

Energy Consumption of Fans

European fan efficiency regulations

Urs Steinemann
CH-8832 Wollerau
Switzerland

Relevant documents

- **Directive** 2009/125/EC
of the European Parliament and
of the Council
of 21 Octobre 2009
- **Regulation** Ecodesign requirements for fans
driven by motors with an
electrical input power between
125 W and 500 kW
first tier: January 2013
second tier: January 2015

Specific Fan Power SFP

$$SFP = \frac{P}{V} = \frac{\Delta p}{\eta_{Fan} \cdot \eta_{Motor} \cdot \eta_{Drive} \cdot \eta_{Control}}$$

- **Minimize Δp**
- **Maximize Efficiencies**

Energy Consumption of Fan

$$E = \frac{h \cdot V \cdot \Delta p}{\eta_{Fan} \cdot \eta_{Motor} \cdot \eta_{Drive} \cdot \eta_{Control}}$$

- Minimize h , V and Δp
- Maximize Efficiencies

Fan Types in regulation

- Axial fan
- Centrifugal forward curved fan and centrifugal radial bladed fan
- Centrifugal backward curved fan without housing
- Centrifugal backward curved fan with housing
- Mixed flow fan
- Cross flow fan

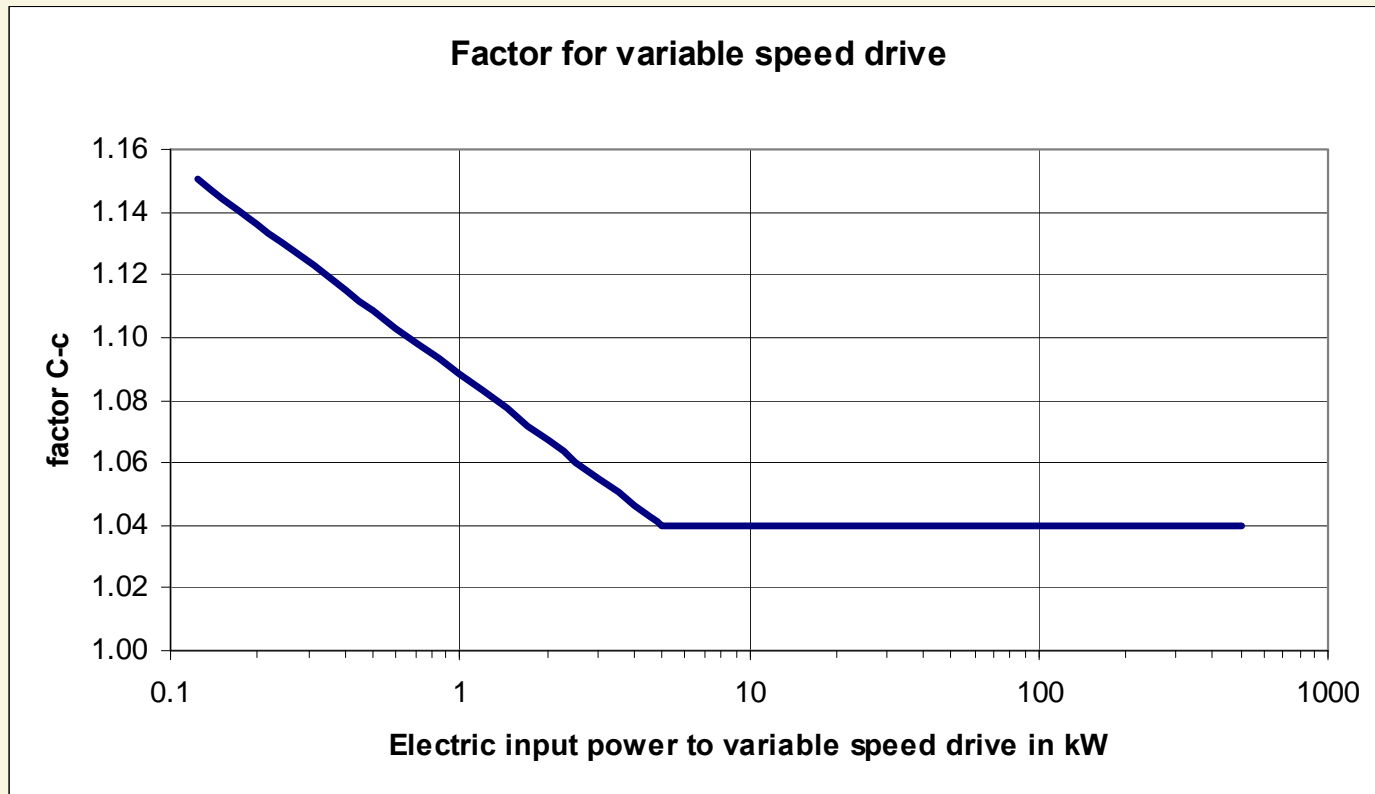
Measurement Categories in regulation

Cat	inlet	outlet
A	free	free
B	free	duct
C	duct	free
D	duct	duct

Efficiency Categories in regulation

- **Static Efficiency**
based on fan static pressure
(measurement categories A and C)
- **Total Efficiency**
based on fan total pressure
(measurement categories B and D)

Where the fan includes a variable speed drive

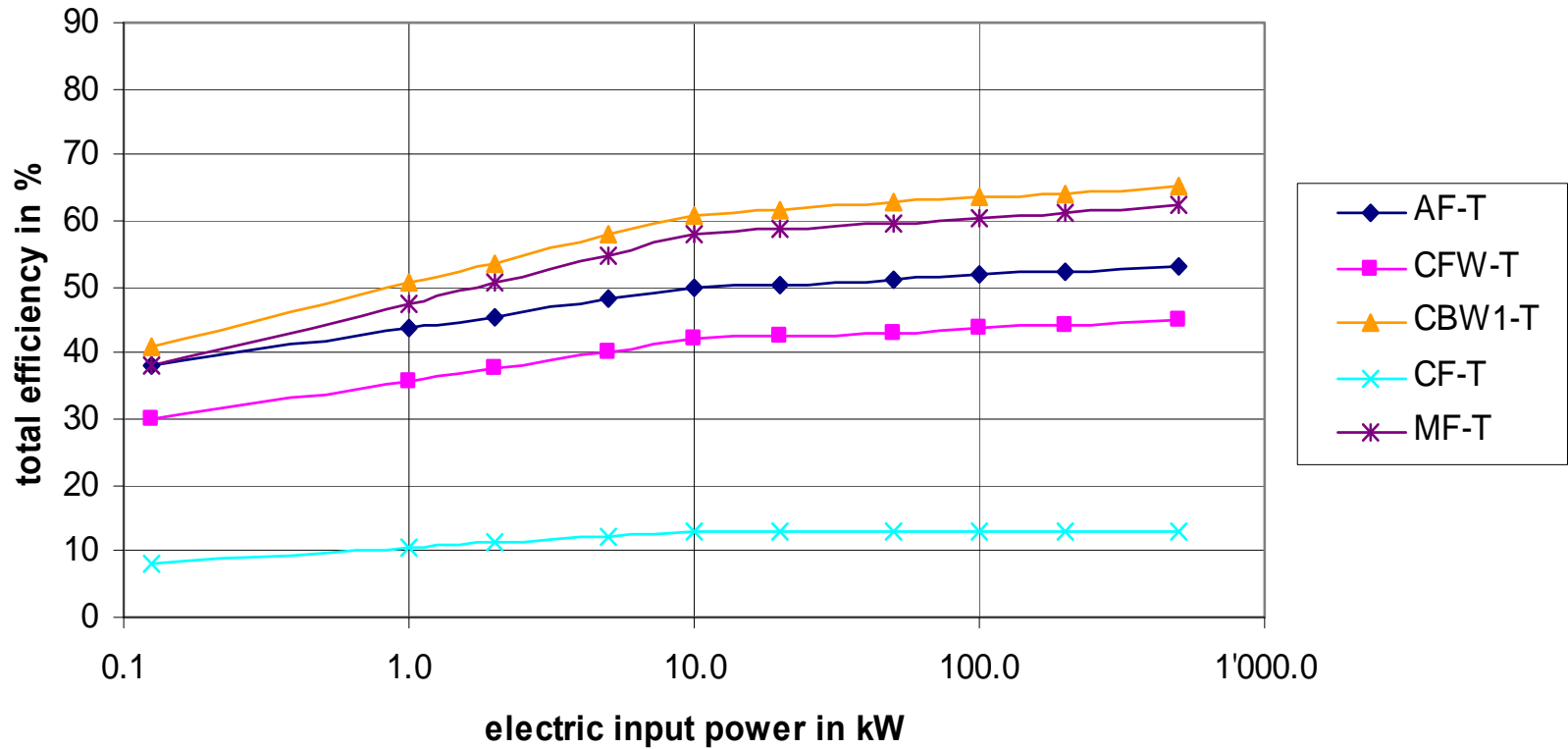


Efficiency Grades (Examples)

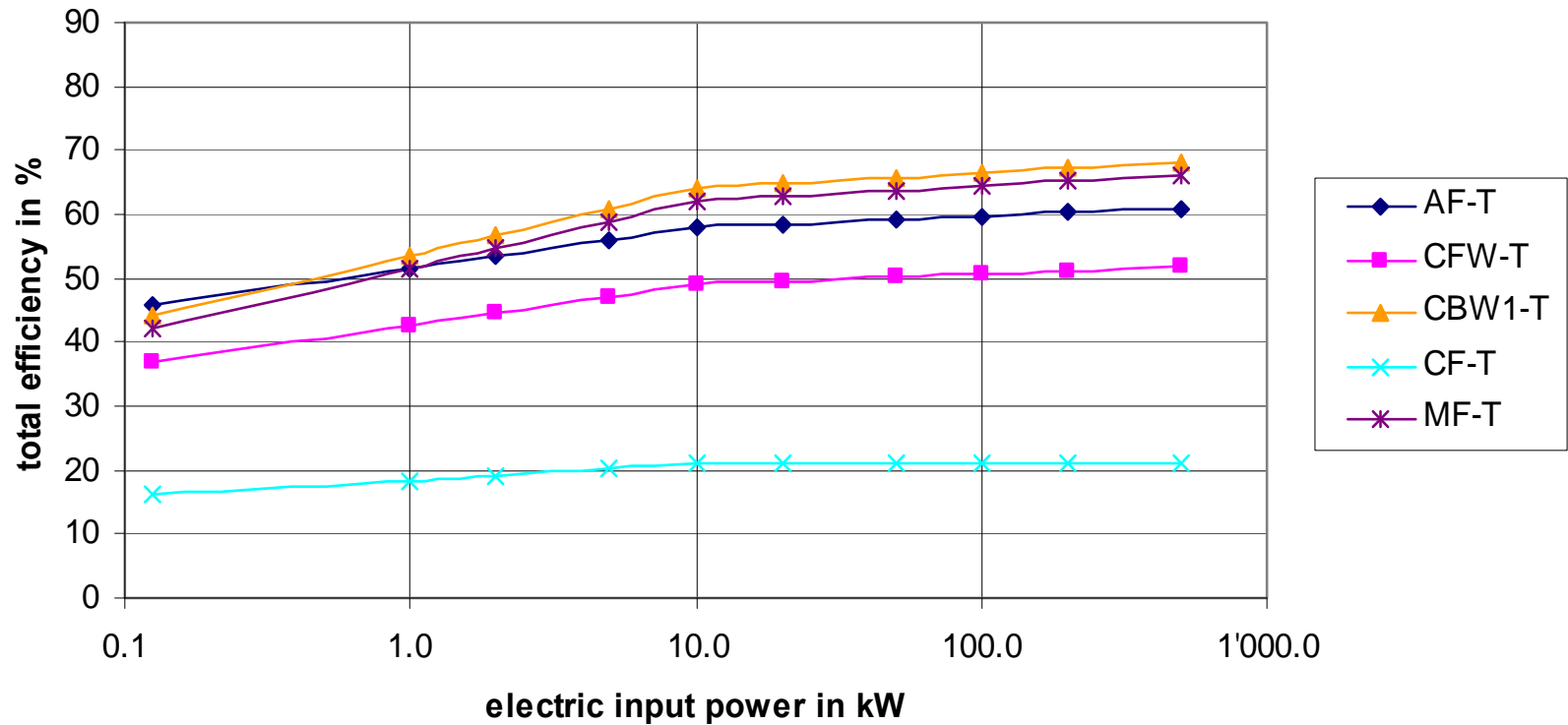
Fan Type	Measurement Category	Efficiency Category	Efficiency Grade		
			Tier 1	Tier 2	BAT
Axial fan	A, C	static	36	40	65
	B, D	total	50	58	75
Centrifugal backward curved fan with housing	A, C	static	58	61	72
	B, D	total	61	64	75
Cross flow fan	B, D	total	13	21	32

Efficiency grade: Efficiency at optimum energy efficiency point of fan with electric input power 10 kW

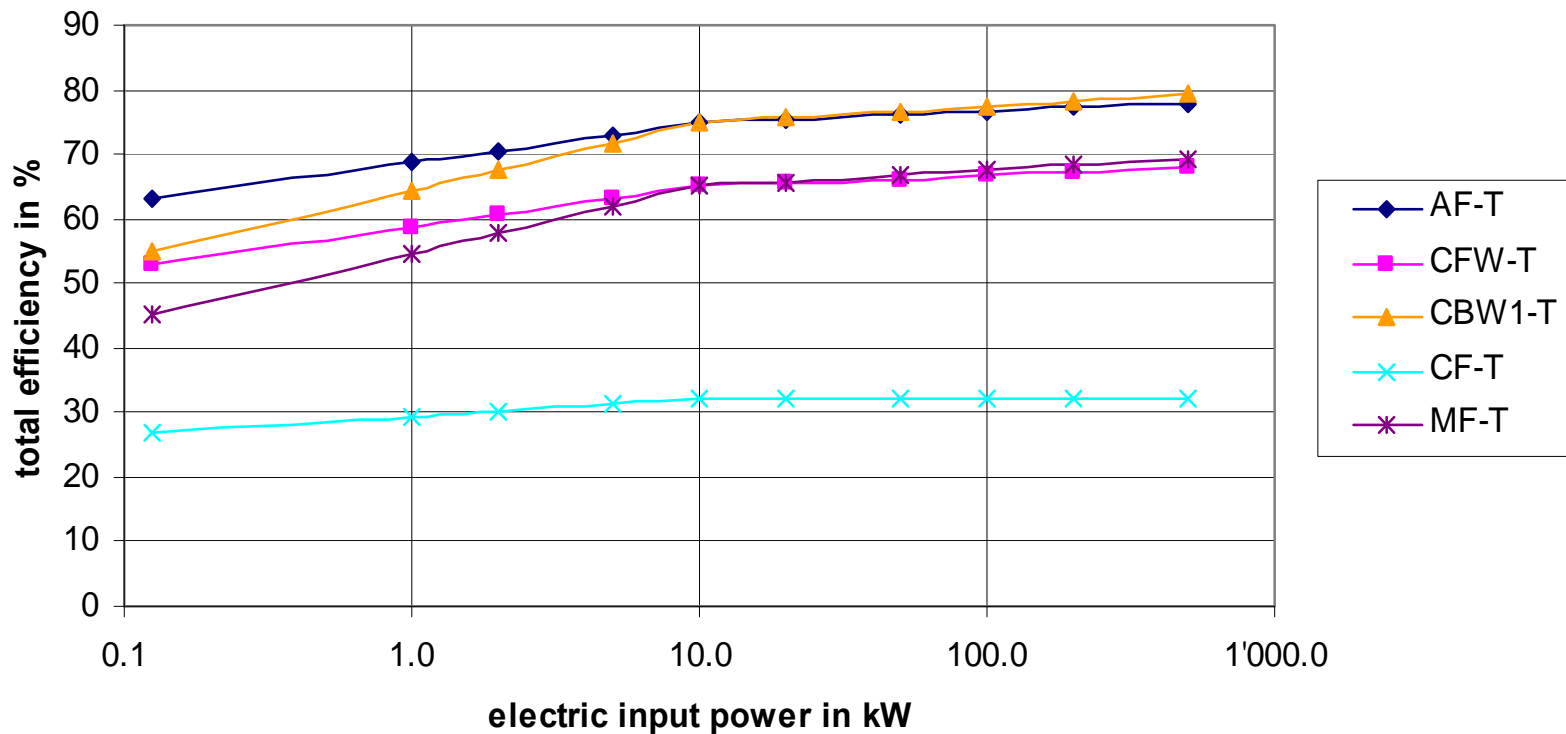
Target efficiency first tier for efficiency category total pressure



Target efficiency second tier for efficiency category total pressure



Target efficiency BAT for efficiency category total pressure



Expected Savings

- Today 410 TWh/a
 - 2020 with no measures: 660 TWh/a
 - 2020 with regulation: 626 TWh/a
- Savings** 34 TWh/a
16 Mt CO₂/a

electric bulb

100 W



energy-saving lamp

20 W



switched off
according demand
0 W



Thank you for your attention