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COMPRESSOR

INSTALLATION

RECOMMENDATIONS

Compressor Installation Recommendations

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An air compressor will live longer and perform better if it is properly installed and maintained. For many people, an air compressor is something that is out of sight and out of mind after the initial purchase, so proper installation is essential. Also, being able to make recommendations to a shop concerning their air system builds your credibility and rapport, increases the chance that they will call you when they need a new compressor and can create opportunities to sell accessories and air treatment products. This guide provides general information that can be applied to most existing air systems and all new air systems.

Location

Outdoors vs. Indoors

Outdoor installations are not recommended for many reasons. First, virtually all compressors, (regardless of the manufacturer) come standard with Open Drip Proof motors and NEMA 1 controls which means that they cannot be exposed to moisture. It is especially critical that these electrical components not be exposed to moisture because of electrical shock hazard, but also, the compressor pumps themselves can have openings such as the crankcase vent holes that can allow water to enter the crankcase and contaminate the oil.

Second, since the compressed air contains moisture, below freezing temperatures will almost certainly cause problems for the compressor package. The moisture in the tank will freeze at the drain, so that you cannot drain the tank. The moisture will freeze at the unloader valve on the pressure switch, which makes the pressure switch inoperable (the unit will not come on because the switch is frozen). Last, but not least is the oil in the

crankcase. Oil becomes much thicker as it gets colder and that makes it harder for the electric motor to start the unit. This causes an increase in starting amperage which can trip circuit breakers and could permanently damage the electric motor.

In warmer climates that never experience temperatures below freezing, it is acceptable to locate a compressor out of doors, if the proper precautions are taken. The compressor must be located under a cover that will not only protect from falling rain, but also from blowing rain. A complete shed around the unit is acceptable if it is designed for proper ventilation of the unit. Generally, proper ventilation would include large vents in the walls or leaving the siding off of the bottom 18 inches of the shed structure, or both.

Proper indoor installation involves placing the unit in a clean, dry place with adequate ventilation. The cleaner the the area the better. The area must be clean because the intake filters will clog much faster in dirty areas. A dirty intake filter starves the compressor for fresh intake air which will cause the pump to unnecessarily run hotter and work harder and wear faster.

Motors can be adversely effected by excessive dust and dirt also. Virtually all compressor manufacturers use Open Drip Proof motors which allow air to flow through the center of the motor around the windings. Dust and dirt can definately build inside the motor and bind or short the motor windings (which is not covered by warranty).

Physical Installation

All compressor packages should be located in an open area with adequate ventilation. Never put a compressor in a closet or small enclosed room. Inadequate ventilation causes the compressor to run hotter which can dramatically accelerate wear on moving parts and bearing surfaces. You should allow a minimum of 18 inches from the nearest wall in any direction to allow for adequate airflow. The natural tendency is to place a compressor as close to the wall as possible to save floor space. Placing a compressor as close to a wall as possible can cause an increase in pump temperature of as much as 45%, compared to a proper installation. Lack of adequate ventilation will dramatically shorten the life of any air compressor.

Another concern is service. The compressor should be located so that oil, filters and belts can be maintained on a regular basis. If it is harder to maintain the unit due to poor installation, then regular maintenance is much less likely to occur. The less maintenance that occurs, the shorter the life of the compressor.

The compressor should be located on a solid, level surface. If a compressor is not level and/or is on a surface that could shake or vibrate, then this vibration will be amplified by the reciprocating forces of the compressor and cause excessive vibration of the unit. Do not bolt an air compressor to the floor! A properly installed compressor will not "walk away" because of vibration.

Proper installation consists of using vibration pads under the legs of the tank or using floor mounted studs with no nuts tightened to the feet of the tank. If floor bolts or studs are used, they should be used for guides only. All reciprocating compressors will have some vibration and rigidly fastening a compressor to a solid surface will cause strain and premature failure of the welds on the compressor tank. Please bear in mind that many compressors could be rigidly bolted down for 5 to 7 years before the welds crack, but this is still a very short life for an ASME Code tank.

Many people want to put their compressor out of doors due to the noise that a compressor makes. It is possible to substantially reduce the noise level of the compressor by piping the intake to another room or to the outside of the building. If you are curious as to just how much this will reduce the noise, go to the compressor while it is running, unscrew the intake filter housing and block the inlet opening This will not harm the compressor as long as it is only done for a very short time, but this should only be done in a clean environment (be careful, as any foreign material could cause major internal pump problems).

To pipe the inlet to the outside, you must be very careful of two things. First, for a distance of 8 feet or less, you must oversize the pipe at least one pipe size larger than the inlet opening itself . This is to allow for higher flows so that the compressor is not starved for inlet air. Also, make as few bends and turns as possible, as straight pipe provides the best flow of air. If you go more than 8 feet and/or make more than two 90 degree bends, piping should again be oversized. The second important thing is to make sure that the inlet piping is well supported by hangers or straps so that it does not put undue stress on the compressor head or inlet elbow. A properly sized flexible connector will make this job much easier. The intake filter should be mounted on the outside end of the intake piping. It is imperative that the filter be mounted in the vertical position (just like it is mounted on the compressor itself) to keep rain out of the compressor intake. If the inlet is being piped to the outside of a building, it is very important to make a good seal where the pipe goes through the wall or roof, so that rain does not run down the outside of the pipe. It is acceptable to use PVC pipe for an inlet extension, because there is no oil, pressure or temperature to worry about. The only danger in piping inlet air to the outside lies in forgetting to check and change the filter element. Many outdoor locations can be at least as dusty and dirty as the inside of the shop and out of sight means out of mind for many shops.

Connections

Electrical

The compressor should be located as close as possible to the electrical breaker box. This is for several reasons, first, the closer the unit is to the box, the less likely low voltage will be encountered. Second, electrical codes call for service disconnect devices at or on units that are more than 50 feet from the breaker or are out of sight of the breaker box. Always check the line voltage before installing a compressor. Low voltage conditions are frequent in many parts of the US and are the leading cause of motor failures. A motor failure caused by low voltage is not covered by the motor warranty and is very hard to

claim against the power company. Make sure that the proper wire sizes are used for the voltage and amperage that your compressor needs. Electrical connections should always be made by a licensed electrician.

Plumbing

As there is always some vibration in reciprocating air compressors, great care must be taken when connecting the piping to the compressor discharge valve. It can be hard to get the compressor located in the proper position and then also run the piping so that it lines up perfectly with the discharge valve on the compressor. If there is any stress on this connection, then it will be very hard to get a good seal and vibration over the course of time could break the seal or crack the tank. It is always a good idea to use a flexible connector of some sort. A stainless steel braided flexible hose or a high temperature hydraulic hose will make the connection easier, safer and more durable.

Piping

A piping system in a shop can be an effective means of air distribution or it can be a hazard to air flow, quality and health. A piping system is something that should last for a very long time and should be carefully planned and installed. Also, a properly installed system will not cause or amplify other problems that are present in the system. A few basic rules about the type of pipe and the way that it is installed can make a huge difference.

Types of pipe

PVC, iron, galvanized iron and copper are the materials widely found in shops today. Each of these materials is capable of distributing air to the shop, but some are much better than others.

PVC (PolyVinylChloride) is a very inexpensive material and it is very simple to install. PVC is easy to cut and the joints are glued together, but it can be very dangerous. During the compression process air, water and oil are mixed at high temperature and high pressure. This chemical reaction creates an acidic juice that can be very hard on many air system components, but especially on PVC piping systems. This acidic mixture attacks and breaks down the glue used in the joints. This process can take several years before the glue gets to the point of failure, but when a failure occurs in PVC, it does not just split apart, it shatters. When this material shatters with pressure inside the system, it throws shrapnel, which can be very hazardous to personnel in nearby areas.

PVC pipe also has a fair bit of flexibility to it and it can also shatter if stress is put on it such as pulling on an air hose. Also, PVC is subject to shatter if it is bumped into with any degree of force. The use of synthetic lubricants is not very common in reciprocating compressors, but it is important to note that many synthetic lubricants will attack the pipe itself and eat it from the inside out...just like pouring gasoline into a styrofoam cup. PVC piping is an accident waiting to happen and should not be used under any circumstance.

There are some new plastic piping products on the market that are specifically designed for compressed air systems, but they are not suitable for 175 PSI maximum pressure and are more suited to rotary compressor applications (which are typically 120 PSI MAX).

Iron Pipe

Iron pipe is available in plain (black) or in galvanized (silver). Black iron pipe will work fine, but the inside will very slowly corrode over the course of time from any water that may be inside the air system. Galvanized pipe is zinc dipped to resist corrosion and is very little more money that black iron pipe. If you are using iron pipe for an air system, it makes good sense to go with glavanized. Iron pipe is an excellent material for an air system, but it must be professionally installed. Most people are not bold enough to go out and rent a pipe cutter and a pipe threader and even if they did, it is very time consuming to install. A properly installed galvanized iron pipe air system will last indefinately.

Copper

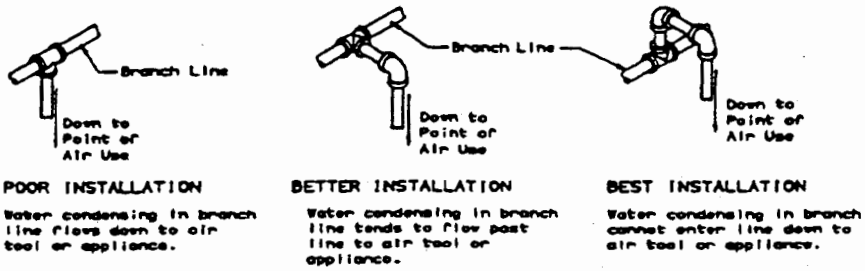
Copper pipe is the best material available for an air system. Copper is the most expensive material, but it is impervious to corrosion and it is easy to install. The joints on copper pipe are sweated (soldered) together and this is a process that is relatively easy to learn and do. Even if the shop owner does not install it himself, the cost of professional installation is generally less that an iron pipe system due to the ease of installation.

Design of the piping system

A piping system can either be loop or it can just run down the wall away from the compressor. A loop goes both ways from the compressor and will keep the pressure equalized throughout the entire system. This is especially important in large systems or where any point of use is more than 100 feet away from the compressor. If a loop is not used, then the furthest user of air may not have as much pressure as the others and for that matter, may not have enough pressure at all. A piping system does two things, it carries air and it stores air. The larger the pipe diameter and the length, the more air you have stored. A properly installed piping system in a large shop could easily add another 80 gallons to the total stored air capacity. The more air stored, the less the compressor has to run. A single pipe run (non loop) is perfectly acceptable for most small shop applications as long as the pipe size is big enough to prevent a pressure drop at the furthest point of use.

Following a few general rules can make a tremendous difference in an air system. Unless a drying system is used at the compressor, then moisture will condense out of the air as it travels away from the compressor and cools. Always remember to use gravity to your advantage. Water will always run downhill, so use a slope of 4 inches for every 50 feet of pipe. Proper installation of an air system will greatly help in preventing moisture from reaching the point of use. Many tool service centers say that air tools will last 3 to 4 times as long if they are supplied with clean air

Every user drop leg should come off of the top of the main line and also should include a drip leg under the user connection. Coming off the top of the pipe avoids letting any water in the pipe from running straight down to the user. A drip leg below the user connection is one more precaution, but must be manually drained regularly or fitted with an automatic drain.



Pipe size

Sizing of pipe is extremely important. If pipe size is too small, then pressure drop could be a big problem. Always use piping that is at least as big as the discharge valve on the compressor itself. Bigger pipe is always better and may be required for long runs, but bigger is also more expensive (so you don't see many shops with 3 inch pipe). Also, the number of turns and bends can contribute to pressure drop, so this is another reason to oversize. As a general rule, use the following chart to size the pipe for a shop.

AIR	LENGTH OF PIPE IN FEET					
CFM	25	50	75	100	150	200
10	1/2	1/2	1/2	3/4	3/4	3/4
20	3/4	3/4	3/4	3/4	3/4	1
25	3/4	3/4	3/4	3/4	1	1
35	3/4	3/4	1	1	1	1
60	1	1	1	1 1/4	1 1/4	1 1/4
80	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2

LEAKS

It is extremely important to check for and fix any leaks in an air system. Many people think of leaks as normal and they do nothing about them, but they are a big problem. In may cases, the replacement of a quick coupler for a couple of dollars could save 2 or 3 CFM of air that is continuosly being vented. Air leaks make an air compressor work harder unnecessarily and also cause dramatic pressure drop to any user that is downstream of the leak. A shop owner or manager should think of any leak as another user of air in the shop. Though that extra user does not earn an hourly wage, it costs big money (sometimes much more than an hourly worker). The electric bill goes up when the compressor runs more often, the life of the compressor can be shortened if it is running too hard and it causes loss of productivity in the shop due to pressure drop.

DID YOU KNOW-At 150 Psi (normal shop air system pressure for a two stage compressor system) a 1/16" leak flows 9.2 CFM and a 1/8" leak flows 36.7 CFM.