Challenges posed by 2 wheelers for meeting next stage emission norms
Background

• Emission regulations in India started in 1991
• Regulations based on Indian Drive Cycle (IDC) which was specially developed for 2 and 3 wheelers by ARAI in mid 80’s
• Over the past few years, mass emission norms have been progressively made stringent
• Industry found it necessary to review test cycle and test procedures, as well as aligning with Global regulations
Indian Two Wheelers Emission Norms – Progression

Current BS III norm is considered to be one of the most stringent world wide
WMTC
WORLDWIDE HARMONISED MOTORCYCLE TEST CYCLE

• Project started in 1999 in Europe
• In year 2000, brought under umbrella of UNECE WP.29 with establishment of WMTC informal group
• **Objective is to develop a worldwide harmonized motorcycle emission test procedure**
• Over the past few years India actively participated in this development along with EU, Japan, FAMI, USA and other international stake holders
• UNECE notified WMTC as a Global technical regulation (GTR 2)

• Govt of India has issued the final notification in June 2012 introducing WMTC as an alternative regulation for BS III in India.
Major differences between IDC and WMTC Test cycles

• While IDC is applicable to all motorcycles, WMTC categorises them into different classes (Class 1, 2 and 3) based on CC and max speed
• specifies three different test cycles (Part 1, 2 and 3) applicable for different categories.
• An alternative set of cycles, which is to be used by low-powered motorcycles
• Totally new test cycles specifying higher max speeds, higher acceleration and deceleration ramps and very different time ratios compared to IDC test cycle
• WMTC specifies cold start condition as against warm start in IDC
Comparison of Cold & Warm start – BS III Vs BS IV (Class 1)

Indian Drive Cycle (IDC) - BS III

Emission Measurement Phase (648 s)

Class 1 WMTC Cycle

Emission Measurement Phase (1200 s)
WMTC Vehicle classification graphical

- Engine capacity in cm
- Max. vehicle speed in km/h

Legend:
1
2-1
2-2
3-1
3-2
Comparison of IDC Vs WMTC Part-I
Comparison of IDC Vs WMTC Part-II
Comparison of IDC Vs WMTC Part-III

Graph showing the comparison of Vehicle Speed (kph) over Time (sec) with three different lines:
- Part3 reduced
- Part3
- IDC

The graph illustrates the performance and efficiency of IDC and Part3 in comparison to Part3 reduced, with higher speed and better performance over time.
# Current BS III norms

<table>
<thead>
<tr>
<th>Class</th>
<th>IDC - BS III</th>
<th>WMTC alternate BSIII</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO</td>
<td>HC+NOx</td>
<td>CO</td>
</tr>
<tr>
<td>1 &amp; 2.1</td>
<td>0.83</td>
<td>0.83</td>
<td>1.87</td>
</tr>
<tr>
<td>2-2</td>
<td>0.83</td>
<td>0.83</td>
<td>2.62</td>
</tr>
<tr>
<td>3-1 &amp; 3.2</td>
<td>0.83</td>
<td>0.83</td>
<td>2.62</td>
</tr>
</tbody>
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- Deterioration factor of 1.2 and Durability of 30,000kms
Built-in in the Norms
BS IV proposals from SIAM to MoRTH

- SIAM Proposal for next stage regulation (BS IV) to be based on WMTC Classification (CC & Max Speed) only
- IDC will be replaced by WMTC test procedures
- Around 25% reduction of emissions (CO, HC+NoX) compared to current BS III levels (This is in line with % reduction between Euro III and the proposed Euro IV norms)
- Combined HC +NOx norm to be continued, to help conservation of fuel and to maintain high fuel economy on Indian motorcycles
- (Govt contemplating fuel efficiency norms for two wheelers soon)
- Evaporative emission norms are proposed for the first time for motorcycles in India (test procedure and norm to be in line with EU)
- Crankcase emission regulation for the first time (ensuring fitment of breather pipe on crankcase, connected to intake system)
Concern - Availability of BS-IV fuel

• In order to meet stringent emission norms as well as durability of after treatment devices, 2 Wheeler industry also requires BS IV fuel.

• Oil companies seem to have difficulty to make BS-IV commercial fuel available all over India in time to meet for BS IV stage.

• BS-IV commercial fuel differ from BSIII commercial fuel on

<table>
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<tr>
<th></th>
<th>BSIII fuel</th>
<th>BSIV fuel</th>
</tr>
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<tbody>
<tr>
<td>Sulphur</td>
<td>150 ppm</td>
<td>50 ppm</td>
</tr>
<tr>
<td>Aromatic content</td>
<td>35% max</td>
<td>42% Max</td>
</tr>
</tbody>
</table>

• There is literature available which indicates that use of fuel with higher sulphur content tends to give higher emissions and lower durability of after treatment devices

• Dual stage emission norms, would create unmanageable logistics difficulties considering the volume of production and No. of models and variants.

• Needs to be sorted out
Technologies to be adopted

• Further optimization of engines to improve combustion efficiency and fuel efficiency
• Improved carburetor systems.
• Secondary air systems
• Improved after treatment devices to reduce tailpipe emission.
• Fuel injection system for some models.
• 3-way catalyst systems for some models
• Evaporative emission control system (first time in India)
• Optimising Crankcase emission system on engines
Summary- Challenges posed by 2 Wheelers for meeting next stage Emission norms (BS IV)

Changing over to totally new WMTC test cycles and procedures
- higher max.speed
- higher acceleration and deceleration ramps
- very different time ratios
- Different test cycles for different categories of m/cycles
- Cold start condition
- Evaporative emission control
- Crankcase emission control
- Deterioration Factor (not currently in EURO)
- Durability limits (not currently in EURO)
- COP procedure in vogue (not currently in EURO)
- Availability of BS IV fuel across the country (?)
- To meet stringent emission norms as well as durability
Thank you