SECTION 4

ELECTRIC MOTORS

UNIT 18: APPLICATIONS OF MOTORS

UNIT OBJECTIVES

After studying this unit, the reader should be able to

- Identify the proper power supply for a motor.
- Describe the application of three-phase versus singlephase motors.
- Describe other motor applications.
- Explain how the noise level in a motor can be isolated from the conditioned space.
- Describe the different types of motor mounts.
- Identify the various types of motor drive mechanisms.

MOTOR APPLICATIONS

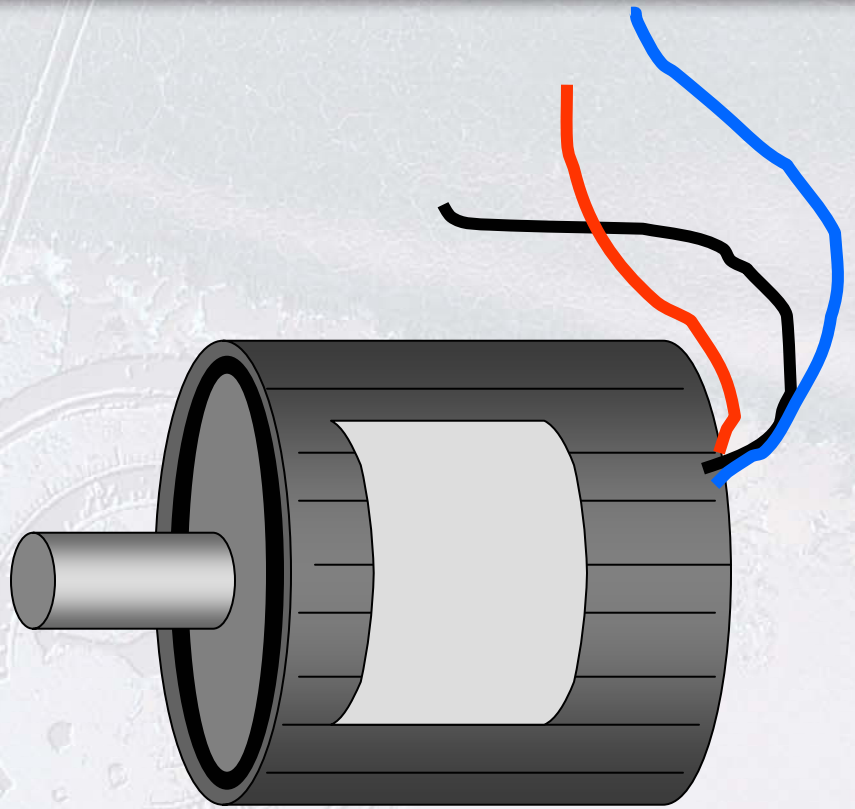
- The proper motor must be selected for proper system performance
- Motor must be able to function in the operating environment
- Motors are selected based on the power supply, system requirements, motor insulation type, motor class, bearing type and method of mounting the motor

THE POWER SUPPLY

- Provides correct voltage and sufficient current
- Motor nameplate provides power requirements including voltage, current, frequency, phase, locked rotor amperage and full load amperage
- Motors should operate within 10% of rated voltage
- Motors have a service factor (reserve horsepower)
- Frequency – number of cycles per second
- Power can be supplied as single or three phase

MOTOR NAMEPLATE

- Voltage
- Frequency
- Phase
- Locked Rotor Amperage
- Full Load Amperage
- Service Factor
- Insulation Type and Class
- Direction of Rotation



208-VOLT MOTOR

10% OF RATED VOLTAGE = 20.8 VOLTS

LOW END OF VOLTAGE RANGE =

208 VOLTS – 20.8 VOLTS = **187.2 VOLTS**

HIGH END OF VOLTAGE RANGE =

208 VOLTS + 20.8 VOLTS = **228.8 VOLTS**

ELECTRIC MOTOR WORKING CONDITIONS

- Working conditions determine the type of motor to be used
- Motors with centrifugal switches cannot be used in an explosive environment
- Sealed motors are used in dirty locations
- Drip-proof motors should be used in wet locations

INSULATION TYPE OR CLASS

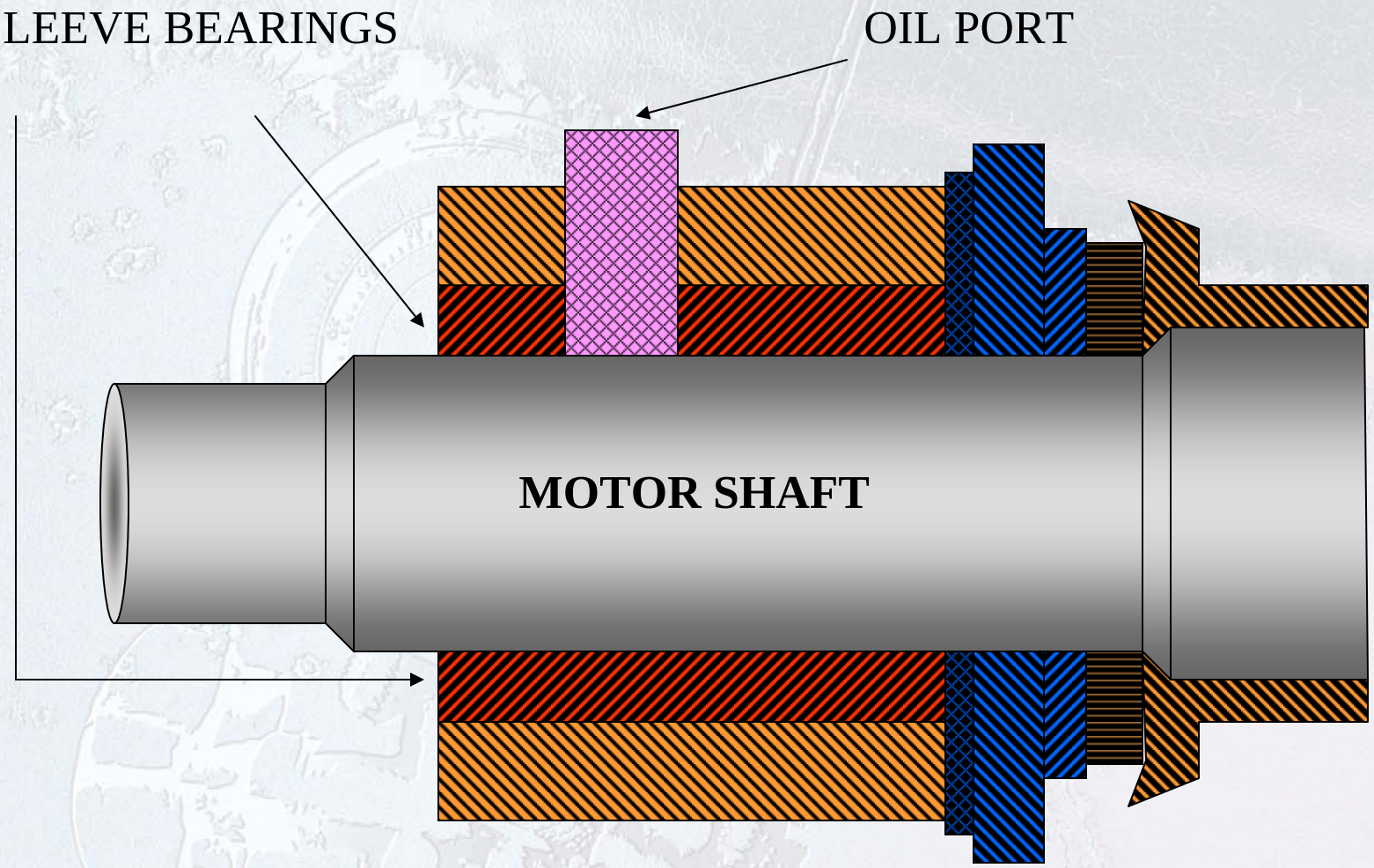
- Motors can safely operate up to a predetermined temperature
- The insulation type determines the maximum allowable safe operating temperature
- The insulation type rating is determined by the allowable rise in temperature above the surrounding ambient temperature

MAXIMUM WINDING TEMPERATURES

- Class A - 221°F (105°C)
- Class B - 266°F (130°C)
- Class F - 311°F (155°C)
- Class H - 356°F (180°C)

TYPES OF MOTOR BEARINGS

- Bearing type is determined by load and acceptable noise levels
- Sleeve bearings
  - Used on light loads and low noise levels
  - Lubricated with oil
- Ball bearings
  - Noisier than sleeve bearings
  - Lubricated with grease



MOUNTING CHARACTERISTICS

- Determine how a motor will be secured during operation
- Rigid motor mount – bolted to frame of fan or pump
- Resilient or rubber mounts – reduced motor noise
- Cradle mounts – motor sits in a cradle
- Rigid-base mount – base mounted to the motor
- End mount – used on small motors
- Belly band strap mount – strap wraps around motor

MOTOR DRIVES

- Connect the motor to the driven load
- Transfers motor's power to the driven device
- Direct drive
  - Motor shaft connected directly to the driven load
  - Driven load turns at the same speed as the motor
- Belt driven
  - Uses belts and pulleys
  - Driven load can rotate at different speeds

UNIT SUMMARY

- The proper motor must always be selected for proper system performance
- The power supply provides proper voltage and current capacity for proper motor operation
- Motors should operate within 10% of rated voltage
- Working conditions determine the motor to be used
- Sleeve bearings operate quieter than ball bearings
- Application determines type of motor mount used
- Motors can be used for direct or belt driven applications