The Air Conditioning, Heating and Refrigeration NEWS

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Interim phaseouts of HCFCs to be discussed in Copenhagen — page 38

ALLIANCE WARNS CONTRACTORS ABOUT TOUGH EPA ENFORCEMENT

by Thomas A. Mahoney

INDIAN WELLS, Calif. — Service contractors will need to familiarize themselves with the refrigerant recovery-recycling rules — or else.

"EPA is serious about it. They've decided to enforce even though the regulations aren't out yet."

"Your life has changed," said James Wolf, chairman of the Alliance for Responsible CFC Policy, who spoke at the annual meeting of the Mechanical Service Contractors Association.

Service contractors should brace themselves for an aggressive enforcement blitz by the Environmental Protection Agency, he said. Government enforcers will be "in your equipment rooms."

EPA has been getting calls daily about service technicians illegally venting refrigerant, and will start prosecuting violators and "setting some examples," he said.

"EPA is serious about it. They promised to come down hard; they'll start sending the troops out. They've decided to enforce the no-vent rule even though the regulations aren't out yet."

He paraphrased a comment from EPA's Eileen Claussen, who spoke at a national CFC conference in Washington recently. She promised to publicize the first violations. She said EPA will go after small contractors as well as large ones.

Wolf

"The EPA is taking a basket approach to enforcement," Wolf said. "You will need to keep good records, and leave a good paper trail. You'll have to make sure you can account for any refrigerants you purchase and any that you billed out.

"Don't lose any of it, just in case they ask to see your records. If you bought 5,000 lb and you only billed out 1,000 lb, where did the other 4,000 lb go? Did you blow it?"

In another enforcement action, EPA and the Occupational Safety and Health Administration (OSHA) have an agreement that will allow OSHA building inspections to ensure that refrigerant

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Energy bill to mandate efficiency, conservation

WASHINGTON — The omnibus energy bill passed by Congress this month will affect every part of the heating-cooling industry — contractors, distributors, manufacturers, utilities, and equipment owners.

President Bush is expected to sign the legislation, which has wide ramifications for gas and electric utilities, automobiles, oil drilling, and nuclear waste.

Enactment of new national efficiency standards for commercial heating-cooling equipment that preempt state and local regulations is "solid accomplishment with many long-term benefits for industry and consumers," according to Arnold W. Braswell, president of the Air-Conditioning and Refrigeration Institute (ARI).

The bill includes the first statutory provision for establishment of efficiency standards at the 1992 levels in ASHRAE/IES Standard 90.1.

"State and local regulations exceeding ASHRAE/IES Standard 90.1 will be preempted after the federal standards go into effect," said Braswell. This will eliminate the possibility of crazy-quilt, patchwork regulations which would be impossible for manufacturers, and confusing and difficult for equipment users."

The law covers unitary commercial air conditioning and heating products up to 240,000 Btuh (cooling capacity); packaged terminal air conditioners and heat pumps; water-source heat pumps covered by ARI Standard 320-86 up to 240,000 Btuh (cooling capacity); certain warm-air furnaces, including combination warm-air furnace/electric air conditioning units; packaged boilers; storage water heaters; instantaneous water heaters; and unfired hot water storage tanks.

The initial federal standards go into effect in 1994 and are based on Standard 90.1. Standards for products below 135,000 Btuh go into effect Jan. 1, 1994, and for products 135,000 to 240,000 Btuh on Jan. 1, 1995. Future revisions by ASHRAE will be adopted by the Department of Energy (DOE) as revised federal standards.

Higher CFC taxes

The bill also includes provisions for raising the CFC excise tax.

The new tax base amount will be $3.35/lb in 1993, $4.35 in 1994, and $5.35 in 1995. After 1995, the base tax amount will increase by 45¢/lb per year, as under present law. The bill does not tax HCFCs.

Here is a brief summary of some of the bill's major provisions affect-

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MAILING LABEL

IAQ AND HVAC

Some major problems and a practical remedy

by Warren Trent

Among the many potential sources of indoor air pollution, one particular source is almost always present: the hvac system.

According to some IAQ experts,

VENTILATION & INDOOR AIR QUALITY

the hvac system may be a major contributor to indoor air contamination. The culprit is condensate — the moisture precipitated inside the air conditioning system.

In this cool environment, any condensate-wetted surface becomes a fertile bed for the growth and proliferation of polluting organisms.

In systems that are properly designed, installed, and maintained, condensate is confined to the cooling coil and condensate drip pan. In such cases, polluting effects are minimal.

Unfortunately, too few systems meet these criteria.

As a result, condensate often finds its way onto inside surfaces throughout the hvac system. There it promotes the growth of bacteria, fungi, and viruses that pollute the system and degrade indoor air quality.

All hvac systems have the potential to generate indoor air contamination. Some systems are worse than others.

Relative to their potential to affect indoor air quality, there are two basic types of systems: the "blow-through" and the "draw-through" (also called "pull-through").

The draw-through system is the greatest offender; it is estimated that there are more than 10 million of these systems operating nationwide.

Thus, the focus here is on defining the problems inherent in the draw-through system, and offering a plausible solution.

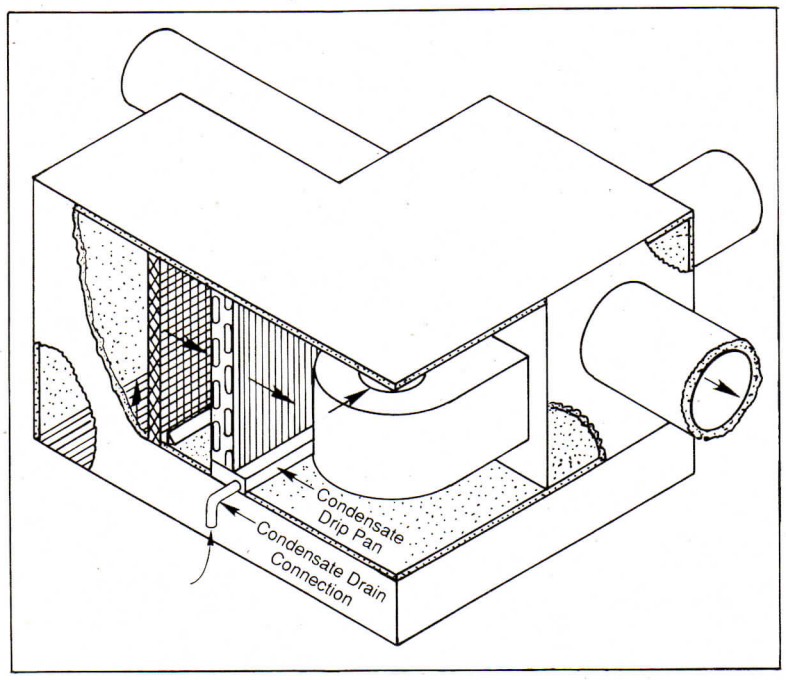

FIGURE 1 — Draw-through hvac unit.

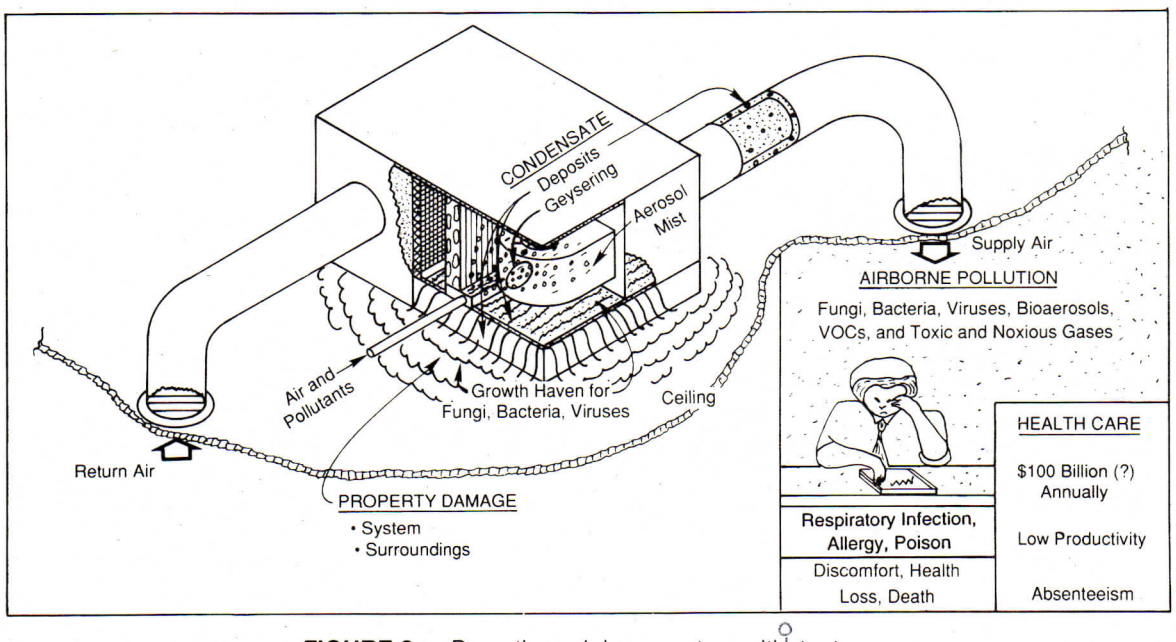

FIGURE 2 — Draw-through hvac system without a trap.

Problems

In the draw-through hvac system, air is drawn through the cooling coil by the blower, thus creating a negative pressure in the region of the condensate drip pan (see Figure 1).

This negative pressure produces two conditions that can result in indoor air pollution. It can:

1. Effect the ingestion of air and other gases from outside the system; and

2. Impede, or even prevent, the flow of condensate from the system.

In an effort to cope with the adverse conditions created by draw-through type units, equipment manufacturers generally recommend that a condensate trap be installed in the drain pipe.

When a condensate trap is in place, filled with water and functioning properly, it provides an adequate seal and prevents the ingestion of air and other gases.

Condensate collected in the condensate drip pan is discharged through the trap; no disturbance to the flow occurs. Under these conditions, the internal components of the system remain dry and clean, and there is little threat in terms of human health.

It has been estimated that, nationwide, the annual cost of health care resulting from indoor air contamination is well into the billions of dollars.

Unfortunately, it is difficult to maintain traps in a properly functioning condition. For this reason, many — perhaps most — systems now in use are operating without traps, or with traps that are dysfunctional.

This is the crux of the problem.

The consequences of operating a draw-through system without a trap (or a seal) to protect against ingestion of air and other gases (Figure 2) are summarized as follows:

- Toxic and noxious gases may be ingested into the hvac system and distributed into the conditioned space, where they pose a threat to human health.
- Air and other gases ingested during the cooling operation also can entrain condensate and produce a geysering effect that propels condensate into the air conditioning unit and ductwork.

Spread in this manner, condensate not only causes damage to the hvac system, but creates a fertile place for the growth of bacteria, fungi, and viruses.

Transported to the conditioned space by the air handler, these organisms pose a serious health threat to all building occupants.

- Air and other gases ingested during the cooling operation also can produce an aerosol mist — the mechanism for spreading legionella pneumophila (Legionnaires' Disease bacteria).
- Negative pressure inside the air conditioning unit greater than the depth of the condensate drip pan — not an uncommon condition — will cause condensate to overflow into the unit.

Spread in this manner, the condensate creates a favorable environment for the growth of various health-threatening organisms.

The extent of property damage caused when an hvac system is operated with a missing or dysfunctional trap, is also readily apparent from Figure 2.

Cases

Information from numerous service personnel, contractors, equipment manufacturers, and hvac end-users, combined with my own observations, clearly shows that far too many draw-through systems are operating without functioning condensate traps (or seals).

As a consequence, few draw-through systems are adequately protected against the ingestion of air and other gases from outside.

I have examined hvac systems in four commercial and public buildings in the East Texas area.

One, a commercial building, was approximately seven years old. At the time there were 18 rooftop units; the traps of 12 had been disconnected.

The second case was a public building accommodating hundreds of occupants daily. This particular building makes use of more than 100 hvac draw-through units, most of which are of the rooftop type.

It is difficult to maintain traps in a properly functioning condition. For this reason, many — perhaps most — systems now in use are operating without traps, or with traps that are dysfunctional.

More than 100 of the units were operating without traps. Inspection of the various units revealed conditions inside the units varying from very damp and dirty, to soaking wet and dirty.

The third and fourth buildings were also public buildings. Inside and on top of these structures, were air handlers and rooftop units of capacities ranging from five to 50 tons.

All the units were operating with traps open at their tops.

Service persons in this area have stated that the conditions I observed are not unusual but, in fact, typical.

Why no traps?

There are numerous reasons why so many hvac draw-through units are operating with dysfunctional traps, or none at all:

- Traps may not be installed initially, because national codes do not require that a condensate trap — or any other sealing device — be installed on hvac systems.

Also, the installation cost goes up when a trap is added.

- Traps are frequently removed by service and maintenance personnel when they become blocked and cause overflow. This is apparently done to reduce service and maintenance work.

Service reports indicate that traps typically become blocked every two to three years.

- Traps are often left open at the top, evidently to facilitate the removal of algae and debris. In these cases, the trap serves no useful function, and causes the same problems as a missing trap.
- Traps are frequently emptied by evaporation during the winter

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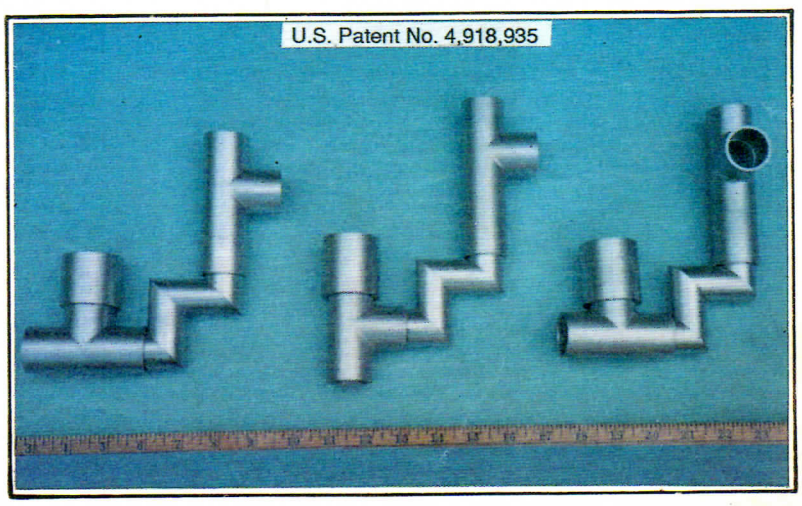

FIGURE 3 — "CosTguarD" device for hvac systems.

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months, when no condensate flows. Hence, during start-up at the beginning of the cooling season, the dry trap causes the same problem as a missing trap.

Also, during late winter (when the trap becomes dry), it may allow the ingestion of toxic gases.

- The geysering effect and the aerosol mist generated by an hvac unit operating without a trap, cannot be seen by service and maintenance personnel.

Condensate flowing from the drain pipe is often enough to convince the service person that the system is operating properly.

It has been estimated that, nationwide, the annual cost of health care resulting from indoor air contamination is well into the billions of dollars.

In an effort to cope with the adverse conditions created by draw-through type units, equipment manufacturers generally recommend that a condensate trap be installed in the drain pipe.

Additional costs in terms of productivity, absenteeism, and litigation may be even greater.

A considerable percentage of these costs can be attributed to missing or dysfunctional condensate traps (or seals). In addition, it is estimated that the annual cost in property damage, plus the added service and maintenance cost associated with missing and dysfunctional traps, approaches one billion dollars.

In view of the above, finding a reliable seal against the ingestion of air and other gases, and thereby eliminating the above health threats and related costs, would appear to demand a serious effort by everyone involved in the hvac field.

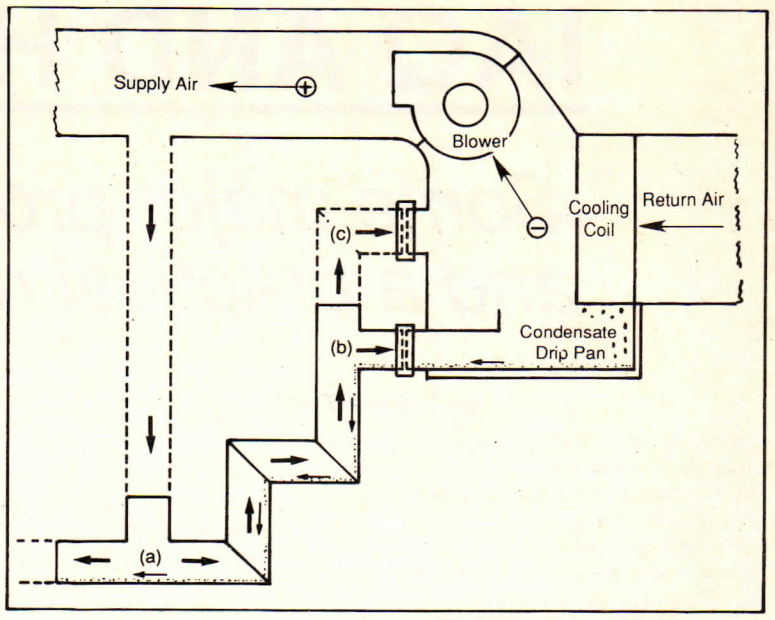

FIGURE 4 — Operating principles.

A remedy

I have invented and patented a simple device which, if used properly, will provide protection against undue cost in terms of health care, absenteeism, low productivity, litigation, and property damage.

For this reason, it is identified as the "CosTguarD" device for hvac systems.

This particular device, about the size of a conventional condensate trap, is constructed of polyvinyl chloride, treated to resist deterioration in sunlight.

Other materials can of course be used. In this configuration, the device consists of four parts to allow flexibility in installation. The photograph shows three of many possible arrangements.

The device was designed to perform the function of a condensate trap (serve as a shield against ingestion).

Specifically, the device:

- Prevents the ingestion of polluted air from the condensate disposal place, during cooling and heating operations;
- Effects a reduction in the growth of bacteria, fungi, and viruses inside the air conditioning

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unit, by preventing geysering of condensate into the system;

- Prevents the generation of aerosol mist;
- Eliminates trap blockage and related condensate overflow;
- Prevents condensate overflow from negative pressure; and
- Precludes damage from freezing temperatures.

How it works

The device has no moving parts, and is self-regulating. Figure 4 shows how it provides a seal against air and gas ingestion.

During cooling and heating operations, ingestion of air or polluted gases and the geysering of condensate into the hvac are prevented as follows:

- Fresh air from the positive pressure side of the blower is supplied to point (a) at a pressure slightly above atmospheric. At this pressure, some air flows away from the air conditioning unit, thus preventing ingestion of air from outside the system.

Simultaneously, a portion of the fresh air returns to the air conditioning unit, passing through points (b) and (c). The quantity of air returned to the unit is minimized by the high pressure loss induced by the mitered elbows.

This pressure loss, plus the bypass connected at point (c), assures that the velocity of air entering the condensate drip pan will produce neither geysering nor an aerosol mist, even at high negative pressures.

Condensate not only causes damage to the hvac system, but creates a fertile place for the growth of bacteria, fungi, and viruses.

Condensate flows through the device without being trapped. Hence, the potential for flow blockage and condensate freeze-up is nil.

Range of operation

The device performs satisfactorily over the following operating conditions:

- Unit size up to 20 tons capacity;
- Up to 1.5 in. wc negative pressure at the condensate drain.

This range of operation is adequate to accommodate most draw-through systems. However, the principles are applicable to any size unit. Prototype units have been demonstrated at -4.4 in. wc. Higher values are of course possible.

The device can be installed either external or internal to the hvac unit. Figure 5 illustrates each of the two types of installation.

An external installation of the device on a rooftop-type unit is illustrated at the left of the chart. For this type unit, where ready access is provided, installation takes about 15 minutes.

Internal installation of the device in most existing hvac units is not feasible. However, there should be little or no installation problem if the device is included in the original design. The figure at right illustrates an internal installation.

Test results

As of August 1992, more than 30 of these devices had been installed in operating systems.

There have been no operational problems. Two devices have operated equally successfully for almost three years. Recent inspections revealed no debris accumulation inside either.

Indoor air pollution is currently being recognized as one of the most serious environmental problems facing our country.

A percentage of its related costs can be attributed directly to missing or dysfunctional condensate traps (or seals) on draw-through type hvac systems.

Whether the device described in this article, or another equally effective, is used to eliminate air and gas ingestion by draw-through type hvac units is unimportant.

What is vitally important, how-

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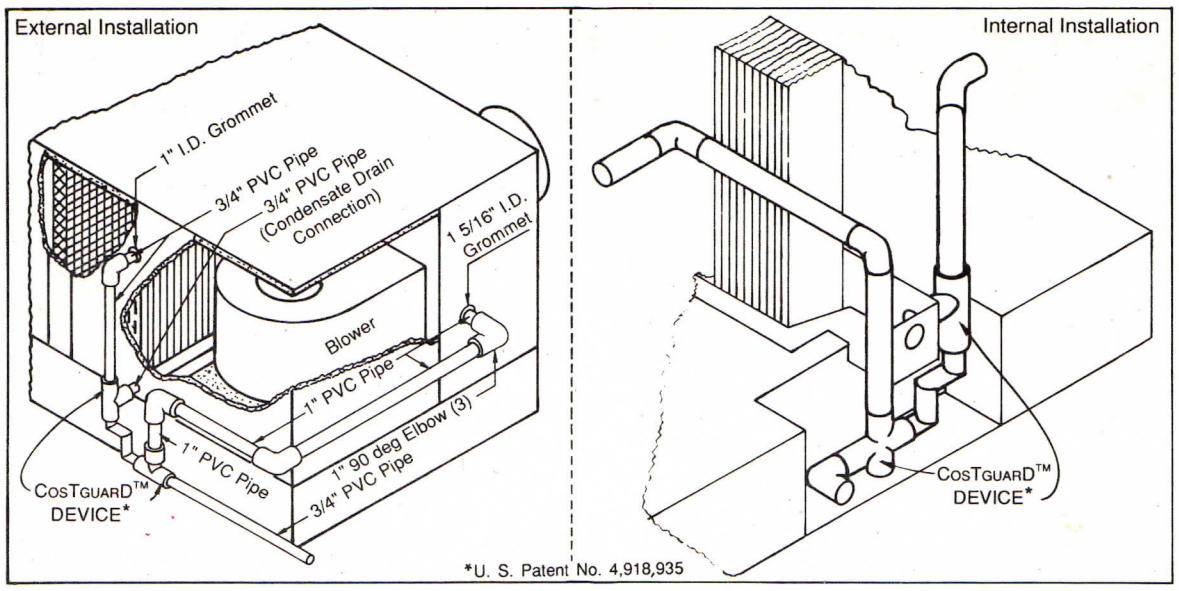

FIGURE 5 — Installation illustrations.

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ever, is that the industry move expeditiously to protect the public against health threats posed by missing and dysfunctional condensate traps.

The prudent next step might well be the enactment of a code requiring all hvac systems to include a device for effectively sealing and protecting units against the ingestion of outside air and other gases, and the spreading of contaminated condensate into conditioned space.

Indoor air pollution is currently being recognized as one of the most serious environmental problems facing our country.

If nothing is done about this problem, we may soon find the public echoing the lamentation of the Mayor in Robert Browning's The Pied Piper of Hamelin: "Oh for a trap, A trap, A trap!"

Among his accomplishments, Warren C. Trent has had 25 years of experience in the aerospace industry, with a background in thermodynamics, fluid flow, heat transfer, and environmental control; is an instructor in Air Conditioning Technology, Tyler Junior College, Tyler, Texas; and was a research engineer in heat pump fundamentals and applications with Kansas State University, Manhattan, Kan. He is a member of the American Society of Heating, Refrigeration and Air-Conditioning Engineers, and owner of Trent Associates, 1410 Woodlands Drive, Tyler, Texas 57503.

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