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TAPE BINDER SHEDDING

In archival magnetic tape storage, the dreaded "s" words are *SHED* and *STICKY*. These problems are inherent to a greater or lesser extent with the binder formulation called polyester urethane that has been used by *all* tape makers for *all* of their products starting in the 1970s. It is *not* a "wearing out" problem, it is a storage-time and storage-conditions (temperature and humidity) problem.

Richard Hess has recently published a paper [1] with results from a lot of recent research on this subject. I strongly recommend that you download it and read it.

Early work on this subject was published in [2]. While the recommendations in that paper may work for the tapes that were involved with shed at the time of the paper, these and other tape types have aged several additional decades and the tape restoration community is seeing further degradation. The best advice is to not trust any of the primary shed-prone tape types for long-term storage. If they contain irreplaceable content, they should be duplicated, preferably to archival digital standards.. The exact composition of the binder also affects the aging rate: all manufacturers appear to have made tape types that were more or less susceptible to shed and even within those types, different batches appear to be more or less susceptible. Storage conditions over time also influence the current state of the tape. Note that tapes made before the 1970s did not use the urethane binders, and therefore never have this shedding problem.

For temporary shed reduction on existing tapes, try placing the tape in an oven at 120...130 °F (50...54 °C) for about a day, as recommended by Ampex [3]. Also see the Ampex patent on this process [4]. The tape manufacturers have been working for many years on developing binders that reduce or eliminate this binder problem.

Now-defunct Quantegy (nee Ampex) and 3M had developed binders which claimed improved mechanical stability due to improved binder technology, raw materials control, and processing control. Tapes that were available after roughly 1995 used these new supposedly stable long-term binders that could be used for archiving. The mastering tapes 3M 986 (originally called 966) and 996, and the Ampex 499, used the supposedly improved binders since their introductions. 3M had discontinued the mastering tapes with the old binders (226, 250, and 806). Ampex (Quantegy) claimed that their mastering tapes 406 and 456 had been changed to the improved binder starting with products manufactured in early 1995. So all of the tape used by MRL starting in early 1995 had been exclusively that with the supposedly new stable binders. All MRL tapes have the manufacturing date on the labels, so you can tell when they were made.

We never knowingly used any tape that had shedding problems — but we really didn't know of problems till our users started to complain, and that is typically after the tape is at least 5 years old. Every tape type that we used was preferred by one customer or another, and every tape type that we used was considered anathema by some other customer. To find what type of blank tape was used to make a particular MRL Calibration Tape, check the color dot, and in some cases the date, on the spine of the tape box. Our color codes are shown in the table below. Manufacturers in [brackets] below no longer make tape.

Alternatively, for tapes made after 2002-12 (SN > 130 026), send us the *serial number* of the tape, and we can tell you the manufacturer and lot number of the tape. Sorry, but we've run out of space, and no longer have the earlier records.

RMGI [BASF, Emtec]:	SM 900 lite blue	SM 911 red	SM 468 white
ATR Magnetics:	dark blue		
[Ampex, Quantegy:]	[406 yellow]	[456 green]	[499 gold]
[AGFA:]	[366 black]	[469 <1993 lite blue]	
[3M:]	[986 <1997 orange]	[996 <1997 dark blue]	
	[806 <1995, 206 <1987, orange]	[250 <1993 red]	[226 <1993 tan]

REPLACING SHEDDING MRL TAPES

If you have any kind of problem with an MRL Calibration Tape within one year of the time you purchased it, we will replace it at no charge under our usual warranty. But nearly all of the shedding tapes are over ten years old. For these, the tape manufacturers disclaim any responsibility for tape shed, or have now gone out of business. MRL will, however, share a little bit of the loss with you: When you purchase a replacement directly from us, we will give you a 10 % discount from the current list price.

First, contact MRL by email (<mailto:mrltapes@comcast.net>), phone, or fax, and tell us that you want to replace a shedding MRL

Calibration Tape. Tell us its Catalog Number and Serial Number ("SN") (on the box and reel labels), and how you want it shipped. We will tell you your replacement price, including shipping. Tell us your credit card information, and we will send you the replacement. We will mark overseas shipments "Warranty Replacement — no commercial value".

After you receive the replacement, please **destroy the shedding tape**.

REFERENCES

[1] Richard Hess, "Tape Degradation Factors and Challenges in Predicting Tape Life", *ARSC Journal V 39, Nr 2*, pp 240...274 (2008 Fall). Available online at http://www.richardhess.com/tape/history/HESS_Tape_Degradation_ARSC_Journal_39-2.pdf.

[2] N. Bertram and E.F. Cuddihy, "Kinetics of the Humid Aging of Magnetic Recording Tape", *IEEE Transactions on Magnetics, Vol. MAG-18, Nr. 5* (1982-09), pp 993...999 (with 11 references).

[3] Jim Wheeler, "Increasing the Life of Your Audio Tape", *Jour. Audio Eng Soc Vol 36, Nr 4*, pp 232...236 (1988-04).

[4] US Patent 5236790 (now expired) at http://www.richardhess.net/restoration_notes/USP5236790.pdf.

