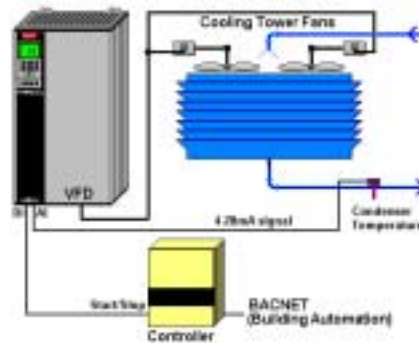


# Post-Test



Answer the following application questions based on this diagram.

## Multiple Choice

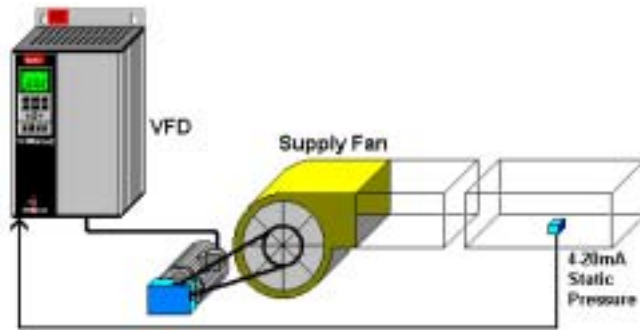
1. What type of application curve must be used inside a VFD to operate these Cooling Tower Fans correctly?
  - A) Constant Torque
  - B) Variable Torque
  - C) Constant Power
  - D) Variable Power
  
2. What level of starting torque for the first minute is needed to operate the Cooling Tower Fans correctly?
  - A) High Overload – 230%
  - B) High Overload – 160%
  - C) Normal Overload – 150%
  - D) Normal Overload – 110%
  - E) Not possible with 2 fans operating off the same VFD
  
3. Looking at the Cooling Tower Fans application above, which of the following is the correct control configuration for both the Controller and the VFD?
  - A) Controller is Open Loop and VFD is Open Loop
  - B) Controller is Open Loop and VFD is Closed Loop
  - C) Controller is Closed Loop and VFD is Open Loop
  - D) Controller is Closed Loop and VFD is Closed Loop
  - E) VFD is Closed Loop and the Controller only starts and stops the fans.

## Post-Test



4. Synchronous Speed for a 3-phase, 4-pole, 50Hz, 230Vac motor is which of the following?
- A) 180rpm
  - B) 240rpm
  - C) 720rpm
  - D) 1500rpm
  - E) 1800rpm
5. The Variable Torque Curve used in a VFD does NOT correctly operate which of the following devices?
- A) Positive Displacement Pump
  - B) Cooling Tower Fan
  - C) Centrifugal Pump
  - D) Centrifugal Fan
  - E) A VFD set for VT has no problem with any of these.
- 6) On an Asynchronous 4-pole, 3-phase 60Hz, 460Vac motor, which of the following is correct about synchronous speed and base speed?
- A) Base Speed = 1800rpm; Synchronous Speed = 1800rpm
  - B) Base Speed = 1750rpm; Synchronous Speed = 1800rpm
  - C) Base Speed = 1800rpm; Synchronous Speed = 1750rpm
  - D) Base Speed = 1750rpm; Synchronous Speed = 1750rpm
  - E) A and D are both correct.
- 7) Using the VT curve on a centrifugal pump, which of the following uses the most energy?
- A) 10 to 20Hz
  - B) 20 to 40Hz
  - C) 40 to 60Hz
  - D) Above 60Hz
  - E) The power is the same regardless of speed.

## Post-Test



8. What type of application curve must be used by a VFD to operate this centrifugal fan correctly with the most energy savings?
- A) Constant Torque
  - B) Variable Torque
  - C) Constant Power
  - D) Variable Power
9. In the application above which of the following VFD settings correctly modulates the VAV Supply Fan? Assume that only Proportional Gain is used; its has a setpoint of 2"wc (500pa).
- A) Normal Control; Gain = 0.01
  - B) Inverse Control; Gain = 0.01
  - C) Normal Control; Gain = 1.00
  - D) Inverse Control; Gain = 1.00
10. In the Static Pressure application above it is desired to have the fan operate as close to 2"wc (500pa) as possible. During loads changes, it is not necessary to get the fan to setpoint quickly. Which of the following adjustments are the most common settings to control this supply fan?
- A) Prop. Gain = 0.01; Integral = OFF; Derivative = OFF
  - B) Prop. Gain = 1.00; Integral = OFF; Derivative = OFF
  - C) Prop. Gain = 1.00; Integral = 10 seconds; Derivative = OFF
  - D) Prop. Gain = 0.01; Integral = 10 seconds; Derivative = OFF
  - E) Prop. Gain = 0.01; Integral = 10 seconds; Derivative = ON

# Post-Test



11. Breakaway Torque (High Starting Torque) is a rating that lasts for how many seconds?
  - A) 0.5 seconds
  - B) 5 seconds
  - C) 15 seconds
  - D) 60 seconds
  - E) 120 seconds
  
12. Which of the following is the most accurate and most costly drive used on AC induction motors.
  - A) Servo
  - B) Flux Vector Drive
  - C) Voltage Vector Drive
  - D) Voltage Vector Plus Drive
  - E) Volts/Hz Drive

# Post-Test



## Answers

- 1) B Variable Torque
- 2) D Normal Overload 110%
- 3) E VFD is Closed Loop; Controller doesn't matter; answers B and D are half right.
- 4) D 1500rpm
- 5) A Positive Displacement Pump
- 6) B Base = 1750rpm; Synchronous = 1800rpm
- 7) D Above 60Hz
- 8) B Variable Torque
- 9) C Normal Control; Gain = 1.00
- 10) C Prop.Gain=1; Integral=10; Derivative Off
- 11) A 0.5 seconds
- 12) B Flux Vector Drive

## Objectives:

1. Student is able to correctly identify a drive application by its curve type.
2. Student is able to correctly identify an application by its starting torque.
3. Student is able to correctly identify an application as Open or Closed loop.
4. Student is able to briefly explain the action, gain, integral and derivative terms as applied to a Closed Loop application.
5. Student is able to identify a drive by its type in terms of accuracy, response and speed range.

If you have any comments, suggestions or questions, please contact:

### Mark Peterson

Training Manager - Industrial

### Danfoss Drives

4401 N. Bell School Rd

Loves Park, Illinois 61111 USA

phone: (815) 639-8721 or (800) 432-6367

fax: (815) 639-8987 or (815) 639-8002

Email: [MarkPeterson@Danfoss.com](mailto:MarkPeterson@Danfoss.com)