

Banbury® Mixing of Hydrin® T6000

Hydrin® T6000 containing normal and high loadings of fillers presents no unusual problems in Banbury mixing. Compounds containing low levels (40 phr) of fillers may require some special precautions to ensure satisfactory incorporation and dispersion of the fillers. This is especially true where fine-particle-size filler (N100 or N200 series blacks or high surface area silicas) are concerned. To minimize dispersion problems in these cases, the mixer should be cooled initially 25C to 38C (75F – 100F) and kept reasonably cool until all fillers have been added. Lubricating materials such as process oils or plasticizers should be withheld until all fillers have been added.

The “upside-down” technique of mixing is recommended for lightly loaded formulations using T6000. This technique is necessary to generate sufficient shear to incorporate the carbon black in compounds that have loadings of 40 phr or lower. Note: Remove the polyethylene film from the bale because the compound may not generate enough heat when mixed to melt the polyethylene.

Mixing Techniques

Hydrin T6000 is somewhat thermoplastic and therefore mixes differently than typical general purpose elastomers. Early in the development of GPCO elastomers, poor dynamic mechanical fatigue properties were observed on some experimental mount compounds. Close examination of the rubber indicated poor filler dispersion.

The effect of different mixing techniques on percent dispersion was thoroughly investigated and certain mixing requirements were established at that time for GPCO elastomers. As is the case with other elastomers, a high percent filler dispersion is necessary for good mechanical fatigue resistance. In order to obtain this high dispersion, the rubber and filler alone should constitute 60% to 70% of the Banbury volume capacity. This assures adequate shear to break down the carbon black agglomerates. If these agglomerates are not broken down, localized stress concentrations occur, which in turn lead to fracture initiation. These agglomerates also need to be broken down before the addition of any plasticizer. For compounds containing less than about 40 phr of filler, the use of preblended masterbatches is recommended. In this manner a high level of filler can be mixed in the first step, assuring adequate shear to obtain good filler dispersion. On the second step, this can be diluted with the addition of more polymer and plasticizer.



Mixing Procedure

1. Base recipe volume on rubber and filler(s); the rubber and filler should constitute at least 65% of Banbury capacity.
2. Mix rubber and filler until well dispersed, usually 2-3 minutes depending on machine set-up. At this point, begin the addition of other dry ingredients and oils.
3. If recipe contains over 10 phr oil, add as indicated by temperature rise.
4. Dump after oil is well incorporated as indicated by temperature rise.
5. Add curatives on second step mix.
6. If recipe contains less than 45 phr carbon black, the use of a masterbatch containing 50 phr to 60 phr carbon black is recommended. Low black levels give low shear in the Banbury with subsequent poor filler dispersion.

Milling Procedure

1. Mill rolls should be clean and run at a temperature between 40C (104F) and 80C (176F) for best results.
2. Mill roll release can be aided by the addition a combination of Struktol® WB222 at 2 phr and Struktol® TR121 at 1-2 phr.