



IN THIS REPORT, WE IDENTIFY THE 5 MOST COMMON ISSUES FACING OWNERS, CONTRACTORS AND FACILITY MAINTENANCE STAFF.

## Top 5 Challenges of Indoor Pools and How to Best Solve Them.

This report provides guidance from Seresco the typical issues experienced with the indoor pool environment. Based on our extensive experience in pool dehumidification, we cover typical causes of the top 5 challenges, how to identify and best solve them. Time and time again, we've been asked to solve the biggest challenges that have been most problematic, so we compiled our most frequently asked questions:

1. Why are my room temperature and relative humidity conditions too high?
2. My patrons are complaining of poor air quality in the pool area. What can I do?
3. I can smell my pool from other parts of the building. What's the problem?
4. What can I do about sweaty windows, doors and ledges?
5. Why does my dehumidifier need frequent and expensive repairs?

If you're experiencing similar issues, you'll want to take a deeper dive. The answer to these questions will help you gain a better understanding to help mitigate these potentially severe issues.

## CHALLENGE #1: Room Temperature and RH Conditions are too High.

Indoor pool spaces are meant to be comfortable places for patrons to enjoy recreational swimming. Temperatures are kept warmer than a traditional indoor space for swimmer comfort and energy savings. Additionally, relative humidity (RH) is generally kept between 50% and 60% so that the space humidity is very similar to what it would be like in any other room. When these two measurements (temperature and RH) are where they should be, an indoor pool area is a perfectly enjoyable environment and the facility investment is protected for years to come.

Yet, pools often operate at different setpoints either because of problems with their dehumidification system or because they don't fully understand the impact of their choices.

*Some popular setpoint ranges for recreational pools are 80–85°F water temperature, 82–85°F air temperature and no more than 60% RH.*

Here are some reasons why your indoor pool conditions may not be right:

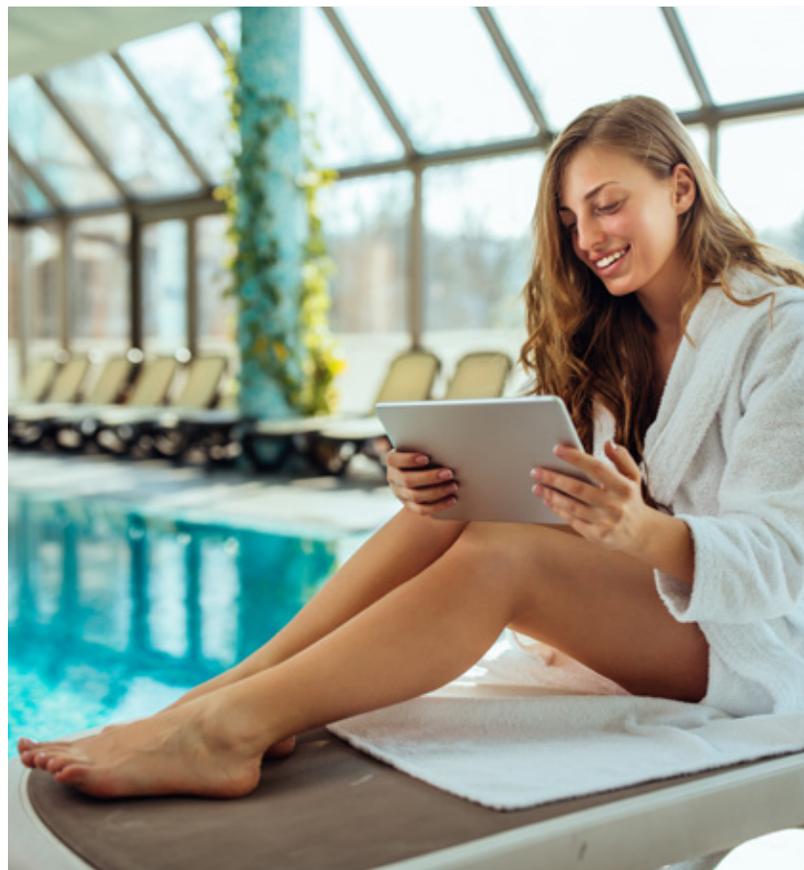
- ▶ Expectations have changed
- ▶ Worn down equipment
- ▶ Ductwork not operational
- ▶ Exhaust fan not functioning
- ▶ Outdoor air intake blocked
- ▶ More outdoor air than required

### Different Operating Parameters

Dehumidifiers are designed and selected for a specific air temperature and RH setpoint, also with a specific water temperature in mind. This is important because these three things will influence the water evaporation rate and that has an impact on whether the dehumidifier is going to be able to keep up with the load and maintain the space. Therefore, the dehumidifier works best when these parameters are not changed. Many recreational pools operate with their water temperatures around 80–85°F and air temperatures between 82° and 85°F. These parameters are popular because they are most likely to keep all

users of the pool comfortable, whether they are in the water or on the deck (including lifeguards and other staff).

While 82°F can feel a bit warm when you are fully clothed, some facilities make the mistake of lowering the space temperature. Changing setpoints from the original unit selection criteria will have an impact on system performance and operating costs. If you set the room too cool, you will wind up with increased evaporation and a unit that may no longer properly maintain the space conditions. Conversely increasing the air temperature too much, while rare, would result in an oversized unit that constantly hard cycles its compressor on and off for short periods of time, frequently over-cooling and over-dehumidifying the room. Either are not good operating scenarios and lead to patron discomfort, increased operating costs and greater wear and tear on the equipment.



## Lowered Equipment Performance

Unless well-maintained, mechanical equipment will experience diminished performance over time. Indoor pool dehumidifiers are especially vulnerable to this because they operate in a typically corrosive environment and their ideal operating parameters are not always understood by people servicing them. While high-quality machines built today can often last 15 years or longer, older models that are less corrosion-protected tend to last a lot less time.

## Equipment Performance Has a Direct Impact on Your Bottom Line

Corroded or improperly operating components, such as cooling coils, heaters and condenser coils, lose their effectiveness over time. It is best to have these components be fully protected with an anticorrosion coating to keep them operating at peak efficiency for the life of the equipment. Older components that have corroded can be replaced, however the pool operator should consider the ROI of replacing old components versus getting new equipment that is equipped with modern features and better corrosion protection.

Additionally, there is much to be gained with regular maintenance of the equipment by people who understand how they should be operating. Internal cleaning, including washing of all coils (inside the unit and also the outdoor heat exchanger coils), can help stave off corrosion. Plus, coils can get dirty over the years and this also lowers their output. For this reason, it is recommended to regularly change return and outdoor air filters, about once per quarter, as they keep small airborne objects from getting caught in the delicate coil fins.

## Other Changes

Besides setpoints, other things may have happened at your indoor pool to change the situation.

Here are some other possibilities as to why your indoor pool may be struggling to keep consistent, desirable space conditions:

- ▶ Are all supply air and return air openings in your duct work operational? Sometimes they get blocked due to objects in the space, like plants or window treatments. Especially with floor-grade supply air openings, sometimes they are covered up because they were blowing air onto patrons and causing discomfort. But, covering up grilles can limit effectiveness of the dehumidification system.
- ▶ The exhaust fan, which may be remote or inside your dehumidifier, could be non-functioning.
- ▶ Was the outdoor air intake blocked off to save money? For public spaces, having outdoor air is a code-requirement and closing it off completely can significantly deteriorate air quality.
- ▶ On the flip side, poor air quality in the space has led some facilities to have more than code-required outdoor air blended in. This can cause the dehumidifier to struggle because it must treat additional outdoor air. Keep in mind, more than necessary outdoor air is expensive to treat and does not guarantee better air quality. If your facility is following the code minimum for outdoor air but still struggles with air quality, it may be a good idea to have an expert review your facility because there are likely more cost-effective ways to address the problem than increasing the outdoor air intake.

## CHALLENGE #2: Patrons Complain of Poor Air Quality.

Having good indoor air quality (IAQ) at your indoor pool isn't optional. It has a direct impact on equipment and building longevity, as well as the comfort, health and safety of your patrons and employees.

Although pool room air will always have a degree of corrosivity, due to the presence of moisture that is usually laced with gases derived from the chlorinated water, the true fact of the matter is that great IAQ is absolutely possible if the right steps are taken.

When an indoor pool possesses good IAQ, patrons will want to come back to that facility next time they are in town — even if they didn't 100% put their finger on why they enjoyed that particular pool so uniquely.



### What Causes Poor IAQ in Pools?

There are a number of possible causes for poor air quality in pools. Any one of them on their own will lead to issues.

One of the most basic is air distribution. The best quality air in a pool comes directly out of the dehumidifier. This air needs to be distributed down to where the patrons are on the deck and in the water. Without getting good air in the breathing zone, the IAQ will suffer and exacerbate an unhealthy and potentially hazardous environment.

Note that for the most part, people are breathing anywhere between the water surface — which is much lower than in a regular room — and 7 feet above the deck, approximately the height of a very tall human. Air must circulate at the deck level and across the water surface. In addition, the HVAC system must blend in the correct amount of outdoor air according to codes, plus the grilles/diffusers must have sufficient throw distance to direct air where it needs to go.

You should be able to feel the supply air a little on your head when you stand on the deck, but it's also important to not create a strong draft as that will chill patrons coming out of the water.

### Avoiding Condensation is Critical to Asset Protection

The air distribution must also address areas of potential condensation, like exterior windows, skylights and fire doors. They need to have the warm air blanket them fully to avoid condensation. This fact is often missed because designers forget that these surfaces are more likely to create condensation than in a regular room, due to the pool's heightened dew point condition. Avoiding condensation is critical to asset protection, because the droplets that collect on windows and ledges can be corrosive and will lead to degradation where it occurs.

Another aspect of air distribution is providing ventilation to move harmful gases away from the surface of the water. These are a major cause of poor air quality in pools. The main type is trichloramine.

Trichloramine is a type of combined chlorine created through reactions between chlorine and contaminants in the water that contain ammonia. Many of these contaminants are introduced to the water by swimmers. Some examples are sweat, urine, body oils, makeup, deodorant and dirt. When the introduction of these contaminants outpaces the introduction of free chlorine, the chlorine reacts with them instead of fully oxidizing them. As a result, the chloramine levels in the

water increase. Trichloramine rapidly off-gasses from the water and causes that signature “chlorine smell” of pools. A slight smell can water your eyes, while a strong one can drive patrons away from your pool, while also accelerating damage to the building envelope due to their corrosivity.

### The Two Keys to Ensuring Good IAQ

There are two key aspects of ensuring good IAQ:

1. The reduction, control, and elimination of chemicals off-gassing. Indoor pools can reduce contaminants entering the water and resulting trichloramine by encouraging patrons to shower before swimming and to avoid urinating in the water. Technologies like UV water treatment and even special exhaust systems are available to minimize the issue as well.
2. Having an air distribution system that supplies sufficient air to the breathing zone, including across the water surface.

Achieving good pool room IAQ isn't just relevant to new pools being designed and built; it is also of critical importance to existing facilities. If your existing indoor pool is experiencing IAQ issues, there are likely some cost-effective strategies you can take to improve the air — and along with it, improve the experience you provide your patrons while also protecting the facility investment.



## CHALLENGE #3: A Pool Smell that Extends to Other Parts of the Building.

While it's true indoor pools can be perfectly safe and healthy environments with good air quality, they must also be contained environments. After all, even great-quality air from a pool room is not air you'd want to have mixing into the front desk area or other parts of the facility.

### Why Can I Smell the Pool Without Being Near the Pool?

Normally, indoor pool rooms should be contained from other areas of the building they are within. This is accomplished through a number of means, including:

- ▶ A physical airlock or vestibule to enter the pool room.
- ▶ A separate HVAC (dehumidification) system with its own ductwork.
- ▶ The pool room is kept at a negative air pressure.
- ▶ A vapor barrier ensuring the higher moisture levels in the pool area stay in the pool area.

These measures ensure that the environment is a closed system for the comfort of all building occupants, including patrons and employees.

Sometimes, however, air can drift out of the room. A common cause is related to the dehumidification system. Indoor pool dehumidification systems commonly include exhaust fans that ensure the environment is at negative pressure. Generally, the exhaust fan is separate from the dehumidifier however they can sometimes be packaged in with the dehumidifier as well. Ideally the exhaust air intake will be located strategically, such as over a spa if the pool has one.

If the exhaust fans are off, or not at the right speed, then they may not be exhausting enough air to the outside to keep the space negative. As a result, the code-required outdoor air that the dehumidifier introduces to the space will be greater and result in a positive-pressure situation that pushes air out to the rest of the facility.

Additionally, a positive-pressure pool room would worsen the phenomena known as vapor migration. This is particularly acute during cold weather, where high pressure moisture inside the pool room tries to migrate through the building envelope to equalize with the lower pressure moisture levels outdoors. While this is a predictable and normal occurrence, it is vital that it is mitigated by special design of the vapor barrier in the building envelope during construction. Anything but a negative air pressure indoor pool exacerbates moisture trying to migrate by forcing air through the envelope.



If you find that you can smell your pool room without being in it, the doors/vestibule to the room should be checked to ensure it is properly sealed. Then, examine the exhaust system to ensure it is removing enough air from the space for negative pressure. It should be exhausting 10–20% more air in CFM than is being brought in from the outdoors. Because indoor pool environments can be complex, it may be valuable to bring in an experienced expert as they will be familiar with this particular problem and how to resolve it.

Of course, another thing to keep in mind is that your indoor pool should not have a strong acidic or chlorine smell. This is an indicator of a potentially hazardous environment and should be addressed as quickly as possible.

## CHALLENGE #4: The Pool Room Windows, Doors and Ledges are Sweaty.

Whether big or small, all indoor pools must have robust measures to control humidity and prevent condensation.

Obviously, an indoor pool has the potential to produce an enormous amount of moist air. But that's not the only reason condensation is a unique concern in pools. Their air temperature is also much higher than a regular room, meaning their dew point is also quite a bit higher than usual. Combined, these factors mean condensation can easily occur in a pool while it wouldn't normally be an issue in another room.



### Dew Point

The dew point is the temperature at which moisture in the air condenses when it comes into contact with a surface that's colder by 1°F or more.

You only have to enjoy a cold drink on a summer day to experience dew point and condensation firsthand. When you pour a cold beverage into a glass, condensation will begin to form on the outside of the glass almost immediately. This is because the surface temperature on your glass is below the ambient dew point temperature.

This happens at indoor pools across North America every year when outdoor temperatures fall during the winter. Exterior-facing surfaces that have low insulation values, like windows, skylights and fire doors, are very likely to have a surface temperature that is below the room dew point during cold weather. As a result, moisture condenses on them.

### The Dangers of Condensation

There are two major concerns when it comes to condensation in the pool environment:

- ▶ It can seriously damage the structure.
- ▶ In doing so, the patron experience will be negatively affected; sweaty windows are unsightly, and visible mold or corrosion could drive patrons away.

Condensation triggers a destruction process, since it allows mold and mildew to grow on the materials from which a building is constructed. It also frequently foments corrosion on metal surfaces.

In an indoor pool, air will almost always have some degree of corrosiveness due to chemicals that off-gas from the water.

Other than condensation that you can see on surfaces, there is a hidden danger. If allowed to permeate the building walls or roof, condensation will not only instigate mold-induced deterioration, it will also cause additional devastation of the structure in winter. This

is because when temperatures drop below freezing point, the moisture that's soaked into the structural components of the building turns into ice and expands, putting additional stress on the materials and causing fissures and cracks that compromise the integrity and safety of the structure. That is why it's critical all indoor pool rooms have a properly constructed envelope with a vapor barrier.

### Preventing Condensation

The pool room dehumidification system is an essential part of condensation control and prevention. It must maintain the interior conditions (temperature and RH) at the correct, desired setpoints as determined when the indoor pool was constructed. The air ducts must distribute air all around the pool room, taking special care to direct warm airflow against surfaces that are likely to drop below the dew point of the room.

It's important to ensure the entire surface is covered by warm airflow. Mother nature will tell you on the first cold day how good a job you've done — it's common to find the top of a window condensation-free because it's near a diffuser, but the bottom is sweaty because the diffuser does not have enough "throw" distance to work the air all the way down.

If your indoor pool room struggles with this, then it is a smart idea to have an expert come in and review your dehumidification system. They will have the experience and the knowledge to identify areas that can be improved to better control condensation. In many cases adjustments can be made for little cost. For example, one facility was recommended to rotate their ductwork to improve supply air diffusion.



## CHALLENGE #5: Dehumidifier Equipment Needs Frequent Repairs.

Indoor pool dehumidifiers used in many indoor pools are precision pieces of equipment. From the materials they are constructed with, to their actual layout and inner workings, they vary in numerous ways from other types of HVAC equipment like air handlers and air conditioners. The environment they operate in is also significantly different than other HVAC systems.

These two facts mean that there are not many service technicians with deep knowledge when it comes to diagnosing and repairing indoor pool dehumidifiers. Often, basic problems can be overlooked and many service visits only see resolution after the manufacturer's customer support department gets involved.

To help you avoid expensive and unnecessary service company visits, here are some things to consider when you experience challenges with your indoor pool dehumidifier.

### Finding the Reason

Anytime you experience an operational challenge related to the pool environment, you should think of the dehumidifier. The first question to ask is whether the dehumidifier is operable.

- ▶ How old is the unit?
- ▶ Is it blowing air as intended?
- ▶ Are any of the fans impeded? They may need a belt replacement, if applicable, or could be blocked by foreign objects.
- ▶ Have any parts failed?
- ▶ Is there major corrosion on key parts such as the coils?
- ▶ Are the filters still good or do they need replacement? It's recommended to change them about once per quarter.
- ▶ Has fluid or refrigerant leaked?
- ▶ Is the outdoor condenser experiencing any similar issues? For example, it may be blocked by some debris that should be cleared away.

The older the unit, the more likely there is a mechanical issue to blame. It's always recommended to periodically

inspect and maintain the dehumidifier to keep track of any issues that may arise and prevent as many as possible. Preventative maintenance is always the best kind of maintenance.

If there is a mechanical or electrical problem with the dehumidifier, it should be addressed by a qualified service technician.



### Check the Conditions

Before you call in a service company or contact warranty support, double-check the dehumidifier's operating conditions. What space conditions (air temperature and RH, plus water temperature) is it currently set to maintain? Compare these to what the unit was designed to maintain (usually on the nameplate). If they are different, then the dehumidifier should be reset to follow what it was originally designed for.

We have observed many facilities turn down their space conditions over the years, often at the request of patrons. While it's true that patron comfort should always be the priority, unfortunately once a pool has been designed for a certain set of conditions, there are negative things that happen when setpoints get changed. For example, if you lower the air temperature by just a couple of degrees the water will increase its evaporation rate. The result will be higher operating

costs to heat the water as well as, ironically, patron discomfort. (As patrons exiting the pool will feel chilled as the water on their skin evaporates quicker.)

### Are the Filters Dirty?

Dehumidifier coils are much deeper than standard air conditioner coils, which helps them effectively condense moisture out of the air. It also makes them hard to clean thoroughly if any foreign particles get into them. Therefore, it's extremely important the air filters are changed consistently to prevent that from happening.

It's also important to note that dirty filters can impede airflow over the coil, which can cause inefficiency and potentially lead to trips on low pressure. This could potentially damage your unit!

The good news is that filters are inexpensive and well worth the price of regular replacement, compared to what it will cost the operator through inefficiencies caused by dirty coils. Refer to the stickers on the equipment or submittal documents for the type of filter equipped (or inspect the filters themselves). Any number of local stores may sell suitable replacements. Check filters for replacement at least once per quarter.

### Ductwork

If it doesn't seem like there is a problem with the dehumidifier itself, you may be experiencing an air distribution issue as noted in Challenge #2.

### When to Replace?

One good time to replace is near the end of the normal life cycle when several other issues you want to fix have been identified. Bundling the work can be more efficient and easier to get funding for since you can show numerous problems will be resolved.

The normal lifespan of a high-quality dehumidifier is 10–15 years. In perfect conditions, they can last much longer. We've seen some still in great shape beyond the 20-year horizon. When to replace is entirely reliant on what condition the unit is in.

Cheaper dehumidifiers tend to have a shorter lifespan because they are built with lower-end components and use fewer corrosion protections. A five-year replacement cycle is common.

In many ways, a dehumidifier is like a car in terms of knowing when to replace. If the unit is constantly raising alarms and shutting down, frequently needing repairs and losing major components like coils or compressors, then it's probably time to replace. Like a car, the repair bills add up and eventually it would be cheaper to buy a whole new machine rather than replace yet another compressor.

## Want to Take a Deeper Dive?

Founded by three engineers seeking to redefine dehumidification, Seresco has built a reputation for premium equipment performance and reliability, combined with the lowest operating, energy, and maintenance costs in the industry. We're committed to ensuring the success of every indoor pool environment we serve, each step of the way — long after installation.