Taiwan Regulatory Experience

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Outline

- Introduction
- Previous and Current Emission Regulations
- In-Use Conformity
- Future Trend
Introduction

● Status in Taiwan
  ▪ Population density: more than 600 persons per square km
  ▪ GNP: USD12,300 yr 1999.

● Environmental loading from motorcycle
  ▪ Motorcycle density: more than 300 vehicles per square km
  ▪ Nearly every two persons own a motorcycle
Distribution Map of Motorcycles in Taiwan

Amount of motorcycle in Taiwan: 10,932,150

.12/1999.
Sales Amount of Domestic Motorcycles

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Stroke</td>
<td>547,003</td>
<td>549,166</td>
<td>396,970</td>
<td>370,236</td>
<td>266,111</td>
</tr>
<tr>
<td>Ratio %</td>
<td>58.0</td>
<td>54.2</td>
<td>46.0</td>
<td>46.1</td>
<td>35.1</td>
</tr>
<tr>
<td>4 Stroke</td>
<td>396,833</td>
<td>464,219</td>
<td>465,496</td>
<td>433,421</td>
<td>493,059</td>
</tr>
<tr>
<td>Ratio %</td>
<td>42.0</td>
<td>45.8</td>
<td>54.0</td>
<td>53.9</td>
<td>64.9</td>
</tr>
<tr>
<td>Total</td>
<td>943,836</td>
<td>1,013,385</td>
<td>862,466</td>
<td>803,657</td>
<td>759,170</td>
</tr>
<tr>
<td>Variation %</td>
<td>6.9%</td>
<td>-14.9%</td>
<td>-6.8%</td>
<td>-5.5%</td>
<td></td>
</tr>
</tbody>
</table>
Average Driving Mileage Per Year in Comparison between 2 and 4 stroke motorcycle

[Graph showing the comparison of average driving mileage per year between 2 and 4 stroke motorcycles over 16 years (1 to 16).]
Previous and Current Emission Regulations

- Process of Exhaust Emissions Control
- Emission Standards for Motorcycles in Taiwan
- Technology Reviews in Each Phases
- Reduction Effectiveness in Last Decade
Process of Exhaust Emissions Control

To implement more stringent emission standards

New Motorcycle

Certification

Online Inspection & Quality Control

Sampling

COP

Recall Program

In-Use Motorcycle

I/M Program

Research for Improvements of Air Pollution

Design Proposal

Mass Production

Useful Life

Useless

Life Cycle of Motorcycles
## Emission Standards for Motorcycles in Taiwan

<table>
<thead>
<tr>
<th>Category</th>
<th>Stage</th>
<th>Effective Date</th>
<th>HC+NOx (g/km)</th>
<th>CO (g/km)</th>
<th>Driving Pattern</th>
<th>Durability Require.</th>
<th>Idle Test</th>
<th>Idle Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Type Approval</td>
<td></td>
<td>CO (%)</td>
<td>HC (ppm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>1</td>
<td>1988.1.1</td>
<td>5.5</td>
<td>8.8</td>
<td></td>
<td>None</td>
<td>4.5</td>
<td>7000</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1991.7.1</td>
<td>3.0</td>
<td>4.5</td>
<td></td>
<td>ECE40</td>
<td>6,000km</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1998.1.1</td>
<td>2.0</td>
<td>3.5</td>
<td></td>
<td>15,000km</td>
<td>4.0</td>
<td>6000</td>
</tr>
<tr>
<td>2 stroke</td>
<td>4</td>
<td>2003.12.31</td>
<td>1.0</td>
<td>7.0</td>
<td></td>
<td>ECE15</td>
<td>15000km</td>
<td>3.5</td>
</tr>
<tr>
<td>4 stroke</td>
<td></td>
<td></td>
<td>2.0</td>
<td>7.0</td>
<td>(cold start)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remark:** Emission Standards for in-use Motorcycle CO: 4.5%, HC: 9000ppm
Emission Test driving pattern for Motorcycle as ECE 40.
Technology Reviews in Each Phases

Stage 1 (1988)
- Carburetor

Stage 2 (1991)
- 2 stroke
- Catalyst Technology + Secondary Air System
- 4 stroke
- Secondary Air System

Stage 3 (1998)
- 15,000km durability req.
- (High Quality Carburetor)
- 2 stroke
- High Efficiency Catalyst + Secondary Air
- 4 stroke
- Catalyst Technology + Secondary Air
CO Reduction Effectiveness in Last Decade

* These certification data must be qualified to meet stage 2 standard from 30 June 1991 for new motorcycle types and from 1 July 1992 for all new motorcycles.
HC+NOx Reduction Effectiveness in Last Decade

* These certification data must be qualified to meet stage 2 standard from 30 June 1991 for new motorcycle types and from 1 July 1992 for all new motorcycles.
In-Use Conformity

- Recall Programs (Driving Pattern Test on Chassis Dynamometer)
  - Objective and Standard of Recall
  - Test Results of Recall Programs

- I/M Programs (Idle Test)
  - Penalties and Incentives of I/M Programs
  - Test Results of I/M Programs
Objective and Standard of Recall

• Objective:
  Properly maintained motorcycles must meet regulation standards, otherwise manufactures must recall and repair them.

• Standard of recall:
  - Preliminary investigation test: Conformity test will continue if average emission from selection of 5 motorcycles in each selected engine family could not meet emission standards, or more than 2 test data from each engine family are failed.
  - Conformity test: Recall must be done if average emission could not meet mission standards from 10 data measured from the same engine family.
Statistics of Motorcycle’s Test in Recall Programs

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Family</td>
<td>3</td>
</tr>
<tr>
<td>Quantity of Motorcycle’s Test</td>
<td>16</td>
</tr>
<tr>
<td>Number of Test Failure</td>
<td>0</td>
</tr>
<tr>
<td>Number of Recall</td>
<td>0</td>
</tr>
</tbody>
</table>
Test Results of CO Emission from Recall Programs

![Graph showing average CO emission from test data (g/km) for Years 1996 to 2000, divided into Stage 2 and Stage 3.]
Test Results of HC+NOx Emission from Recall Programs

![Graph showing HC+NOx emission from 1996 to 2000, divided into two stages: Stage 2 and Stage 3. The graph indicates the average HC+NOx emission from test data (g/km) for each year.]
Penalties and Incentives of I/M Programs

- **Road-side Test. Idle.**
  To block motorcycles for an idle test beside roads by 23 local environmental authorities: The government will impose a fine NTD1,500 if the motorcycle could not meet the emission standards of I/M Programs.

- **Periodical Test. Idle.**
  To inform owners for a periodical idle test in the local test station by the central environmental authority: The government will impose a fine NTD3,000 if owners do not obey the information to test on schedule.
Encourage people to inform EPA of high emission motorcycle

Anyone could inform a high emission motorcycle to the environmental authority. The Taiwan EPA will order the owner to proceed an idle test for this motorcycle in the local test station. If it could not meet the emission standards, the informer could obtain bonus NTD100.
Quantity of Motorcycle’s Participation in the Periodical Idle Test for I/M Programs

~2000,09,30
Ratio of Participation in the Periodical Idle Test for I/M Programs in 1999
Ratio of Failure in the Periodical Idle Test for I/M Programs

![Graph showing the ratio of failure over time for I/M programs from 1996.01.22 to 2000.09.30. The graph displays the percentage of failures against the age of the vehicles (in years) over the years 1996 to 2000. The data points are represented by different colors and markers for each year: 1996 (pink), 1997 (green), 1998 (dark blue), 1999 (light blue), and 2000 (red).]
Test Results of CO Emission from Periodical I/M Programs in Taipei City

Average CO Emission from Test Data (%)

Year


Standard: 4.5%
Test Results of HC Emission from Periodical I/M Programs in Taipei City

Average HC Emission from Test Data (ppm)

Year


Standard: 9000 ppm
Emissions Improvements for Motorcycles after Adjusted to Standards in Comparison with the Original from Periodical Idle Test for I/M Programs in 1999

<table>
<thead>
<tr>
<th>Motorcycle’s Emissions</th>
<th>2 Stroke</th>
<th></th>
<th>4 Stroke</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO (%)</td>
<td>HC (ppm)</td>
<td>CO (%)</td>
<td>HC (ppm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Original</td>
<td>Adjusted</td>
<td>Original</td>
<td>Adjusted</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>5.41</td>
<td>1.75</td>
<td>7,658</td>
<td>3,824</td>
<td></td>
</tr>
<tr>
<td>Reduction</td>
<td>67.5%</td>
<td>50.1%</td>
<td>80%</td>
<td>63.5%</td>
<td></td>
</tr>
<tr>
<td>Samples</td>
<td>531,126</td>
<td></td>
<td>211,968</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Future Trend

- Taiwan EPA provides subsidy for purchasing low emission motorcycles, including electric scooter, fuel-injection motorcycle, etc.

  - To eliminate old motorcycles: A subsidiary payment is NTD2,000 for giving up motorcycles over ten years old.
  
  - To encourage purchase of electrical scooters: A subsidiary payment is NTD20,000 for purchasing new electrical scooters accumulated more than 20,000 up to now.

- To encourage purchase of low emission motorcycles: Objects including EMS, fuel injection system & high efficiency catalyst technology, however, subsidiary payments have not conformed yet.
- Stage 4 emission standard will be implemented from 31 December 2003
  - Cold start test will be adopted to simulate the normal riding condition
  - To diminish 2 stroke engines: Standard of HC+NOx for 2 stroke (1 g/km) is more stringent than 4 stroke (2 g/km).
- Requirements to meet emission regulations in the future: Installations of accurate fuel metering, high conversion efficiency catalyst and low emission control strategies for motorcycles.
- Emission regulations for motorcycles of displacement greater than 700cc will be stipulated in half year after accession of WTO.