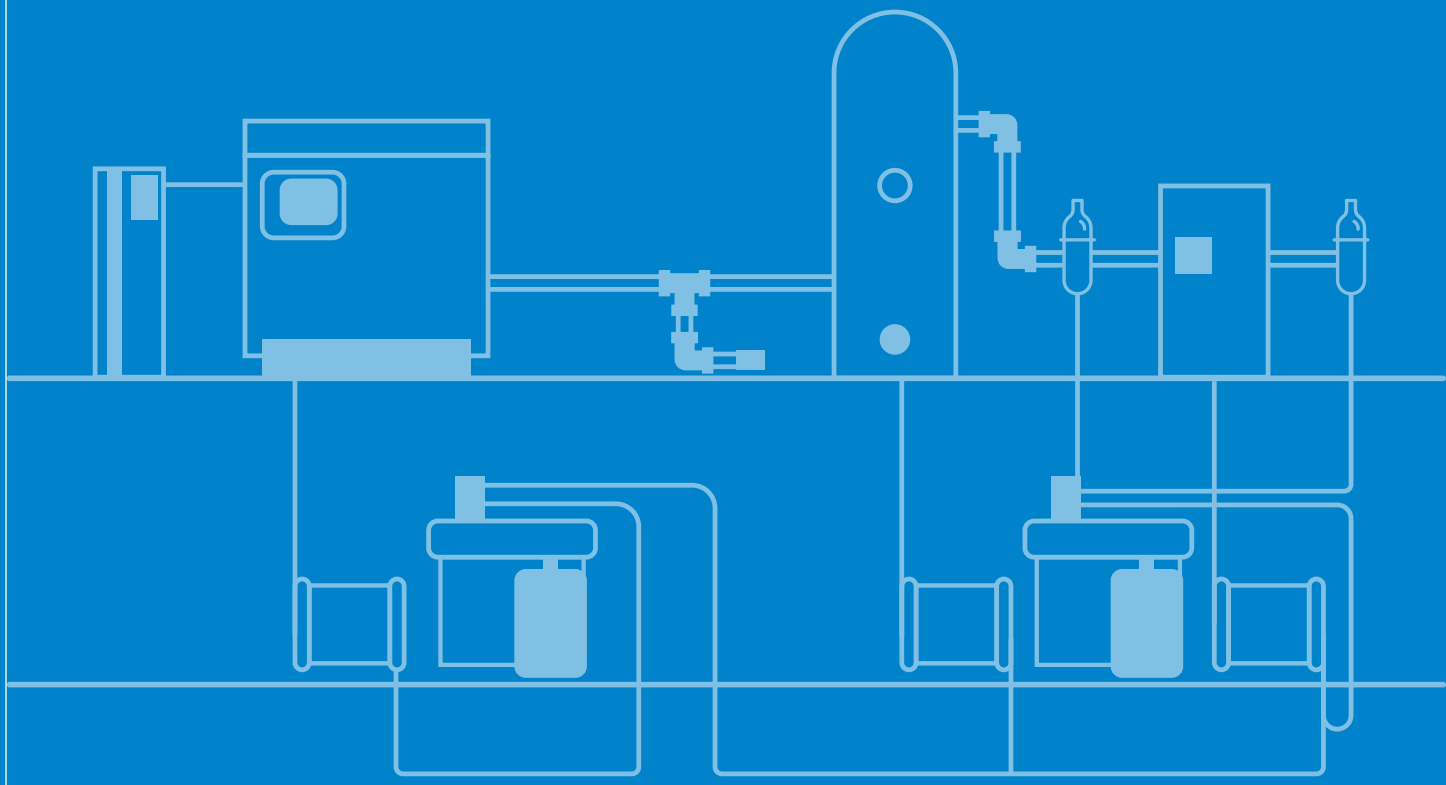
WHITE PAPER

THE IMPORTANCE OF CONDENSATE DRAINS

Understanding Proper Drain Selection

ASP Filtration Group®

PART 2



Condensate drains. These unsung heroes of a well-functioning compressed air system are oftentimes overlooked. When the right drain is in place and functioning properly, the stage is set for an optimized compressed air system.

Understanding the important role of the condensate drain is part of a larger equation. The drain is one of many variables and can help with substantial savings in operating costs. The drain must be the best choice for the system, installed properly, and rated for your system, otherwise this unsung hero will not be able to do the job to its full potential.

This paper is the second of a three-part series. The first installment addressed the comprehensive, and hidden, costs of compressed air. This installment will address the importance of proper drain selection and how it affects your overall cost of compressed air. The third and final installment will cover the safe and effective management of system condensate.

Compressed Air = Condensate = Challenges

Condensate shortens the lifespan of a compressed air system and results in the loss of productivity, and increased maintenance costs. One thing is guaranteed: when compressed air is produced, so is condensate. Because the outside air naturally contains moisture, condensate (the liquid formed by compressing the ambient moisture) is an inevitable by-product that can build up in the compressed air system.

Due to free water, condensate will shorten the life of the compressed air equipment. Compressors, much like car engines, rely on lubricating oil to protect moving parts from wear. Free water causes havoc in the system by washing away these lubricants. Some of the lubricating oil also migrates into the condensate along with scale, corrosion, metal particles and rust. This results in substantial maintenance costs, operational downtime and loss of productivity. A condensate drain removes the condensate formed to protect the compressed air system. Without one in place and operating properly, contaminants are guaranteed to collect in the system and cause havoc.

Not all Drains are the Same

There are a variety of condensate drains available to handle the many variables that accompany a compressed air system, such as different configurations, capabilities, ages and workload. Due to the direct impact on a system including the operational costs, choosing the right drain for your application is important.

It is well understood that proper drain sizing and selection will help to minimize the loss of compressed air. [For more information on the cost of lost compressed air, refer to the first paper of this three-part series, 'The Cost of Compressed Air', which can be downloaded by going to AirSysPro.com.] Drains can be installed on an intercooler, aftercooler, filter, dryer, receiver, drip leg, or at the point of use. They are available in a variety of types and fall into two primary categories: Timer Drains and Demand Drains (commonly referred to as Zero Loss or No Loss). Timer Drains are set to discharge at predetermined intervals. No Loss Drains will collect condensate and discharge when the reservoir is full.

Selecting the proper drain is of utmost importance - the wrong drain can result in wasted air, increased demand on employees who must maintain faulty equipment, and a loss of revenue. In order to have a fully optimized and cost-effective system there are a number of key variables to consider:

Ambient Conditions & Compressor Size

determine the amount of condensate generated. More condensate will require additional capacity on the drain output. Most manufacturers offer a tool to assist in selecting the appropriately sized drain for your application.

Seasonal Variations & Ambient Environment

cause temperature and humidity fluctuations in the ambient environment and these fluctuations need to be considered when selecting a condensate drain. Even the most temperate climate will experience significant differences in temperature and humidity variations and affect the volume of condensate. For example, a dry climate will generate lower amounts of condensate than a humid climate.

Level of Contaminants

can be a challenge to predict, yet most operators understand if their systems have low or heavy levels of contaminants. If a drain is not capable of handling the levels of contamination, they can clog. Misunderstanding a drain's capacity to affectively handle contaminants, can be costly.

System Pressure

will also have a bearing on the type of drain design selected. If there's too much or not enough pressure, the drain may not operate as planned. Some systems require specialty systems to handle vacuum applications. While most air systems operate at a positive pressure, there are negative pressure or vacuum systems that have to control condensate. Variants of zero loss drains are specially designed for such applications.

A full understanding of your operating conditions is essential. In addition to the ambient air, some environments are exposed to heavily corrosive elements which may damage standard materials. When operating in highly corrosive environments, stainless steel components are able to withstand harsh elements and will not break down.

Not all environments have available power, such as the case in mobile applications, and in these circumstances a pneumatically driven drain might be required.

Location, Location, Location & Installation

Location
Condensate drains may be required at several points in your compressed air system. The amount of condensate may vary after different system components (i.e., compressors, receivers, and dryers), and it is important to remove this moisture at more than one location.

Avoid Trapped Condensate
The drain needs to be installed below the source of condensate. This ensures that the condensate does not collect and pool in unwanted locations. If you are attaching the drain to a drip leg, make sure drip legs are properly sized.

Avoid Air-locking
Undersized piping can cause the drain line to become blocked, known as air-locking. A properly sized balance line will prevent this from happening.

A Single Drain on Multiple Drain Points
It may be tempting to run two or more drain points to one drain. However, it is likely that there are different pressures at these points. Air and condensate will take the path of least resistance. Multiple drain points may bypass one or more operations resulting in condensate downstream and potential failure.

Allow Headroom for Connection Paths
Top, side, and bottom inlets are available on some drains so you must consider the orientation of your drain installation.

Physical Space
You must allocate space for the drain to be installed and connected.

Timer Drains: ‘They’re Not All Equal’

The most basic way to remove condensate is to use a manual valve that is opened periodically, perhaps once a day. This, however, can place an increased demand on employees who would need to manually open the valve which is not ideal.

Relatively inexpensive and easy to install, timer operated drains can be reliable, cost-effective solutions in certain situations. Due to the lower price point, timer drains are appropriate in smaller systems where the condensate generated is low and the investment of a more costly zero loss drain may not be justifiable.

However, as convenient and inexpensive as timer drains can seem, they have limitations. Timer drains are unable to adjust to operating conditions and cannot effectively manage surges of condensate. These drains come with adjustable discharge timing options. Preventative maintenance includes pressing a ‘test’ button to check its operation, making sure it is plugged in and, if required due to the valve design, cleaning the inlet strainer. And, because adjusting timer drains constantly is neither practical nor cost-effective, intervals and durations are typically set for worst-case conditions which can lead to unnecessary air loss during excessive drain opening and increased operational costs.

We get what we pay for. It is important to remember that not all timer drains are equal. Timer drains are appropriate in some situations, but they do not have the capacity to detect condensate. They can open too frequently or not frequently enough, and this can result in wasting air and/or a buildup of condensate which results in a loss of system capacity.

A TIMER DRAIN MAY BE THE BEST CHOICE IF:

- The operating system has a small capacity, less than 25 SCFM
- The cost of a higher-performing drain cost more than the system
- Consistent, preventative maintenance and servicing is not an obstacle
- The ambient environment is not corrosive
- The system is free from scale and corrosion

No Loss or Zero Loss Drains: ‘The Smart Kid’

Intelligent by design, zero loss drains filter collected condensate without venting compressed air and automatically monitor ambient conditions and system fluctuations. This means that in regions subject to distinct seasonal variations or fluctuations in temperature and humidity, little condensate will be generated in cooler months compared to the amount generated in humid, summer weather. Zero loss drains discharge condensate on-demand and are therefore ideal for environments with fluctuations. In circumstances with extremely cold weather, some types of zero loss drains require an optional heating element to prevent freezing.

Zero loss drains have become increasingly popular not only for their precision functionality, but also for their energy efficiency. Due to increased efforts to eliminate wasted air and create more energy efficient systems, manufacturers are recognizing the improved energy savings of these reliable drain options.

In most cases, a zero loss drain will pay for itself within 12 months of purchase. In many cases, customers realize the return on investment much sooner. Initially, a zero loss drain is likely to be more expensive than other drains, yet the value they deliver typically makes the higher price the least costly and most effective choice.

‘Seeing is Believing’

Because zero loss drains actively control the amount of condensate, they are more effective. Some fully automatic, zero loss drains have a translucent reservoir to give visual assurance of its functionality. This translucent vessel allows the operator to see the amount of condensate is in the drain. This ‘seeing is believing’ option proves to be exceptionally valuable over time.

There are a variety of zero loss drains including those that require electricity and/or air (commonly referred to as pneumatic drains). Some do not require any additional input to operate and each have their respective pro’s and con’s. Common to all types, these drains do not allow for the loss of plant air when firing which helps a facility save operating costs.

A ZERO LOSS DRAIN MAY BE THE BEST CHOICE IF:

- The ambient conditions and size of a compressor generate a lot of condensate
- The requirement for air quality is essential
- There are limited maintenance resources
- A facility is wasting too much compressed air
- Controlling the Total Cost of Operation (TCO) is important

Conclusion: The Drain Game

Condensate Drains are valuable components of a complete compressed air system. While responsible for much of the success of an optimized system, condensate drains are rarely given adequate consideration. In fact, properly placed, well-operating drains play an integral role for facilities to successfully operate optimized systems that help to reduce energy consumption and save money.

Compressed air systems vary, as do ambient conditions. With all the variables at play, selecting the best drain for your system can be challenging - but it doesn't have to be. By examining the benefits, the costs, and your return on investment, the decision becomes easier.

Taking into consideration your ambient environment, the range of variables that apply to your facility, and the amount of wasted money in lost compresed air, will help you to determine the best-suited drains.

According to the U.S. Department of Energy, up to 50% of all compressed air generated for the manufacturing floor is lost to leaks, artificial demand and inappropriate use. With increased focus on energy consumption and the demand for energy-efficient systems, selecting the proper drain is even more critical.

Less expensive drains are appropriate in some situations. However, what may initially appear to be the more expensive solution, zero loss drains often have a lower Total Cost of Ownership (TCO) and provide a relatively short payback.

Drain Selector Guide

Compressor Size (CFM or HP)

☐ The larger the compressor the more condensate you can expect

Compressor Volume

☐ Location	Depending on the location of the drain the amount of condensate varies. After-coolers and air receivers typically generate more condensate than a dryer or drip leg.		
☐ Environment	The volume of condensate produced depends on		
	☐	Ambient Temperature	Hot air has a higher moisture content. When the area is compressed, the moisture is compressed into water vapor (condensate)
	☐	Relative Humidity	A higher relative humidity contains more moisture and will yield more condensate.

Operating Pressure

☐ Drains are typically designed with a maximum operating pressure of 200-250 PSI. Some systems require drains that are designed for higher pressures.

Levels of Contamination and Valve Design

☐ The amount of contamination present in the condensate will impact the operation of a drain. A straight-through valve design is often recommended to handle a variety of contaminants.

Hazardous and/or Corrosive Environments

☐ The environment where the drain is positioned may dictate the need for a robust material or construction. In corrosive or hazardous environments, a stainless steel drain and/or a NEMA-rated housing may be required.

Vacuum Systems

☐ Vacuum systems operate at a negative pressure and require a unique design. This design ensures the drain reservoir is isolated, so the condensate is expelled and not pulled into the vacuum system.

Availability of the Appropriate Utility to Operate the Drain (Electric or Pneumatic)

☐ Most timer drains operate with electricity and require a power outlet. For zero loss drains, there are fully pneumatic options available that either use system pressure (i.e. internally operated pneumatic drain) or control air (i.e. externally operated pneumatic drain) to open the valve.

Proper Size and Type of Connection

☐ The connection size and type must match the drain point. Careful attention must be paid to ensure the volume of condensate passes without restriction.

Visual Check or Alarm

☐ A translucent housing or alarm system may be necessary for a visual indication that the drain is functioning properly.

Special Vendor Considerations

☐ Customer support, warranties and local energy-consumption incentives can potentially save costs.

Visit AirSysPro.com
FOR THE SELECTOR GUIDE

A CLOSER LOOK
TIMER DRAIN VS ZERO LOSS DRAIN

A Tier-2 automotive supplier located in the Midwest United States

This automotive supplier was using a standard timer drain on the dryer of a 100HP compressed air system. The drain worked well throughout the winter months when the ambient air was drier. However, during the humid summer months, they experienced an increase in system problems due to condensate. After consulting with their compressed air dealer, they received the diagnosis: the timer drain was not staying open long enough to effectively evacuate the periodic increases in condensate.

They had two options: discharge for a longer period of time or consider transitioning to a zero loss drain.

Option 1

Opening the value from 5 seconds to 10 seconds every hour would eliminate the increased amount of condensate. If they chose this option, they calculated the total amount of lost compressed air over the year would cost **$500**.

Option 2

The transition from a timer drain to a zero loss drain would have a total cost, including installation, of **$350**.

Decision

The automotive supplier invested in the zero loss drain. Because the zero loss drain was able to clear its reservoir as needed, the condensate was completely eliminated and the drain operated effectively. And, no additional maintenance was required. **The new drain paid for itself in 8 months.**

FOR MORE INFORMATION

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With more than 30 years of industrial experience, Bill has managed processes on individual and group levels to improve and optimize operations, including implementing engineering processes and enhancing revenue streams. Currently, he is responsible for overseeing operations at ASP, a company recognized as the best in condensate management. ASP is an integral part of Filtration Group, the world's fastest growing filtration organization. Bill holds a BSChE and an MBA from the University at Buffalo and is a senior member of ASQ.

About ASP

Air System Products (ASP) is a leading designer and manufacturer of condensate management products, including condensate drains and oil-water separators for the air and gas compressor market. Since 1981, ASP has developed efficient, reliable, and cost-effective products and systems for industries that use compressed air. ASP products exceed stringent environmental regulations that apply to condensate for a global customer base. ASP's innovation, condensate management, and service are regarded to be the best in the industry.

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