



## Cycletime Tips - Automotive

### Volume 35: Over-drying Heat Stabilized Nylon

Some new information has been revealed in the past few years regarding drying of nylon. Once upon a time, we looked at over-drying as the point in which the residence time in the dryer had done permanent damage via the removal of additives or oxidation of the pellet. Well, that can still happen in nylon products, but it can go a bit deeper in the nylons using heat stabilizers.

Research has indicated that under elevated temperatures and/or extended drying times, we can encounter what is known as Solid State Polymerization or SSP. This reaction causes the molecular weight (MW) in the polymer to increase. In our world, an increase in this category produces a tougher part, but it also produces a more viscous polymer melt. The result is either an inability to fill the part or weak weld lines when we consider injection molding.

By the time the resin hits this threshold, it has discolored to a dark tan and eventually a chocolate brown so unless you're running very dark colors you will see a shift in color prior to a substantial property shift. While non-stabilized nylon will see a color shift as well as a loss in additives, the molecular weight goes the other way and parts become more brittle. Not even moisture conditioning can reclaim them. As you believe an epiphany has been realized, read-on and learn more as we discuss the specifics.

When we look at the mechanism for true over-drying, we have to consider more than time and temperature. Obviously, we don't want to get into the habit of leaving dryers on over the weekend or purchasing large amounts of this hygroscopic material and using oversized dryer hoppers, but we can minimize these accidents if we look at a hidden variable - oxygen. Today, we have access to vacuum dryers, which will minimize all and even eliminate some of these issues (including oxidation induced color shift).

Understanding that standard desiccant bed dryers aren't going to disappear overnight, don't be surprised if you begin to see drying information from suppliers change. To date, we thought that drying nylon 6 and 66 below .20% was all we had to accomplish. The short-term answer might be to state that these products should be dried below approximately .20% to avoid hydrolysis (MW destruction), but not below .10% moisture. Nylon suppliers typically dry without oxygen, so don't expect destruction to occur on their end.

This is just one of the many concerns that we must extinguish before we embark on a new program which involves nylon processing. Please let us know if you'd like to discuss this or other nylon related production issues.

Bill Fierens  
Ashland Distribution Co.  
General Polymers - Automotive  
[wjfierens@ashland.com](mailto:wjfierens@ashland.com)

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