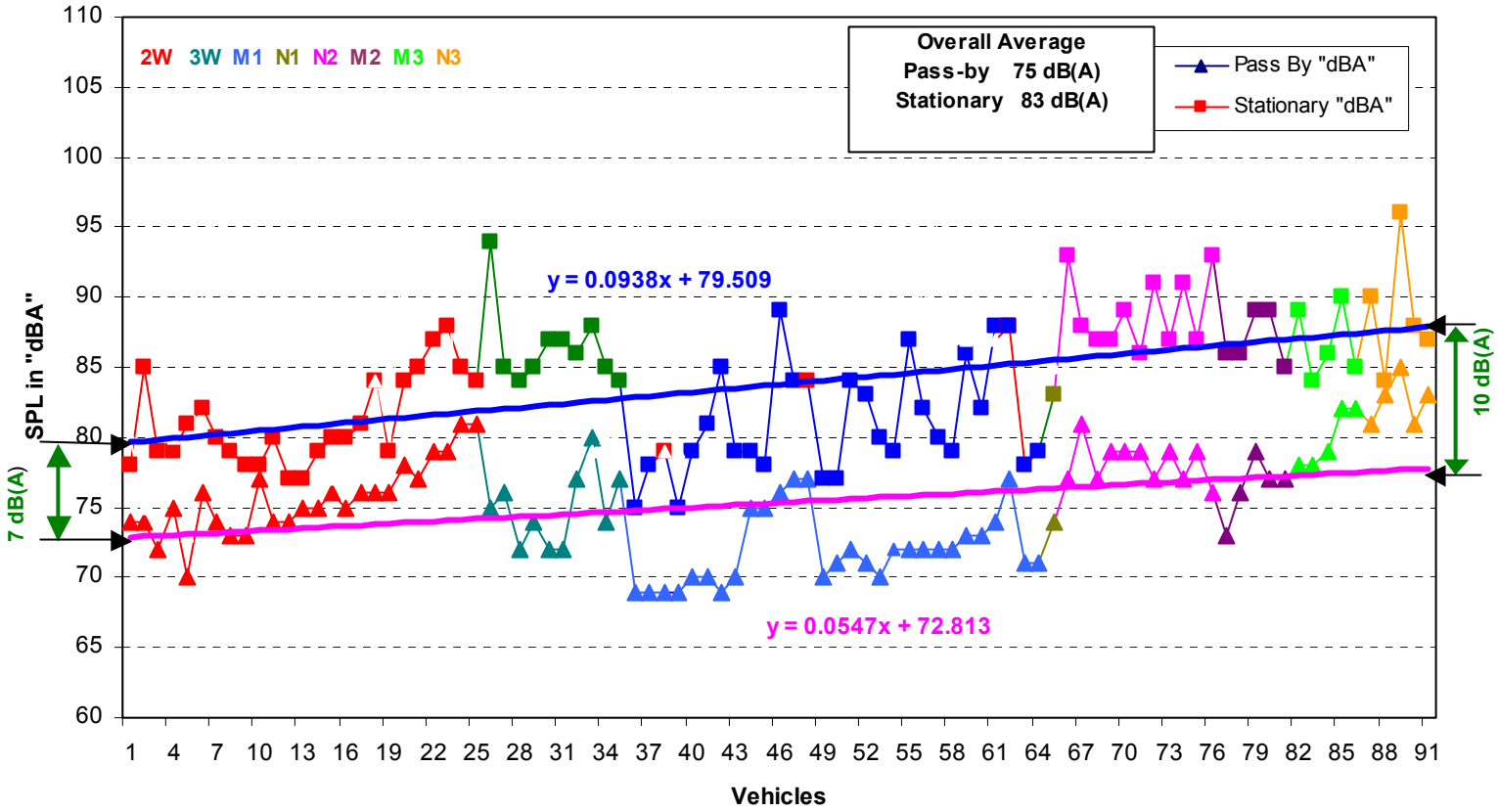


**Fig. 16 : Comparison of Stationary and Pass-by Noise Levels of all 91 New Vehicles of Different Categories**

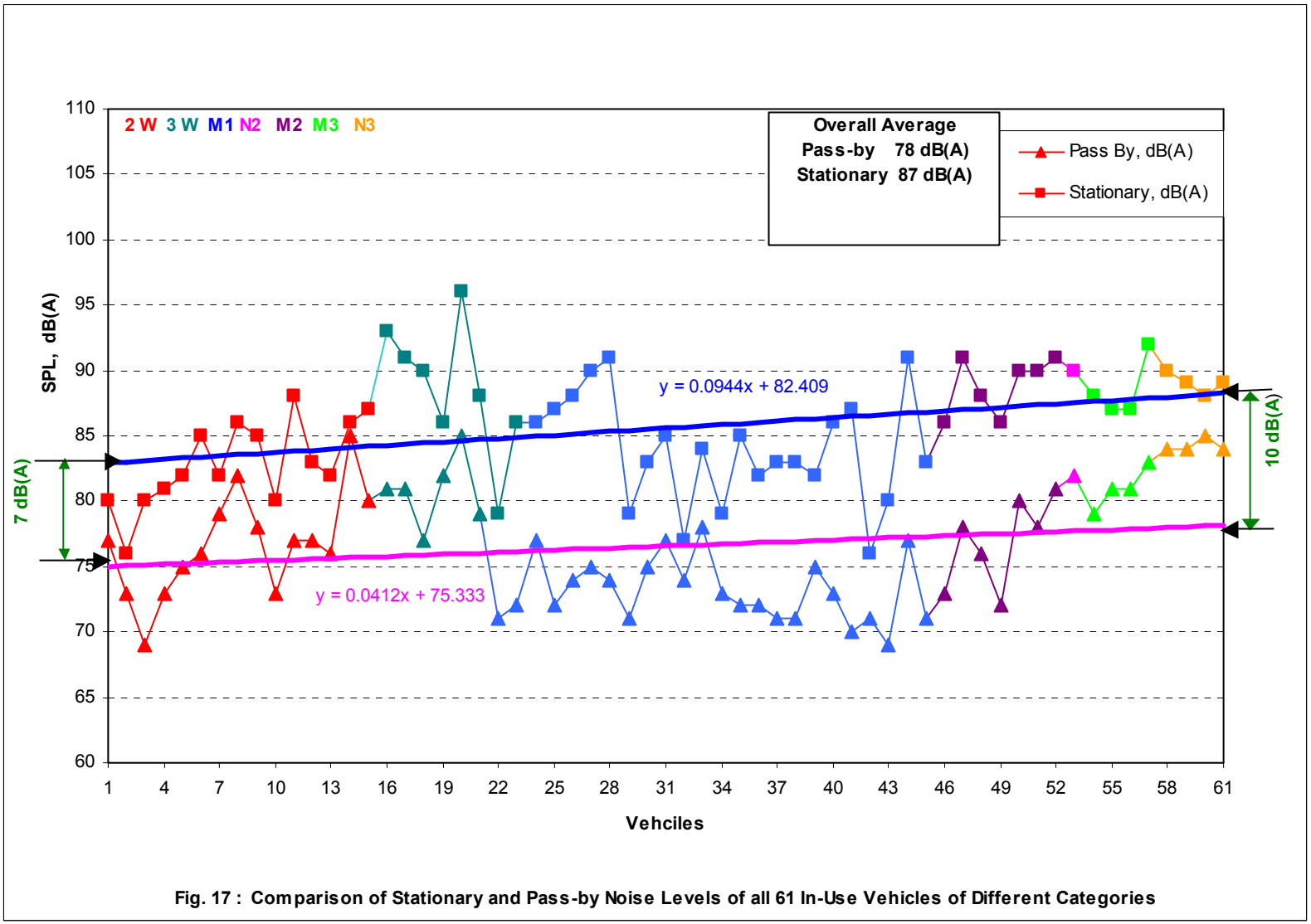


**Fig. 17 : Comparison of Stationary and Pass-by Noise Levels of all 61 In-Use Vehicles of Different Categories**

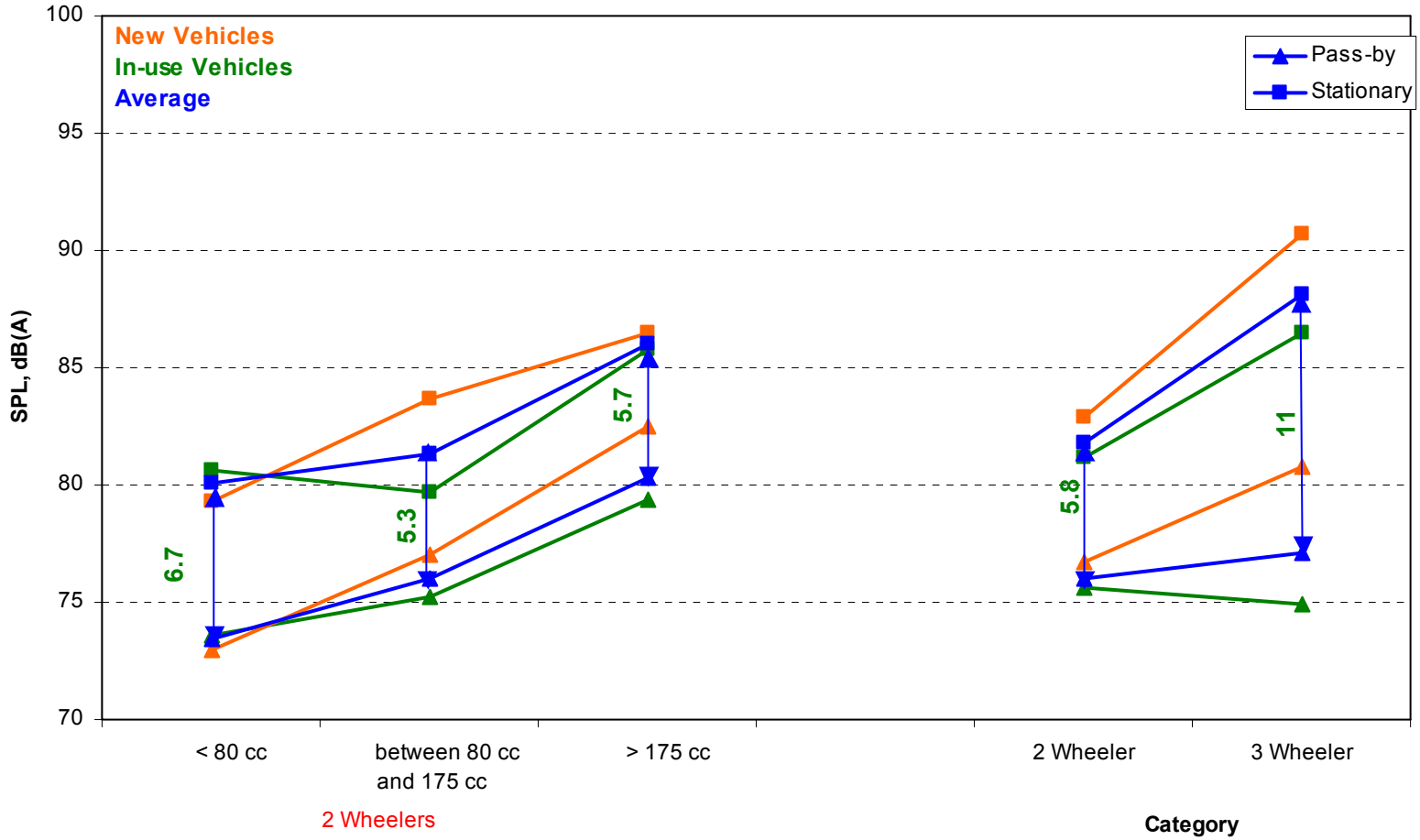


**Fig. 6 : Comparison of Average Values of Stationary and Pass-by Noise Levels of Two and Three Wheelers**

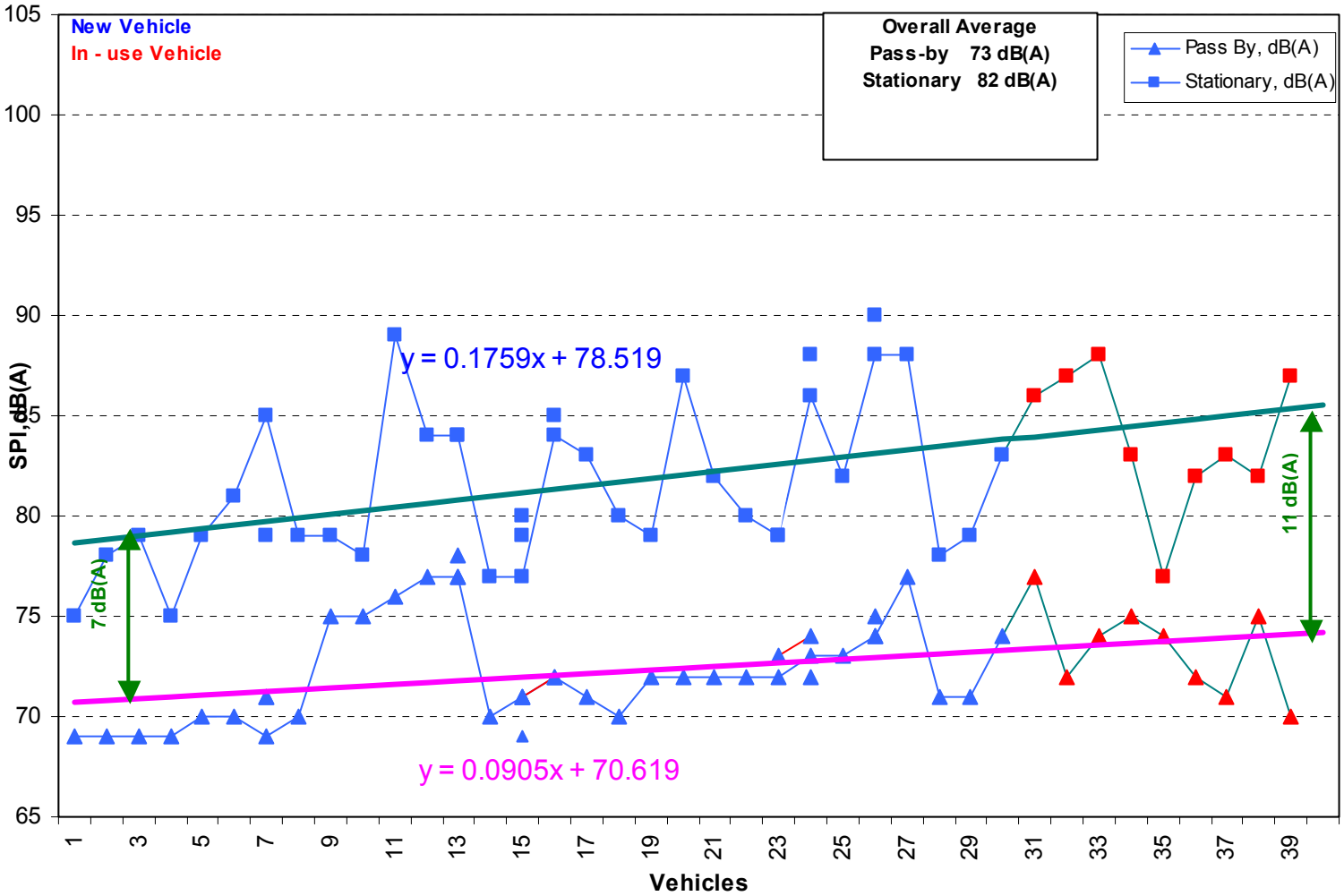


**Fig. 8 : Comparison of Stationary and Pass-by Noise Levels of all 52 M1 Category Vehicles**

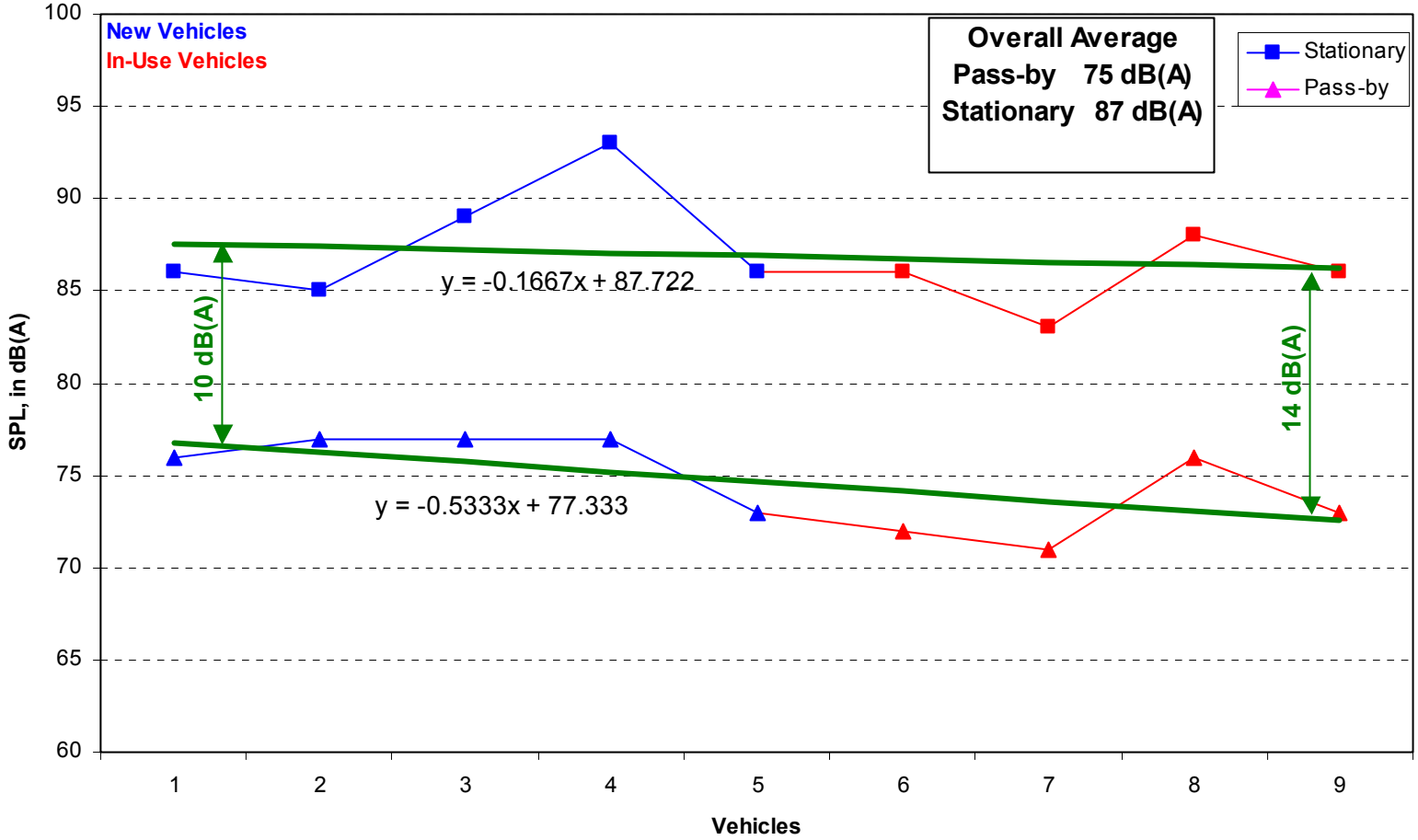


**Fig. 9 : Comparison of Stationary and Pass-by Noise Level for the M2/N1 Category with GVW between 2 and 3.5 tonnes**

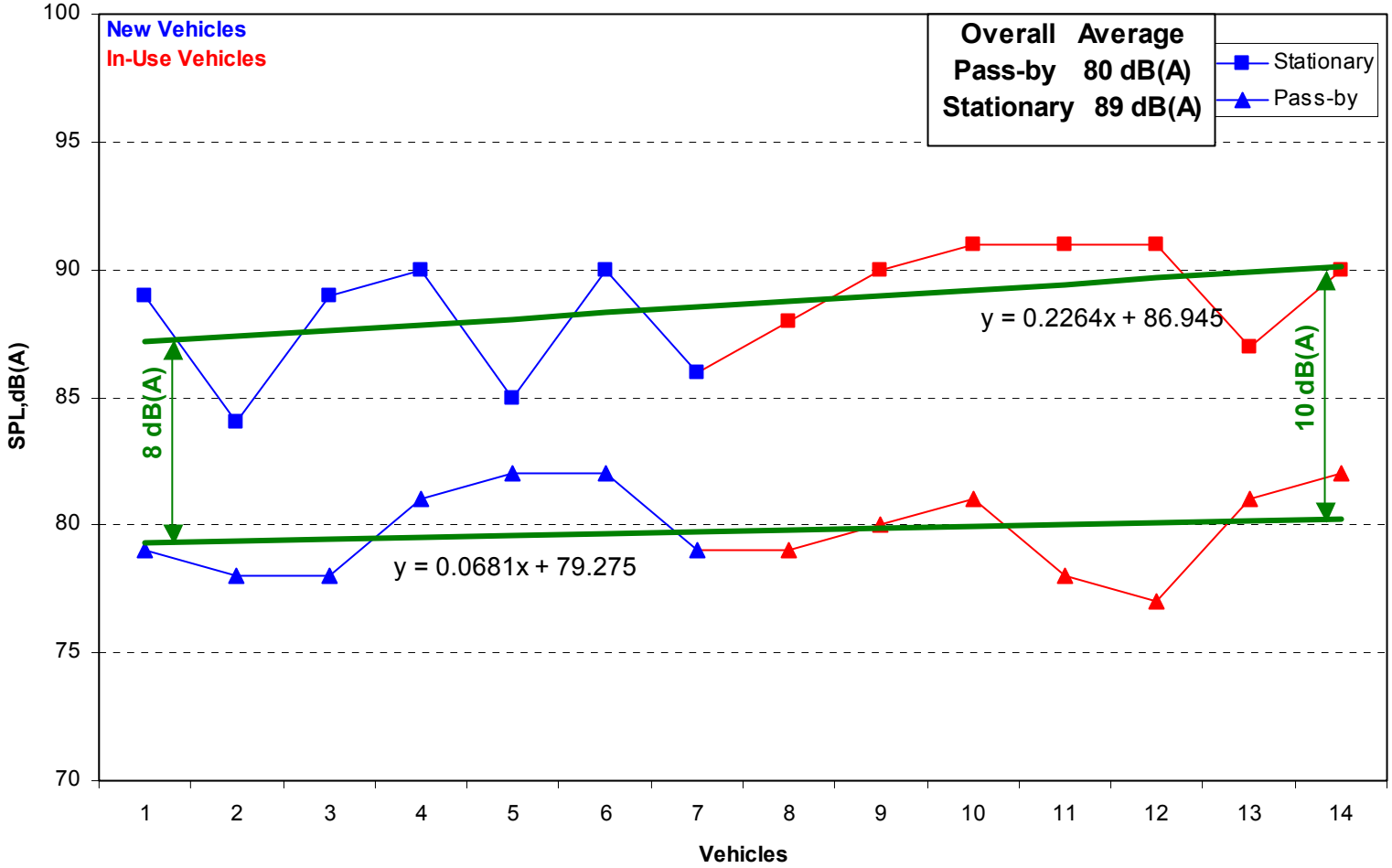


**Fig. 10 : Comparison of Stationary and Pass-by Noise Level for the M2/M3 Category with Engine Capacity Less Than 150 kW**

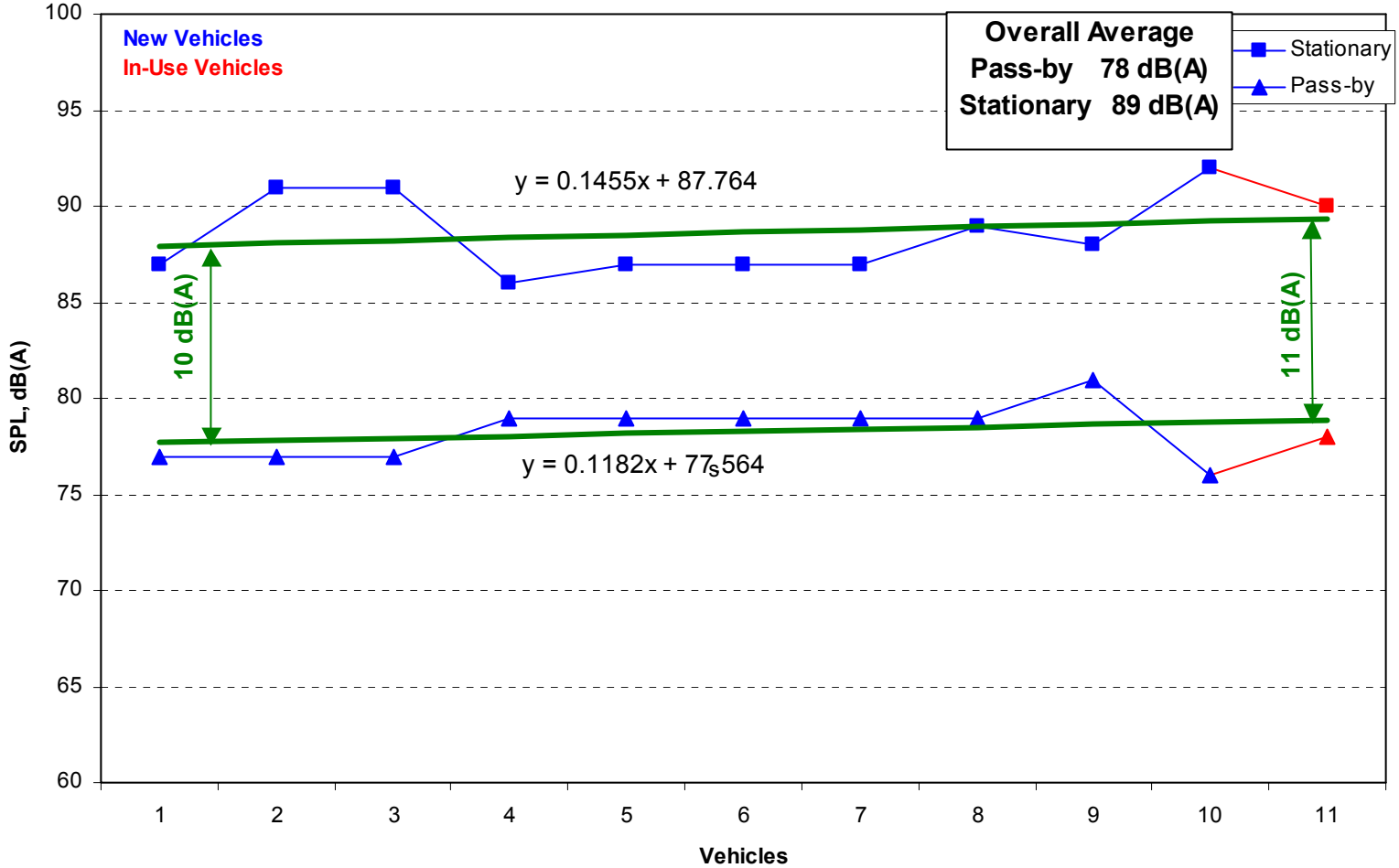


**Fig. 11 :Comparison of Stationary and Pass-by Noise Levels of all 11 N2/N3 Category Vehicles with Max. Mass More Than 3.5 tons and Engine Power Less Than 75 kW**

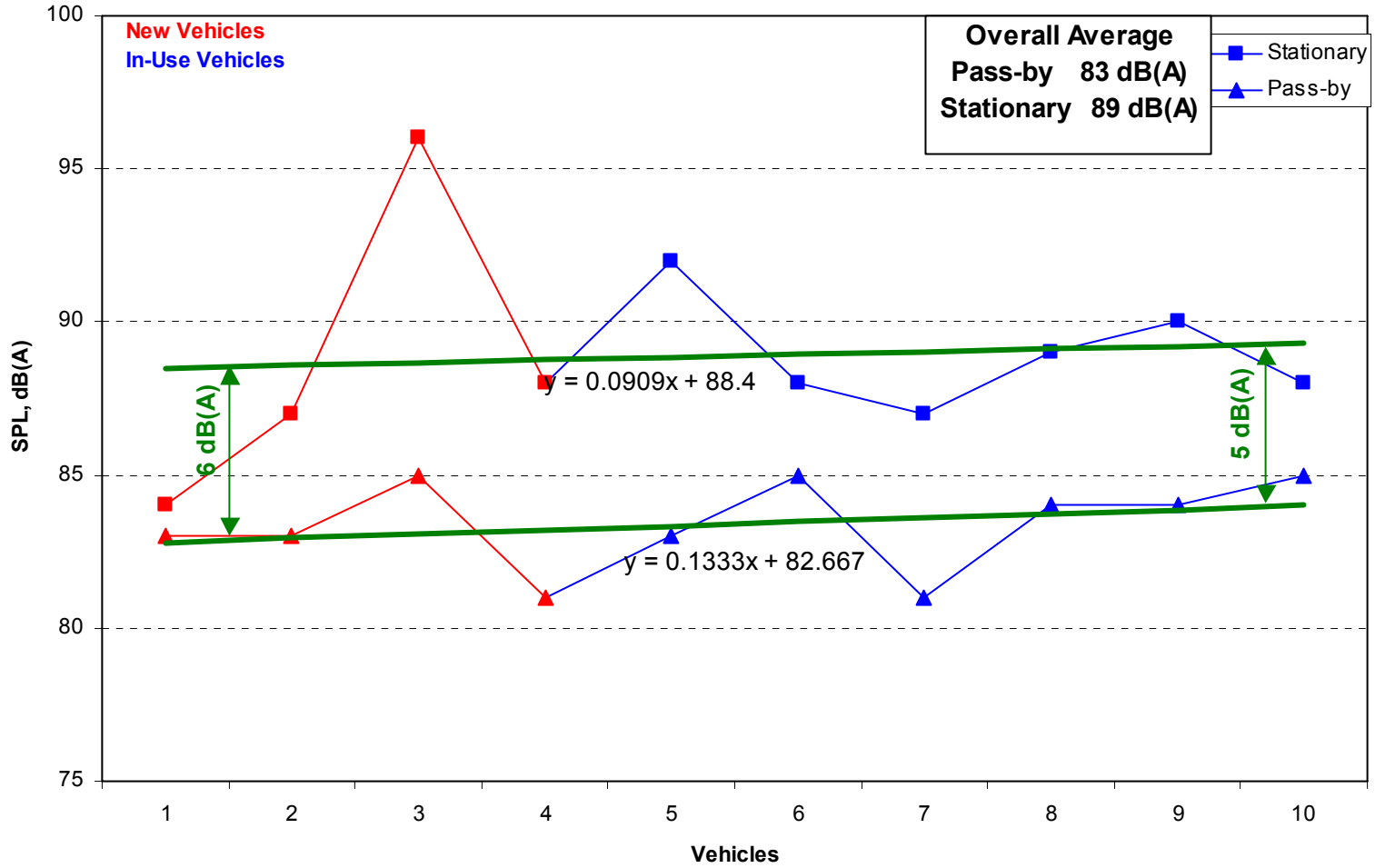


**Fig. 12 : Comparison of Stationary and Pass-by Noise Level for the N2/N3 Category with Engine Capacity between 75kW and 150 kW**

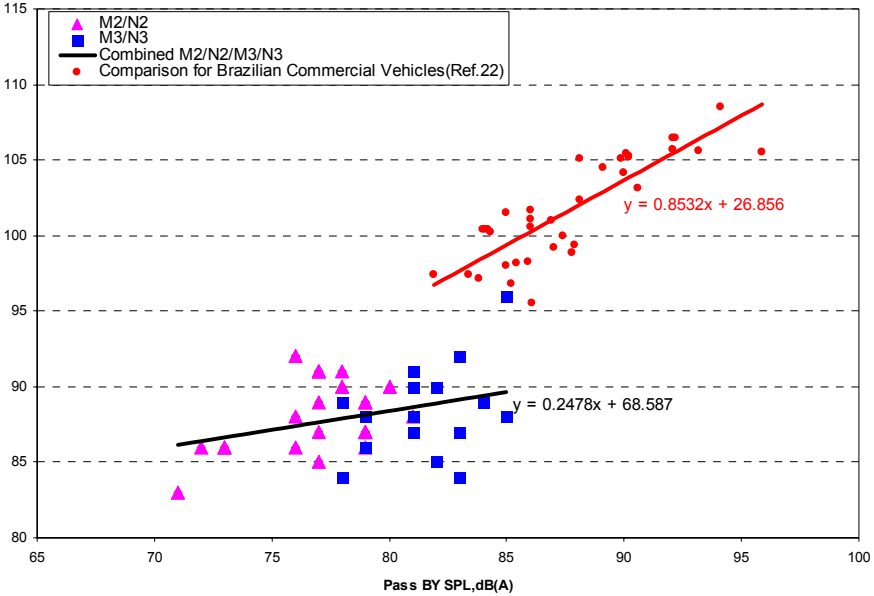


**Fig.13 Comparison of Correlation of Stationary and Pass-by Noise Levels Between Measured Data and Literature for Commercial Vehicles (Ref. 22)**

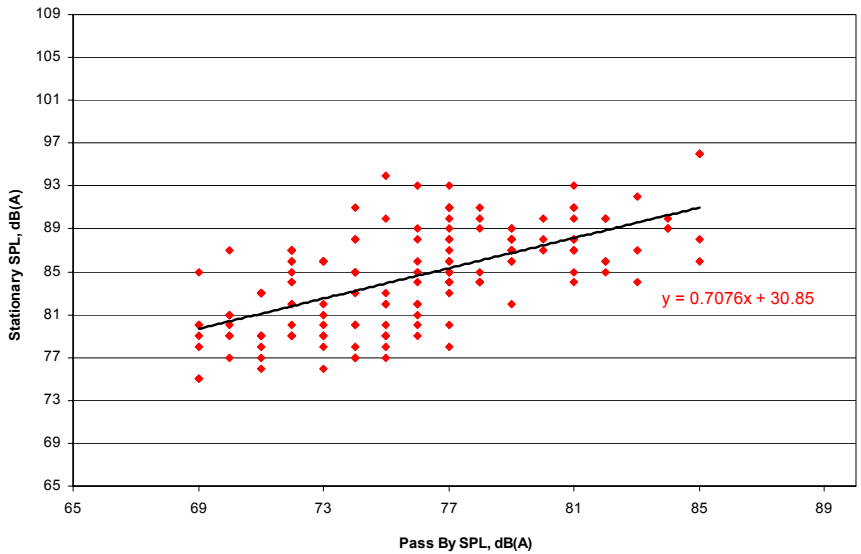


**Fig. 14 : Correlation of Pass-by and Stationary Noise Levels of all 152 Vehicles**

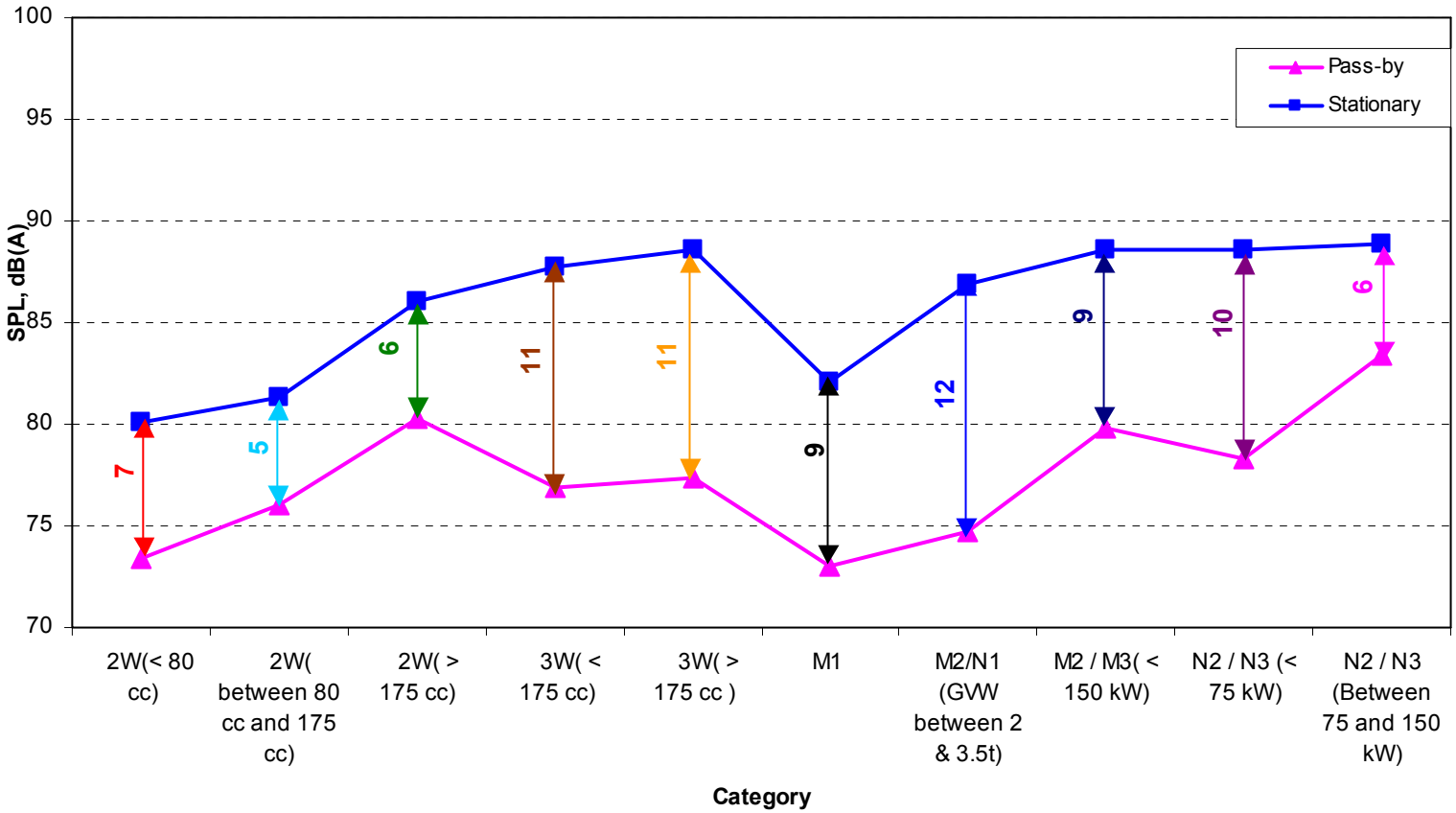


**Fig. 15: Global Comparison of the Difference Between Stationary and Pass-by Noise Levels for Different Categories of Vehicles**

**TABLE V : Comparison of Variation in Pass-by and Stationary Noise Levels of New and In-Use Vehicles - 31 Vehicles of 19 Models**

**(All Values in dB(A))**

| SR. NO | | New | | In-Use | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pass-By | Station-ary | Age in km | Pass-By | Diff. * | Station-ary | Diff. * | Age in km | Pass-By | Diff. * | Station-ary | Diff. * | Age in km | Pass-By | Diff. * |
| **Two Wheelers (7)** | | | | | | | | | | | | | | | | |
| 1 | | 81 | 84 | 6000 | 80 | **-1** | 87 | **3** | | | | | | | | |
| 2 | | 70 | 81 | 10496 | 69 | **-1** | 80 | **-1** | 15984 | 73 | **3** | 81 | **0** | | | |
| 3 | | 79 | 88 | 12078 | 85 | **6** | 86 | **-2** | | | | | | | | |
| 4 | | 75 | 79 | 21532 | 79 | **4** | 82 | **3** | | | | | | | | |
| 5 | | 75 | 79 | 39728 | 77 | **2** | 80 | **1** | | | | | | | | |
| 6 | | 76 | 81 | 53675 | 73 | **-3** | 80 | **-1** | | | | | | | | |
| | | **76** | **82** | | **77.167** | | **82.5** | | | **73** | | **81** | | | | |
| **Three Wheelers (5)** | | | | | | | | | | | | | | | | |
| 7 | | 77 | 84 | 15000 | 85 | **8** | 96 | **12** | 34887 | 82 | **5** | 86 | **2** | 200000 | 79 | **2** |
| 8 | | 72 | 87 | 112113 | 77 | **5** | 90 | **3** | 200000 | 81 | **9** | 93 | **6** | | | |
| **M1 Category Vehicles (15)** | | | | | | | | | | | | | | | | |
| 9 | | 77 | 84 | 2974 | 78 | **1** | 84 | **0** | 3100 | 77 | **0** | 85 | **1** | 12974 | 77 | **0** |
| 10 | | 74 | 88 | 4796 | 74 | **0** | 91 | **3** | 52635 | 75 | **1** | 90 | **2** | | | |
| 11 | | 71 | 77 | 5762 | 69 | **-2** | 80 | **3** | 141076 | 71 | **0** | 76 | **-1** | 380393 | 71 | **0** |
| 12 | | 72 | 84 | 8910 | 72 | **0** | 85 | **1** | | | | | | | | |
| 13 | | 69 | 85 | 9000 | 71 | **2** | 79 | **-6** | 33676 | 71 | **2** | 83 | **-2** | | | |
| 14 | | 72 | 79 | 9684 | 73 | **1** | 79 | **0** | | | | | | | | |
| 15 | | 73 | 86 | 13191 | 72 | **-1** | 86 | **0** | 46570 | 74 | **1** | 88 | **2** | 107058 | 73 | **0** |
| **M2 / N1 Category Vehicles between 2t & 3.5t (1)** | | | | | | | | | | | | | | | | |
| 16 | M2 | 73 | 86 | 12000 | 72 | **-1** | 86 | **0** | | | | | | | | |
| **M2 / M3 Category Vehicles less than 150kW (1)** | | | | | | | | | | | | | | | | |
| 17 | M3 | 79 | 86 | 100000 | 81 | **2** | 87 | **1** | | | | | | | | |
| **N2 / N3 Category Vehicles less than 75kW (1)** | | | | | | | | | | | | | | | | |
| 18 | N2 | 76 | 92 | 13595 | 78 | **2** | 90 | **-2** | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| **N2 / N3 Category Vehicles between 75kW and 150kW (1)** | | | | | | | | | | | | | | | | |
| 19 | N3 | 81 | 88 | 300000 | 84 | **3** | 89 | **1** | | | | | | | | |

**Diff. * - The difference In the Stationary and Pass-by Noise Levels between In-Use and New Vehicles**

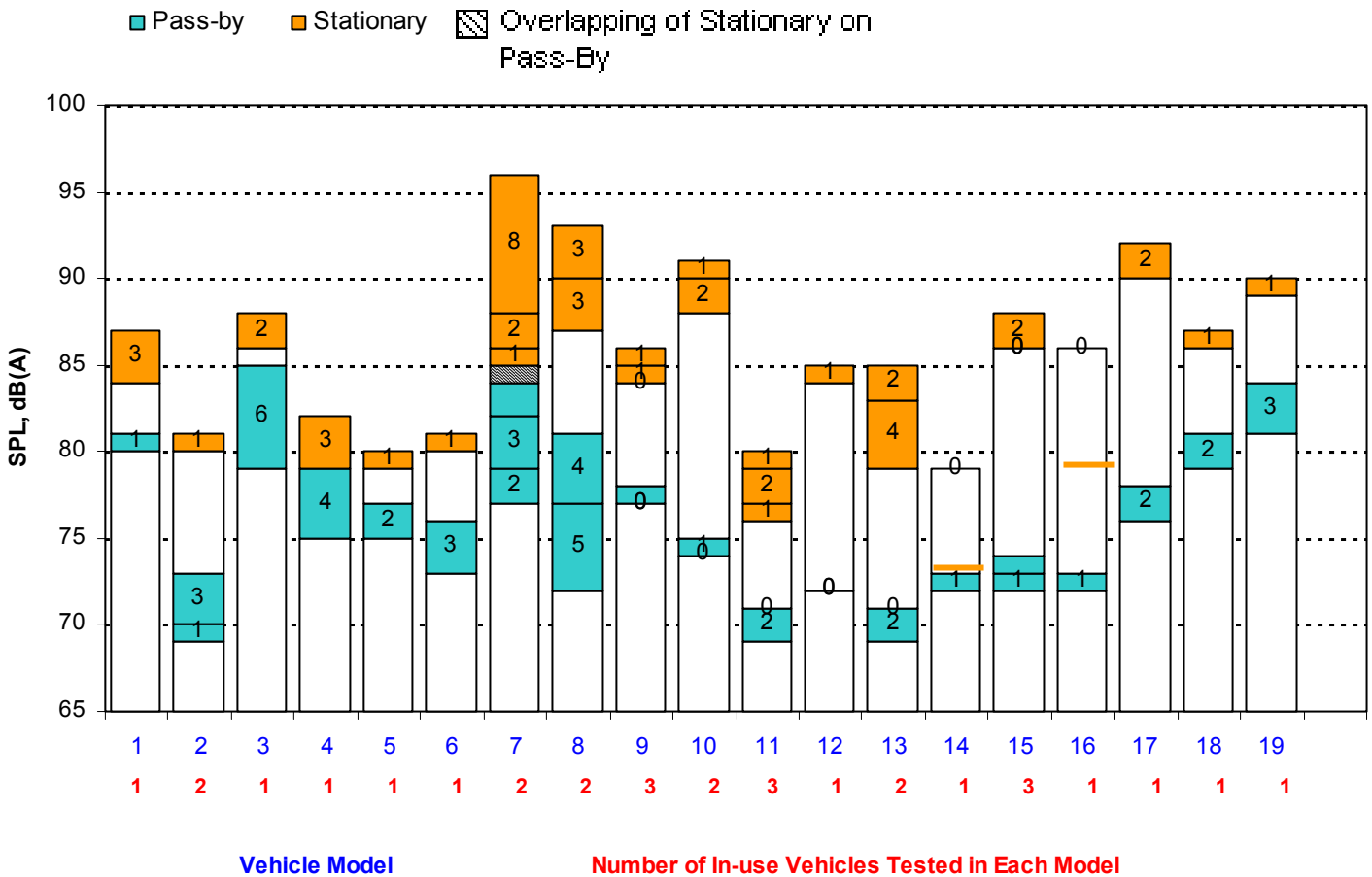


**Fig. 18 :Comparison of Variation in the Stationary and Pass-by Noise Levels Between New and In-use Vehicles (31 Vehicles of 19 Models)**

# NOISE LEVEL IN NEW AND IN-USE VEHICLES

| Class | Avg. Increase in Pass-by / Stationary / Mileage, dB(A) / dB(A) / km | Range of Pass-by / Stationary in New Vehicles, dB(A) |
|---|---|---|
| 2 Wheelers | 1.6 / 0.5 / 6-54,000 | 9 / 10 |
| 3 Wheelers | 6 / 6 / 15-200,000 | 8 / 10 |
| M1 | 0.25 / 0.35 / 8-400,000 | 8 /18 |
| M2 / M3 / N2 / N3 | 1.25 / 0 / 12-300,000 | 4 / 6 (M2/M3)<br>8 / 10 (N2/N3) |

## Table VI : Comparison of Noise Limits in Japan and Australia

| Vehicle Category | Noise Limits, dB(A) | | | | | |
|---|---|---|---|---|---|---|
| | Japan | | | Australia | | |
| | Pass-by | Statio-nary | Diff. | Pass-by | Statio-nary | Diff. |
| 2 Wheelers | 75 | 99 | 24 | 77-81 | 94 | 13-17 |
| 3 Wheelers | --- | --- | --- | 77 | 90 | 13 |
| M1/N1 | 78 | 103 | 25 | 77 | 90 | 13 |
| Other Vehicles ≤ 200 PS | 83 | 105 | 22 | 83 | 101 | 18 |
| Other Vehicles > 200 PS | 83 | 107 | 24 | 86 | 103 | 17 |
| No allowance for in-use vehicles over pass-by | | | | | | |

Norway : 5 dB(A)

EEC/ECE : 3dB(A) …?

# NOISE LIMITS FOR IN-USE VEHICLES

- **Not many countries with legislation for in-use vehicle noise norms**
- **New South Wales ranging from 85 dB(A) to 103 dB(A)**
- **Japan ranging between 94 and 99 dB(A)**
- **As compared to 96 dB(A), the highest noise level measured in the present study for a N3 new vehicle**

- **No stationary noise levels prescribed for type approval under EPA.**
- **FMCSA specifies 88 dB(A) for vehicles with mass more than 4.5 tons.**
- **Measurement procedure in USA is different :**

  **> the point of measurement is 15 m away from the exhaust as against 0.5 m in ISO [adds 29.5 dB(A)]**

  **> the engine has to be tested from idling to no-load governed speed as against upto 75% of the same in ISO:5130 and other European standards [adds 3-7 dB(A)]**
- **Results in 120-124 dB(A)**

# NOISE LIMITS FOR IN-USE VEHICLES

- **Aim of proposed revision of ISO:5130-2002 :**

  **To provide a simple method for use in road-side check.**

  **Not recommended against a general noise limit for categories of road vehicles.**

  **But with reference to measurements made under similar conditions such as during the type approval of road vehicles.**

- **Globally looking, mandatory noise limits for in-use vehicles seems to be the exception rather than a rule. Further, wherever such norms has been legislated, the limits have been kept very high so that their effectiveness is not felt.**

# Comments from Final Report on "Noise Emissions of Road Vehicles - Effect of Regulations"

- **" Regarding New South Wales, "the limits for at least some vehicles are far above current state-of-the-art and it is even stated that the State Enforcement agencies are unlikely to invest resources to enforce limits that are so high that subjectively judged noisy vehicles 'pass' the stationary test at current AVSR and ADR limits. "**

- **" New Zealand has a regulation that prohibits the operation of any in-service vehicle that creates 'excessive' noise. However, the excessive noise provisions are not particularly well enforced, and the trend of enforcement is declining. "**

- **" According to FMCSA, there has not been any active enforcement of the regulation in recent years, but if a complaint is filed the Administration would act and do some measurements to follow-up the problem. "**

# Comments from Final Report on "Noise Emissions of Road Vehicles - Effect of Regulations"

- **" In Sweden, it has been subject to revision for some years and in the meantime no regulation is in effect. "**
- **" In Norway, the experience after a few years showed that less than 1% of the tested vehicles failed at the inspection. It was then decided that only those vehicles that are rated subjectively as having abnormally high sound levels are to be tested. Motorcycles are not part of this in-service inspection system, so at the moment the system has no effect on motorcycle-noise-related complaints. "**

# NOISE LIMITS FOR IN-USE VEHICLES

- **Globally looking, mandatory noise limits for in-use vehicles seems to be the exception rather than a rule. Further, wherever such norms has been legislated, the limits have been kept very high so that their effectiveness is not felt.**
- **There is no defined deterioration of noise levels with age of the vehicles**
- **No data is available in the production variation of individual model of vehicles in literature.**
- **The present study does not cover the band of variation in pass by and stationary noise of the same model during production.**
- **Based on the present study, it is possible to arrive at the average differences between the stationary and pass by noise levels for individual categories of vehicles to a reasonable extent.**
- **The exercise is much limited in numbers.**
- **If the in-use vehicle noise is found to be high, there is no predictable and easy solutions, by which a vehicle owner can reduce the noise levels and be within the norms.**