

FAN TROUBLE SHOOTING



1.0 GENERAL

Problem

Possible Cause

Recommended Action

1.1 Motor Noise

Firstly determine if the noise is electrical or mechanical.

If the noise doesn't stop instantly, but runs down with the motor, the problem is more likely to be mechanical, generally the bearings; see Mechanical section below:

If the motor is switched off and the noise stops instantly the problem is more likely to be electrical; see Electrical section pages N-12/14.

2.0 MECHANICAL

Problem

Possible Cause

Recommended Action

2.1 General Fan Noise

The fan could be running in stall.

Check the actual fan performance against the fan curve to determine where on the curve it is operating. If it is to the left of the peak pressure point the fan is generally in stall. If in stall see if the ductwork can be modified to eliminate high pressure loss sections. Low amps could indicate the fan is in stall. Reduce the pitch angle.

2.2 Bearing noise varying from a 'dry' rumble to a squeal

Improper greasing.

Check the bearings are packed with the correct grade and amount of grease. If the bearings are of the sealed-for-life type replace them.

The bearings may be loose on the shaft or bearing support.

Tighten the adaptor sleeve or collar.

The bearings have not been properly tensioned

Re-tension as required

2.3 Rough lumpy sound.

The bearings may have brinelled. Brinelling occurs when the fan is vibrated during transit or through ground vibration when stored. This causes the bearing to vibrate at a single point and therefore indenting the bearing race. Problems with brinelling usually occur shortly after a fan is installed.

Replace the bearings. To avoid brinelling the fan impeller should be rotated frequently, at least daily.

Excessive belt tension.

Check and adjust the belt tension.

2.4 Shaft seal squeal

The seals may have dried out.

The seals may require lubrication or may be misaligned.

2.5 Air noise

Air noise can be generated from a number of sources such as grilles, bends, badly designed duct fittings, excessive duct velocities etc.

Check the duct design is such it does not generate turbulence and therefore noise. An attenuator may be needed to resolve the problem.

2.6 Vibration

The impeller may be out of balance.

Site balancing may be practical but, if not, remove the impeller and balance.

The shaft may be bent.

The shaft will have to be replaced.

Impeller may be worn as a result of handling abrasive or corrosive materials.

The impeller will have to be replaced.

Material such as dust or grease could be sticking to the fan blades.

Clean the impeller blades. This should be done on a regular basis if dust and/or grease is constantly present in the air being handled.

The impeller may have been damaged by loose material in the duct system.

Depending on the level of damage the impeller may have to be replaced



2.0 MECHANICAL (Cont.)

Problem

2.6 Vibration (Cont.)

Possible Cause

Vibration being transmitted through the building structure.

Recommended Action

Check vibration isolators have been fitted and, if fitted, check they are correctly positioned.

Vibration isolators are fitted but not strong enough. If bottoming, adjust if possible or replace with more suitable mounts.

Fit flexible connectors between the fan and ductwork.

3.0 IMPELLERS

NOTE: If there is any doubt about the impeller contact the supplier, do not run the fan. Refer to Do's and Don'ts section of this catalogue for design advice.

Centrifugal

Problem

3.1 Impeller excessively noisy

Possible Cause

The impeller may be striking the fan casing or inlet cone, check for the following causes:-

Impeller may be loose on the motor or drive shaft.

Impeller incorrectly mounted onto the shaft

Impeller not centred in the casing

Casing inlet cone may be damaged

Bent motor or drive shaft

Impeller not centred on the inlet cone.

The inlet cone has been damaged

Shaft loose in bearings.

Bearing loose on its support.

The cut-off in the fan discharge has been damaged.

Cut-off is insecure.

Recommended Action

Tighten the fixings.

Re-install the impeller onto the shaft with the key installed correctly

Adjust to the correct position.

Repair the damage.

Replace the shaft

Check and re-align as required.

Repair or replace.

Tighten the bearing rings.

Tighten the fixing bolts.

Repair or replace.

Refit securely.

Replace the impeller but also check the fan speed. Advise supplier of the problem.

3.2 Damaged Impeller

Impeller bulging. This could be caused by the impeller being built from lighter than specified materials or the fan is running above its recommended speed.

Recommended Action

Contact the supplier.

Check the alignment of the motor, relative to the casing, and tighten the fixing bolts. Contact the supplier.

Trim the blades to suit, check with the supplier for advice.

Axial Flow

Problem

3.3 Impeller excessively noisy

Possible Cause

Impeller blades may be loose and could be striking the fan casing.

The motor may have moved.

The blade tip clearance may be insufficient.

Check the alignment of the motor, relative to the casing, and tighten the fixing bolts. Contact the supplier.

Trim the blades to suit, check with the supplier for advice.

3.4 Bent blades

The blades may have been damaged during transit or by loose material in the duct system.

Bent blades can be caused by the fan running in stall or the air entry/discharge conditions to the fan creating excessive vibration.

Check the condition of the fan and impeller on receipt and for debris in the duct. Replace the impeller if damaged.

Check the air entry conditions to the impeller do not generate excessive turbulence.

Replace the impeller.

FAN TROUBLE SHOOTING

Axial Flow (Cont.)

Problem

3.5 Disintegrated Impeller

Possible Cause

Possibly caused by the blades being struck by loose material in the duct system.

Excessive impeller speed.

Recommended Action

Ensure the ducts are clear of all debris. Replace the impeller.

Check the motor speed and, if belt-driven, the pulley ratios. Replace the impeller.

4.0 BELT-DRIVES

Problem

4.1 Various problems

Possible Cause

The belts are loose and striking the belt-guard.

Belts are wearing out too quickly and/or the belts are too tight.

The pulleys are worn.

The belt may be the wrong cross-section for the pulley.

The pulleys may be incorrectly aligned.

The drive selection may be incorrect.

The fan, motor or its base may not be securely fastened.

Recommended Action

Adjust the belts to the correct tension.

Adjust the belts to the correct tension. Also check the belts are a matched set, if they are not replace the complete set.

Replace both the pulleys and belts.

Check and replace the belts as necessary.

Check the pulleys and realign as necessary.

Check and change as necessary.

Check and secure as necessary.

5.0 ELECTRICAL

Problem

5.1 Fan running the wrong way.

Possible Cause

Incorrect wiring.

Recommended Action

To reverse the rotation of a three-phase motor interchange any two supply leads. To reverse the rotation of a single-phase motor interchange leads on the start winding. Refer to the directions in the motor junction box.

This note applies to single-speed motors only. For 2-speed motors refer to the supplier.

5.2 Fan won't run

Wrong electrical supply.

Electrical connections in the motor terminal box or starter are not tight.

For single-phase motors the capacitor is not wired in or is faulty.

Fuses are blown

Belts on belt-driven units have broken.

Overloads have tripped out.

If a variable speed drive (VSD) has been fitted incorrect installation can cause an electrical 'spike' causing the motor windings to fail.

Check the electrical supply matches the motor nameplate.

Check and tighten as necessary.

If a capacitor is fitted check with a multimeter or replace.

Before replacing fuses check the motor circuit for any faults.

Replace the belts and re-align the drive.

Check the motor before resetting the overloads.

Check the motor windings and if failed replace the motor. Check the installation is in accordance with the VSD supplier's recommendations.

5.3 Fan runs in alternate direction.

The capacitor is not in circuit or it could be faulty.

Alternatively, the connections could be poor or incorrect.

Check with multimeter or replace.

Check all connections and ensure there are no loose terminals.

5.0 ELECTRICAL (Cont.)

Problem

5.4 Electrical hum

Possible Cause

Electronic speed-controllers can generate an electrical hum.

If a variable speed drive (VSD) is fitted incorrectly it can cause a high level of harmonics in the supply.

Phase imbalance on three-phase motor.

Motor is not designed for the electric supply ie. wrong voltage or frequency.

Motor is overloaded and drawing greater than the nameplate amps.

Motor has excessive clearance between stator and rotor. In this situation the motor will run slower than the normal speed. ie. have excessive slip.

Recommended Action

If the electronic controller is not faulty explore using a SSC single-phase 2-speed switch in its place. Alternatively, use an auto-transformer speed controller.

Check the installation conforms to the VSD supplier's recommendations.

Check and correct the supply.

Check the electrical supply matches the motor nameplate.

Check the correct motor is fitted. If correct check the pitch-angle if an axial fan or the belt-drive details if a belt-driven fan. If these are correct contact the supplier.

Check motor speed, if slow contact the supplier.

5.5 Motor overheating or high current draw.

Faulty instruments.

Incorrect power supply

Three-phase motor running with one phase disconnected. This is called single-phasing. When single-phasing, the motor will draw uneven current on each phase and will generally not start from standstill.

Impeller has too much inertia for the motor power and does not achieve full speed.

Excessive dirt on the motor cooling fins so the heat is not able to dissipate.

If the motor is out of the airstream either the cooling fan is not fitted or the air inlet to the motor cooling fan is obstructed.

Excessive stopping or starting - 10 starts/hour is generally acceptable.

A conventional three-phase motor is connected in Delta when it should be in Star, or vice-versa.

The fan impeller is jammed resulting in a locked rotor situation. The motor will draw 6-10 times the rated current in this situation.

A 2-speed motor, when switching from high to low speed, can generate heat if the supply is not switched off.

Backward-curved centrifugal impellers may be running in the wrong direction. When running in the wrong direction they will tend to overload the motor. Airflow capacity will be down to approximately 30-40% of full flow.

Ensure all instruments are accurate and calibrated where necessary.

Check the electrical supply matches the motor nameplate.

If single-phasing, check if it is the power supply or the motor windings. If a winding has failed the motor may need to be replaced. Fitting correct overloads or phase protection will prevent this problem.

Check the inertia of the load and reduce as necessary. Alternatively, fit a larger motor.

Remove the dirt and dust on the motor body and between the cooling fins. Increase the maintenance frequency.

Fit the motor cooling fan if not fitted and remove any obstructions from the air inlet to the motor.

Check the control system and reduce the number of starts/hour as recommended.

Check the motor nameplate and re-wire correctly.

Check to ensure the impeller can rotate freely.

Switch off the power first and allow the motor to run down before engaging low speed. Alternatively, use a time delay interlock.

Check and correct the direction of rotation of the impeller if necessary.



5.0 ELECTRICAL (Cont.)

Problem

5.5 Motor overheating or high current draw. (Cont.)

Possible Cause

If the fan is a forward-curved centrifugal there may be insufficient system resistance.

Axial fan impeller overpitched.

Error in the motor selection for the required duty.

With belt-drive units incorrect pulley selection or pulleys on the wrong shafts

Gas density greater than design.

Recommended Action

Ensure the duct system is installed correctly and, if necessary, lower the fan speed.

Alternatively, increase the system resistance by fitting perforated metal on the fan inlet but note that this is inefficient.

Re-pitch to the correct angle.

Check the motor nameplate and change as necessary.

Check the pulley ratio and that the pulleys are on the correct shafts.

Increase the motor size to suit.

6.0 DUAL & TAP WOUND MOTORS

Problem

6.1 High current draw and/or 'growling' bearings

Possible Cause

Tap-wound motors can create problems if the 'star point' contactor is not connected. The motor will be fine in low speed but in high speed will have a high current draw and a severe electrical noise that sounds like noisy bearings. The motor will not last long when run in this condition.

Dual-wound motors are rarely a problem.

Recommended Action

Faulty wiring in the switchboard, check the correct contactor is connected.

7.0 PERFORMANCE

NOTE: Refer to Do's and Don'ts section of this catalogue for design advice.

Problem

7.1 Low air flow

Possible Cause

Faulty instruments

The wrong size fan has been installed.

The fan is running backwards.

Pitch-angle of an axial fan may be wrong.

Fan speed is too slow.

The ductwork is undersized.

If a centrifugal fan check the cut-off position.

Bad installation.

Recommended Action

Ensure instruments are accurate and calibrated where necessary.

Check the fan specifications are correct for the particular system.

Check rotation of the impeller. If the rotation is wrong refer to the 'Electrical' section above.

Check the pitch-angle against the schedule, if wrong contact the supplier. Site adjustment may be practical.

Check the motor speed and, if belt-driven, the pulley ratios. If wrong change to suit.

Check the ductwork and grilles are the correct size. If smaller than design this will increase the system resistance.

Contact the supplier.

Check the entry and discharge conditions to the fan are of a good design.

If the fan is mounted close to bends on the intake or discharge this will impact on the fans' performance.

Check there are no duct obstructions on the intake or discharge of the fan. Internal duct lining may have come loose, check and repair.

7.0 PERFORMANCE (Cont.)

Problem

Possible Cause

Recommended Action

7.1 Low air flow (Cont.)

The ductwork is undersized.

Check the ductwork and grilles are the correct size. If smaller than design this will increase the system resistance.

Fan speed is too low.

Check the motor speed and, if belt-driven, the pulley ratios. If wrong change to suit.

7.2 High air flow

Faulty instruments

Ensure instruments are accurate and calibrated where necessary.

The wrong size fan has been installed.

Check the fan specifications are correct for the particular system. If an axial fan check the pitch angle and, if wrong, adjust.

The ductwork is oversized.

Check the ductwork and grilles are the correct size. If larger than design this will decrease the system resistance.

Fan speed is too high.

Check the motor speed and, if belt-driven, the pulley ratios. If wrong change to suit.

7.3 System resistance is greater than estimated.

The ducting and/or the grilles, coils etc. may be smaller than design, which will increase the system resistance.

Check that the ductwork and system components are the correct size. Check that all dampers are open. Check that all registers and grilles are open. Check the ducting is clear of rubbish. Check flexible connectors are installed correctly. Check if filters are dirty, clean or replace as necessary. Check if coils are dirty and clean them if necessary. Check duct take-offs and general duct fittings are correctly installed and of good design.

7.4 System resistance is lower than estimated.

If the duct system and associated components are larger than design this will reduce the system resistance.

Check the ductwork and associated components are the correct size. Check for leaks around flexible connections.

There may be leakage from the ductwork.

Check the ductwork for leakage and rectify as necessary.

Leakage around the base of Roof Ventilators.

Ensure there is a proper seal between the unit base and the up-stand. If there is no seal then install one.

8.0 MOTOR PROTECTION

It is important to note the following regulations that form part of the Australian & New Zealand Wiring Rules (AS/NZS 3000:2007). Failure to comply with these regulations would void warranty.

8.1 Section 4.3.4.1

Protection against overload

'Each electric motor having a rating exceeding 0.37 kW shall be provided with control equipment incorporating means of protection against overload of the motor'.

8.2 Section 4.3.4.2

Protection against over-temperature

'Any unattended single-phase motor having a current draw greater than 1.0 Amp, or any unattended three-phase motor having a current draw greater than 0.578 Amps, shall be fitted with an over-temperature protection device'.

8.3 Section 4.3.4.2.3

Over-temperature protection devices

Protection of motor windings against excessive temperatures shall be provided by thermal-overload protective devices complying with AS1023.1 or by a device which affords an equivalent degree of protection'.

