

4th ACEM Annual Conference

The Powered Two-Wheeler contribution
to better quality of life in cities

Urban Innovations



Urban Mobility

The Powered Two-Wheeler Contribution to better quality of life in cities

Urban innovations

- Increasing traffic in European cities and towns calls for new solutions in urban mobility.
- ACEM manufacturers are developing Powered Two Wheeler innovations supporting the urban mobility of citizens, public services and businesses.



Urban Mobility

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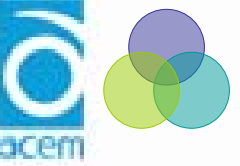


Better quality of life in cities



Urban Mobility

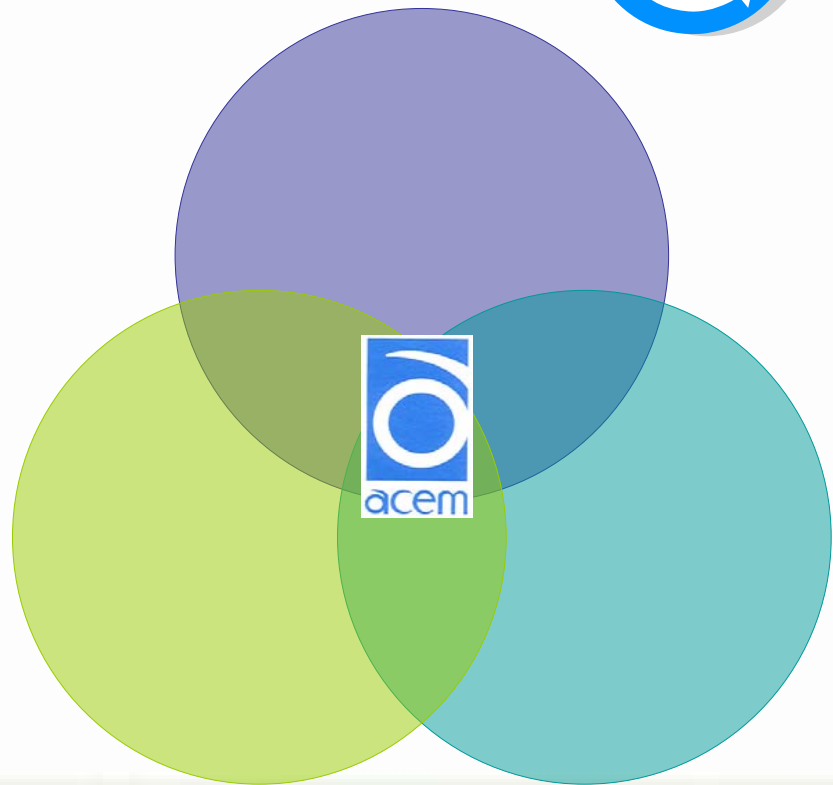
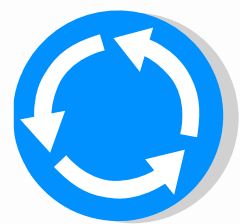
The Powered Two-Wheeler Contribution to better quality of life in cities



Urban innovations



MOBILITY



ENVIRONMENT



SAFETY

Urban Mobility
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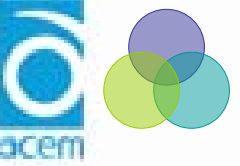
BMW C1 with Electrical Engine

A Research Vehicle

Technical Data

- Engine Performance: 8kWh/42V
- Stored Engine Capacity: 3,8kWh
- Li-Ion Batteries
- Range: ~40km
- Top Speed: ~90km/h

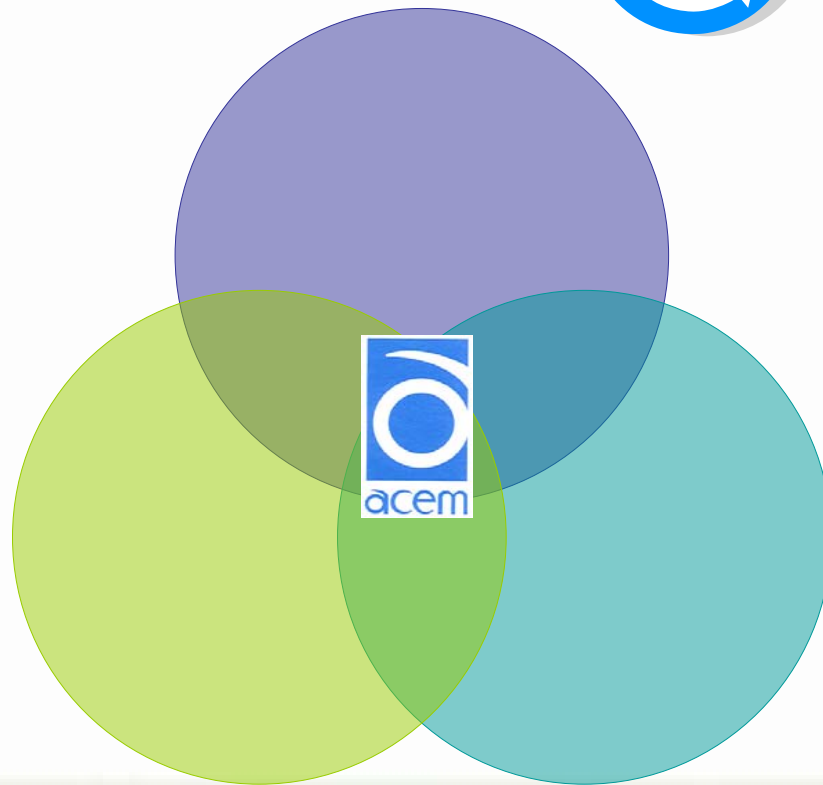




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Honda and PTW Safety



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Honda Safety Concept

Preventive Safety Training



Traffic education



Riding Simulator



Riding Trainer



Bicycle trainer



Fun & Safety Training



Research on ASV 3 vehicle communication systems

Training of riding and risk prediction skills:
Honda has trained more than 40,000 people in Germany

Next activities:

Further expansion of Riding Trainer in Europe and worldwide, Research on Bicycle Trainer, Development of ASV 3 Technology

Active Safety Accident avoidance



Advanced braking systems



CBS

Optimum brake balance



ABS

Prevention of wheel lock

Combined ABS

Optimum of modern braking technology

In Europe more than 750,000 powered two-wheelers with advanced braking system have been sold by Honda

Next activities:

By the end of 2010 Honda will equip all new models over 250cc with Combined ABS systems

Passive Safety

Reduction of accident consequences



Collision safety



Airbag Gold Wing

The world's first motorcycle airbag is available for the Honda Gold Wing

World premiere for an airbag-equipped motorcycle at ADAC crashtest facility



ADAC crashtest with Honda Gold Wing

Airbag efficiency is demonstrated by ADAC in a 72km/h side impact crashtest

ADAC Crashtest result:

„The airbag developed by Honda is a milestone in motorcycle safety.“



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Honda and Fuel Economy

Contributing to reduce CO2



Existing Technology

Electronic Fuel Injection



More Environmentally Friendly

- Cleaner exhaust emissions
- Reduced fuel consumption



More User Friendly

- Significantly improved cold starts
- Significantly improved starts after long inactivity
- Stable idling in all situations/weather conditions



Technical challenges

Electronic Fuel Injection for small commuters

Miniaturization

Smaller
Lighter

Smaller engine capacity

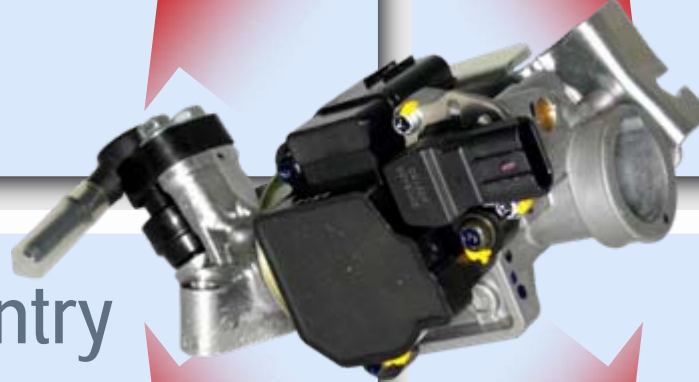
Controlling small fuel amounts
Fuel atomization

Developing country needs

Kick-start (flat battery)
Air-cooled engines

Low cost

Cost down
Less parts
Multi-functionality



Fuel Economy

Achieved improvements



2004 SH150 → 2005 SH150i

+10%



2005 Innova → 2006 Innova i

+6%



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New Technology: Ultra-low Friction engine

 Fuel Efficiency Improved by 13% compared with 2005

 Reduced Internal Friction = reduced by 24% between 1995 and 2005

- Increased displacement and higher gearing
- Cylinder offset
- Roller-type rocker arms with needle bearings
- Thinner piston ring
- Reduced piston skirt depth and new surface treatment
- Smaller-diameter crankpin



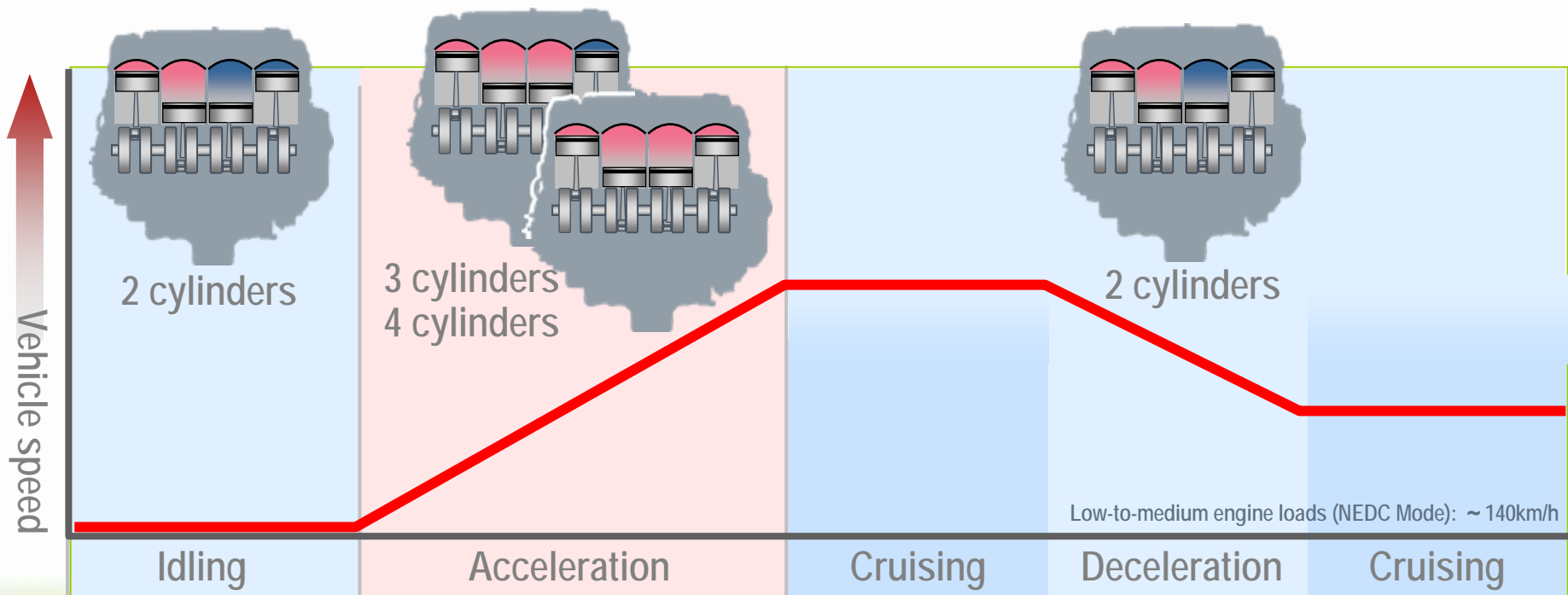
New Technology: VCM

Variable Cylinder Management

+30%

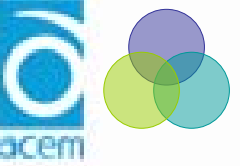
Fuel economy improvement

Compare to 2005 conventional engine



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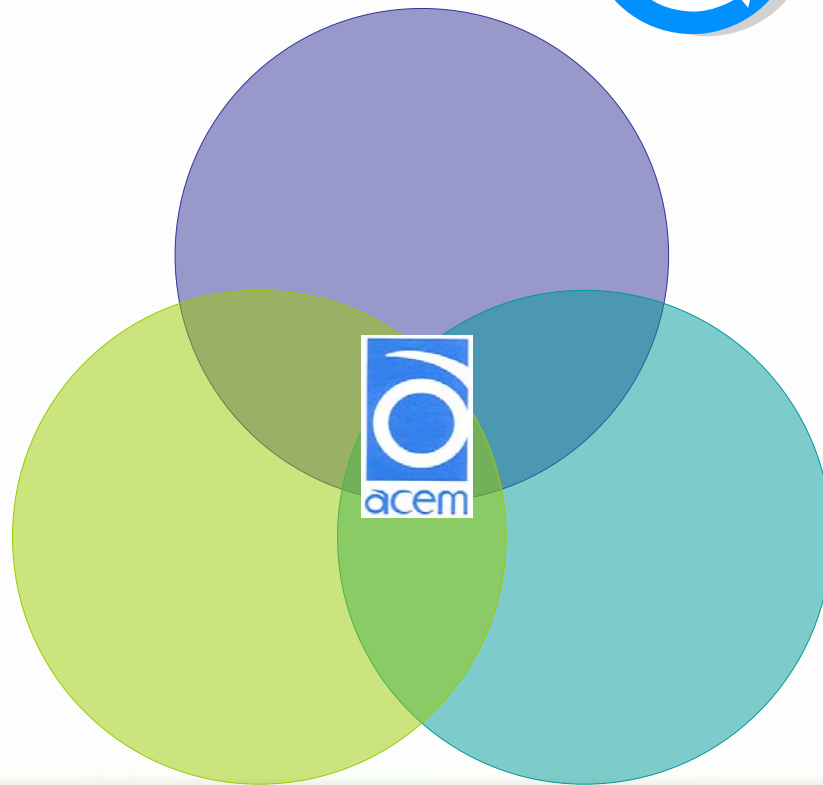
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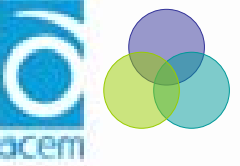


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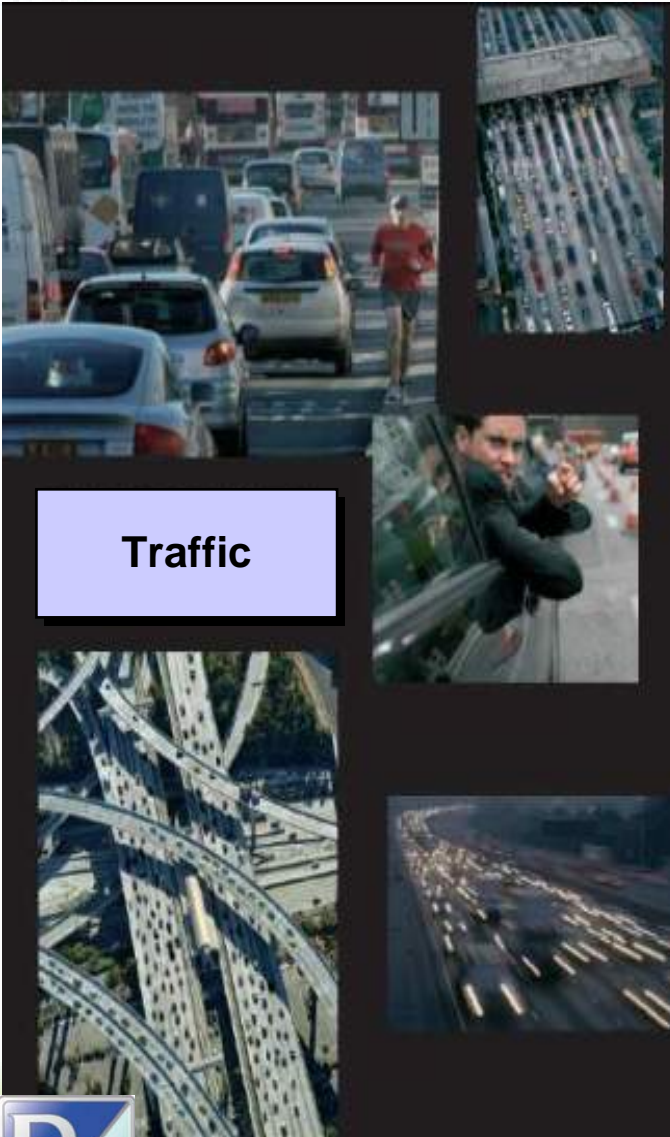


SAFETY

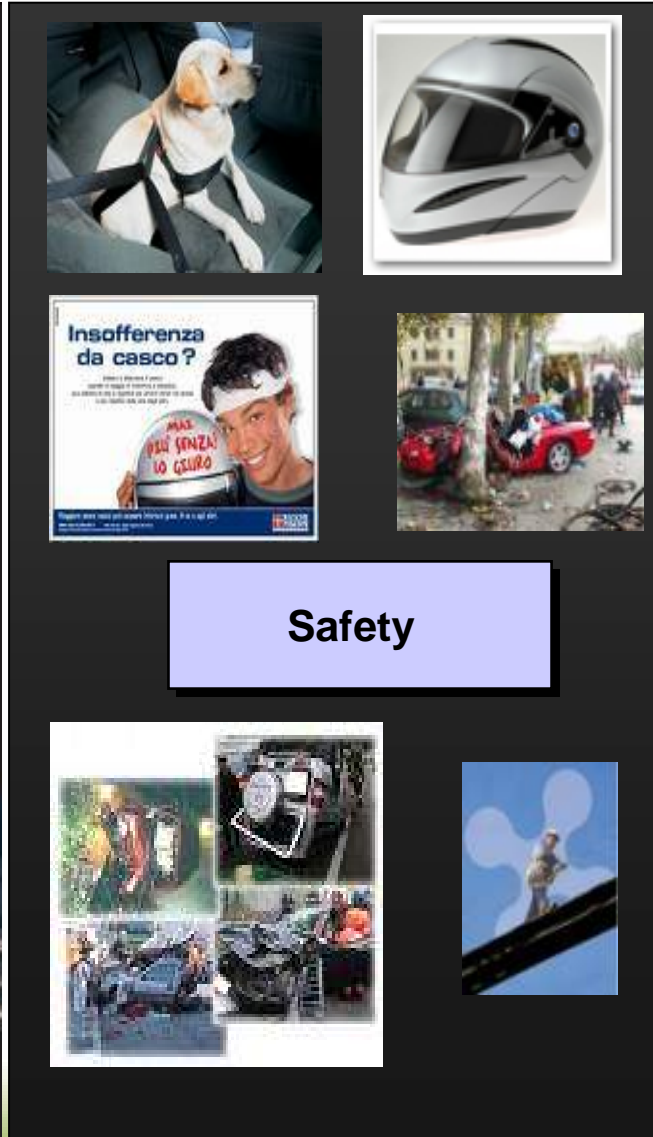
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Mobility: 3 global challenges



Traffic



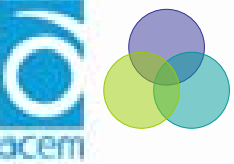
Safety



Pollution



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Mobility in Safety

- In recent years European citizens found in powered-two-wheelers (PTW) a way to beat congestion, without sacrificing time schedule flexibility
- The development of individual mobility on PTW brings a potential drawback in road safety, increasing road accidents involving damage to persons, while European cities experience the strong need to reduce gaseous emissions
- Piaggio is tackling both issues, concretising its own concept of sustainable individual mobility





MP3: a *safety* tangible benefit

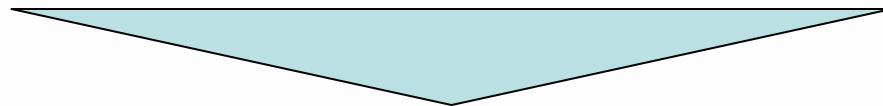
More and better contact with the ground, better road-holding, homogeneity of behaviour; all this and more is provided by the all-Italian technology implemented in **Piaggio MP3**. The two front wheels guarantee cornering stability beyond that of any other scooter. At speed, even when riding behind large vehicles, the **Piaggio MP3** stays stuck to the road and can always deliver maximum performance in total safety. The benefits of the **three wheel revolution** really make themselves felt on wet roads and in other riding conditions that are critical for conventional two-wheelers. The revolutionary **Piaggio MP3** can stop in **distances so incredibly short** that no other scooter can hope to compete. Thanks to a **triple disc braking system** and the exceptional grip afforded by the two front wheels, **stopping distances are 20% shorter** than those of the best conventional scooters.

Piaggio MP3

➤ **Better Grip**

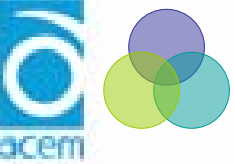
➤ **Better Stability**

➤ **Better Braking**



Better active safety





Hybrid Powertrain

Hybrid Scooters are not merely 'dual-engine scooters', but absolutely innovative vehicles that combine a low emissions internal combustion engine with a zero-emissions electric motor to create a winning synergy. Piaggio's MP3 HyS Hybrid Scooter is an environment-friendly 'all-rounder' with low running costs, and embodies all the innovation, safety and fun that is making Piaggio's revolutionary MP3 three-wheeled scooter so successful.



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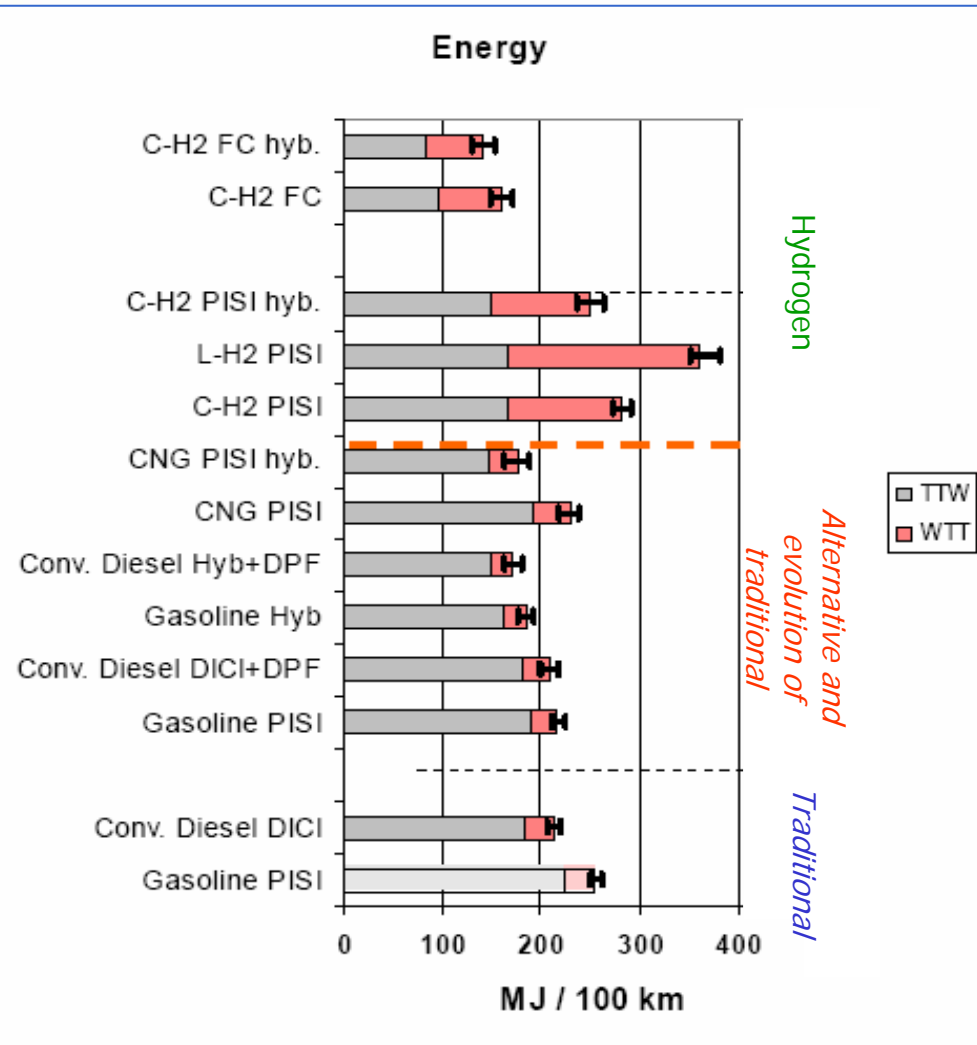
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Why Hybrid in the short/medium term?

Graph comparing the energetic efficiency of different solutions with different fuels, from *well to wheel*: Hybrid is convenient.



Legend:

PISI: Port Injection Spark Ignition

DICI: Direct Injection Compression Ignition

C-H2: Compressed Hydrogen

L-H2: Liquid Hydrogen

FC: Fuel Cell

CNG: Compressed Natural Gas

DPF: Diesel Particulate Filter

ICE: Internal Combustion Engine

WTT: Well To Tank

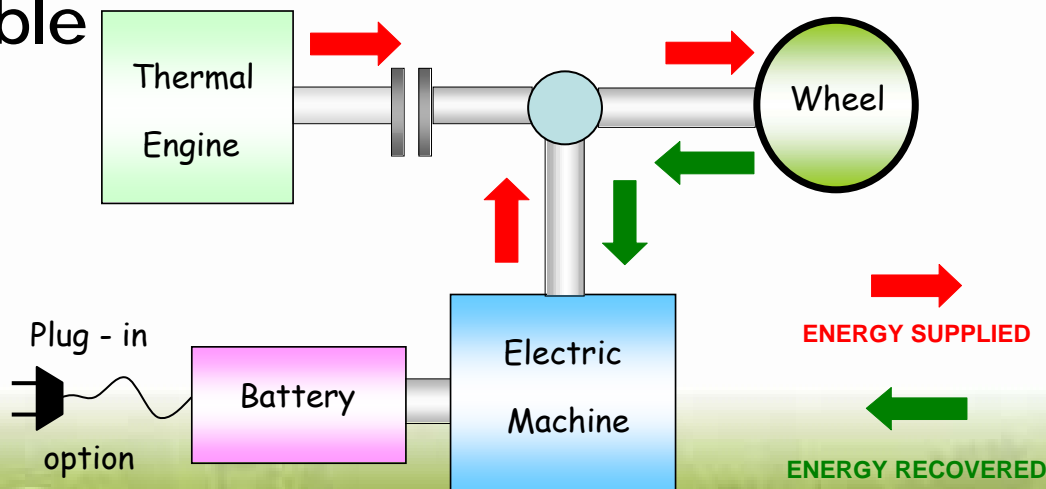
TTW: Tank To Wheel





HyS: Piaggio Hybrid Scooter

- Piaggio has chosen the parallel hybrid scheme:
 - Both engines can give power to the wheel
 - Battery recharge by thermal engine while running or directly by mains
 - Energy saving into the battery braking or decelerating
 - Electric mode is possible. **Only thermal mode is not possible**





HyS: Piaggio Hybrid Scooter



MP3 HyS Hybrid Scooter



HyS is a Piaggio International patent



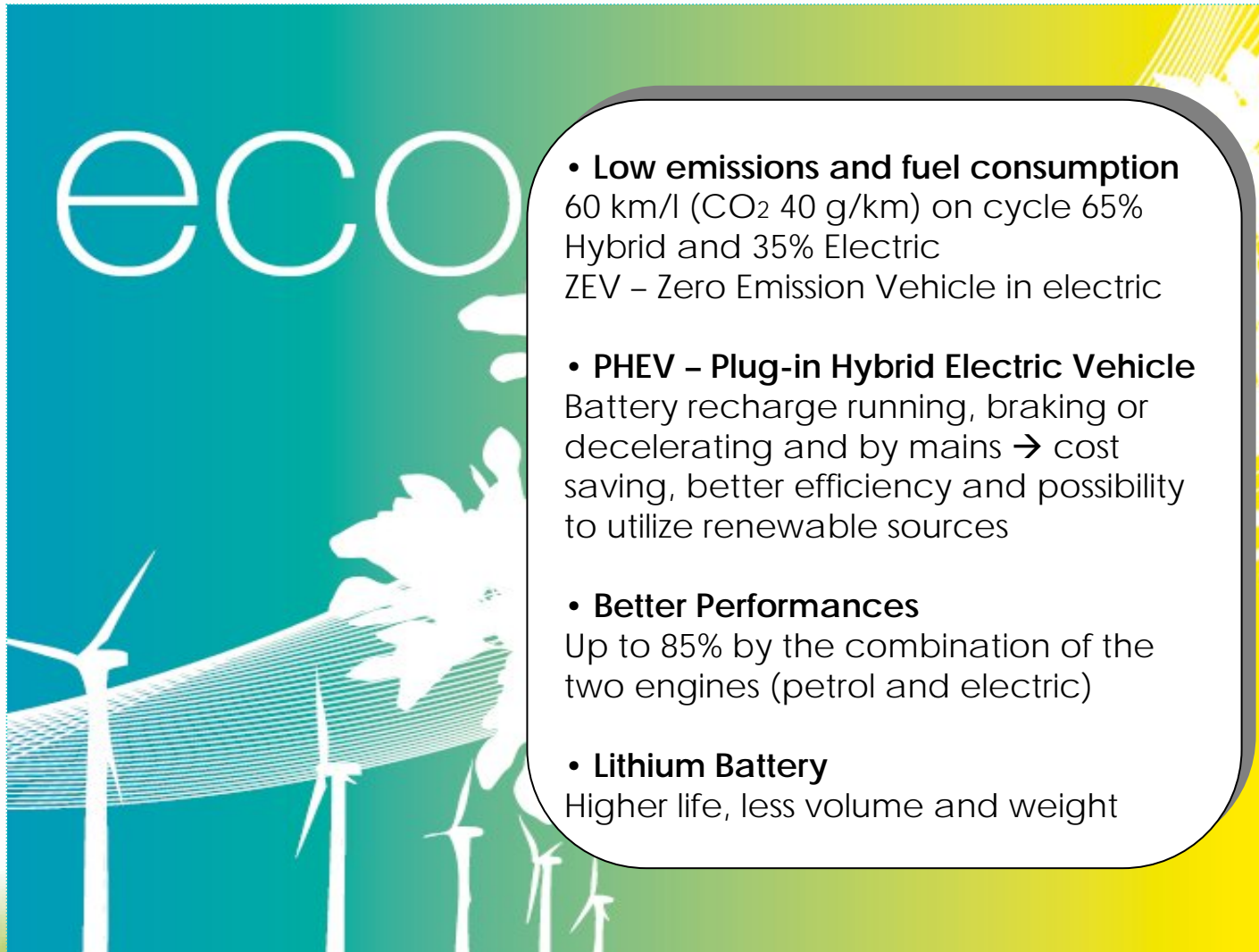
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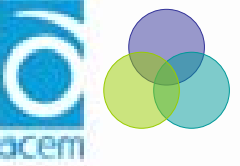


HyS: Piaggio Hybrid Scooter



eco

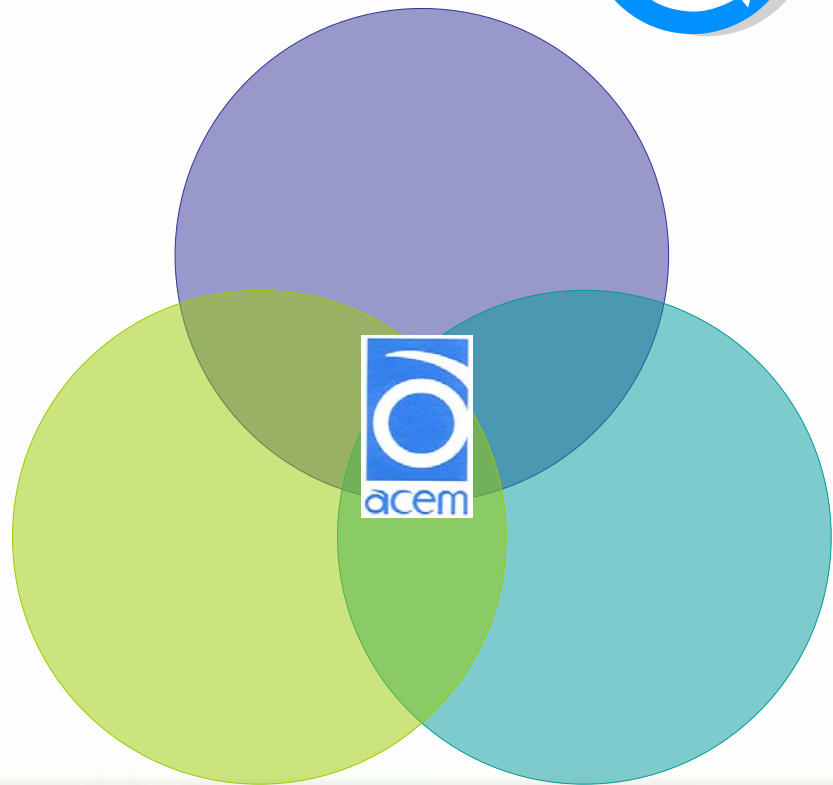
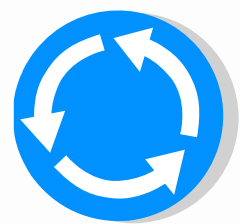
- **Low emissions and fuel consumption**
60 km/l (CO₂ 40 g/km) on cycle 65% Hybrid and 35% Electric
ZEV – Zero Emission Vehicle in electric
- **PHEV – Plug-in Hybrid Electric Vehicle**
Battery recharge running, braking or decelerating and by mains → cost saving, better efficiency and possibility to utilize renewable sources
- **Better Performances**
Up to 85% by the combination of the two engines (petrol and electric)
- **Lithium Battery**
Higher life, less volume and weight



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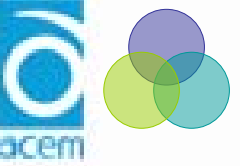


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Yamaha Passol electric moped

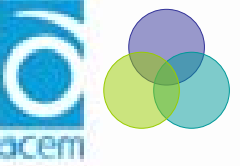


Permanent
magnet
synchronous
motor



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Yamaha Passol electric moped

Maximum power

1.2kW at
2,250r/min

Maximum torque

7.5N•m at
310r/min

Mass

47kg

(41kg without
battery)



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Yamaha FC-me Fuel cell

Yamaha Direct
Methanol Fuel
Cell (DMFC)
System



Liquid
methanol-
water solution





Yamaha FC-me Fuel cell

Maximum
power

0.95kW at
1,830 r/min

Maximum
torque

5.4N•m at 560
r/min

Mass 69kg





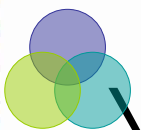
Yamaha FC-AQEL Fuel cell



Compressed hydrogen gas



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Yamaha FC-AQEL Fuel cell

Polymer electrolyte fuel cell

Synchronous motor

Secondary battery:
Lithium-ion



Hydrogen tanks (35 Mpa)

Fuel cell radiator

Fuel cell module

Ultra-thin Yamaha integrated Power Unit (YIPU)



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