

## Variable Frequency Drives on Fuel Burners

Forced draft burners typically use dampers to meter the air flow to the proper volume at various fuel flows. They are very functional but the fan horsepower does not appreciably drop very far from high fire to low fire.

Air volume varies in a 1:1 ratio with fan speed but the fan horsepower varies in a power of three ratio with its speed. In other words, when the speed is doubled the horsepower goes up by a factor of 8.

Variable frequency drives can be an excellent means of controlling both the air and the electricity expense especially with burners with more than a 2:1 turndown ratio. Following is a table showing the *theoretical* savings possible with a variable frequency drive.

| Firing rate | turndown ratio | cfm  | static pressure | rpm  | hp  |
|-------------|----------------|------|-----------------|------|-----|
| 100%        |                | 5000 | 6.0             | 3500 | 5   |
| 50%         | 2:1            | 2500 | 1.5             | 1750 | .6  |
| 33%         | 3:1            | 1665 | .7              | 1166 | .2  |
| 25%         | 4:1            | 1250 | .4              | 875  | .1  |
| 20%         | 5:1            | 1000 | .2              | 700  | .04 |

The actual savings are less than those shown because most motors should not be turned down more than 50%. Mixing heads on many burners do not perform well enough at greatly reduced static pressures either. Therefore the fan is sometimes reduced to 50% speed and the air damper utilized for low firing rates.

But still, variable speed drives on burners offer considerable savings in fan horsepower and kilowatts.