ENERGY SAVINGS IN DRY KILNS - SOMETHING OLD, SOMETHING NEW

William Brubaker
Wellons, Inc.
Sherwood, Oregon

Let's start with something old, first. In earlier days, when electric power was expensive, dry kilns were sold with 2-speed motors to drive the line shaft fan system. The reason for this is that the greatest air circulation requirements in a dry kiln occur during the first half of the schedule, which is about when the lumber reaches fiber saturation point (approximately 28% to 30% moisture content). After that level has been reached, air circulation needs are greatly reduced and fans can be dropped down to slow speed, thus using only half the initial horsepower.

About ten years ago, I discovered that a mill in Northern California had ten dry kilns, each powered with a 50 H.P. 2-speed motor driving the fans. No one in the mill could remember ever running the fans at slow speed. Power was fairly cheap by then, so why should anyone be concerned about using less electricity? I suggested they try one kiln charge with the fans at low speed during the last half of the schedule, and then check the lumber carefully on the dry sorter against a charge dried with fans on high speed only. They found absolutely no difference and have been utilizing the 2-speed fan schedule ever since.

This may not sound very important until you calculate the savings in dollars. Assuming a power cost of five cents per kilowatt hour today (it was one-half cent ten years ago), 500 horsepower (ten 50 H.P. motors), operating 340 days a year, 24 hours a day, will consume $141,530 in electrical power. Running the low speed one-half the time will reduce the total power consumption 25%, or a savings of $35,380 per year--at today's power prices!

Saving electrical power in the dry kilns can contribute more to reducing your energy bill than any other place in the plant--simply because your kilns run practically all year long, 24 hours a day, or over 8,000 hours annually. In comparison, your sawmill and planing mill, running two 8 hour shifts, are in operation only 4,000 hours per year.

We've talked about something old, now let's talk about something new. It is not uncommon in sawmills to have 300 to 400 H.P. (or more) in dry kiln fan motors. Recognizing the time-tested reliability of the line shaft fan system in dry kilns, Wellons set out to improve their dry kiln with a fan system which greatly reduces or even eliminates electrical power requirements. Five years ago, we unveiled two dry kilns with a new fan system in which we intended to accomplish:

1. Lower electrical horsepower requirements.
2. Non-reversing fans.
3. Reversible air flow.
4. Normal or above normal air flow in either direction.

All of these objectives were met. With 40% to 50% less horsepower, we have a fan system which never turns off during the kiln drying cycle, air circulation which can be reversed automatically (as frequently as every 15 minutes to as little as every five hours) and very acceptable air flow by today's high efficiency line shaft standards.

The accompanying figures illustrate how the air travels and reverses. On a standard line shaft (Figure 1) looking at a plan view, the zig-zag fan ducts are arranged with alternating right- and left-hand fans. The air flows in the direction of the arrows (Figure 2) in counter clockwise rotation of the fan, and the opposite direction (Figure 3) in clockwise direction. If we could, in effect, move fan wall A (Figure 4) to position X, and fan wall B to position Y, air would be forced to move in the opposite direction (Figure 5). By making these fan walls (Figure 6) into "jalousie louvers" a 90° rotation closes one louver and opens the adjacent one (Figure 7).

Okay, let's go to something old again. Years back, in the old mills, steam was used to drive almost everything. So, of course, all of you are one step ahead of me--since the line shaft only needs to turn in one direction, why not do it with a steam turbine? Right! And that's just what we're in the process of doing. We'll use 150 PSIG steam and turn the turbine (using the PRESSURE of the steam to do the work in turning the turbine) and use the 15 PSIG exhaust steam to supply the heating coils and steam spray humidification (using the HEAT in the steam to do the heating job in the dry kiln heating coils). Interestingly enough, only about 10% more fuel is required to generate steam at 150 PSIG, instead of 15 PSIG (starting from water at 212°F, in both cases, assuming 60% boiler efficiency). Having your cake and eating it, too? You bet!

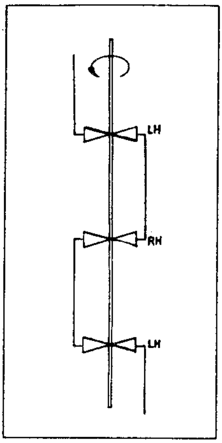

Figure 1

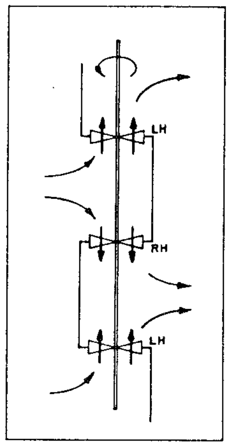

Figure 2

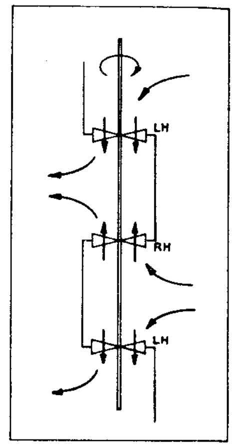

Figure 3

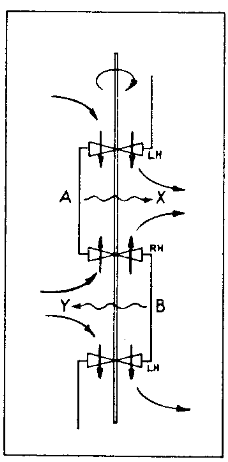

Figure 4

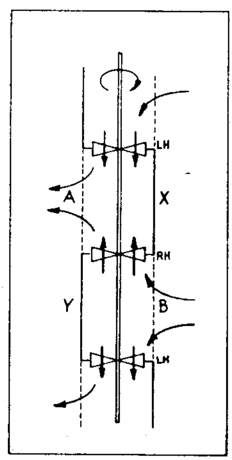

Figure 5

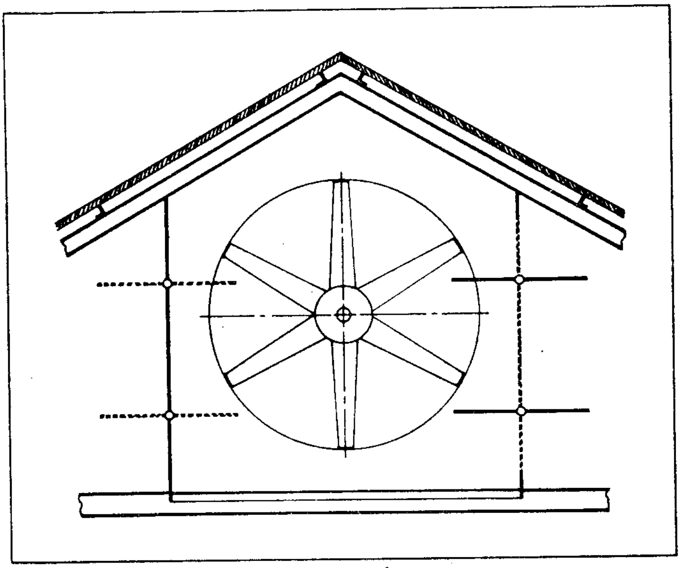

Figure 6

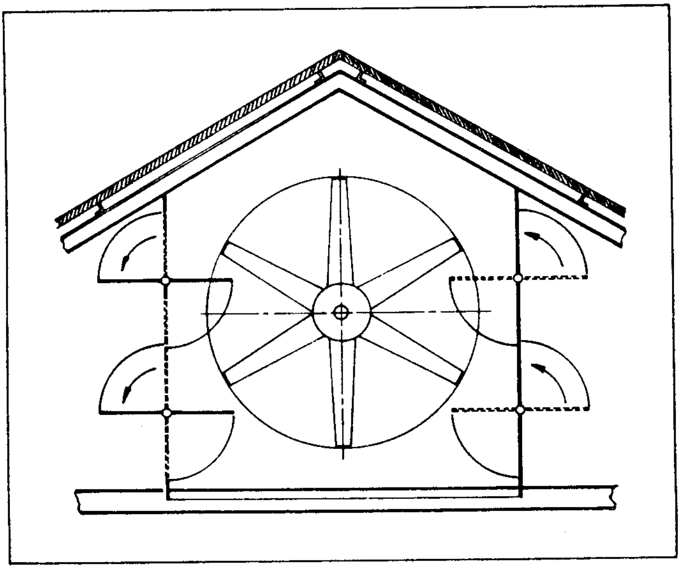

Figure 7