

Guitar Humidification: A "Case" Study

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Freestanding 2-Guitar Musik™ Tent Instrument Humidor

Stringed instruments allowed to dry out will tend to shrink and may experience splitting along the wood grain of the body, bridge or fret board. Under dry conditions, if not properly oiled, fret board shrinkage may eventually result in "fret sprout" where the ends of the fret wires become exposed. The internet is full of photos showing dry and damaged stringed instruments. Too much or too little moisture and temperature may result in string buzz, warpage, inability to keep the instrument in tune, finish cracking/checking, and even instrument devaluation or damage. Many guitar repair sites report that up to 70% of their guitar repairs are related to dried-out instruments. Guitar manufacturers even add clauses to their warranties excluding damage related to temperature or humidity.

Current solutions include keeping an instrument, along with a moisture source, inside a case to contain the moisture. Multiple instruments require purchasing multiple humidifiers. Sponge humidifiers, typically in the \$10-\$20 range, require regular rewetting and most have no means for controlling the amount of moisture delivered to an instrument. Pouches offer a way to control the level of the relative humidity. Some guitar players report spending as much as \$75 to \$100 annually on pouches for a single guitar, and some report pouch chemicals leaking onto instruments.

Other options include humidity display cabinets and room, or humidifiers as generally used in music stores. Drawbacks to room humidifiers may include daily refilling, mold and mildew formation, and a constant musty smell. Whole-home humidifiers may cost thousands of dollars to install, and humidity cabinet furniture may not be affordable to many musicians preferring to invest in instruments rather than furniture.

Musik Tent™ was developed to bridge the gap between current solutions - with the ability to last months between refills. It stores, displays and uniformly humidifies up to two full size guitars or cases, or other wood Instruments or cases. Musik Tent may actually eliminate the need for cases for a majority of musicians with instruments that never leave home. In addition to having a moisture source that is not in direct contact with the instruments inside, instruments are quickly and easily accessible, and accessories such as capos, tuners and straps may remain affixed to the Instruments during storage. Musik Tent may be mounted to a wall, ceiling, door or placed in a closet for those not wanting their instruments displayed, taking up floor space, or exposed to visitors, pets, kids or sunlight. One option is to mount a Musik Tent on a wall, so the bottom of the enclosure touches the floor, thus allowing cases or traditional stands to be supported inside. Additionally, free-standing frames are available with built-in, adjustable stands that can store 2 guitars, or 1 guitar and 1 case (possibly 2 cases if not jumbo size).

Putting these humidifiers to the test

For this study I selected sponge sound hole humidifiers because they are commonly used, and initiated the testing during the driest period of the year in Pennsylvania. Sponge humidifiers are generally comprised of a section of perforated rubber tubing, about 12 inches in length, with an elongated sponge contained inside. On one end is a plug to hold the sponge in place. On the other end is a cap that prevents the device from falling inside the instrument when inserted into the sound hole through a separation in the strings. Sponge humidifiers are generally wetted by holding them under running water to absorb to their capacity, wringing out the excess water, and towel drying before each use.

I reluctantly drilled holes in one of my hard-shell plastic guitar cases, so I could feed hygrometer leads inside with probes placed at four key positions to observe the relative humidity variation inside the case. The goal was to allow the case to close tightly, without pinching the leads or leaving the case partially open during testing. Wireless hygrometers were not small enough to fit into the various positions inside the case with a guitar inserted.

Beginning January 12, 2019, I placed an already humidified guitar into the prepared case and inserted a single wetted, sponge humidifier into the sound hole. I then placed hygrometer probes in the areas around the headstock, neck/body, sound hole, and on top of the body near the output jack. I latched the case shut and placed a fifth probe just outside the case to measure the surrounding ambient humidity.



The next day, the sound hole was reading 40% RH, while the other probes inside the case read about the same relative humidity as the room. I'd expected the sound hole value to be considerably higher, given the moisture content in a newly wetted sponge, and that the guitar was already humidified. To confirm the accuracy of the hygrometers, I performed a salt test and found they were reading a few percent higher than the expected 75% RH. I elected not to apply a bias since the difference was minimal. I returned the hygrometers and added a second wetted sponge humidifier.

Additionally, to compare two methods under the same ambient temperature and humidity, I set up a 2-guitar model Musik Tent, inserted a second guitar, and placed hygrometer probes at essentially the same four positions around the guitar, as done with the case.



Tracking results by percentages

Over the following days, I observed the performance of all the humidifiers, including during a outside temperature drop to 13 degrees F, where the home heater worked continuously to maintain ambient temperature at 68 deg F at night and 72 deg F during the day. The ambient humidity dropped as low as 19% RH during this period.

One week into the testing, the sound hole humidity inside the case reached 50% RH. By January 24, the ambient humidity increased to 31% RH. Even so, the sound hole humidity inside the case had declined to 47% RH. Musik Tent sound hole was measuring 49% RH, so I made a small adjustment of the filament to increase the humidity slightly. By the next morning, the Musik Tent sound hole humidity had increased to 50% RH.

A week later, Pennsylvania experienced another cold snap where the ambient humidity dropped to 17% before returning to 31% RH. These were not "normal" conditions, with the outside temperature reaching nearly 60 Deg F. The sound hole humidity inside the case had declined to 41% RH.

The case hadn't been opened since inserting the 2nd sponge humidifier, but I suspected the sponges were dried out and moisture was being released from the instrument. As a reminder, instruments used for these studies were already humidified. The Musik Tent continued to maintain a few percent variation in humidity over entire instrument, and had consumed little distilled water at this point in the study.

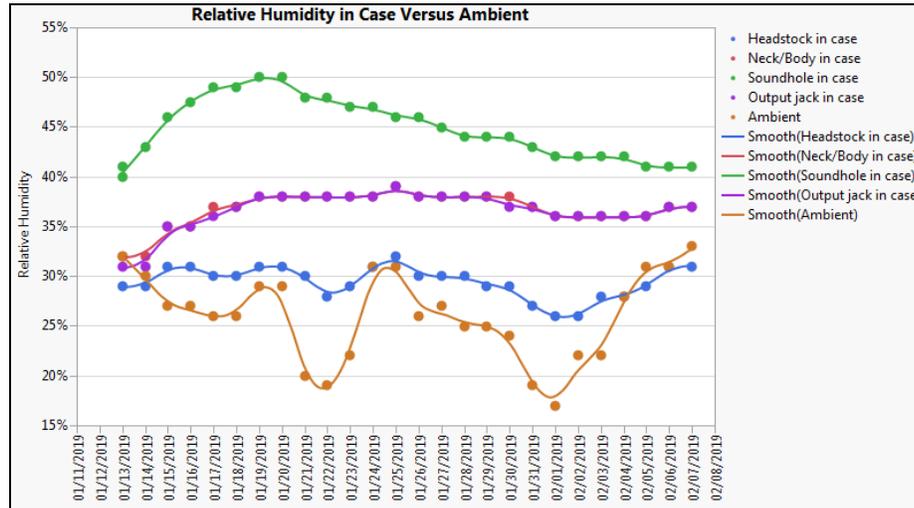
On February 7, the ambient humidity further increased to 33% RH, although the sound hole humidity inside the case remained at 41% RH. I elected to open the case for the first time since Jan 13th, removed the sponge humidifiers, and closed the lid. As suspected, both sponge humidifiers were dried out.

Observations of the case testing

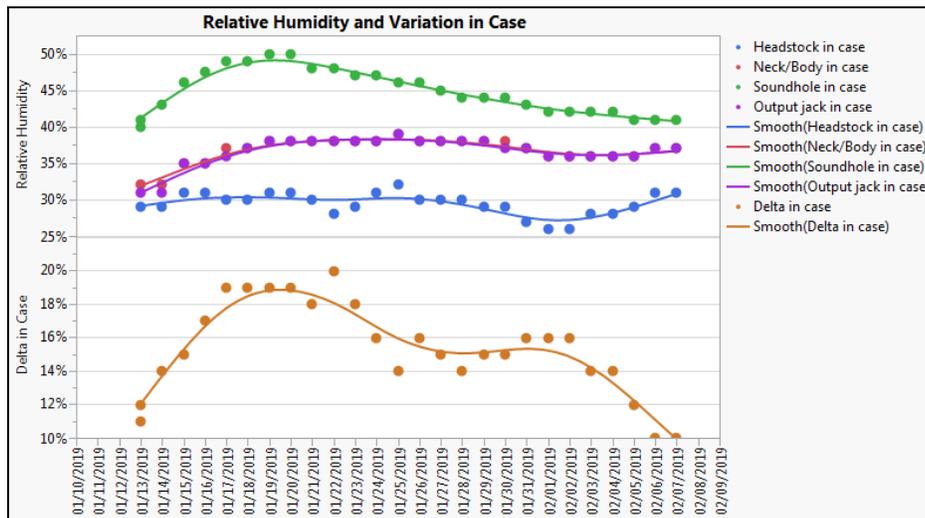
It had taken nearly a week for the sound hole humidity to reach a peak of 50% RH, with 2 inserted sponge sound hole humidifiers, where humidity remained at peak for about two days before declining. The neck/body and output jack humidity inside the case tracked very closely together and were essentially identical. Headstock humidity inside

the case tended to track somewhat with the ambient humidity highs. This may be indicating the case seal is less effective around the headstock, and/or moisture from the sponge humidifiers is being blocked from reaching the headstock. There may also be a sponge effect from the case liner that was not pre-humidified prior to the study.

Following the study, we learned from a major high-end guitar manufacturer that some wood cases may absorb twice as much, or more, moisture as the instrument. And that if allowed to dry out, cases may actually rob moisture from the guitar inside resulting in considerable damage. This was not a factor in this study due to me arbitrarily selecting a plastic guitar case.



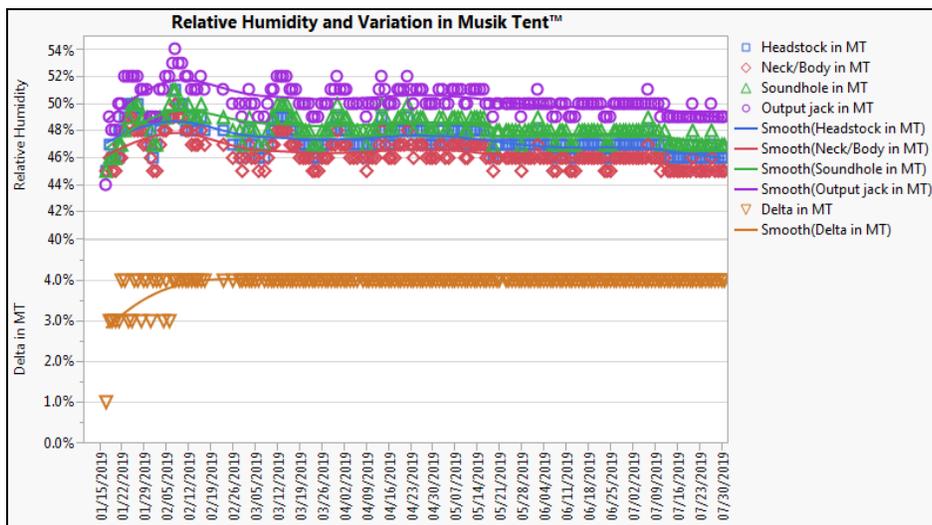
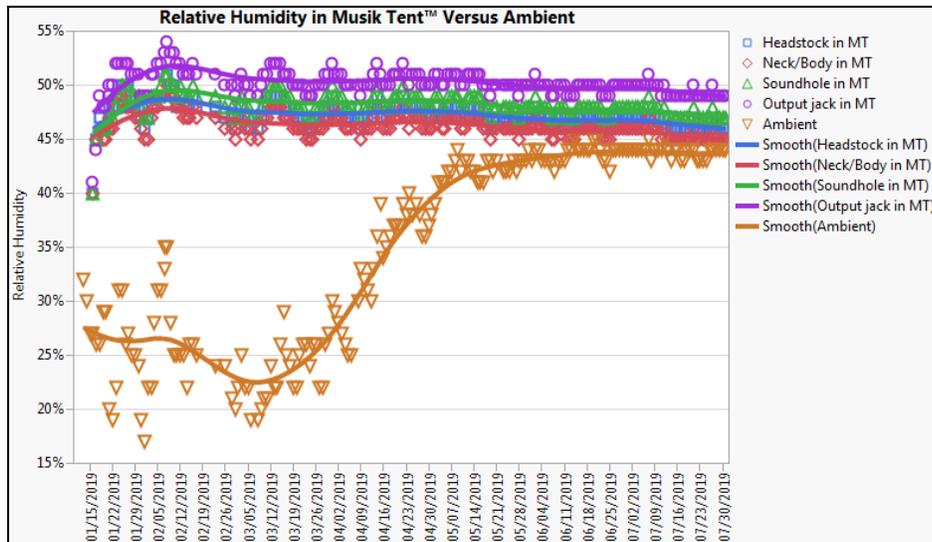
Variation inside the case reached as high as 20% between the sound hole and headstock about a week into the study, following the peak in the sound hole humidity level.



At the conclusion of the case portion of the study in early February, the guitar from that study was moved to the Musik Tent. So, two instruments were humidified inside the Musik Tent through the remainder of the study that concluded at the end of July, 2019 when the reservoir containing the distilled water was nearly dry.

Observations of the Musik Tent testing

The sound hole humidity took nearly one week to reach an initial peak of 50% RH, and slowly declined over 200 days of testing. The neck/body area was consistently the lowest recorded humidity value while the output Jack humidity was consistently the highest recorded humidity value. I suspect this may be related to variation of air density inside the enclosure - or variation of the probes. Headstock humidity inside the product tended to track somewhere between the neck/body and sound hole.



Musik Tent showed big-top performance

While the original intent of the study had been to monitor the effectiveness of various instrument humidification schemes for a normal winter in PA, the large variation in ambient humidity and outside temperature during this testing appeared to have little effect on the results. The exception being the headstock inside the case that seemed to be partially influenced by ambient conditions.

While sponge humidifiers stored in instrument cases may be adequate for maintaining the desired relative humidity greater than 45% inside the sound hole, there are several downsides with their use. The humidity inside the sound hole appears to take approximately one week to reach peak relative humidity, and then very quickly begins to decline. If the instrument owner forgets to rewet the sponge regularly, allowing the instrument to dry out each

time between charging the sponge(s), it's possible that the cycling up and down of the humidity could cause damage to the instrument over time.

Additionally, in this study we observed humidity variation across the instrument inside the case as high as 20% RH with the headstock that never got above 32% RH. The effect on the instrument of having low humidity around the headstock was not considered in this study. The results may be indicating a need to keep the case humidified even when not being used.

Musik Tent achieved an initial peak of 50% RH in about a week with adjustments to the filament, slowly declining to around 47% RH over 200 days of testing. This meant that **Musik Tent lasted more than 6 months - on a single fill of distilled water**, compared to sponge humidifiers lasting only a few weeks after being wetted. Humidity variation inside the Musik Tent remained nearly constant at 4% RH throughout the study, compared to as high as 20% RH for the two sponge humidifiers. Another bonus observed with Musik Tent was that the guitars stored inside tended to remain in tune during the duration of the study, with very little retuning needed.

After the initial cost of a Musik Tent Instrument Humidor of around \$150 for the hanging version, and about \$325 for the freestanding version, the cost-of-ownership is around \$1 to \$2/month for distilled water and periodic filament replacements, making Musik Tent a cost-effective alternative with considerably better performance than sponge humidifiers.