

## **Modifier for Processing Of Nylon Tubing & Pipe**

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**Production of Nylon into tubing and pipe is not like extruding other plastics. Nylon is a condensation polymer. Like all condensation polymers precautions in drying is critical. Furthermore, even under the best of conditions the tendency for the resin to thermally break down at high processing temperatures and shear leads to the formation of caprolactam and other degradation products that generate voids due to gassing and discoloration i.e. yellowing and ultimately lowering UV stability of the final product.**

**This problem has not been solved by the resin manufacturers who supply nylon. However, they do add copper halides when thermo-oxidative stability is required. This had also led to discoloration of the nylon and corrosion problems in the industry. Therefore, the use of nylon has been limited by the historical problems but only where its physical chemical nature is demanded is it tolerated. However, when a solution to a historical problem is finally solved the message is rarely heard because of deep seated inertia in the industry.**

**Today a solution to this long term problem is readily available as a simple masterbatch added to the production line with the Nylon resin as a pellet to pellet blend. A 20% masterbatch in a polyamide carrier resin is available to significantly reduce shear forces, allow temperatures to be dropped opening processing windows, inhibition of yellowing, increasing production line speeds by over 30%, increasing thermo-oxidative stability, increasing bleach resistance, lowering pigmentation cost for colorants other than black, increasing gloss, increasing the number of feet of tubing produced in a 24 hour period, eliminating warpage and providing intrinsic Ultraviolet Stability and Gas Staining resistance. In addition for those producing glass filled nylon pipe for added strength the modifier will reduce shear forces on the glass fibers allowing the final pipe to have a resin rich surface and embedding the glass fibers. The appearance of the pipe will now be smoother without the appearance of glass fibers on the surface.**

**Figure 1 illustration was accomplished with only 0.40% final of the modifier added to the throat of the extruder when making black pigmented Nylon 6 tubing for the automotive industry. Before addition of the modifier production was set at a horizontal pull rate and outputs per hour were 2,700 ft per hour. After addition of the modifier and adjustments in line speed to allow for the same weight per foot of tubing production output rates were now 3,900 feet per hour or from 51,000 feet to 74,800 feet in a twenty four hour operation. This translates into over a 40% increase in productivity. In addition the operation was able to lower their temperatures by 20°F.**

Figure 1: Tubing Production

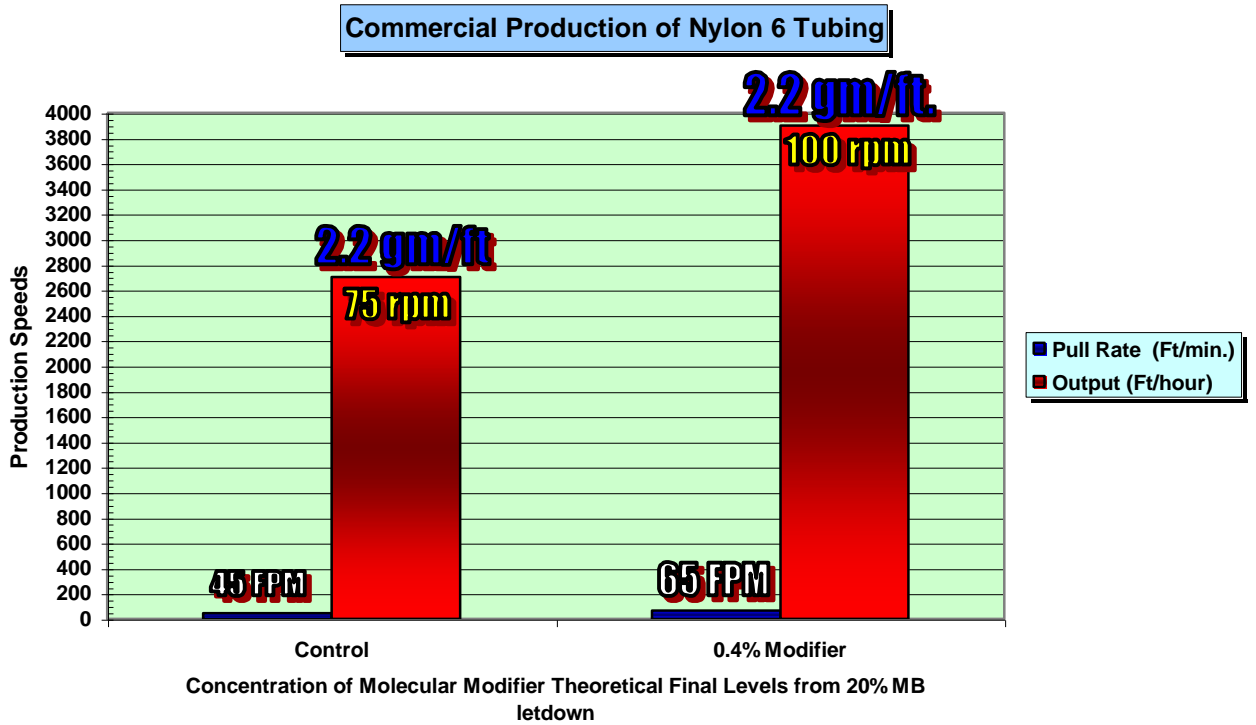
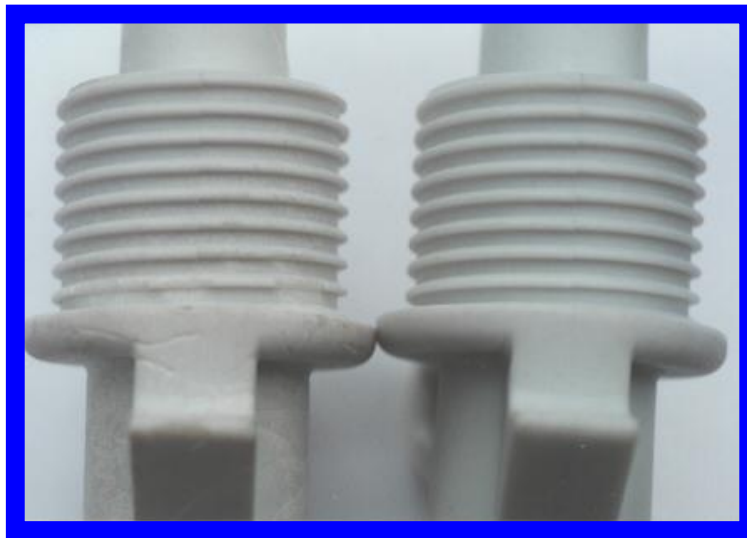
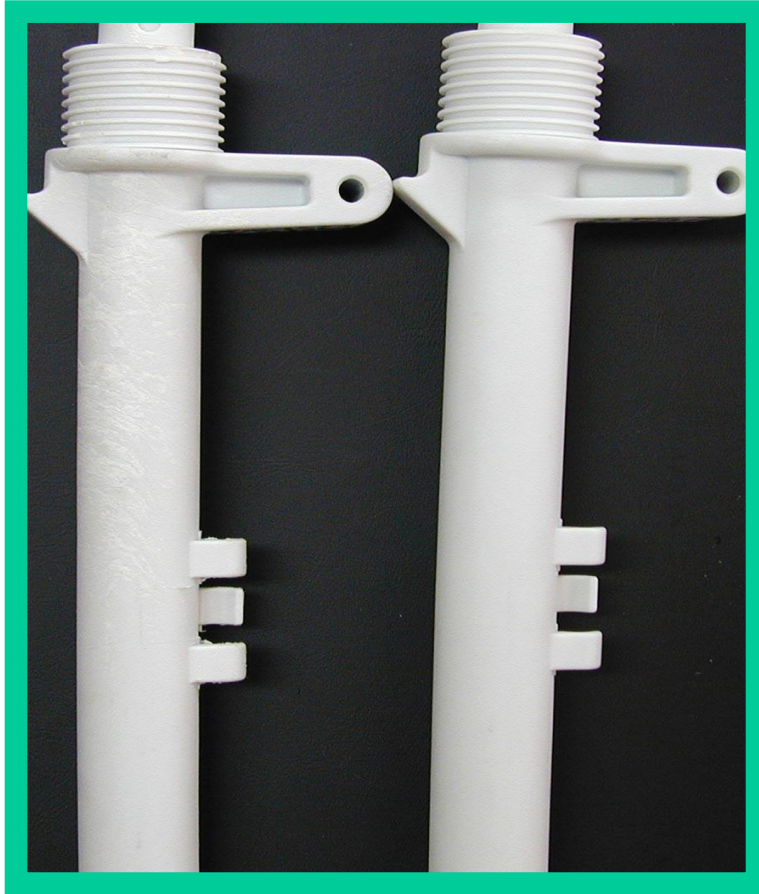


Figure 2: Threaded tubing Glass Filled 33%. Control on left while modifier added To threaded tubing to the right of the control. Modifier at 0.30% wt.



- Note the threads on the control are distorted. Adding modifier enhances the threads by reducing shear forces around the glass fibers allowing them to flow easier.

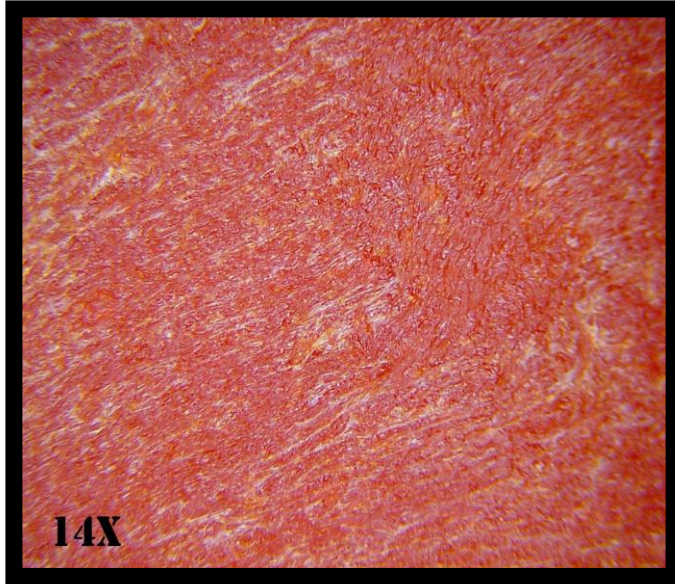
**Figure 3: 33% Glass Filled Nylon 6 with and without modifier at 0.3% wt. Control on the left. Modified resin on the right with a theoretical level of 0.3% from a 20% masterbatch of modifier.**



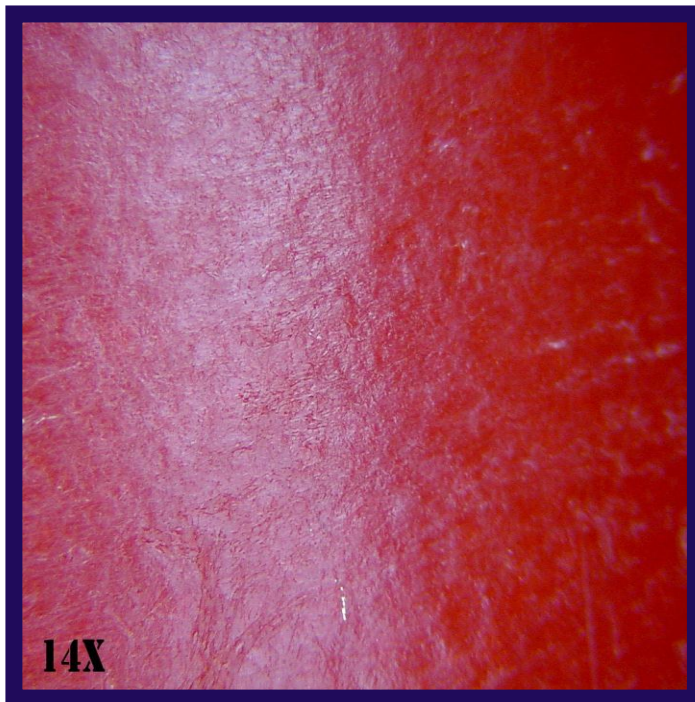
- note glass fibers are not readily visible in the modified part on the right.

**Figure 4: Surface photos of Red Pigmented Glass Filled Nylon 6 with and without modifier at 0.3% wt.**

**Control: No Modifier Added.**



**Modified Glass Filled & Pigmented Nylon with 0.3% wt.:**



- Even at 14 X magnification of the surface of the molded glass filled nylon we see better orientation of the glass embedded into the resin rich surface of the part.

**For information on availability and sampling of the modifier call or E mail me at  
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