

## Belt vs. Direct Driven Fans

Fans of all types have traditionally been driven by belts. Speed adjustment for belt driven fans is performed via the adjustment of sheaves and pulleys. While perhaps more familiar than direct driven fans, belt driven fans have the disadvantage of requiring more maintenance. Belt tightening, inspection, and eventual replacement are all inevitable with belt driven fans. In addition, belt driven fans are less efficient than a direct driven fan of equivalent size due to transmission losses. As energy costs increase it has become desirable to transition to a more efficient means of driving fan systems.

Direct driven fans mount the motor to the fan shaft in order to directly transmit energy. The nature of this intimate contact between the fan and motor, with no mechanical linkages as in the belt driven system, leads to higher efficiencies as well as lower levels of vibration and noise. Further advantages include reduced weight, more compact installation, less maintenance, as well as extended service life through reduced bearing loading.

Modern HVAC techniques continue to focus on matching supply to meet demand. This in turn has caused a shift from single speed motors to motors that can be controlled to achieve multiple operating speeds quickly and easily. Two of the most common means of changing motor speed are to use an ECM (electrically commutated motor) with an integral controller or pairing a VFD (variable frequency drive) with a three phase motor. Both an ECM and a VFD control motor speed by manipulating the frequency and voltage of electricity supplied to the motor. Of these technologies, an ECM is preferred when possible (only available for direct drive, single phase motors) as an ECM is extremely efficient. For three phase motors a VFD offers the same capabilities as the ECM, but efficiency is limited by motor characteristics. Field adjustments in either case can be performed via manual potentiometers or device keypads. In addition to competitive Rupp pricing, both the ECM and the VFD allow for greater efficiency, speed control, and soft start capability.



Figure 1: Belt driven blower<sup>1</sup>



Figure 2: Direct driven blower<sup>2</sup>

### At a Glance:

#### **Belt Drive:**

- Transmission losses
- Belts require tightening and eventual replacement
- Belt residue requires cleaning
- + Versatile speed adjustment via sheave and pulley adjustment
- + Motor is outside of airstream (high temp. applications)

#### **Direct Drive:**

- Requires an ECM or VFD for speed control
- + Competitive pricing through Rupp
- + More efficient
- + Little to no maintenance
- + Less vibration than belt drive
- + Fewer points of failure
- + Reduced weight; more compact
- + Soft start with speed control