

# Industrial Exhauster Operating and Maintenance Manual

PLEASE READ THE ENTIRE MANUAL BEFORE HANDLING ERECTING OR OPERATING EQUIPMENT

Record your exhauster serial number here \_\_\_\_\_

**this number will be required to obtain capacity, information and parts in the future**

Your serial number is a five digit number beginning with the last two digits in the year of manufacture i.e. 88001 means this equipment was manufactured in 1988 this will be required to obtain capacity information and parts in the future.



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# Foreword

With proper care and attention, your Murphy industrial exhauster will provide maximum performance and long service at minimum cost. We are sure that it will prove to be a most valued asset to your company.

Our interest in your equipment does not end with its sale. We are interested in constantly maintaining contact with your company. Should you have any questions or problems, or wish to have your equipment serviced or updated, by all means contact us and we would be pleased to have our representatives discuss these questions with you.

The purpose of this manual is to assist you in keeping your industrial exhauster in the best possible operating and mechanical condition at all times. It is our endeavour to manufacture the finest equipment available and to be able to solve your dust collecting problems.

If you have any special requirements, from small to large, contact us and we would be pleased to supply the information on the equipment you require.

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## Safety Precautions



**EQUIPMENT WITH ROTATING PARTS CAN BECOME A SOURCE OF INJURY AND DEATH IF NOT PROPERLY INSTALLED, OPERATED OR MAINTAINED.** Do not exceed the maximum operating temperature or speed limits for which the industrial exhauster was designed. Limits for Industrial exhausters are available from N. R. Murphy Limited and must not be determined otherwise. Do not rely on limits obtained in any other manner. The user must make all personnel in contact with the equipment aware of all possible hazards.



**THE RESPONSIBILITY FOR PROVIDING SAFETY ACCESSORIES FOR INDUSTRIAL EXHAUSTERS SUPPLIED BY N. R. MURPHY LIMITED IS THAT OF THE USER OF THE EQUIPMENT.** N. R. Murphy Limited sell industrial exhausters with or without safety accessories, and accordingly, it can supply standard safety accessories and components if ordered. It is the customers responsibility to ensure that all necessary safety accessories have been installed prior to operation of the equipment.

**THE WARNING NOTICE, AS ILLUSTRATED BELOW SHOULD BE ATTACHED TO INDUSTRIAL EXHAUSTERS AT ALL TIMES**

N. R. Murphy Limited  
**Warning**

This equipment has rotating parts and can cause serious personal injury or death. Keep body, hands and feet, loose clothing and foreign objects away from inlet, outlet, shafts and drives. Do not touch equipment or motor during operation as it may be hot.

Do not attempt any service or maintenance work without thoroughly adhering to the instructions and procedures as defined in the Operating and Maintenance Manual for this specific equipment.

No work is to be performed by untrained personnel. Be sure to disconnect all electrical power sources and lock the disconnect switch in the off position before commencing any work. Clean-out doors must be secure during operation. An unsecured clean-out door can become a projectile during operation because of pressure buildup.

*Additional safety accessories are available from N. R. Murphy Limited. The responsibility for providing necessary safety accessories is that of the user. Consult the manual for guidance.*

*Failure to follow the manufacturer's instructions for installation, operation, maintenance, adjustment, safety equipment or appropriate operation conditions can result in damage to the equipment, damage to other objects, personal injury or death*



The user of INDUSTRIAL EXHAUSTERS, in making their determination as to the appropriate safety accessories to be installed and any additional warning notices to be affixed upon the exhaust equipment, should consider the following:

- location of the exhauster
- accessibility of personnel to the exhauster
- adjacent equipment
- applicable building codes
- applicable health and safety legislation

- any other current regulations or regulations awaiting future implementation

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## Installation and Operation of Industrial Exhausters

### Introduction

The purpose of this section is to aid in the proper installation, operation and maintenance of your industrial exhauster. These instructions are not intended to supplement good general practices and are not intended to cover detailed installation procedures.

The receipt, handling, installation, operation and maintenance of N. R. Murphy Limited equipment is the responsibility of the user. It is important that the installation and start-up of the equipment be supervised or inspected by personnel experienced in such work and equipment.

### Shipment and Receiving

N. R. Murphy Limited has thoroughly inspected the equipment at the factory and has prepared your industrial exhauster for shipment. The equipment should be in as new condition when received unless damaged in transit. Upon acceptance by the carrier, as evidenced by a signed bill of lading, the carrier accepts responsibility for all shortages or damage, whether concealed or evident. Claims covering shortages or damage must be made to the carrier by the purchaser. Any shortages or damage should be noted by the user on the delivery receipt.

### Handling and Storage

Your new industrial exhauster should be handled with care. Most industrial exhausters are provided with lifting lugs or holes for ease of handling. Others must be handled using straps or well padded chains and cables to protect the exhauster's finish.



**NEVER LIFT OR HANDLE THE EXHAUSTER BY THE SHAFTING, IMPELLER, FLANGES OR INLET SUPPORTS AS IT COULD CAUSE SEVERE DAMAGE TO THESE COMPONENTS.**

If the exhauster cannot be installed immediately it should be stored in a dry area which is free of vibration and be protected from extreme and rapid changes in humidity and temperature using the following guidelines:

1. Temperatures: between 10°C (50°F) and 49°C (120°F)
2. Maximum relative Humidity: 60%
3. Shock or Vibration: 2 mils displacement maximum to prevent bearings from Brinelling.
4. Rotate the exhauster wheel by hand approximately 6 to 8 rotations at maximum one month intervals. This is to redistribute grease on internal bearing surfaces and minimize the chance of flat spotting.

On V-belt driven exhausters, belts should be checked at the time of removal from storage for proper V-belt tension. Tighten belts if necessary (refer to V-Belt Drive Installation section beginning on page 3 of this manual)

### Installation

1. Safe and smooth operation of the exhaust equipment requires a proper foundation that is level, rigid and of sufficient structure and mass to support the equipment. **It is always imperative to consult a qualified engineer to design a proper foundation.** A properly designed concrete base is the preferred foundation. The concrete base mass should be a minimum of

four times that of the exhaust equipment when the plan view area of the concrete base is no more than twice the plan view area of the exhauster.

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Steel platforms or bases are good alternatives when properly designed. Steel platforms must be braced in all directions. Care must be taken to ensure that the natural frequency of all steel base components differs significantly from the rotating speed of the exhauster and driver. **Failure to heed this good design practice may result in a resonant condition and consequent life threatening catastrophic structural failure.**

Exhausters mounted off ground level should be rigidly mounted to a structural platform and should be placed as near as possible to, or over, a solid wall or column.

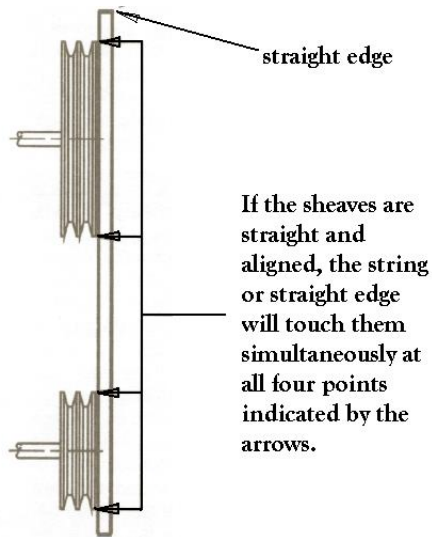
Supports for suspended exhausters must be diagonally braced to prevent sway.

2. Industrial exhausters must be mounted on a flat surface. Do not twist or distort industrial exhausters. Shim exhauster support points before tightening foundation bolts to help ensure distortion does not occur.
3. **Ducts and other components must be independently supported, and should never be supported by the exhauster.** The independent mounting of stacks and ducts to the exhauster will ensure that the exhauster housing is not twisted or deformed with the application of external loads. All ductwork or other attachments must be installed so that the exhauster can be removed and the remainder is self supporting.
4. It is recommended that access doors be placed in ductwork just ahead of the exhauster inlet and just behind the exhauster outlet for ease of inspection and maintenance. **IN ORDER TO AVOID EQUIPMENT DAMAGE AND PERSONAL INJURY, ACCESS DOORS IN A DUCT SYSTEM SHOULD BE SECURELY CLOSED AND SHOULD NEVER BE OPENED WITH THE EXHAUSTER RUNNING.**
5. Lubricate exhauster bearings in strict accordance with bearing manufacturer's recommendations. **DO NOT OVERLUBRICATE.** Bearings should be locked to the shaft. Ensure that locking mechanisms on bearings are in the correct position and locking mechanisms are fastened before operation of the exhauster. Also see bearings and lubrications listed under **Maintenance of Industrial Exhausters.**

### **V-Belt Drive Installation**

V-belt drive systems are the most common type of belt systems used to drive industrial exhausters. Other types of systems are used but are not discussed within this manual. All sheaves must be balanced. Proper alignment is essential to long exhauster bearing, driver bearing, V-belt and sheave life. Ensure that the driver and exhauster shafts are parallel.

Check the location of the sheaves on the shaft with a straight edge or a piece of string. If the sheaves are properly aligned, the string will touch them at the points indicated by the arrows in illustration. **Rotating each sheave one half revolution will indicate if the sheave is misaligned or the shaft is bent. Correct any causes of misalignment.**



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Fan and motor bearings are engineered for normal belt tension. Excess belt tension can cause premature bearing failure on both exhausters and motors.

Always use matched V-belts and never mix new and used belts on a drive. Install V-belts correctly:


1. Normal belt tension can be determined by being able to depress belt a distance equal to one belt width with normal finger pressure midway between the drives.
2. Operate the drive and exhauster a few minutes to seat the V-belts in the sheave grooves. (*operate the exhauster **only** after following the procedure listed in the "Operation of Industrial Exhausters" section of this manual*) Observe the operation of the drive under it's highest load condition (*usually startup*) A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tensions.

If the V-belts **squeal severely** as the motor comes on, or at some subsequent peak load, they are not tight enough to deliver the torque demanded by the exhauster. The exhauster should be stopped and the V-belts tightened.

It is normal on V-belt drives handling more than 20hp to "squeal" on start-up. Do not over-tighten belts.


3. Check the tension on a new drive frequently during the first day of operation by observing the slack side span. After a few days of operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust so that the drive again shows a slight bow in the slack side.

## Operation of Industrial Exhausters

1.  **CAUTION: DISCONNECT AND LOCK OUT ALL POWER SOURCES TO THE EXHAUSTER**
2. Check the exhauster wheel to inlet cone and exhauster wheel to exhauster housing clearance to ensure that there is no interference. Turn the exhauster wheel by hand, ensuring that it rotates freely. On direct drive applications it may become necessary to re-position the motor/exhauster wheel assembly by shifting and/or shimming as required to ensure an on centre position.

3. Check set screws and keys (or taperlock hub if present) in the exhauster wheel, and bolts on cooling disc.
4. Ensure that bearings are properly aligned and lubricated with special attention to the locking mechanisms, cleanliness, and possible corrosion. Bearings showing signs of corrosion must be replaced prior to operation of the industrial exhauster.
5. Ensure that the exhauster housing, ducts, etc. are free of foreign objects and matter.
6. Ensure that all access doors are secure.
7. On belt driven exhausters, check sheave alignment and V-belt tension. (refer to the section entitled "**V-Belt Drive Installation**" starting on page 3 of this manual)
8. Check foundation bolts and other hardware for tightness.
9. Connect the power source.

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10. Exhauster wheel should always be stationary prior to start-up. Start-up while exhauster wheel is rotating backwards can cause damage.
11. Jog the exhauster electrically. Ensure that exhauster wheel rotation agrees with housing mounted rotation sticker.
12. Start and run the exhauster for approximately one hour. If the exhauster motor overload protection kicks out on start-up:
  - Do not install oversize heaters as this may cause motor failure and will nullify the motor warranty.
  - Low system resistance may cause overloading of the exhauster motor on any installation. On a direct drive application, air flow must be restricted. This is usually accomplished by installing a blast gate c/w a locking device. On a belt driven exhauster, this can also be accomplished by changing the exhauster speed. Amperage draw must be checked on start-up of the completed system to ensure that it does not exceed the full load amp rating shown on the motor nameplate. If amperage draw is too high, then additional resistance must be added to the system or the exhauster speed reduced.
13.  **CAUTION: DISCONNECT AND LOCK OUT ALL POWER SOURCES TO THE EXHAUSTER** and check tightness of all set screws, keys, foundation bolts and any other hardware.
14. Once it has been determined that the industrial exhauster is operating satisfactorily, it should be operated, if practical, for at least eight continuous hours. Operation should be monitored at least once per hour during this period. Inspection should be made for any change of operation during this period. Some bearings will have to be "run in" and will heat up during this period. The maximum bearing temperature should not exceed 93°C. (200°F) It is normal for bearings lubricated with grease to purge a small amount of grease through the bearing seals during "run in".

**NOTE THAT ALL BOLTS, SETSCREW AND V-BELTS SHOULD BE RE-TIGHTENED AFTER TWO DAYS OF INITIAL OPERATION. RECHECK AGAIN IN TWO WEEKS AND PERIODICALLY THEREAFTER.**

# Maintenance of Industrial Exhausters



**CAUTION: DISCONNECT AND LOCK OUT ALL ELECTRICAL POWER TO THE EXHAUSTER BEFORE PERFORMING ANY MAINTENANCE AND SECURE THE EXHAUSTER WHEEL.**

## Bearings

Selection of the correct exhauster bearing lubricant and lubrication intervals depends on several factors. Extreme high or low temperatures and dirty or damp atmospheres are all conditions that will create a requirement for more frequent lubrication or special lubricants.

1. Lubricate exhauster bearings in strict accordance with the manufacturer's recommendations. We would recommend that the bearings be re-lubricated every four to six months. It is always very difficult to give precise guidance on the amount of lubricant to supply to the bearings. **WE DO KNOW THAT THE TENDENCY IS TO BE SOMEWHAT OVERZEALOUS.** As a rule of thumb, one or two shots from the normal grease gun is sufficient and must be slowly applied while the units are turning. For reference, the original grease pac is only 48 to 55 grams (less than 2 ounces) which fills approximately 40% of the available space inside the sealed bearings. From this it should be realized that the bearing actually needs very little lubricant to perform satisfactorily.

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2. If the exhauster is stored for any length of time, the bearing should be lubricated again before start-up. After 36 hours of operation, the bearings should be checked again for lubrication.
3. Check shaft and bearing alignment carefully before operation.
4. Bearings must be properly locked to the shaft. Check before operation. Certain bearings use setscrews, tighten these. Some bearings use an eccentric locking collar. This collar should be driven on in the direction of exhauster wheel rotation and then held in position with set screws.
5. For further details, see bearing manufacturer's instructions.

## Vibration

If excessive vibration develops, check the following

- a) Accumulation of dirt and foreign matter on exhauster wheel.
- b) Loose bolts on housing, drive or bearings.
- c) Misaligned belts or improper belt tension. (belt driven exhausters only)
- d) Loose bearing locking collars.
- e) Loose set screws on exhauster wheel.
- f) Damage to exhauster wheel caused by foreign matter.
- g) Proper clearance between exhauster wheel and inlet collar.
- h) Source of vibration external to the exhauster: stop exhauster and determine if vibration still exists. Disconnect drive from the exhauster and operate the motor by itself to determine if it causes vibration

## Spare Parts



To avoid losses in operation it is always recommended that the customer stock operational and plant critical components. We at N. R. Murphy try to stock many of the common components but due to incoming replacement orders and new equipment builds sometimes these components are not always in house. Other items such as exhauster wheels when not in stock will require several days to fabricate and balance before it can be shipped to a customer who may have their entire plant down.

Replacement and maintenance parts may be obtained through N. R. Murphy Limited by providing us with the exhauster Serial number and a description of the component that you require and if possible the exhauster shaft diameter or bearing size. Due to the custom built nature of many of our products, we maintain files on every piece of equipment we sell. If further information is required please contact the N. R. Murphy Limited or your Technical Representative.

## Industrial Exhauster Wheel Removal / Adjustment Arrangement 4

 **CAUTION: DISCONNECT AND LOCK OUT ALL ELECTRICAL POWER TO THE EXHAUSTER BEFORE PERFORMING ANY WORK.**

There is always a possibility that during handling and shipping that the position of the wheel could have moved. Please find below simple instructions for checking the wheels position in the case.

1. Remove bolts from fan case side plate, while leaving the fan motor bolted to the plate, mark 1 case hole and side plate hole for reassembly.
2. Lift the motor, plate and wheel assembly vertically out of the exhauster case.

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3. Dimension between the fan back plate and the fan case removable side plate =
4. To adjust the wheel position on the motor shaft, loosen fan wheel hub set screws, reposition wheel and re-tighten set screws to shaft.
5. Vertically insert fan wheel, side plate and motor into fan casing position.
6. Replace bolts through the fan case side plate and weld nuts, but do not tighten.
7. Rotate exhauster wheel assembly to ensure that the wheel is not striking the inlet bell, adjust fan case side plate positioning if necessary to eliminate the striking. Tighten the bolts.

## Industrial Exhauster Trouble Shooting Chart

PROBLEMS	PROBABLE CAUSES
<b>INSUFFICIENT AIR FLOW</b>	<ul style="list-style-type: none"> <li>• exhauster wheel rotating in the wrong direction</li> <li>• dampers shut</li> <li>• system resistance higher than design</li> <li>• exhauster speed lower than design</li> <li>• restricted exhauster inlet or outlet</li> <li>• inlet or outlet screens clogged</li> <li>• dirty or clogged filters or coils</li> <li>• duct elbows near exhauster inlet or outlet</li> <li>• faulty ductwork</li> </ul>
<b>EXCESSIVE AIR FLOW</b>	<ul style="list-style-type: none"> <li>• exhauster speed too high</li> </ul>

	<ul style="list-style-type: none"> <li>• system resistance less than design</li> <li>• blast gates not installed or improperly adjusted</li> <li>• improper damper adjustment</li> <li>• filters not in place</li> </ul>
<b>EXCESSIVE HORSEPOWER DRAW</b>	<ul style="list-style-type: none"> <li>• static pressure less than anticipated</li> <li>• exhauster speed higher than design</li> <li>• gas density higher than design</li> </ul>
<b>EXCESSIVE VIBRATION</b>	<ul style="list-style-type: none"> <li>• bent exhauster shafting</li> <li>• accumulated material on exhauster wheel</li> <li>• sheaves out of balance</li> <li>• loose or worn bearings, loose bearing bolts</li> <li>• bearing or drive misalignment</li> <li>• mismatched belts</li> <li>• motor out of balance</li> <li>• exhauster wheel or sheaves loose on shaft</li> <li>• belts too close or too tight</li> <li>• worn or corroded exhauster wheel or out of balance</li> <li>• loose mounting bolts</li> <li>• structures not cross braced</li> <li>• exhauster operating in unstable system condition</li> <li>• inadequate, weak or resonant foundation</li> </ul>
<b>INOPERATIVE EXHAUSTER</b>	<ul style="list-style-type: none"> <li>• blown fuses</li> <li>• loose sheave, belts or broken belts</li> <li>• incorrect motor voltage or wiring</li> <li>• motor undersized</li> </ul>

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## Manufacturer's Warranty

- *All equipment is guaranteed as per the original manufacturer's guarantee & warranty. All parts fabricated by N. R. Murphy Limited are guaranteed to be free from defects in material and workmanship under normal use and service for the period of one year from the date of delivery or 2,000 hours of operation, whichever occurs first, on the cost of parts only, NOT replacement labour. Cost of labour and/or transportation is by the customer. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, WRITTEN OR ORAL, WHETHER EXPRESSED BY AFFIRMATION, PROMISE, DESCRIPTION, DRAWING, MODEL OR SAMPLE. ANY AND ALL WARRANTIES OTHER THAN THIS ONE, WHETHER EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.*
- *LIMITATION OF DAMAGES: THE COMPANY'S LIABILITY, WHETHER IN CONTRACT OR IN TORT, ARISING OUT OF WARRANTIES, REPRESENTATIONS, INSTRUCTIONS, OR DEFECTS FROM ANY CAUSE SHALL BE LIMITED EXCLUSIVELY TO REPAIRING OR REPLACING PARTS UNDER THE CONDITIONS AS AFORESAID, AND IN NO EVENT WILL THE COMPANY BE LIABLE FOR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS, RENTAL OR SUBSTITUTE EQUIPMENT, OR OTHER COMMERCIAL LOSS.*
- *LIMITATION OF DAMAGES: THE SELLER WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS) ARISING OUT OF OR RELATING TO THIS AGREEMENT OR THE TRANSACTIONS IT CONTEMPLATES. IN NO EVENT WILL THE SELLER'S LIABILITY EXCEED THE PRICE THE BUYER PAID TO THE SELLER FOR THE SPECIFIC GOODS PROVIDED BY THE SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION.*