Haunting With Compressed Air

To really spook up your haunt, you need animation. Yeah, you might be the king of Monster Mud, but as creepy as statues might be, they scare more if they threaten, and they threaten more if they *move*.

There are plenty of ways to get motion into your haunt. Most of them involve electricity. But every technology has strong and weak points. Electricity - at least the kind that is easily available in the home - isn't terribly good at sudden forceful linear motion. And that's just what compressed air is good for.

Here is some information to help your compressed-air projects along.

Overview

Pneumatic animation is really quite simple:

- You start with a source of pressurized air.
- The air is routed through hoses and splitters (manifolds) until it gets close to the prop.
- A valve is used to turn on and off the flow of pressurized air to the prop on demand.
- When the air is sent to the prop, the pressure pushes out a piston.
- The moving piston is attached to whatever you want to move.
- When the valve is turned off, the piston retracts.

A Big, Honking Compressor

If you want to run animated props on compressed air, you need a source of compressed air. That's clear enough, isn't it?

We have a page on compressors and other air sources.

Conditioning

Yes, this is about air conditioning, but not the kind you wish you have in the middle of summer in Arizona. This section is about conditioning the compressed air from the compressor. [One could argue that this should go in the compressor page.]

The air from a compressor might need conditioning for several reasons:

- The air is usually damp, if not downright wet. Normal air has a certain amount of humidity to it. When you compress that air, you also collect a lot of water. Much of this condenses in the compressor's air storage tank, some of it goes out the hose to your prop. You can add a filter that helps trap this airborne water.

- Compressed air sometimes has a little particulate matter in it - dust. You might not notice a bit of dust floating around in the air, but when it gets blown at you at 120 PSI, it could be a problem. Filters in the air line help here, too.

- Compressors with an oil sump will put some oil into the output air. In some situations, this could be a benefit, but if you are painting a car it can ruin the finish. Filters in the air line help here, too. [But if you are serious about painting a car, use an oil-less compressor, add a filter, and use hoses that have never been used with oil.]

- Pressure. The air in the compressor's storage tank will be at a pressure that is as high as the design of the compressor safely allows. This means that you store more air and can run for more time before the pump motor kicks in again. But the props should be run off of lower pressure - as low as possible. Somebody has to regulate the high air pressure from the tank down to a lower working pressure.

  At Wolfstone, each prop has its own Haunt Air Manager (HAM) that provides local pressure regulation. Most compressors come with an output pressure regulator. I'm not aversed to using regulators in both places: 125 PSI in the compressor tank, 75 in the hoses, and 30 in the prop.

- Air-powered tools require lubricating oil. In order to propong the life of your tools, you might actually want to inject an oil mist into the air coming out of the compressor.

Given the rather common requirements to purify, regulate, and lubricate compressed air manufacturers have responded with units designed to do all this.

This unit from Harbor Freight Tools performs filtration, regulation, and lubrication.

Distribution

OK, you have a big, honking compressor in the back yard. How do you get air to the three props you have in the front yard?

You use lots of hose and a distribution manifold to send the air to more than one place.

Both of the units shown here work the same way: they accept air through a male quick-connect; they dispense air through three female quick-connects. Note that the female quick connectors contain built-in valves so that air is not released through unused connectors.

You can get manifolds like these already assembled. We put these together ourselves from threaded manifolds and quick connectors from Harbor Freight Tools.

You can save money on hose if the distribution manifold is located close to the props. This way, instead of three long hoses to the props, you can have one long hose from the back yard to the front, and three short hoses distributing the air to the props in the front yard.

In 2000, we had only two pneumatic props. We put a manifold on the roof, using it as a 2-way splitter, near the giant animated spider. If we end up using the spider again in 2001, we will have one manifold on the roof, and one on the front yard.

Lotsa Hose

As a haunter, you are probably aware of the rule which states that "you can never have too many extension cords" (just don't use them to run your compressor). The same rule holds true for air hoses, which are the extension cords of the pneumatic world. We have several in what we consider standard lengths of 10 and 50 feet.

You can buy short 10-foot hoses, but they are relatively expensive. We prefer to start with a good grade of 50-foot hose; cut it into smaller sections, and add the appropriate connectors to them.

The connection in the middle was added to the cut end of a hose. First, a barbed connector was shoved into the end. Then a hose-clamp added to secure the barbed connector. Finally, the quick connect was threaded on the exposed end of the barbed connector.

Control

You need a way to turn on and off the compressed air in order to activate the prop. This means some sort of valve, and it's a good idea to make it an electric (solenoid) valve so that you can trigger the scare remotely, or under automated control.

We build our solenoid valves into a standard assembly that we call the Haunt Air Manager (HAM).

NOTE - The solenoid valve should be as close as possible to the prop, in order to get a fast, crisp animation. If the valve is far away, turning it on must first pressurize many feet of air hose, before the pressure can do useful work in the piston that drives the prop. The result is a time lag, and sluggish deployment.

Pistons

Compressed air can provide your animated Halloween gear with forceful, rapid linear action by activating a pneumatic cylinder (piston).

Pneumatic cylinders can be purchased new, found used, and improvised from a variety of materials. There is occasional debate on the safest, best, and cheapest form of pneumatic cylinder.

We doubt that there is any one true "best". The best piston for your application depends on your applicatin and all of its requirements.

In some of our projects, we have used a improvised pneumatic cylinders made from screen door closers and bicycle pumps.

Standards

Whenever possible, we like to build our haunt equipment to clear standards that affords us mass-production and interchangability of components. In the pneumatic area, this means:

- All threaded connectors are 1/4-inch NPT, sealed with Teflon-style tape.
- Every air hose or discreet pneumatic assembly terminates in a snap-on quick connector.
- Snap-on connectors are 1/4-inch "industrial" type.
- Female connectors for air sources, male connectors for air users.
- Any hose of appreciable length is 3/8" diameter.
- All solenoids are powered by 110 VAC.

Sticking to these few, simple standards helps us deal with unexpected problems. The hose is too short? Add another 10-foot section with a snap. Solenoid acting funny? Unsnap the HAM assembly and snap in another.

The standards apply to assemblies that we think likely to be swapped, which includes:

- compressor

- hose
- HAM
- distribution manifolds

Individual props are only standardized in that they take their air through snap-on quick connectors. Internally, they may or may not use standard components like air cylinders.

For more information, please see our preferred standards.

Fittings and parts

We get a lot of our pneumatic fittings and parts from Harbor Freight Tools. Here are some interesting parts that they carry (prices as of January 2002):

model	price	description	notes
32905	$2.99	brass flow regulator	
36797	$5.99	air pressure regulator	BEWARE - actually a flow regulator
32872	$9.99	1/4" air diaphragm regulator	a true pressure regulator
42444	$2.99	5pc brass quick-connector kit	assortment; often on sale for $1.97
4873	$3.69	5pc steel quick-connector kit	assortment; often on sale
34700	$6.99	5-pack of F quick-connectors with M thread	
34701	$7.99	5-pack of F quick-connectors with F thread	
34704	$2.99	5-pack of M quick-connectors with M thread	
34705	$2.99	5-pack of M quick-connectors with F thread	

Note:

- The 5-piece coupler assortment is a good way to get started.
- The 5-pack of identical couplers is a good way to stock up in quantity.
- Brass versus steel seems to be mostly an issue of personal preference.

Pneumatic Projects

Here are some of our air-powered projects:

- pop-up skeleton
- giant animated spider
- pumpkin popup
- mad monk
- HAM

Air Compressors

If you want to run animated props on compressed air, you need a source of compressed air. That's clear enough, isn't it?

Intro

A compressor is a big expense, and most home haunters just approaching pneumatic props seek cheaper alternatives. There are some, but few are practical:

- tank of compressed air

  You can buy an inexpensive air storage tank, fill it up with compressed air at the gas station, and use it to run your props. Even if you needed two or three $10 tanks, it would still be a lot cheaper than a decent compressor.

  This is actually a workable plan, but it has the effect of shifting costs from the air source to the props and distribution system: you must make sure that your connections don't leak (avoid quick-connectors), your props use very little air, and you exhaust through the valve, not a bleeder.

- tank of CO2 or other liquified gas

  Such tanks contain enough gas to run your props all night, but bring with them dangers of cryogenic temperatures and extremely high pressures. This is not a project for the amateur hoping to cut costs.

- canned air

  You can get small "spray cans" of compressed air, often used to clean off stuff. Jerry Chavez of SpookyFX has built self-contained pneumatic props capable of numerous actuations on a single can of air. But Jerry *specializes* in props that are very air-thrifty. Unless you master the art of low-pressure, low-volume pneumatics, canned air will disappoint you.

- tire inflation pumps

  These are inexpensive pumps designed to be carried in you car and powered from the lighter plug. They are capable of high pressure (good), but only at a very low volume (bad). Such a device would require the addition of a storage tank, a pressure switch, and a power supply. And if you get it all to work, you'll have to replace the pump fairly soon, because the mechanism is made just to top up your tires now and then, not for extended service. The low price continues to be attractive (on sale for $10 as of August 2001), but they aren't really practical.

Shopping for a compressor

Your best bet is to borrow or purchase a compressor.

When shopping, consider these characteristics:

- size of air storage tanks

  They should hold at least a couple of gallons.

- size of motor that powers it (HP; horsepower)

  Different manufacturers measure horsepower differently; so comparing horsepower is only effective between the machines offered by the same manufacturer. When the maker wants to lie to you about the quality of a compressor, creative means of measuring horsepower (to get larger numbers) is usually where it happens. The lies start by quoting "peak" horsepower.

- Current drawn when the motor is running (Amps)

  If your motor draws too many amps, it will pop the circuit breaker. Most companies quote running current, but the startup peak can still still pop the breaker.

- air delivery rate (SCFM; standard cubic feet per minute)

  The more props you have, the more often you actuate them, and the more each prop consumes - then the more SCFM your compressor must deliver to keep the props running.

- RPM

  A high RPM compressor will be louder than a low-RPM compressor.

- oil-sump or oilless

  Oilless compressors have a reputation for being noisy. This is probably because oilless compressors tend to run at higher RPM, and the higher the RPM, the louder the compressor.

Every compressor in the range that we are looking at will have a pressure-switch that turns off the compressor when the tanks are full of air, and turns it back on when the stored air has been used up. If you manage to get the right size compressor and storage tank, the compressor will turn on only occasionally, and most of the time, the props will run (quietly) on the stored air. If you get the wrong size, the compressor motor will run all the time, and you will have a significant noise problem.

Generally, anything that can power a full-sized spray paint gun is sufficient for pneumatic props. If you get too large a compressor, it may trip the circuit breaker when it cuts in.

There are plenty arguments about which brands are better, how large is enough, and oil-sump versus oilless. We'll skip those issues for now (other than mentioning that).

You can find suitable equipment at:

- Harbor Freight Tools
- Wal-Mart
- Home Depot
- Sears
- and just about any other store that carries power tools

Note that there are different kinds of compressors, designed for different purposes. Just because a compressor only has a half-gallon tank, and is rated for 1 SCFM doesn't mean it is a bad compressor. It might be excellent for air brushes. It's just the wrong compressor to operate pneumatic props.

I suspect that most home haunters would be happy with:

- 2 HP, electric
- 4 gallon
- 5 SCFM at 90 PSI
- oil-lubricated

Such a compressor would also be capable of running most air-operated power tools.

A big commercial haunt that runs year-round would probably want a much larger compressor with a belt-driven, cast-iron, oil-lubricated pump.

Gallery of inexpensive compressors

We have composed a table of compressors, not as an exhaustive list (because any such attempt would be instantly obsolete), but as an example of what's out there. Prices are circa January 2002, in southern California.

These are all direct-drive units. Larger units tend to be belt-driven.

		power					storage	max	delivery	delivery	delivery		
make	model	source	motor	noise	type	weight	tank	pressure	@40 PSI	@90 PSI	@100 PSI	price	store
Central Pneumatic	40400	110 VAC ? Amps	2 HP 3360 RPM	? DB	oil lube	? lbs	8 gal single	115 PSI	7 CFM	5 CFM	? CFM	$	HF
Hitachi	EC12	110 VAC 15 Amps	2 HP 3450 RPM	75 DB	oil lube	60 lbs	4.3 gal twin	125 PSI	? CFM	? CFM	3.6 CFM	$247	HD
Campbell Hausfeld	FP2020	110 VAC ? Amps	? HP ? RPM	? DB	oilless	? lbs	4 gal pancake	125 PSI	? CFM	? CFM	? CFM	$139	HD
Campbell Hausfeld	WL506255AJ	110 VAC 14 Amps	3 HP 3450 RPM	? DB	oilless	62 lbs	4 gal twin	125 PSI	? CFM	6.2 CFM	? CFM	$248	HD
Campbell Hausfeld	WL6500	110 VAC ? Amps	5 HP ? RPM	? DB	oilless	? lbs	13 gal single	125 PSI	6.9 CFM	5.5 CFM	? CFM	$198	HD
Campbell Hausfeld	WL504355AJ	110 VAC 13 Amps	2 HP 1725 RPM	? DB	oilless	56 lbs	4 gal pancake	125 PSI	? CFM	3.1 CFM	? CFM	$?	HD

Campbell Hausfeld	WL505855AJ	110 VAC 13 Amps	2 HP 1725 RPM	? DB	oilless	62 lbs	4 gal twin	125 PSI	? CFM	4.3 CFM	? CFM	$?	HD

MORE COMING SOON

Compressors I have known

This is a Central Pneumatic #40400 from Harbor Freight Tools.

It is the new official compressor for use in our haunt, saving Dave from lugging his back and forth.

Locating your compressor in the haunt

Once you have your compressor, find a place to put it that is (a) close to a wall outlet and (b) far from your haunt.

It is important that the compressor be close to the outlet, because these machines take a lot of power, and ordinary extension cords aren't suitable to run them. If you have to use an extension cord, make it as short as you can get away with, and use a very heavy duty model. Remember the adage that "it is better to run hose than wire."

You want the compressor in a remote location because they tend to be noisy when they run. Count on it - repeat after me "all compresors are noisy." Whenever the pressure in the storage tank runs low, the motor will come on. Unless you can work random engine sounds into your haunt, it will be a distraction - move the compressor away. Some enterprising haunters have built housings around their compressors, with sound-deadening insulation. This isn't a bad idea, but make sure that:

- the compressor has plenty of fresh air to keep it cool
- nothing flammable touches the warm parts of the compressor
- nothing touches the moving parts of the compressor

Compressor Maintenance

A compressor is a significant investment. You can't treat it as a disposable thing. You have to take care of it.

You should read and follow the maintenance instructions that come with the compressor. Some highlights:

- If the compressor has an oil sump...

    - Make sure that the oil is always full!
    - Change the oil at the recommended interval. Unlike engine oil, the old oil in the compressor doesn't get black and nasty-looking. So you must change it based on hours of operation, not appearance of the oil.
- Drain condensed water from the air storage tank after every use.

Air tools

I'm just starting to learn about this, but so far, I know...

Different types of tools require differing amounts of air. Check the SCFM (Standard Cubic Feet per Minute) rating on the exact tool(s) you will be using.

Here's a rough list of air tool applications, sorted by increasing air requirements:

- inflation (tires, balls)
- staplers and brad nailers
- spray guns
- finishing nailers (about 2X a brad nailer)
- framing nailers and roofing nailers (about 2X a finishing nailer, 4X a brad nailer)
- screwdrivers and drills
- impact wrenches and rachets
- die grinders and air chisels
- sandblasters and sanders

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