Clean = Green

Condensate treatment reduces disposal costs and helps facilities meet tough environmental regulations

By Scott Norton

Consumers want to buy from environmentally responsible businesses, as illustrated by the ever-increasing number of companies seeking the relatively new ISO 14001 certification. Virtually every industry segment currently is trying to reduce water pollution. In compressed air applications, condensate treatment, although sometimes overlooked, is becoming increasingly important.

The need for treatment

Regulations related to the amount of oil allowed in wastewater vary by location. Allowable oil concentrations can range from 100 parts per million (ppm) down to only 10 ppm.

All air compressors produce condensate, which contains varying levels of oil and contaminants. Even oil-free compressors draw in hydrocarbon vapors, which are compressed and entrained into the condensate. Oil-free compressors also produce an acidic condensate that must be treated before it is drained into the sewer system.

Because all compressors produce contaminated condensate, chemical plants and other industrial facilities should routinely treat the condensate. To promote condensate treatment, many air compressor companies now offer condensate treatment systems as part of a complete compressor package. A 25-horsepower (hp) compressor can produce more than 20 gallons of contaminated condensate a day; therefore, disposal costs for untreated condensate can be significant.

Condensate management systems come in a variety of sizes.

The bulk volume of contaminated condensate is water. By separating and removing the oil, facilities can discharge the clean water into virtually any drain. The remaining waste oil then can be collected and disposed of in a responsible and economical manner.

Proper condensate management also protects the environment. The initial cost of a treatment system represents only a fraction of the potential fine assessment that could be imposed if untreated condensate is dumped into a public sewer.

The need to treat condensate is clear, but the selection of the best treatment method for the application can be a challenge. This article takes a look at some treatment options.

Treatment system options

The three primary types of condensate treatment systems are gravity-type, heated and membrane oil-water separator designs. To determine which type of condensate treatment system will work best for your application, you first must identify the type of oil used in the system.

Different types of oils have different emulsion properties. An emulsion is basically one liquid dispersed into another liquid — in this case, oil into water. Stable emulsions require special processing such as the use of heat to evaporate the water from the oil.

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Other important factors are temperature, humidity and the operating environment, as are the types of compressors and condensate drains used. The drain will determine how much and how quickly the condensate will be delivered to the treatment system. More importantly, some less expensive "electric-timed" drains can "stir" the oil and water mixture as it is discharged from the drain, causing the emulsion to become more stable.

Gravity-type systems use the natural tendency of oil and water to separate. They work best with oils that separate from water easily (synthetic and semi-synthetic oils are good examples). These systems require time for the oil to separate from the water and float to the top. See the figure.

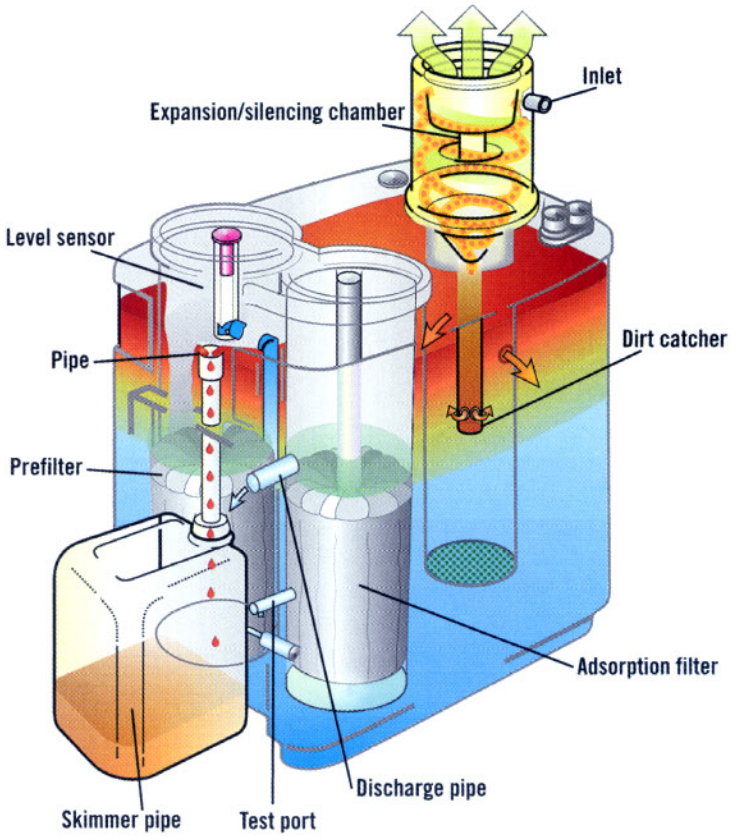
The condensate is fed under pressure directly to the inlet and expansion/silencing chamber, where condensate is separated from the air. The condensate then flows through the dirt catcher and into the settling tank, where the oil rises to the surface. The partially clean water passes through a pipe and through a prefilter. A level sensor measures the degree of contamination. The condensate then flows into the adsorption filter, where the remaining oil content is removed. The clean water flows out via the discharge pipe. The separated oil is collected in a special canister via the skimmer pipe. Water quality can be checked easily from a test port.

Heated systems use heat to turn the water into steam and evaporate from the oil. The condensate is collected in a container or vat. A heated coil is used basically to "boil" away the water, and the resulting steam is vented away. The oil is then collected and disposed of properly.

They are used for stable emulsions or difficult separations. Although these systems require a significant amount of electricity for heater operation, they offer a compliance solution to more difficult separations.

Membrane systems are yet another alternative and are ideally suited to applications in which the oil content in the wastewater must be lower than the standard allowable limit of 20 ppm. Condensate is pumped into the membrane, where it passes through capillaries that separate the oil from the water. The water molecules are small enough to pass through the capillaries, but the bigger oil molecules are trapped, captured and collected for disposal.

Gravity-type System



Treatment trends

The condensate treatment system is usually the last piece of the air system considered. In addition, when it is used, it often is not properly maintained or serviced. Lack of maintenance can lead to clogged filters or membranes and render the system useless.

End-users are looking for treatment systems that do not require frequent attention or maintenance and will provide predictable performance under varying operating conditions. Some companies now are offering simple, disposable systems. Manufacturers today also are looking for ways to make condensate treatment systems more convenient, cleaner and less expensive. The user simply removes a sealed cartridge, disposes of it at a waste oil collection facility and then replaces it with a clean, fresh cartridge.

In this type of disposable system, filter cartridges are designed to operate for a predetermined service life — for example, six months — based on the horsepower rating and the cubic-feet-per-minute flow of a specific compressor.

As concerns about the environment continue, you can expect manufacturers to develop increasingly improved ways to treat condensate. Emerging filter media and treatment methods now are being developed that will make condensate treatment easier, less expensive and — above all — cleaner. **CP**

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