

Why Tubes Fail.....



And what to do about them!

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Management Summary:

The purpose of this document is to explain what leads to the failure and required maintenance of pneumatic tube systems used to provide remote drive-thru service. This document then describes the technologies available that solve the problems of downtime and cost commonly found with these systems.

What you will learn:

Pneumatic tube systems are complex devices that use air as the drive medium. As a result, variables such as temperature and humidity greatly affect the workings of the equipment. Air requires that the system be sealed and any defects, even minor ones, hurt the performance of the system.

Mechanically, air is a difficult transport medium. Friction fits must be maintained air tight in order for the system to work. This friction fit must also not be so tight as to impede the carrier's move throughout the tube. This is a fine line and a source of problems. As the system operates, the friction wears the systems out and eventually requires that parts be replaced. Motors must work very hard in order to move the large volumes of air required to move carriers. Further, because of the carrier's high speed, sensors, pads and other compo-

nents are highly stressed and tend to fail faster than in other environments.

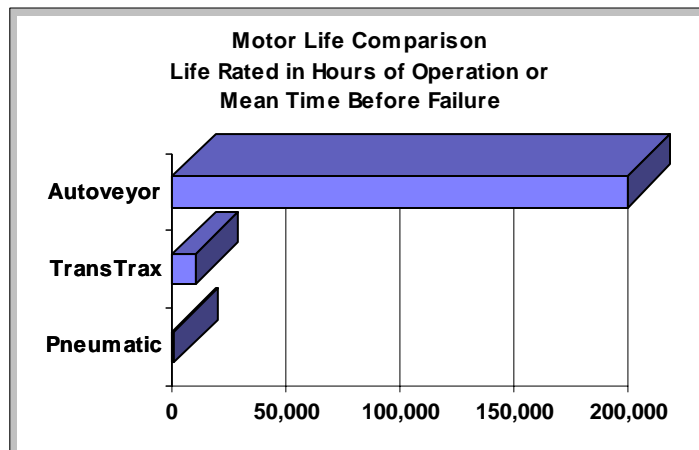
In order to price competitively, promoters of tube systems are forcing the cost of these systems lower and lower. As a result, compromises are made in selecting components and materials. These compromises lead to even quicker failures.

How does one solve all of the problems?

Rather than continue with pneumatic technology and its associated complexity, change to the technology that operates in factories around the world, positive drive conveyor systems.

To even further enhance reliability, reject the 1920's vintage relay control system and use solid state electronics. Solid state electronics do not rely on mechanical switches and relays and offer far greater reliability and longevity.

With today's technology, conveyor based systems can be sold at prices which are competitive with all but the very cheapest pneumatics. Most conveyors use today's electronic controls rather than relays. Finally, these systems offer flexibility which can be used to provide even better customer satisfaction which is not available with pneumatic tube systems.



Why Do Pneumatic Tube Systems Fail?

They use air as their drive medium...

Pneumatic tube systems use the differences in air pressure to move the carrier from one side to the other. The carrier, through the friction fit accelerator pads, bridges the difference between a high pressure area and a low pressure area. Because the density of air changes greatly with varying temperatures and humidity levels, the performance also varies. If the pneumatic cannot handle the wide swings in these environmental changes, the system fails.

Too many moving parts - all of which are critical...

Pneumatic tubes have lots of moving parts like valves, motors and solenoids. If any one of these parts fails, the entire system is down.

Not only do these parts fail as they wear out, they also fail when they are dirty, wet, cold or just worn a little. When the environment is not just right, many of these parts work intermittently.

Even parts that do not even seem important are critical. For instance, the felt or rubber rings that seal the carrier to the tube, which are called accelerator pads, must seal, or the carrier will stop, normally in the radius requiring a service call and sometimes replacement of the carrier at between \$75 and \$150 each! This is just one of the multitude of parts that must work in order for the pneumatic tube system to function. With each part added to the system, the chance for failure increases.

Demand for cheaper and cheaper systems means that compromises in parts and materials are made...

Manufacturers of pneumatic tube systems have gone from industrial turbines and stainless steel tubing to vacuum cleaner motors and plastic tubing, all in an effort to supply lower cost systems.

Because of these compromises in the materials and components used, the failure rate of tubes has increased. There has been no major improvement in tube technology in the last decade,

only a lowering of price which has increased the need for repairs and maintenance.

Sales margin on tubes is very low...profit is made on the service agreement and part sales...

Because of the cost pressures on promoters of pneumatic tubes at the time of sale, margins have been cut. Profit is now being made on service agreements and part sales.

In fact, warranties on pneumatic tubes often require that an annual service agreement be in force. These agreements are renewable annually in order to limit the risk of the seller. As a result, it is to the advantage of the pneumatic salesperson to get systems which operate fine for the period of the warranty, normally 90 days to a year, and then have it fail after the warranty period so that parts and service can be sold.

Because the margin on the sale of repair parts is high, promoters of tube systems have learned that it is worthwhile to literally give the tube system away on the initial sale and then make up the margin on the total sale through the sale of repair parts after the warranty period. Chances are that the sale of repair parts will generate more profit over the long haul than selling a reliable system at normal sales margins. First cost has become such an issue in the sales process that this strategy is now possible.

How to protect yourself from this?

In the next few pages we take you through what can be done to protect you from each of these points...

What to do about... Using Air as the drive medium...

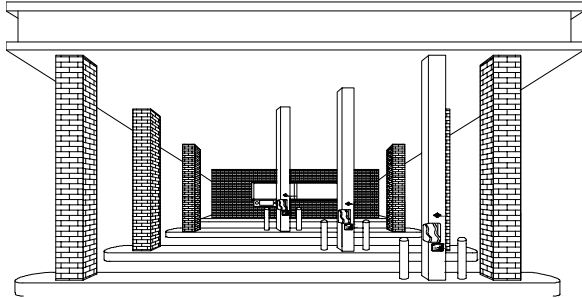
The simple answer is to not use air as the drive medium. If you want to increase reliability, you must find a "positive drive conveyor system".

Positive Drive means that there is a physical attachment between the carrier and the drive medium. For the best possible reliability, that attachment must be to a drive medium that is impacted the least by the environmental factors that affect pneumatic tubes. Historically, belts and tapes have been reliably used in other in-

dustries in applications where goods need to be moved from one place to another.

Belt Based Systems...

In everything from mining operations to production equipment to even farm equipment, belt conveyors have been the drive medium of choice. These types of systems require few moving parts; they do not require critical alignment and are simple to install and maintain.



The top of the line in belt based systems is currently the Autoveyor™ System by E. F. Bavis and Associates, Inc. This system not only provides incredible reliability over pneumatic based systems, but also offers superior ergonomics and weight carrying capacity not possible with pneumatic systems.

Tape Based Systems...

A new high tech solution to the drive medium issue is drive tape systems. The automobile industry was likely the first to make commercial success of this technology when it chose tape drives to move windows up and down and to automate the wrapping of the seat belt around the occupant. Tape drive systems have also been very successful in floppy disk drive systems where the tape drive moves the read-write head back and forth.

Again, the industry standard product that utilizes a push/pull tape drive is manufactured by E. F. Bavis and Associates, Inc. and is called the TransTrax® System. This particular system offers superior reliability over any pneumatic system, but does not compare with the weight carrying capacity or longevity of the Autoveyor™ System.

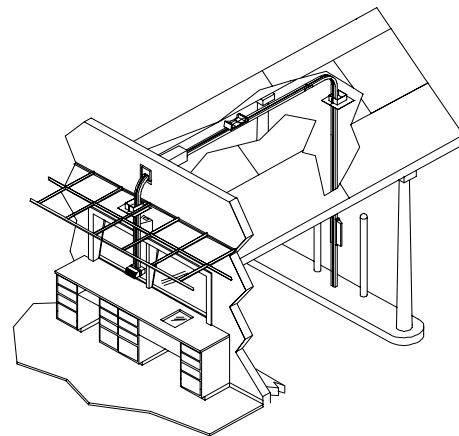
Other Alternatives...

There have been automatic electric car systems and systems that use a cable to pull a carrier

from side to side, but none of these have proven to be more reliable than the typical pneumatic.

So, the best drive systems are...

Belt based conveyors and push/pull tape conveyors have proven themselves a superior alternative to air used by pneumatics. While there have been other alternatives offered, only belt based and push/pull tape based conveyors, a.k.a. positive drive conveyors, have been a proven over time to be a superior alternative to pneumatics.



What to do about...

Too many moving parts - all of which are critical...

Again the answer is simple, find systems that do not require as many moving parts. In the case of a pneumatic tube this is difficult because all of the various air handling functions must be completed in order to move the carrier. If any of these key components of the pneumatic tube system do not operate and or do not seal, the carrier does not move. High quality components which have better wear characteristics can be added to pneumatic systems, however, this does not solve the environmental issues nor does it address what to do about dirt and condensation which also negatively affect performance.

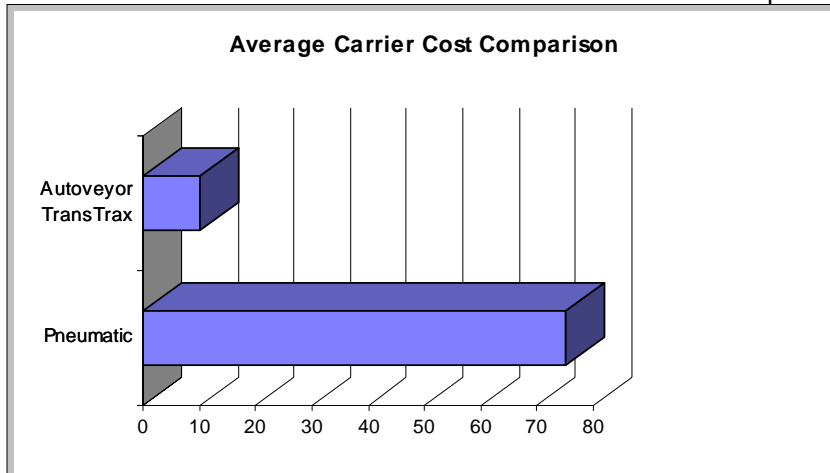
In the previous issue, the positive drive conveyors systems, the Autoveyor™ and TransTrax®, were identified as providing better drive systems. How do they stack up on moving parts?

The Autoveyor™ System...

The Autoveyor™ system consists of a motor, belts and belt rollers or pulleys. While there are a lot of pulleys in the system, these particular components are warranted for 10 years. There are four belts per vertical section. The system is designed so that it can run with one of the belts removed.

In fact, in the manufacturer's promotional video tape they demonstrated the Autoveyor™'s ability to run with 25% of the belting removed.

Since the Autoveyor™ system is a belt conveyor, it is not negatively affected by dirt as pneumatic tube systems are. Fact is, the belt conveyor is self-cleaning to a great extent.



The controls on the Autoveyor™ are all solid state electronics. Even the system that turns the 1/2 hp motor on and off is done electronically, so there are no relays or other moving parts. There are two wand switches used to detect the arrival and presence of the carrier, however, these switches are mechanically isolated from the carrier, a technique that few pneumatics use because of cost, in order to minimize wear and tear.

Warranty on the electronics, including the audio, is 5 years without the requirement for any scheduled maintenance.

The TransTrax® System...

The TransTrax® system is even simpler than the Autoveyor™. It consists of a push/pull tape, a motor and a carrier. There are only four moving parts in the entire system. The entire system

is warranted for 3 years and, like the Autoveyor™, there is no requirement for regular maintenance in order to maintain that warranty.

Like the Autoveyor™, the TransTrax® drive system is self-cleaning and, therefore, is not subject to the problems that pneumatics have with dirt.

The TransTrax® control system is microprocessor based and, therefore, is solid state with no moving parts. Even the sensors on this system are electronic and have no moving parts in them.

The TransTrax® system has been designed to provide all the functionality of a pneumatic tube and is priced competitively. It exceeds its design criteria and offers features like car and truck stopping heights for the customer, superior visibility between customer and teller and the TransTrax® does not require the cost of having power run out to the island as is required by pneumatics.

Conclusion regarding the number of moving parts...

Once again, the positive drive conveyors systems like the Autoveyor™ and the Trans-Trax® systems outshine the pneumatic tube systems in terms of the low number of parts. In addition, they offer other features like weight carrying capacity or customer car and truck stopping heights not found on tube systems.

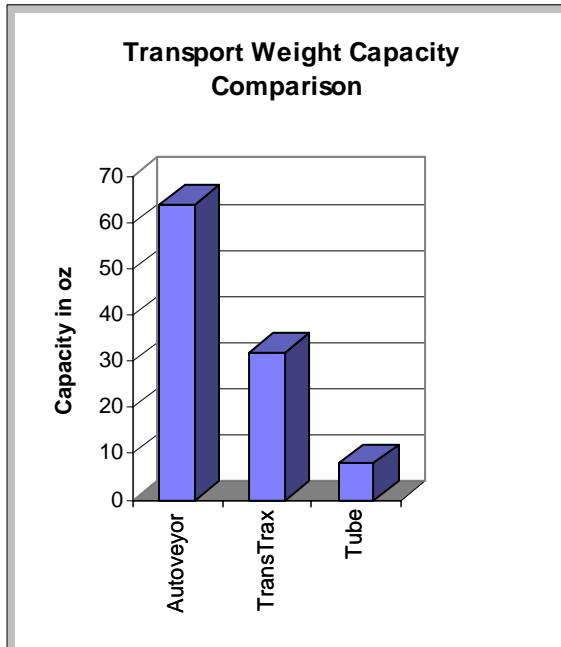
**What to do about...
Cheaper and cheaper systems that compromise the choice of parts and materials are used...**

As has been stated, the attempt to offer cheaper pneumatic systems has caused manufacturers to accept lower cost components at the expense of long term durability. Some examples of this are: consumer grade vacuum cleaner motors are now used to power the pneumatic tubes rather than commercial turbines as was used in the past, steel or plastic components have been

substituted for aluminum or stainless steel and bushings being used in place of ball bearings.

What About the Autoveyor™?

The Autoveyor™ system flies in the face of “cheaper is better”. In fact, it adheres to the philosophy that “you get what you pay for!”



The Autoveyor™ is constructed of aluminum and stainless steel as it has been since its inception back in the 1970's. It also costs more than most pneumatic tube systems today. However, each component has been refined to provide superior life and that life is backed up by very long warranties that do not even require scheduled maintenance.

There are savings though; carriers for the Autoveyor™ cost a fraction of what pneumatic carriers cost.

Motor life is another example of the quality used in the Autoveyor™. It uses a motor that has a rated life of 200,000 hours. Remember that the typical life of pneumatic tube motor is rated at only 500 hours and that there normally is a minimum of two motors per tube system.

That means that the Autoveyor™ motor has a life rated at 400 times greater than that of a pneumatic tube.

Twenty year old Autoveyors™ can be rebelted and have the paint touched up and run like new.

Today it is hard to get parts for tube systems that are more than 5 years old. Even if you could get the parts, the condition of the older tubes makes it unwise to even attempt to rebuild them.

And the TransTrax®...

The TransTrax® costs less than an Autoveyor™, but how does it compare with the pneumatic tube?

The TransTrax® system is constructed almost entirely of aluminum. Most of the critical components like the motor and electronics are all housed inside the building and are never exposed to the outside.

The electronics involved in the TransTrax® continue to improve to unheard of levels, even the customer start buttons are solid state and have no moving parts in them. The level and technology of the TransTrax® actually are improving as the volume of sales grows. The manufacturer of this product has chosen to take the increase in margin, which results from economies to scale, and put it back into making the system even better.

Motor life of the TransTrax® cannot be compared favorably to the Autoveyor™ system, but is stellar when compared to pneumatic tube motors.

The life of the TransTrax® motor is rated at 10,000 hours or 20 times the life of a typical pneumatic tube.

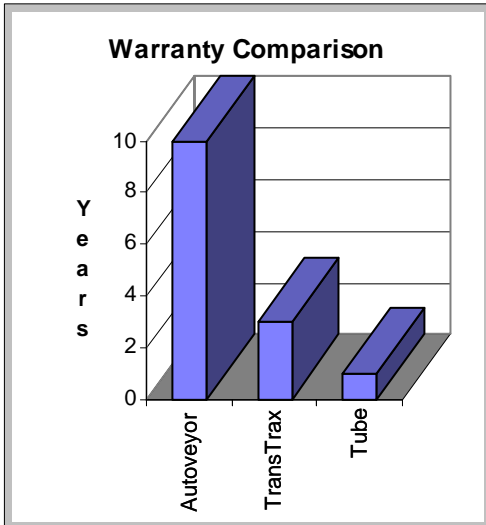
All of this and the TransTrax® is priced competitively with the pneumatic tube!

Conveyor systems are the best solution and they continue to improve!

While the pneumatic tubes spiral down in quality in order to meet some low target price, positive drive systems are taking the high road in order to offer value to their customers by investing in quality parts and parts that use the latest technology.

What to do about...

...profit is made on the service agreement and part sales...



With the low margin made on the sale of pneumatics, parts and service sales are the only way for promoters of tubes to make a reasonable profit. If one purchases a pneumatic tube, sooner or later a profit will be made on the sale of parts and/or service.

If this is unacceptable, then purchase one of the positive drive conveyors like an Autoveyor™ or a TransTrax®. These two systems are the honest alternatives that do not misrepresent themselves!

Conclusion:

Pneumatics have been around for a long time; that does not mean that they are the right choice for drive-thru service. In fact, as has been shown, the environmental factors alone assure that pneumatics will fail and require ongoing maintenance.

In order to solve the problem, operators of drive-thru service must turn to the technology used in just about every other production environment and that technology is the positive drive conveyor, like the Autoveyor™ or the TransTrax®.