RESS-12-07

Development of FC-motorcycles

IMMA

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Positioning of the FC-motorcycles

- Risk hedge for CO_2 reduction
  - The CO2 emissions reduction should become big issue for the motorcycle manufactures in future.
- Hydrogen fuel as alternative energy
  - Hydrogen energy is important for Motorcycles as same as M/N category.
- FC system can provide longer range to the electric motorcycles with zero emission.

Development history of the FC motorcycle in Japan

※ TMS: Tokyo Motor Show

2004
HONDA developed FC Motorcycle

2006
Yamaha exhibited FC-AQUEL in EVS22

2009
SUZUKI exhibited FC scooter in TMS

2010
SUZUKI started vilification test in UK

2013
SUZUKI exhibited second generation of FC scooter in TMS

2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

2003
YAMAHA conducted verification test with DMFC scooter(FC-06)in JAPAN

2005
YAMAHA exhibited DMFC scooter (FC-me) in TMS

2007
SUZUKI exhibited FC Motorcycle (Crosscage) in TMS

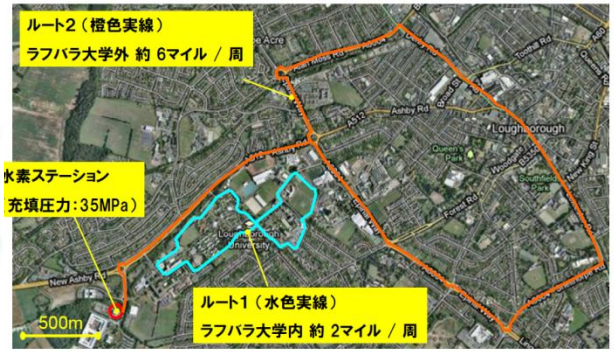
YAMAHA exhibited FC scooter (FC-AQUEL) in TMS

YAMAHA exhibited DMFC scooter (FC-Dii) in TMS

2011
SUZUKI started verification test in JAPAN

Experimental run of SUZUKI

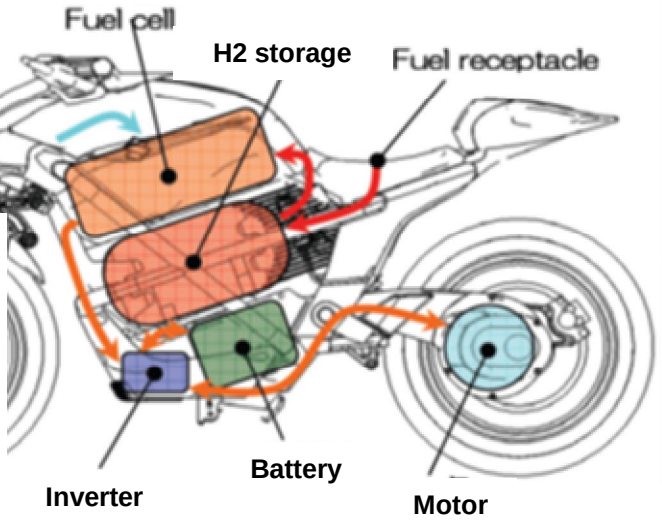
	In England	In Japan
Purpose	・Extraction of FC system issues	・Extraction of FC system issues and actual usage issues
Term	Feb./2010～Mar./2014	May/2011～Mar./2014
Test vehicles	Two FC-scooters	One FC-scooter
Driving rout	Around the Loughborough university	Kitakyushu-city,(Hydrogen gas provided by Nippon Steel)
Rider	Engineers of Intelligent Energy	Nippon steel employee



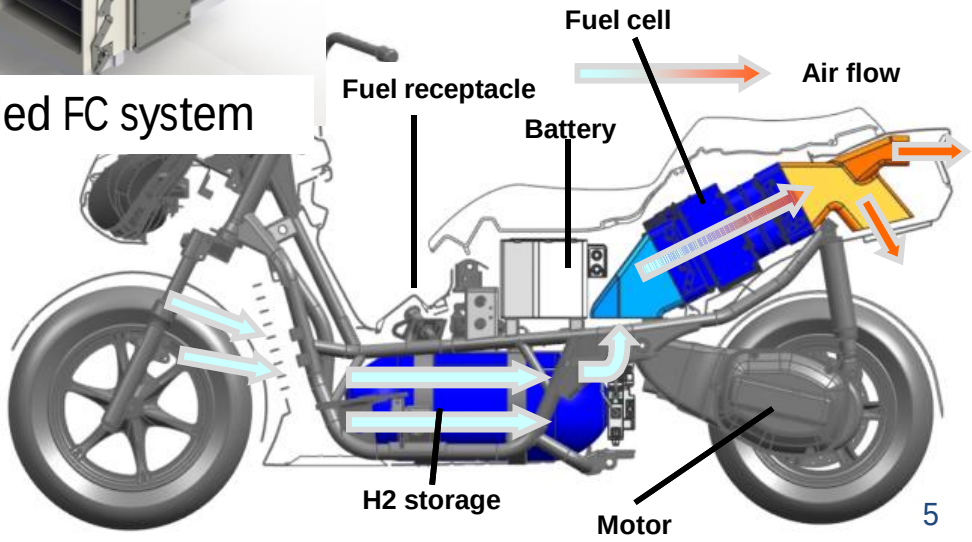
Example of FC-motorcycle development

SUZUKI Crosscage 2007

Air cooled FC system



SUZUKI BURGMAN FCS 2013



Specification

	SUZUKI Crosscage 2007	SUZUKI BURGMAN FCS 2013
Engine type/power	Electric motor/0.98kW	Electric motor/ ≧4kW
FC Type	Air cooled PEFC 1.6kW	Air cooled PEFC N/A kW
Manufacture of FC	Intelligent Energy, UK	←
Rechargeable battery	Li-Ion	←
Dry weight:	156.0 kg	175.0kg
Overall height:	1,020 mm	1,390mm
Overall length:	1,985 mm	2,055mm
Overall width:	645 mm	830mm
Maximum speed	N/A	N/A
Range	350km @30km/h	140km @60km/h

Safety standards preparation in Japan

- JAMA ask Japanese government to prepare the safety standards.
  - No hydrogen safety standards for motorcycles in Japan.

※「Standards 」≒「Regulation」

- Determination of Japanese government （July/2013）
  - To prepare the safety standards for FC-motorcycles Acts, start the study from 2013 and obtain the conclusion 2015, enforce ASAP

Specific safety standards should be prepared because of few space around the hydrogen storage against the shock

Preparation schedule in Japan

1) Safety standards for road transport vehicle Acts for motorcycles

- Hydrogen safety standards ・・・ ～Sep./2015
  (Japanese original standards Act based on GTR13)
- Electric safety standards ・・・ ～Feb./2016

(Adopt Rxxx to Japanese safety standard)

2) Technical standards of compressed hydrogen gas safety Acts for motorcycle

- Hydrogen storage system and specific components for the hydrogen storage system based on GTR13 ・・・ ～Sep./2016

Conclusion

- Rxxx should cover the electric safety of FC systems on the motorcycles
- We strongly require not to delete the part 5.1.3.3. from Rxxx
  - Preparing Safety standards for road transport vehicle Acts for motorcycles until 2016 in Japan
  - Proposal of the international hydrogen safety regulations for motorcycles (Ryyy) can be made by Japan after 2017