ATRANS
ASIAN TRANSPORTATION RESEARCH SOCIETY

ATRANS Research Project: No. A -09-004

Development of Driving Cycle of Motorcycle in Khon Kaen City, THAILAND

การสร้างวัฏจักรการขับขี่ของรถจักรยานยนต์ในจังหวัดขอนแก่น ประเทศไทย

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by

Dr.Thaned Satiennam

Dr.Thana Radpukdee

Mr.Watcharain Saengsuwan

Presentation Outline

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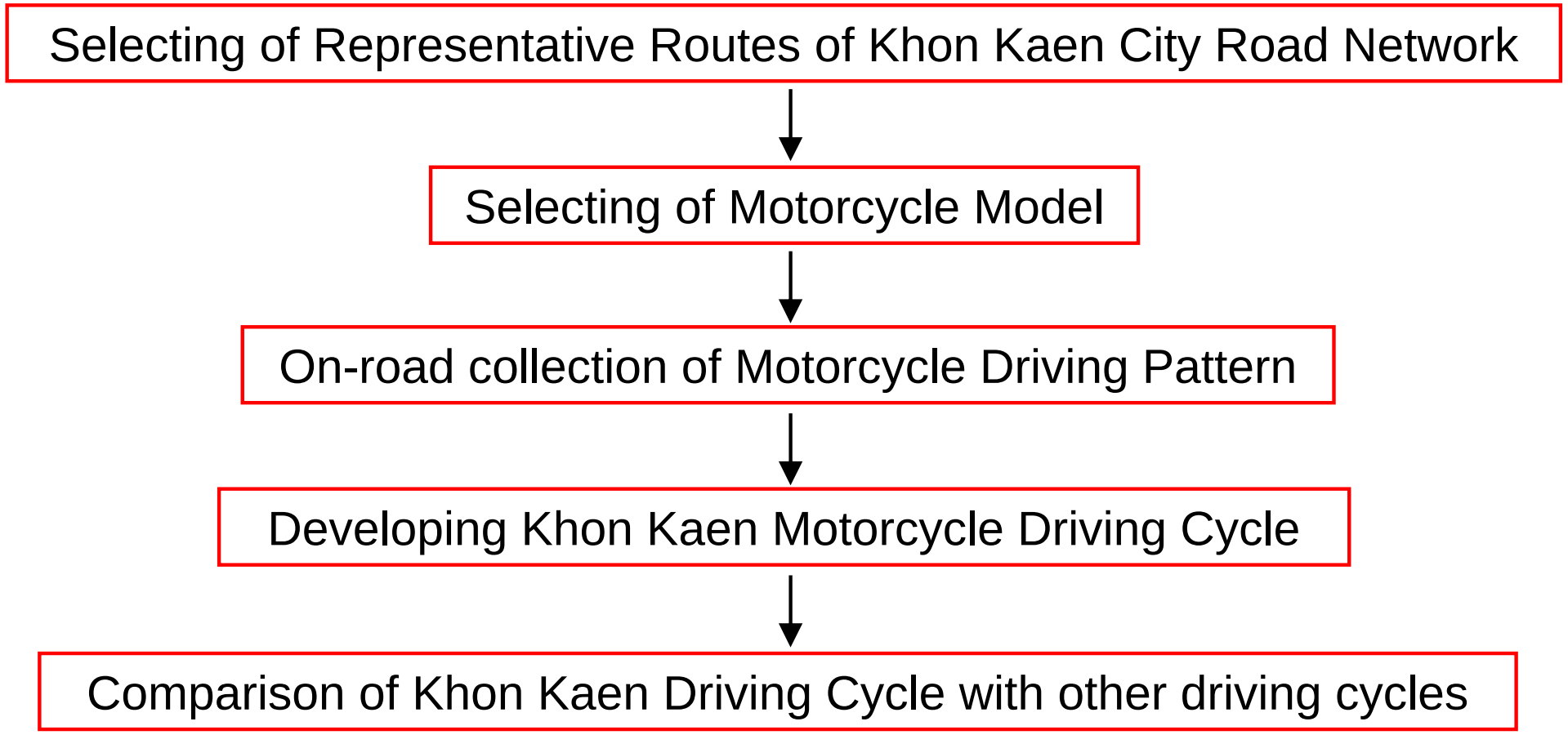
Background

- No driving cycle developed specifically for motorcycle in Thailand
- Existing Bangkok driving cycle may not representative wholly for Thailand driving cycle, especially provincial cities which their traffic and road conditions as well as motorcyclist's driving behavior totally different from Bangkok
- Therefore, these existing driving cycles may not be used to estimate accurately the amount of gas emissions and fuel consumption of motorcycle
- Khon Kaen City selected as a study area due to high number of motorcycle and % of mode share, 30%.
- Moreover, Khon Kaen city currently encountered traffic congestion problem, especially on peak hours.

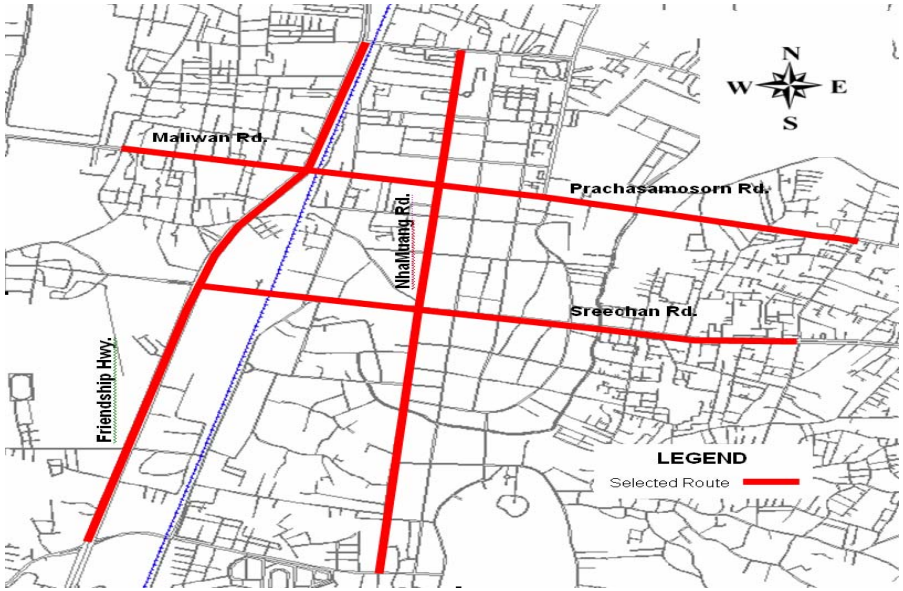
Objectives

- To collect driving behavior pattern of motorcyclist in Khon Kaen city
- To propose the algorithm to develop motorcycle driving cycle
- To construct driving cycle representing driving behavior of motorcycle in Khon Kaen city
- To compare developed driving cycle with driving cycle of other countries

Research Methodology



Selection of Routes for On-road Data Collection



No.	Selected Routes	Distance (km)	Aver. Speed, km/hr (LOS)	Traffic Volume*, PCU (V/C)
1.	Friendship Hwy.	3.9	≥ 50 (A) 40 – 49 (B)	1,737 (0.40)
2.	Sreechan Rd.	3.0	30 – 39 (C)	1,235 (0.66)
3.	NhaMuang Rd.	3.8	20 – 29 (D)	920 (0.62)
4.	Prachasamosorn Rd.	2.8	15 – 19 (E) < 15 (F)	1,054 (0.7)
5.	Maliwan Rd.	1.0	15 – 19 (E) < 15 (F)	2,149 (0.68)

Note: *Traffic volume during morning peak hour (7:30-8:30 AM) Source: SIRDC, 2008

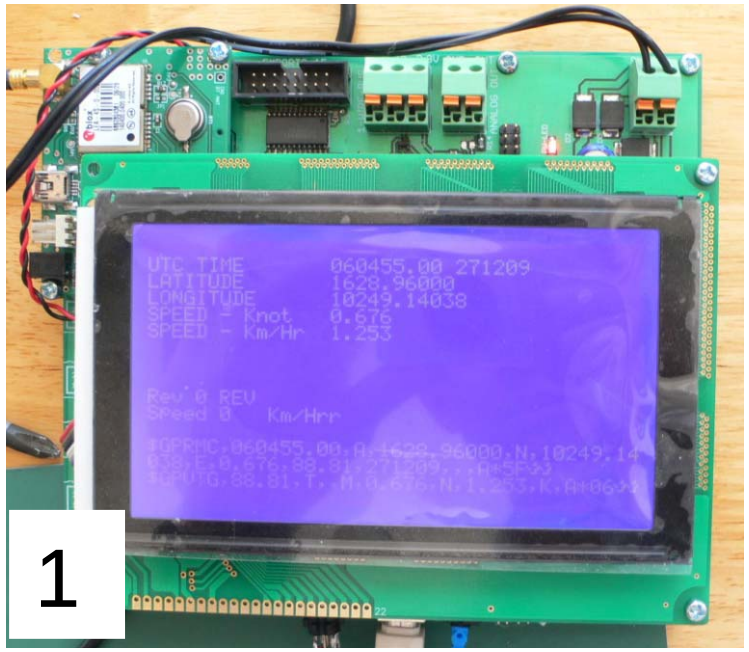
Selection of Motorcycle Model for Data Collection

No.	Manufacture	Engine Capacity (cc.)				Total
		<100	101-125	126-150	>151	
1	Honda	6,499 (22.4%)	12,884 (44.4%)	132 (0.5%)	63 (0.2%)	19,578
2	Kawasaki	-	197 (0.7%)	2 (0.0%)	10 (0.0%)	209
3	Platinum	-	24 (0.1%)	17 (0.1%)	3 (0.0%)	44
4	Suzuki	-	708 (2.4%)	-	-	708
5	Yamaha	7 (0.0%)	8,117 (28.0%)	372 (1.3%)	-	8,496
	Total	6,506	21,930	523	76	**29,035**

Source: Khon Kaen Land Transportation Authority Office, 2009

Yamaha, Fino 125 cc.

Development of Data Logger



1


3


2


4

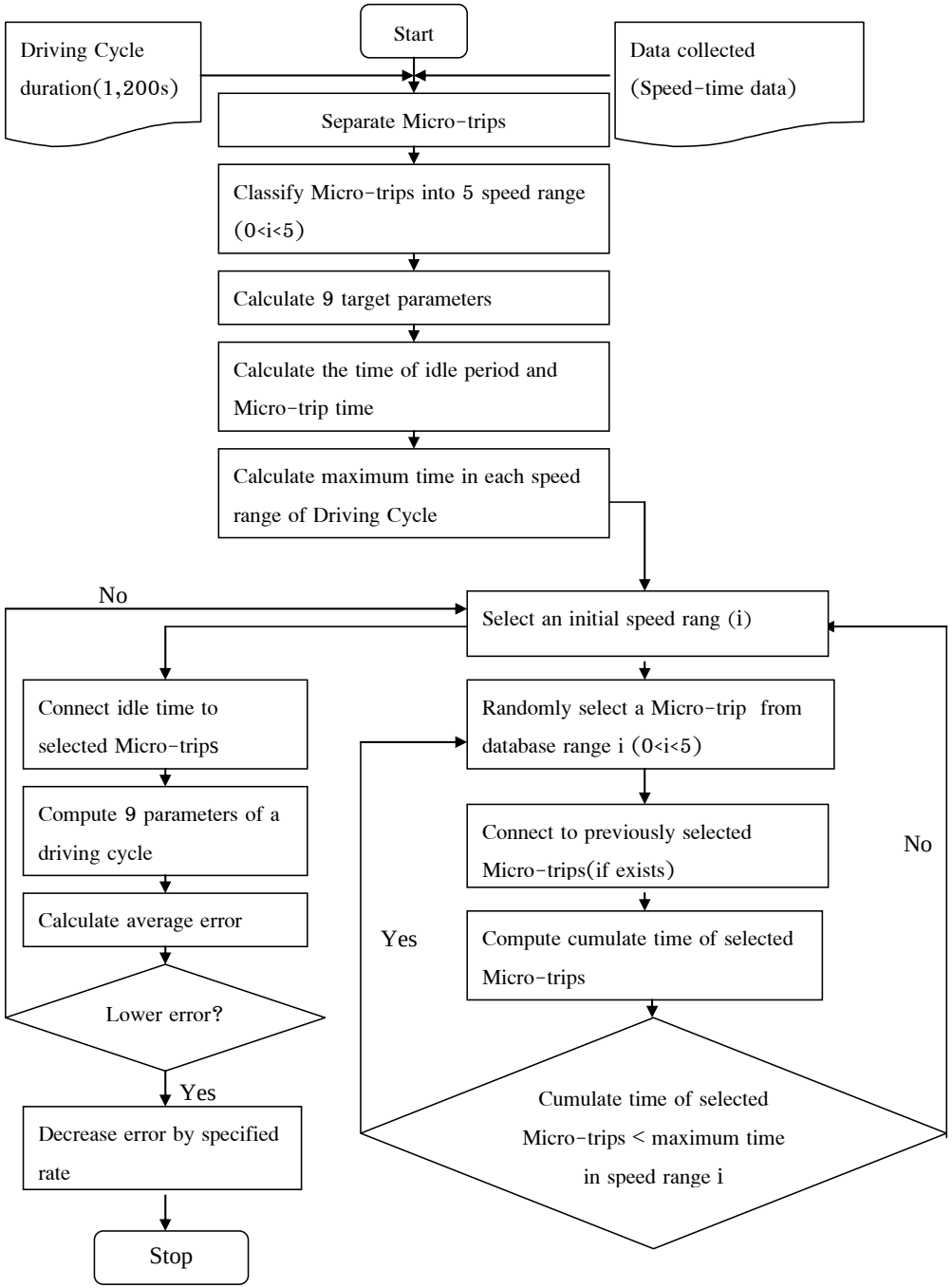
Component:

1. Display unit
2. GPS & engine speed sensor
3. Wheel speed sensor
4. Battery box

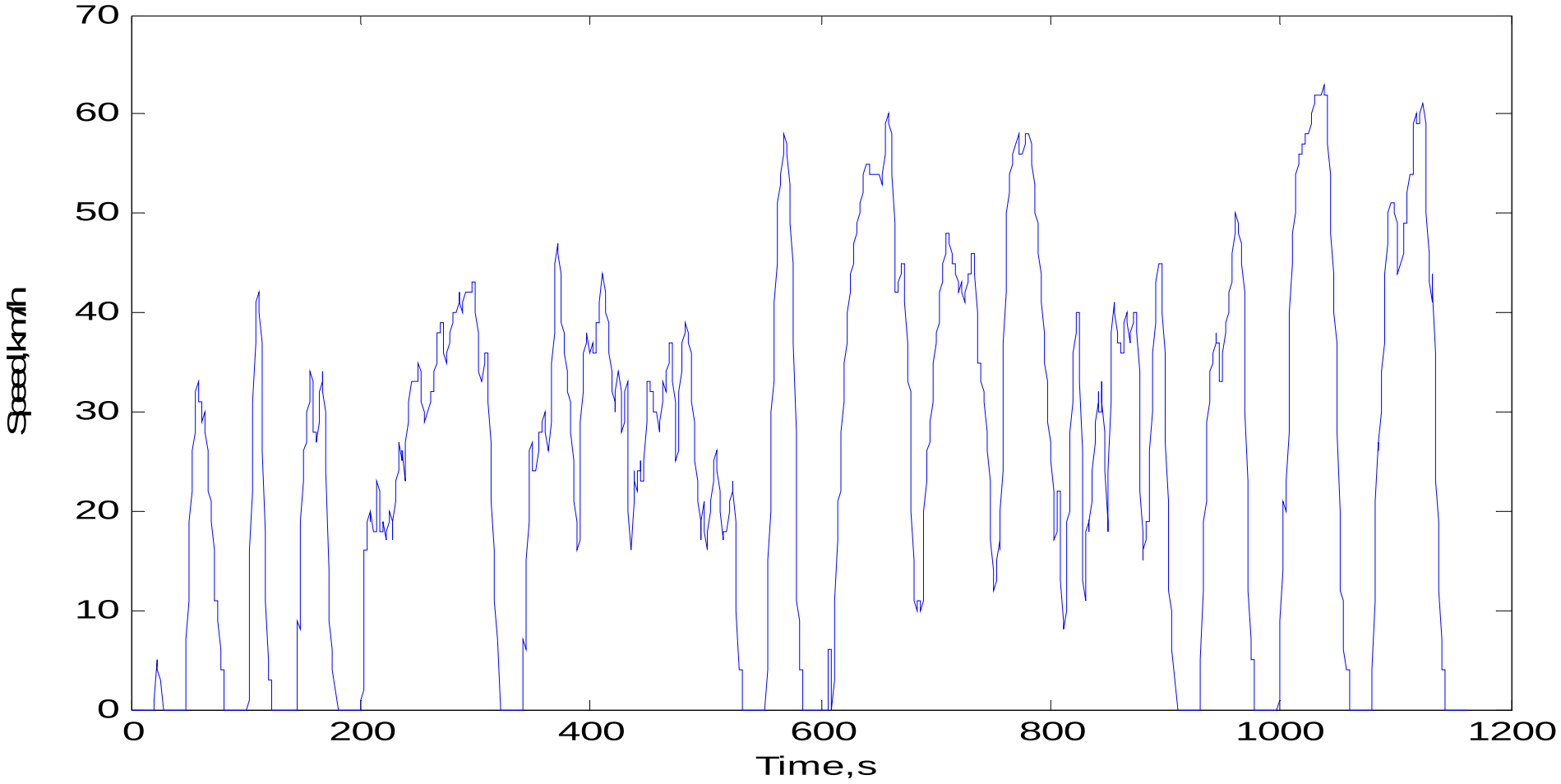
Schedule of On-road Data Collection

No.	Selected Routes	Distance (km)	Time	Day	Total Time (hr.)
1	Friendship Hwy.	3.9	7:00-9:00	21	42
2	Sreechan Rd.	3.0	7:00-9:00	21	42
3	NhaMuang Rd.	3.8	7:00-9:00	21	42
4	Prachasamosorn Rd.	2.8	7:00-9:00	21	42
5	Maliwan Rd.	1.0	7:00-9:00	21	42
	Sum	13.5		105	210

Algorithm for Developing Driving Cycle



Khon Kaen Motorcycle Driving Cycle



V_{max} = 63km/h; Acc_{max} = 2.778; Dec_{max} = -2.778; length 1164 s; distance = 8.113km

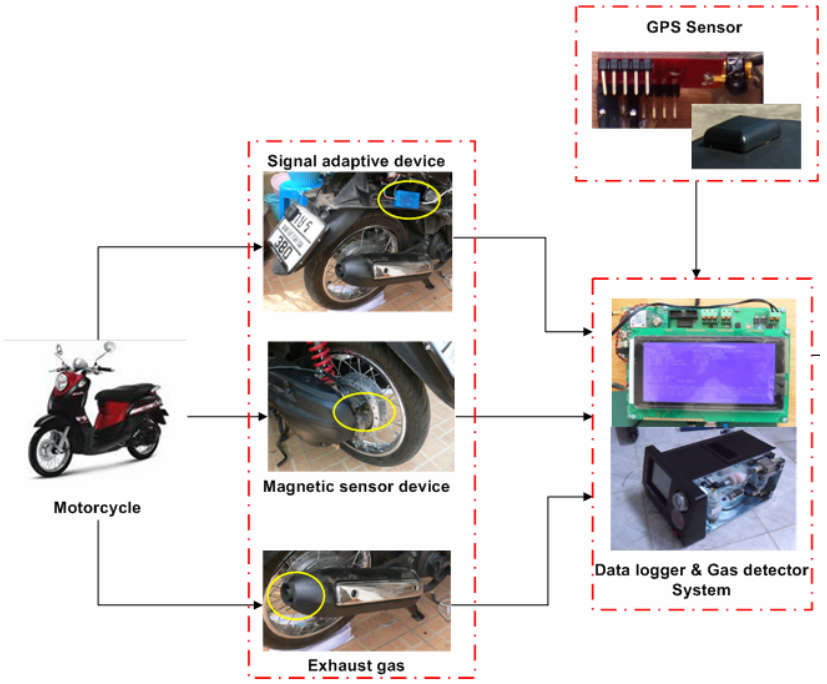
Comparison of Developed Driving Cycle with Other Driving Cycles

Target Parameters	Khon Kaen Driving Cycle	ECE Driving Cycle	Taipei Driving Cycle	Bangkok Driving Cycle*
V_{avg}, km/h	24.968	33.4 (33.8%)	16.62 (-33.4%)	17.4 (-30.3%)
$V1_{avg}$, km/h	31.842	44.4 (39.4%)	23.66 (-25.7%)	28.1 (-11.8%)
Acc_{avg}, m/s	0.636	0.541 (-14.9%)	0.68 (6.9%)	0.71 (11.6%)
Dec_{avg}, m/s	-0.692	–0.789 (-14%)	-0.68 (1.7%)	–0.71 (-2.6%)
%Idle	20.799	23.7 (13.9%)	30 (44.2%)	37.7 (81.3%)
%Cruise	17.828	42.2 (136.7%)	22 (23.4%)	23.7 (32.9%)
%Acc.	31.971	18.3 (-42.8%)	24 (-24.9%)	15.2 (-52.5%)
%Dec.	29.401	15.8 (-46.3%)	24 (-18.4%)	23.4 (-20.4%)
PKE, m/s	0.448	0.224 (-50.0%)	-	0.45 (-0.4%)

* From **Tamsanya (2008)**

Conclusion and Next Step

- Khon Kaen motorcycle driving cycle developed for further use to test fuel consumption and emissions in laboratory
- Khon Kaen motorcycle driving cycle considerably different from motorcycle driving cycles of other cities
- Next step, further developing on-board equipment by combining gas measuring unit on motorcycle to record real-time the emissions and fuel consumption of motorcycle
- Expected results showing graphically relations between speed and emission/fuel consumption by road type/traffic condition



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FOR YOUR ATTENTION