



**AIR MOVEMENT AND CONTROL
ASSOCIATION INTERNATIONAL, INC.**

Energy Efficiency Regulations in the Asia Region by Goh Swee Lee Executive Director Asia AMCA

**Presented at the International Fan Efficiency Regulation
Symposium
Swaibisch Hall, Germany
17 July 2014**



**AIR MOVEMENT AND CONTROL
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AGENDA

Energy Efficiency in Asia

- China
- Taiwan
- Malaysia
- Singapore
- Hong Kong
- Philippines
- India
- Thailand
- Korea





AIR MOVEMENT AND CONTROL
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ENERGY EFFICIENCY IN ASIA

- China



- National Standard: GB 19761-2009

- *“Min Allowance Values of Energy Efficiency & Energy Efficiency Grades for Fan”*

- Standard Specifies:

- i. Energy Efficiency Grades
 - ii. Min. Allowable Values of Energy Efficiency
 - iii. Applicable to Centrifugal, Axial fan for common use, boiler, power station and air-conditioning application.
 - iv. Test Methods for Fans
 - GB/T 10178 – Industrial fan performance testing in situ
 - GB/T 1236 (ISO5801) – Industrial fan performance testing using standardized airways.





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ENERGY EFFICIENCY IN ASIA

- **China**



- Using Pressure Coefficient and Specific Speed to categorized the different types of fans into 3 grades.
- Manufacturer's Lab must be accredited and test report must submit with self declaration on Energy Grade.
- Alternatively, manufacturer can use the 3rd party Lab listed in CNIS website for the report submission.
- Both AMCA International and Asia AMCA were approved and recognized as CNIS 3rd party Lab in China.





ENERGY EFFICIENCY IN ASIA

- China 

Table 1 Energy Efficiency Grade of the Centrifugal Fan

Pressure coefficient ψ	Specific speed η_s	Efficiency $\eta_f/\%$								
		№2 < Device No. < №5			№5 ≤ Device No. < №10			Device No. ≥ №10		
		Grade 3	Grade 2	Grade 1	Grade 3	Grade 2	Grade 1	Grade 3	Grade 2	Grade 1
1.4 ~ 1.5	$40 < \eta_s \leq 65$	55	61	64	59	65	68			
1.1 ~ 1.3	$35 < \eta_s \leq 55$	59	65	68	63	69	72			
1.0	$10 \leq \eta_s < 20$	63	69	72	66	72	75	69	75	78
	$20 \leq \eta_s < 30$	65	71	74	68	74	77	71	77	80
0.9	$5 \leq \eta_s < 15$	66	72	75	69	75	78	72	78	81
	$15 \leq \eta_s < 30$	68	74	77	71	77	80	74	80	83
	$30 \leq \eta_s < 45$	70	76	79	73	79	82	76	82	85



ENERGY EFFICIENCY IN ASIA

- China 

Table 3: Energy efficiency grade of air conditioning centrifugal fan with outer rotor motor

Pressure coefficient	Specific turns η_e	Unit efficiency $\eta_e/\%$														
		Machine No. \leq No2			No2<Machine No. \leq No2.5			No2.5<Machine No. \leq No3.5			No3.5<Machine No. \leq No4.5			Machine No. \geq No4.5		
		Gra de 3	Gra de 2	Gra de 1	Gra de 3	Gra de 2	Gra de 1	Gra de 3	Gra de 2	Gra de 1	Gra de 3	Gra de 2	Gra de 1	Gra de 3	Gra de 2	Gra de 1
1.0 ~ 1.4	$40 < \eta_e \leq 65$	38	43	46												
1.1 ~ 1.3	$40 < \eta_e \leq 65$				44	49	52									



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ENERGY EFFICIENCY IN ASIA

- **China** 

Visit CNIS website www.energylabel.gov.cn for the list of product and Labs registered.

As of to-date:

- **Product registered = 23,460**
- **Company participated = nearly 400**
- **Independent Lab = 15 (AMCA Lab is one of them)**
- **Manufacturer accredited Lab = 52**



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ENERGY EFFICIENCY IN ASIA

- **Taiwan**



Issued by Taiwan DOE in year 2013 and it is on voluntary basis.

- Currently only applicable for Axial and Centrifugal Fan.
- Testing must comply with ISO 5801 or AMCA 210.
- Follow ISO 12759 to calculate the FMEG grade.
- Motor test report (CNS1057 or 14400) must be submitted
- Each model must be tested by Authorized 3rd party Lab. Currently it is ITRI (Industrial Technology Research Institute)
- Range of product to be certified:
 - Impeller diameter from 125mm to 2000mm
 - KW from 125W to 75KW
 - Pressure up to 500mmAq
 - Air Volume up to 3000 CMM





ENERGY EFFICIENCY IN ASIA

- Taiwan 

Axial Fan

FMEG grade must be equal or greater than **55** and
FEG grade must be equal or greater than **71**.

Centrifugal Fan

	FEG	FMEG
Backward Curved	80	67
Forward Curved	71	62



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ENERGY EFFICIENCY IN ASIA

- Taiwan 

Website www.energylabel.gov.tw

As of to-date:

- Product registered = 54
- Company participated = 3



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ENERGY EFFICIENCY IN ASIA

- **Malaysia** 

Draft Malaysian Standard - 13S020R0

“Code of practice for Energy Efficiency standard for fan”

- Follow ISO 12759 guidelines.
- Developed by a work group authorize by Industry Standards Committee.
- It is at the final review stage.
- Motor Driven Fans Input Power Range from 0.125kW to 500kW.



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ENERGY EFFICIENCY IN ASIA


- **Malaysia** 
- The Minimum Energy Performance Standards (MEPS) for all Bare shaft fans shall be at least FEG 71.
- The MEPS for driven fans shall be FMEG graded as per EU327 table 1.
- All Bare shaft fans are to be certified by Independent 3rd party (AMCA or Eurovent or equivalent) and to bear the FEG certified performance seals.

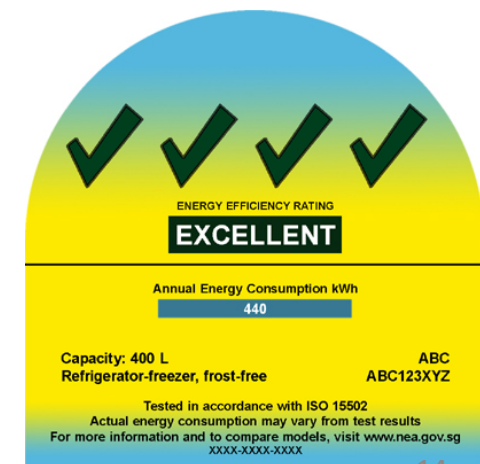




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ENERGY EFFICIENCY IN ASIA

- **Singapore** 
 - National Standard: SS553-2009
“Code of Practice for Air-conditioning & Mechanical Ventilation in Buildings”
 - Energy Audit Code
 - Developed by Building & Construction Standards committee.
 - Framework
 - Ashrae 111, 90.1 and 62.1 (ventilation for acceptable IAQ)
 - Green Mark Award



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ENERGY EFFICIENCY IN ASIA

- **Singapore**



Fan Power Limitation in Air-conditioning Systems

Allowable Nameplate motor power	
Constant volume	Variable volume
1.7 kW/m ³ /s	2.4kW/m ³ /s

Green Mark baseline on Fan System Motor Nameplate

Air Distribution System Type	Allowable Fan System Input Power	
	kW/m ³ /s	W/CMH
AHUs/FCU >4kW CAV	1.5	0.42
AHUs/FCU >4kW VAV	2.1	0.58
Fan Systems with NP Motor power <4kW	0.6	0.17



ENERGY EFFICIENCY IN ASIA

- **Singapore**



BCA Green Mark for non residential buildings:

- For Building using Air Cooled Chilled-Water Plant or Unitary ACs

Green Mark Rating	Peak Building Cooling Load (RT)	
	<500	>500
	Min Design System Efficiency DSE (kW/RT)	
Certified	0.9	0.80
Gold	0.9	Not applicable
Gold Plus	0.85	
Platinum	0.78	



ENERGY EFFICIENCY IN ASIA

- **Hong Kong**



- Building Energy Code (BEC)

“Code of Practice for Energy Efficiency of Building Services Installation”

- Developed by Electrical & Mechanical Service Department in collaboration with various professional institutions, trade association and Govt. Department.

- Energy Audit Code (EAC)

- Code of Practice for Building Energy Audit

- Standard Specifies:

- i. **Air Distribution System Fan Power**

- Constant Air Volume: should not exceed 1.6W per L/s
- Variable Air Volume: should not exceed 2.1W per L/s
- Supply or return fan for VAV flow with motor power 5kW and above should install with controls and devices such that motor demands no more than 55% of design input power at 50% of design air volume flow.





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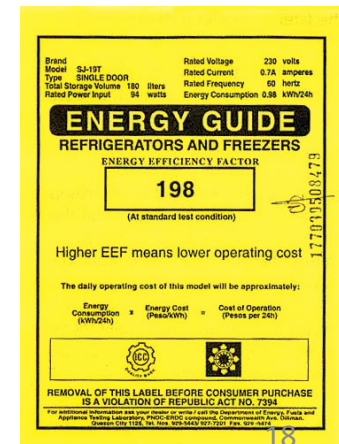
ENERGY EFFICIENCY IN ASIA

- **Philippines** 

Guidelines on Energy Conserving Design of Buildings by DOE

- Follows ASHRAE Standard
- Standard Specifies:
 - i. Fan System Design Criteria
 - Constant Air Volume: should not exceed 0.5 W/m³/h
 - Variable Air Volume: should not exceed 0.75 W/m³/h


Proposed enactment of a City Ordinance for Green Building Regulations of City of Makati. As a background Makati is the premier and wealthiest City and business district of the Philippines.





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ENERGY EFFICIENCY IN ASIA


- Thailand 
 - Building Energy Code (BEC)
 - Draft of Fan Energy Efficiency Standard and Regulation

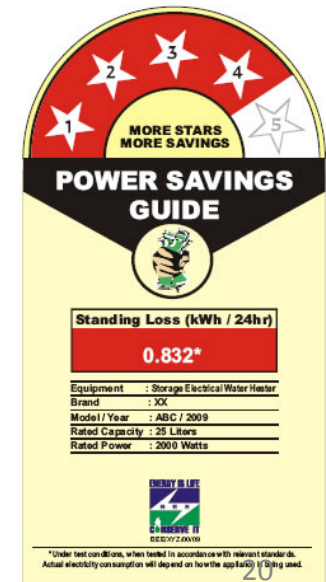




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ENERGY EFFICIENCY IN ASIA

- **India** 
 - Energy Efficiency Policy is regulated by Bureau of Energy Efficiency (BEE)
 - Mainly on Consumer product with Labels and Mandatory requirement to fulfill.
 - Ventilators efficiency not regulated and no progress at this moment.



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ENERGY EFFICIENCY IN ASIA

- **Republic of Korea**



- Ventilators is under

- ***“High-Efficiency Appliance Certification Program of Korea’s Energy Standard & Labeling.”***

- Certified by KEMCO (*Korea Energy Management Corporation*) for energy efficiency and quality certification standards.

- One of the authorized Lab is KTC – AMCA Independent Lab in Korea.

- Label provided and test is in voluntary bas



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ENERGY EFFICIENCY IN ASIA

Country	Efficiency Requirement	Mandatory	Standard:	3rd party certification	Others
Korea	Yes	No	High efficiency Appliance Certification Program (KEMCO)	Conducted by KTC	
China	Yes	Yes	GB19761	Yes	Self-declared by manufacturers but test lab need accreditation by appointed authority.
India	No		No		
Malaysia	Yes	No	13S020R0 basically follow ISO12759	AMCA CRP is acceptable.	It is in a final review stage
Thailand	No		Processing		
Taiwan	Yes	No	ISO12759	Currently only accept ITRI test report	It subjected to 100% test on every model.



ENERGY EFFICIENCY IN ASIA

Country	Efficiency Requirement	Mandatory	Standard:	3rd party certification	Others
Singapore	Yes	No	SS553 / Ashrae 90.1	No	Result is based on Energy Auditing with W/ Flowrate criteria. They are in the process of reviewing but not consider ISO during reviewing.
Hong Kong	Yes	No	BEC code / Ashrae 90.1	No	Energy audit base on W/ Flow
Philippines	No	No	Follow Ashrae code	No	Will commence the energy audit base on W/Flowrate soon on voluntary basis. They are in the midst of set up their local energy efficiency standard.



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THANK YOU!

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