

Tape Baking - Video Restoration - Sticky Tape Syndrome



Though the image degrades a varying amount each year, by the time 25 years or so have elapsed, more seriously than the image degradation, is that the video tape is often now unplayable..... owing to mechanical breakdown of the tape itself. The video tape has sadly arrived at the end of it's useful life. All might not, yet be lost..... it can often be brought back from the grave ! It's not the fountain of youth, but it will stabilize it at least long enough to make a good transfer. After baking, the transfer should be made as soon as possible - generally within 24 hours. This area of the video restoration process is known as Tape Baking and is effective in about 95% of the cases where tapes are experiencing stickiness !

The main problem with videotape is simply bad chemistry. Videotape is made from a base of polyester, which is coated with polyurethane. The coating acts as a binder (alas, it's name), trapping magnetic oxide particles -- the carriers of the

magnetically encoded information -- within the tape. The binding system is fragile. High temperatures and humidity can play havoc with it, causing the urethane particles in the coating to react with water infiltration (a process known as hydrolysis), break free, and migrate to the surface of the tape. The next time the tape is played, the oxide particles, no longer bound by the binder, peel off, taking with them all evidence of anything previously recorded.

Tapes manufactured between 1965 and 1985 are especially susceptible to the "Sticky Tape Syndrome", where in addition to the binder delaminating, it also turns in to a "sticky - gooey - mess" (not the scientific term, but nevertheless, an accurate descriptor...). The only hope of video restoration is to literally attempt to bake out the moisture and thus stabilize the binder.... Sort of re-manufacturing the tape "on the fly"

The tape is slowly baked in a highly accurate temperature controlled electric convection laboratory oven for a time determined by the mass of the tape. The procedure is not a permanent fix and the positive effects are short lived, ranging from a few days to a couple of months before the effects of hydrolysis become apparent again. Should that fail, then the sad reality is that you waited too long to have it transferred. The tape and all that it might contain is lost forever, and will simply make a great paperweight.... (There's probably other applications for the tape, but none come quickly to mind.....)

Should "Sticky Tape" be encountered, immediately stop the machine and eject or remove the tape right where it is. Do not even attempt to rewind it. To proceed further may not only permanently ruin the tape, but will most likely lead to a severe jam requiring disassembly of the machine to remove the sticky tangled mess or even wiping out the video heads.

To read more on Tape Baking: [Click Here](#)

Laboratory Oven - Tape Baking



Just as an aside; we are often asked the equipment we use to bake magnetic tape media. The lab oven we use is a "Blue M" DC-256 configured with an optional Type J temperature controller. Though there are other laboratory ovens that also perfectly "fit the bill", the DC-256 in this configuration offers dead accurate temperature controls, timer, alarm set points, NTE safety limit, and a generous 25x20x20 stainless steel interior, that allows the baking of many tapes at once. Like "Chocolate and Vanilla" - each outfit no doubt has their personal preferences, but when it comes to Lab Ovens: this is ours.

What makes a lab oven so critical to the process, is it's ability to precisely and smoothly ramp up to temperature without overshooting, and then hold a consistent 122 deg F \pm 1/2 deg., and then smoothly ramp down to ambient at completion of the cycle, thus allowing enough time for the tape to cool evenly. No kitchen oven designed for cooking (even the latest models with digital controls) affords such precise process control, regardless of the thermal loading, moisture content and thermal mass of the tapes. Consistent repeatable success will require the use of a true lab oven, if one ever hopes to achieve consistent results.

With that said, some folks have reported success in using home food dehydrators and others even using a cardboard box and a light bulb to serve as a heat source. Such drying "equipment" is not exactly in the same "league" so to speak, nor should it take much imagination to figure out that consistent results can rarely if ever be achieved employing such techniques... Yet, a cardboard box and light bulb is far less expensive than a commercial lab oven..... and if one has only a few tapes requiring baking, then might be worth some experimentation. As a side note: tapes can be re-baked as many times as necessary without any risk of damage. Temperatures not far below 122 deg f, will result in substantial increased baking times (or nothing much happening at all) and temps above 143 deg f, run the risk of exceeding the Curie Point. 122 deg F is the accepted safe "magic number", but more importantly is that whatever temperature you opt to bake

at, holding the temperature consistent with adequate airflow to continuously purge the chamber of moisture is critical if one ever expects to achieve 100% success each and every baking run...

NEVER - EVER - NEVER use your kitchen electric oven used for cooking/baking or broiling food, for baking tapes.

No electric oven (even the latest digital types) offer the necessary accurate temperature control required. In fact; "make & break" thermostats often result in chamber temperatures that can swing widely, to as much as ± 70 degrees or more for short periods, while the heating elements kick in and then "idle" til the ovens cools sufficiently, at which time they "kick in" again at full power & the process repeated... Even with the newer digital models, short transients in chamber temperatures will pose problems. - Though much better in terms of temperature stability, since most employ a thermocouple to actually measure the chamber temperature, ovens designed for cooking/broiling/baking, still do not require nor have the precise temp controls of a true lab oven. None I'm aware of, have a ramping function to bring the chamber smoothly and precisely to operating temperature without overshooting the set point, nor is holding the temp within $\frac{1}{2}$ degree necessary for cooking.... No "Big Deal" when doing a roast, as the wide temp swings from the temperature peaks to the troughs, average out..... Just fine for a Thanksgiving Turkey or roasting an 8 lbs rack of beef/ham, as those short temperature spikes encountered as the heating elements cycle on and off, don't account for anything of consequence (the thermal mass of the meat itself, averages out the BTU's added to the system).

Magnetic media is far less forgiving... Exceed the "Curie Point" of the tape for even a short period however (typically 144 deg F for most tape formulations) , and magnetic media will begin to be erased ... not only that, but the outside edges of the tape will naturally heat or cool much faster than the inside center of the tape, often resulting in scalloping of the tape... Thus It is critical that one does not place a tape into a 122 deg pre-heated oven for that reason. Instead, the tape should be placed in the lab oven at ambient temperature and then slowly and smoothly the oven is ramped up to the Process Value (PV) temp over at least a 1 hour period.

There are other concerns such as mass of the tapes themselves to be considered, moisture content, and how one determines and programs the ramping functions of the controller commensurate with the media to be baked. Put another way: A tiny MiniDV tape for example, will require a baking cycle quite different from a 12 inch reel of 1" tape weighing 16 lbs., or even a VHS tape for that matter.

In short: Wish as you might: But when the precision of a Lab Oven is called for, nothing else other than a Laboratory Oven will do, if repeatable consistency is something more than just a passing thought.

Should baking & re-lubing fail, then the sad reality is that you waited too long to have it transferred. The tape and all that it might contain is lost forever, and will simply make a great paperweight.... (There's probably other applications for the tape & spool, but none come quickly to mind.....)

Anyways, should "Sticky Tape" be encountered, immediately stop the machine and eject or remove the tape. Do not even attempt to rewind it. To proceed further runs the risk of I not only permanently ruining the tape, but will most likely lead to a severe jam requiring disassembly of the machine to remove the sticky tangled mess as well as another hour spent cleaning up the sticky residue from the tape path and pinch roller.
