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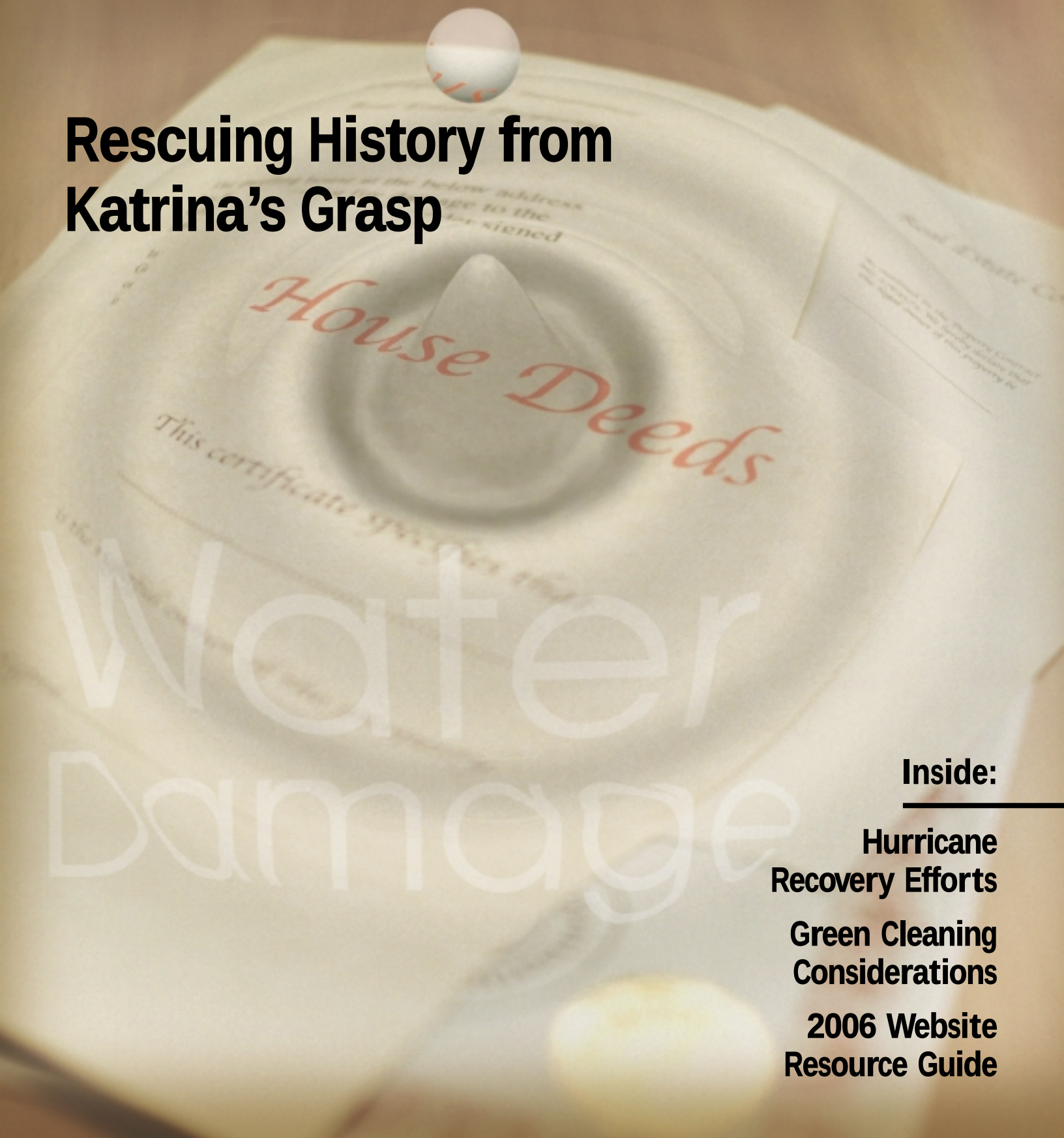


Rescuing History from Katrina's Grasp

Inside:

By Darren Hudema

Do LGRs Really Make a Difference in Drying?

Editor's Note: This is the seventh installment of an eight-part series that looks at a dry standard and quality documentation.

Refrigerant dehumidifiers have been an important part of successful building dry out for the past 25 to 30 years. It seems like not long ago, many of us were using small, homeowner-grade refrigerants, but as we continued to dry buildings over the years, we found limitations in their ability to handle the humidity load caused by rapid evaporation. The result: extended drying times and in many cases, secondary damage.

As the restoration industry developed, manufacturers recognized the need to build larger dehumidifiers capable of handling the high amounts of evaporation which occur in the first 24 to 48 hours of drying (created by air movement). These larger, commercial grade refrigerants are, by far, the most common dehumidifiers used for water damage restoration work today.

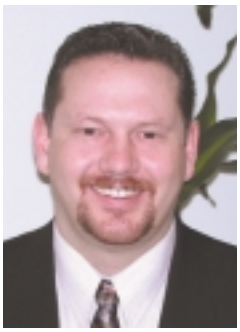
Recently, the refrigerant dehumidifier has evolved even further. *Bigger is better* began to fade away as the industry's motto. Restorers became much more focused on improved performance—both in high and low humidity. Thus, manufacturers worked to create Low Grain Refrigerant (LGR) technology. As with any change in technology, many questions arose as these newer dehumidifiers reached the marketplace. Restorers wanted to know: *"Is there really a difference between these units?"* and *"Is this new technology really required to dry a structure?"*

Most Important Tool

If asked *"What is the most important tool we use to dry out buildings?"* many restorers would answer: *air movers, heaters or dehumidifiers*. Although these are all important, none is the correct answer. Why? Because the most important tool used to dry structures is not a piece of equipment.

Moisture is always trying to seek equilibrium. The second law of thermodynamics states that *more wants to move to less, high to low, hot to cold* and, in drying terms, *wet to dry*. No matter what equipment is placed into a building to dry it back to pre-loss condition, *unless the air is dry enough, wet structural material will not dry quickly*.

Therefore, the most important tool used to dry structures is *the air*. This is why complete and accurate monitoring is essential; it enables us to know for sure that the air is dry enough to accept the moisture that is evaporating. A complete monitoring program includes gathering temperature and relative humidity, then calculating the grains per pound (gpp). Only then can we really determine if air movers, heaters and dehumidifiers are effectively promoting drying. The information collected allows us to make informed decisions, adjust equipment properly, and ensure successful drying.



That said, the equipment used to dry structures is still important. Without air movement and dehumidification, drying would not occur quickly enough to prevent additional damage. Obviously, dehumidifiers play a critical role in preventing this damage. The job of the dehumidifier is to *reduce the amount of moisture in air*. If the appropriate quantity and type of dehumidifiers are installed, the air becomes drier—allowing materials to release moisture as they seek equilibrium with the drier air.

One would think that installing a dehumidifier guarantees that the air will be made drier, and that it will remove water; however, this is not always the case.

No Water in the Bucket

Remember when dehumidifiers used to pump or drain out into a bucket? Did you notice that after the first 24 hours the bucket was full, and after you emptied it and then returned 48 to 72 hours later, there was very little moisture in the bucket? Was this because the structure was dry? As we all know, moisture meters are the only way to determine if you have hit your drying targets, or dry standard. Most of us have experienced "no water in the bucket," yet our moisture meters have indicated that materials were still very wet. Why

is this? In most cases, this is because the air has become too dry for the dehumidifier to continue to pull substantial water, yet not dry enough to promote rapid evaporation.

Limitations

Many restorers feel that there is no reason to change the type of dehumidifier on a job after one has been installed. Some argue that because it is a dehumidifier, it must be doing its job. In fact, many structures have been dried this way in the past.

In reality, the ability for the dehumidifier to remove water is limited by the amount of water in the air, measured as grains per pound of dry air (gpp). The drier the air becomes (lower gpp), the lower the dew point temperature of the air. Dew point is the temperature at which air becomes saturated—and is a critical part of how refrigerant dehumidifiers operate.

A refrigerant dehumidifier removes water from the air through condensation. In other words, it cools the air *below* the temperature at which condensation will occur (dew point). As the air becomes drier, dew point temperature decreases. The drier the air is (lower gpp), the colder the dehumidifier must become to create condensation (water removal).

To better understand how the amount of water in the air can limit dehumidifier performance, consider the evaluation of temperature, gpp (moisture in air) and dew point (temperature necessary for condensation) encountered in a water damaged structure. For example, an average temperature while drying is 80 F. After 24 hours of drying, the average indoor relative humidity is approximately 40 percent. This translates to approximately 60 gpp (actual water in air), and a dew point temperature of 53 F.

How does this limit dehumidifier performance? Well, remember what the dehumidifier must do with the air in order to remove water vapor: *it must cool the air below its dew point temperature*. In this example, it must take an 80 F air mass and cool it below the dew point, which in this case is 53 F. Almost 30 degrees of cooling MUST occur for ANY water removal!

Compare this with the very humid air in the structure when the drying process "starts"—when air is 80 F and 60 percent relative humidity (96 gpp with a dew point of 65 F). In this case, the dehumidifier only needs to cool the air 15 degrees to reach dew point.

Therefore, with a traditional refrigerant, once the air in the affected area gets below about 60 gpp, the cooling necessary to remove water vapor from the air begins to severely limit the unit's performance. If you have attended a WLS, WRT or ASD class recently, you may have noticed a greater emphasis on Low Grain Refrigerant (LGR) dehumidifiers over traditional (standard) refrigerants. Why is this?

LGR Technology

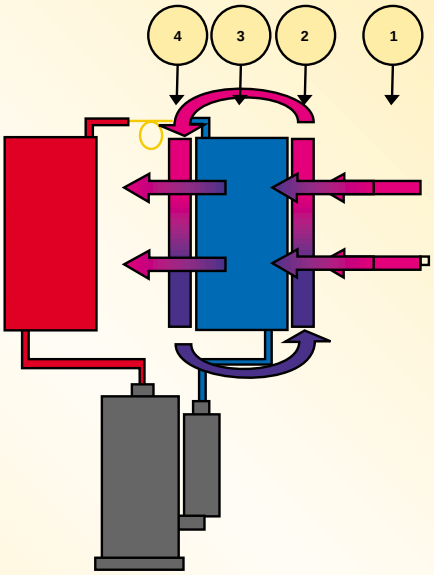
LGR refrigerants employ many of the same components as traditional (standard) refrigerant dehumidifiers. The primary difference between an LGR and a traditional dehumidifier is the fact that the LGR *pre-cools incoming air*. This has a dramatic impact on the dehumidifier's effectiveness. The unit basically cools the air twice, allowing for a greater temperature drop.

In the previous example, we learned that it took a 30 F drop in air temperature in order for any water removal to occur if the air is at 80 F and 40 percent relative humidity. A traditional (standard) dehumidifier has difficulty creating this temperature drop. Because of the supplemental cooling mechanism, an LGR does not have this problem.

This added feature allows LGR dehumidifiers to remove water vapor

Low Grain Refrigerant Dehumidification — *Heat Pipe® Technology*

1. **Warm air enters the LGR dehumidifier.**
2. **Entering air is PRE-cooled.**
3. **Pre-cooled air is then cooled well below its dew point on the cold evaporator coil.**
4. **Air exiting evaporator coil is extremely cool, and used to cool the Heat Pipe's® system. This system contains refrigerant that, when cooled, is then brought to the front of the system for "pre-cooling" incoming air and starting the LGR's unique dehumidification all over again.**



from the air—even when humidity is below 40 grains per pound (gpp).

This becomes critical when it comes to drying materials such as concrete, hardwoods, wooden sub floors and other materials that can contain chemically bound moisture. Drying bound moisture requires a lower specific humidity, or lower vapor pressure, than easier, free water (e.g., wet carpet, wet pad, etc.). Thus, a dehumidifier that has the ability to create a lower specific humidity—an LGR—will generate much better results.

Do I need LGR Dehumidifiers?

When it comes to equipment, greater versatility means more value—for both you and your customer. Traditional refrigerants have done the job in the past at the expense of time, and in some cases, additional damage. They perform well when humidity is high, but are limited when humidity is lowered. Restorers who dry using only traditional refrigerants take longer to complete the job, and if extra time is not allowed, may not actually dry all materials back to pre-loss condition.

Only moisture meters can tell for sure if a job is complete. Because an LGR produces drier air over the length of the job, it will get to the finish line faster. Up until about four years ago, LGRs were not available. What does all this mean? Because traditional refrigerants remove very little water when air is dry, if meters were not used effectively, restorers may very easily have left buildings wet—that is, if they pulled equipment *"because there was no water in the bucket"* and assumed that materials were therefore dry.

LGRs are relatively new to the industry because of recent changes in technology and design, but they have proven quickly that they are the new workhorse for the professional restorer. They have the capability to create air dry enough to dry difficult materials that hold onto bound water.

Monitoring

The responsibility of the restorer is to ensure constant progress. Monitoring not only includes measuring water in materials affected by the water intrusion, but it also includes making sure that equipment is still working and doing its job. By measuring temperature and relative humidity, restorers can evaluate air moisture content (gpp) and determine if air is actually being "dried." This measurement is commonly called "grain depression," and is a comparison of air entering a dehumidifier and air exiting a dehumidifier.

Regardless of the type of equipment used, each job should be monitored on a daily basis to ensure that expected results actually occur and to prevent situations that could lead to secondary damage. With this information, the restorer using traditional refrigerants can easily see when it may be appropriate for equipment to be adjusted, or even replaced with newer *low grain refrigerants*. ■

Darren Hudema has been in the restoration and cleaning industry since 1988, beginning as an account manager for a cleaning and restoration supplies distributor. Before opening his own business in Kelowna, British Columbia in Canada, he managed a staff of 18 people and processed many claims that included trauma cleanup, and fire and water damage mitigation. Over the past 17 years he has had the opportunity to work on hundreds of water damage jobs. His work ranged from residential to commercial buildings like a heritage hotel.

Adapted from *The New Guide to Restorative Drying*.