INDUSTRIAL FAN BASICS

What is a fan?

A fan is a machine that increases the pressure of a flowing gas, typically air.

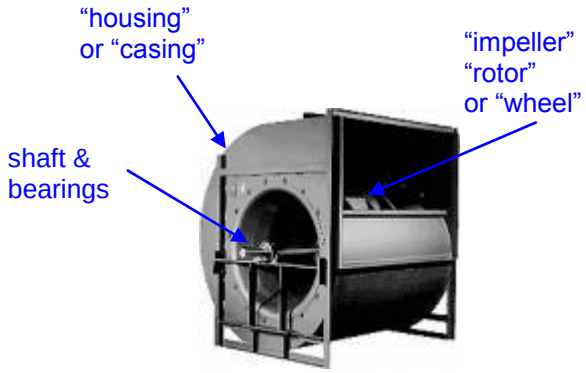
By adding pressure to a flowing gas, a fan transfers energy to the gas. Energy input to the fan is usually from an electric motor but in some cases it could be a steam-driven turbine.

Fan terminology (see illustration below):

- impeller (also know as rotor or wheel)
- housing (casing)
- shaft and bearings

A fan assembly refers to the fan complete with the motor and drive. Fans are usually operated in one of the following ways:

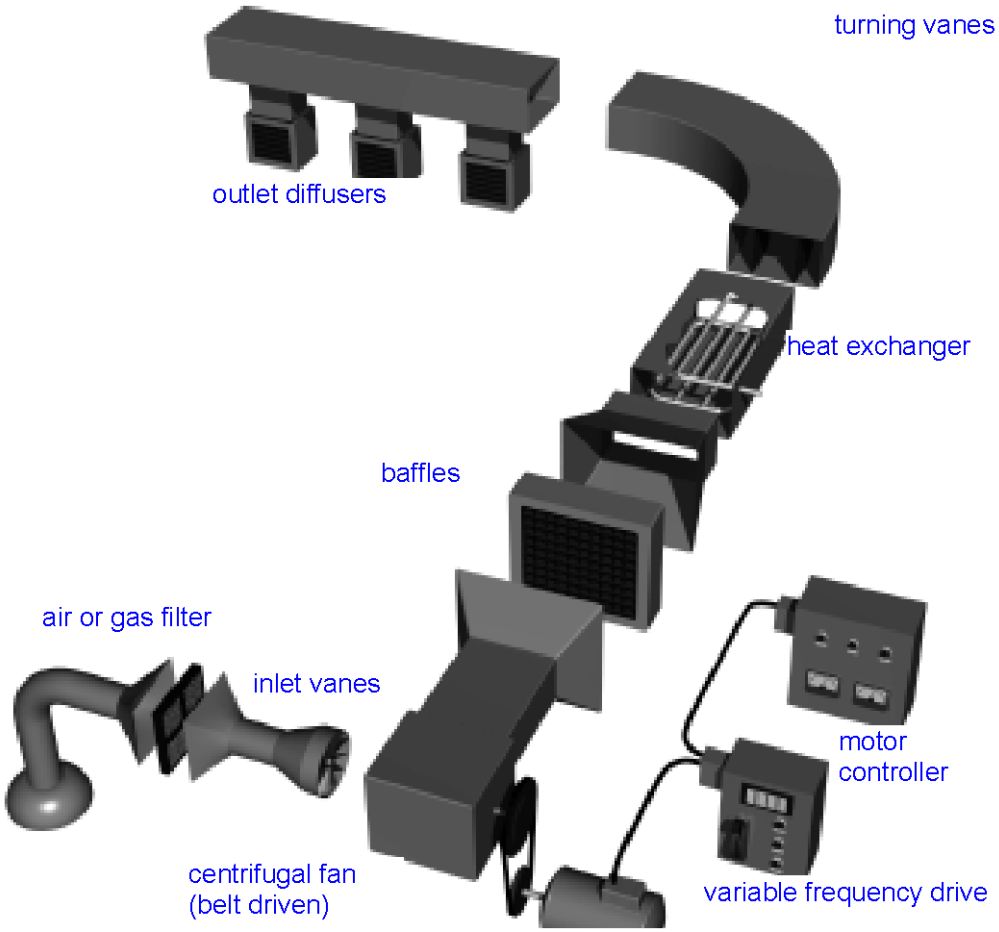
- on/off
- throttle (inlet damper, inlet vane[1], or outlet damper)
- speed control (e.g., variable frequency drive, two-speed motor or sheaves)



[1] An inlet vane is similar to an inlet damper, except the vane rotates at an angle to the gas flow and usually dissipates less energy than an inlet damper.

What is a system?

Fans can be part of some industrial systems. A system includes the fan assembly and the associated equipment that work together to do something useful such as deliver dry air to a dewatering system. A sample diagram of a fan system follows.

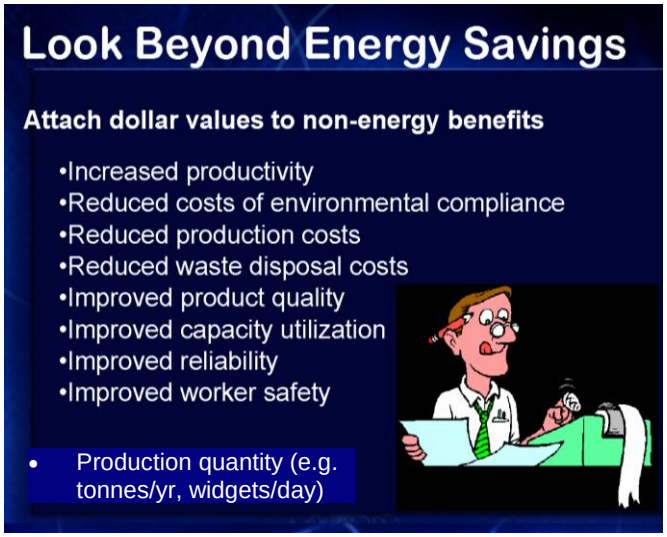


What can be done to reduce electric kWhs consumed by fans?

	Measure	Range of kWh savings
Improve fan or fan assembly	Better control, eliminate throttle losses, reduce speed, use it only when you need it	5-50%
	Upgrade or replace with more efficient fan	10-50%
	Replace impeller (a.k.a. wheel or rotor) with a more efficient design – usually only economical for large industrial fans (200 hp and larger)	10-40%
	Replace a V-belt with an energy-efficient "synchronous" belt	3-5%
	Upgrade to a more efficient motor	2-5%
Improve system	Modify the process and system to reduce flow or pressure required	5-50%

What does Power Smart need to know to help our customers?

Information to ask	Possible or sample answer
Description of fan and what it does	blows hot air in a building space heating system; part of a wood drying kiln …
For each fan: rated motor horsepower (hp), nameplate	50 hp
For each fan: hours per year it operates	6 days/week @ 16 hours/day = 96 hours/week (~ 5000 hours/year)
For each fan: how is it controlled?	on/off, throttled (inlet vane, inlet damper, outlet damper), variable speed
Any problems with this fan?	high maintenance, fails frequently, difficult to control, not enough capacity, vibrates a lot, overheats
"Look beyond the energy savings"	Are there plans to change production? Change operation? Save maintenance costs?



Additional Resources

- Improving Fan System Performance - a sourcebook for industry (1989) http://industrial-energy.lbl.gov/files/industrial-energy/active/0/LBNL-43985.pdf
- Energy Savings in Fans and Fan Systems – Good Practice Guide (GPG383, 2004) www.carbontrust.co.uk/Publications/publicationdetail.htm?productid=GPG383&metaNoCache=1