Trainer Instructions: Fans and Blowers

From: Energizing Cleaner Production – a Guide for Trainers, UNEP/InWEnt, 2007

Title	**FANS AND BLOWERS**
Objective	To obtain an understanding of fans and blowers, including their types, how to assess their performance and the main areas for energy conservation.
Minimum duration and approach	▪ 1.5 session (2 – 2.5 hours), including the quiz and workshop exercise ▪ Recommended approach: spend up to 1 session (1.5 hours) on the PowerPoint presentation. There are a number of complex terms and definitions which take time to explain. If time is left, go through the quiz as a group (10 - 15 minutes, including a simple calculation). The workshop exercise is relatively long and should therefore be completed (30 minutes) and discussed (15 minutes) in a separate session. ▪ Presentation: 51 slides ▪ Textbook chapter: 21 pages
Contents	▪ Introduction ▪ Types of fans and blowers ▪ Assessment of fans and blowers ▪ Energy efficiency opportunities
Assessment of participants	▪ Pose questions during the presentation. Some suggested questions are included in the trainer notes underneath each slide. ▪ Take the quiz with 10 multiple choice questions. ▪ Carry out the workshop exercise. Participants can be asked the following: *An induced draft industrial fan is used to draw air through a bag filter. The following information is given for the fan:* - *Flow rate is 90 m^3/s at a static pressure of 80 mm water column (WC)* - *65 mm WC is the static pressure across the bag filter* - *Motor power drawn is 120 kW* - *Motor efficiency is 86%* - *Impeller diameter is 70 mm* - *RPM is 1000* *The company decided to replace the bag filter with an electrostatic precipitator (ESP). After installation of the ESP:* 1. *Static pressure across the ESP is 20 mm WC* 2. *Flow rate increased by 20%* 3. *The flow rate can be brought back to 90 m^3/s by two options: (a) Impeller trimming and (b) Reduced pulley diameter to reduce the RPM*

	Calculate the following: 1. *Fan static efficiency before installation of the ESP* 2. *The new impeller diameter if the impeller is trimmed, that would result in a reduction in fan efficiency of 5%* 3. *The new RPM that would result in a fan efficiency of 60%* 4. *Which of the two options is more energy efficient* Participants may have difficulties completing the exercise because it involves so many calculations. In this case it may be useful to give out the formulae to be used, but leave it up to them to determine which one is used for each question. The formulae are: - *Power input at fan shaft = power drawn by motor x motor efficiency* - *Fan static efficiency = (Flow x Pressure developed across fan) / (102 x Power required at fan shaft)* - *New static pressure across the fan = total static pressure – static pressure across bag filter + static pressure across ESP* - *New flow rate Q = original flow rate x increase* - $(Q_1 / Q_2) = (H_1/H_2)^2$, *where Q = flow rate, H = static pressure or head* - $(D_1 / D_2) = (kW_1 / kW_2)^{1/3}$, *where D = impeller diameter, kW = power input* - $(N_1 / N_2) = (kW_1 / kW_2)^{1/3}$, *where N = RPM, kW = power input*
Other comments	▪ Case study options from www.energyefficiencyasia.org or other sources could be included in this session as illustrations of how other companies reduce energy consumption and costs. ▪ Fans use motors and therefore it is recommended to place this session on the agenda after the session on electric motors. ▪ In the agenda, one session is allocated for completing the workshop exercise for fans and blowers and for pumps and pumping systems.