

VLBA ACQUISITION MEMO #345

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To: VLBA
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Re: Update of Self-Packing Reel Specifications

Flange Separation at Hub: .9990/1.0000" at minsep position,
sep runout (maxsep-minsep, assembled reel): .0015" max p/p,
hub axial runout (between flange locating surfaces): .0005" max p/p

Note: Original spec, 1.000/1.004" at hub, is incomplete and allowed a worst case difference between flange separation and tape width, then .996/1.000", of .008" near the hub (.004" typ). New spec with tapes at .997/.999" makes worst case difference .003" (.0013" typ with .9982 nominal slit). The reduction in scatter amplitude by a factor of three near the hub may be important for thin tape since beam strength goes as thickness cubed. Loosening of the pack near the hub is possible as a result of temperature changes, and damage like that to a scatter-wound turn can occur from axial relative movements of portions of the pack due to mechanical shock. In practice, however, the tighter hub appears less important than guaranteeing sufficient pinch in the outer portion of the pack to suppress scatter of even an already damaged turn.

Flange Separation at OD: .986/.996" at minsep position,
sep runout (maxsep-minsep, near OD): .006" max

Note: Limits on OD minimum flange separation and runout were not originally directly spec'd; instead it was suggested that flange curvature be turned inward rather than outward to improve scatter-wind suppression. I recently measured ODminsep in the range .990/1.000" in a sample of about 10 of the 1978 vintage Corning SP reels. Those with ODminsep greater than .996" are generally OK but do not always fully suppress scatter especially of a 'pre-crushed' edge segment. New 'tightness-margin' test prototypes from Acrometal with ODminsep in the range .981/.984" and runout up to .0035" have been used as trial takeup reels to shuttle and windtest AT tapes and have shown no evidence of being too tight. (The use of an SP reel for takeup is not recommended in normal operations however, because it is awkward to thread and start, difficult and critical to keep clean, and does not appear to let a pack distorted by shock in shipment relax as quickly, in a single prepass.) A special test of these tight reels was to wind 3M, Sony, and Ampex tapes at 330ips and 3.5" vacuum, looking for loss of vacuum, slippage, voids and softness of pack; none of these potential problems occurred. A gentler operating point as low as 5" vacuum could be supported by these reels and the 96 drive. A misassembled reel with ODminsep = .978" and .007" runout produced voids and bumps at 330 ips even at 15" vac and this high tension was needed to pack and run properly at 67.5 ips.

Hub Details:

1. The flange mounting surface to have adhesive-free locating areas on both sides of the adhesive ring area, near the flange ID as well as near the hub OD, unlike the Corning design which only has the latter, in order to keep the flange from flexing due to shrinkage of some adhesives and some cure conditions.
2. Hub OD corners to have .025"x45deg chamfer in order to provide some debris tolerance with zero clearance between tape edge and flange.
3. The hub will have a natural aluminum color (clear anodize).

Assembly Details:

1. The heat-shrink hub band, used for electrostatic attraction to assist threading of the standard glass reel and useful for this purpose in a takeup reel, is to be omitted. This is so as not to defeat the purpose of the chamfer, for easier assembly, and because it is virtually useless in a supply reel which does not need to be continually rethreaded.
2. The flange mounting surfaces will not be covered by a label and the adhesive will contrast sharply in color (for example red or black, not gray, silver, or transparent). This is to facilitate inspection of the adhesive-free locating areas, required to be so to help guarantee the parallelism of the mounted flanges.
3. A small label with the ODminsep+runout measured for that reel indelibly printed on it will be placed radially oriented near the OD at the location (angle) of ODminsep.
4. The manufacturer's label will be similarly placed on the opposite flange. It will contain the words SELF-PACKING REEL conspicuously as well as part and serial numbers. It will be green and white in color for consistency with the old self-packing reels. This label will be no larger than .5x4.5" and may carry the manufacturer's logo. The labels, as well as the outside polyurethane safety coating, must withstand repeated flange cleaning with alcohol or heptane soaked paper towels or rags.
5. There is to be no debris (especially polyurethane) on the inside surfaces of the reel. Reels may be delivered clean either in sealed or Ziplock plastic bags or with reel bands that may be customer supplied in order to insure cleanliness until tape is loaded.

Further Improvements:

1. A stiffer connection than that provided by RTV is desired and substitution of an epoxy will be investigated. Many tapes pack hard against one flange tending both to flex it outward and to separate it from the hub when a rubber connection is provided. This effect can destroy the self packing property of reel temporarily, and is typically significant only under windtest (combination of flow speed and high tension, <2m/s and >10"water=2.2N) conditions. The stiffness of the flange itself can hardly be improved without making it thicker.
2. A permanent hydrophobic low-friction transparent coating for the inside flange surfaces is desired to minimize 'hangup' of the tape edge on the flange.
3. A smoother (more polished) finish to the ground rounded OD edge of the flanges is desired to minimize the possibility of tape edge damage due to high speed (up to 900ips relative at 330ips tape) contact with an asperity on the flange periphery. Note significant asperities are most often not 'builtin' but sticky residues from handling with insufficient attention to cleanliness.