

## MOISTURE CONDITIONING OF POLYAMIDE

Due to their chemical nature Polyamides are hygroscopic, therefore absorb moisture from environment. The moisture pick-up depends on;

- Crystallinity
- Filler type and amount
- Thickness of the part
- Temperature and relative humidity of the environment
- Time

Because of its molecular structure and crystallinity, PA 6 absorbs more moisture than PA 6.6. In addition, moisture absorption decreases with an increase in glass fiber ratio. Figure 1 presents the saturation levels of PA 6 and PA 6.6, where Figure 2 presents equilibrium moisture content depending on the glass fiber content.

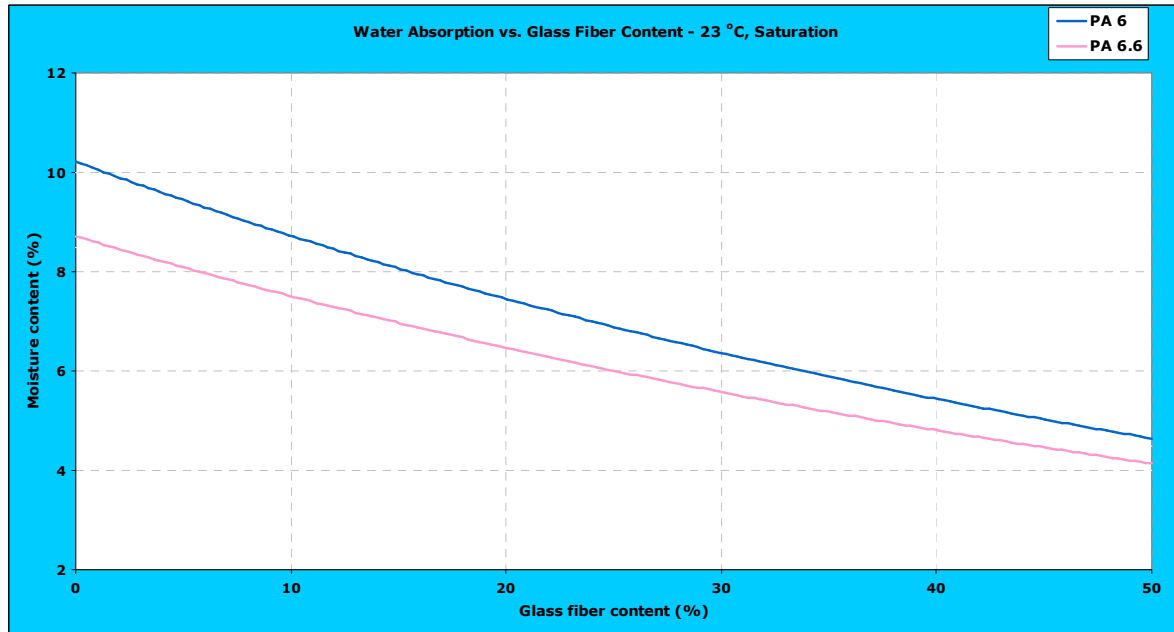


Figure 1. Saturation moisture content of PA 6 and PA 6.6 for un-reinforced and glass fiber reinforced grades.

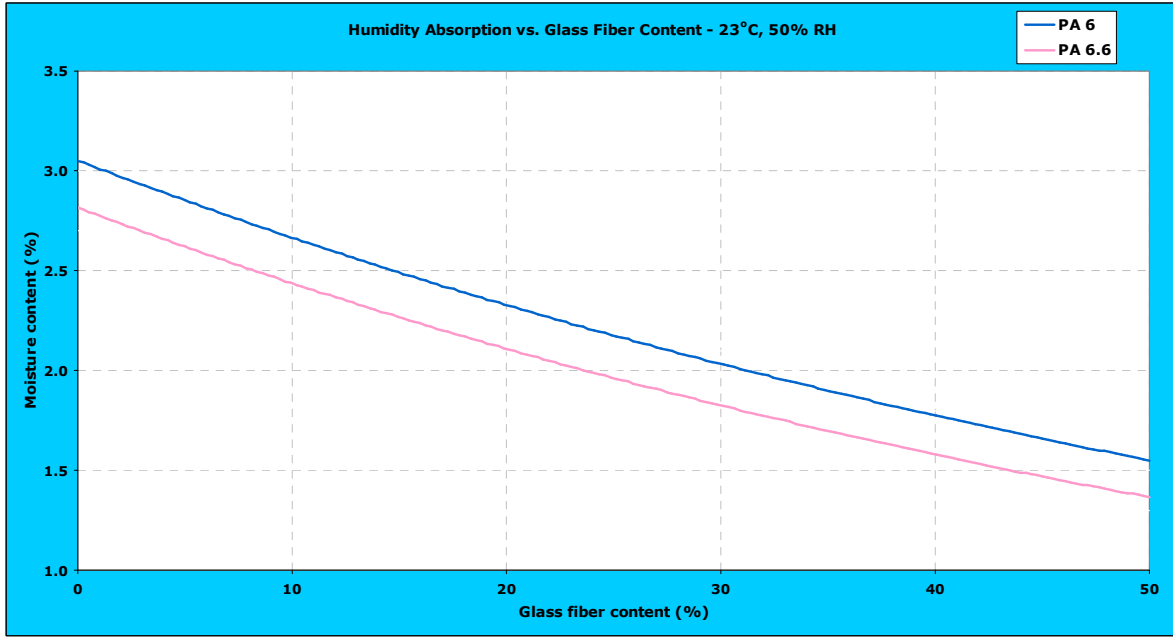


Figure 2. Equilibrium moisture content of PA 6 and PA 6.6 for un-reinforced and glass fiber reinforced grades.

Moisture absorption of un-reinforced and 30% glass fiber reinforced Tecomid® grades depending on part thickness are shown in Figure 3. As thickness increases time to absorb moisture increases.

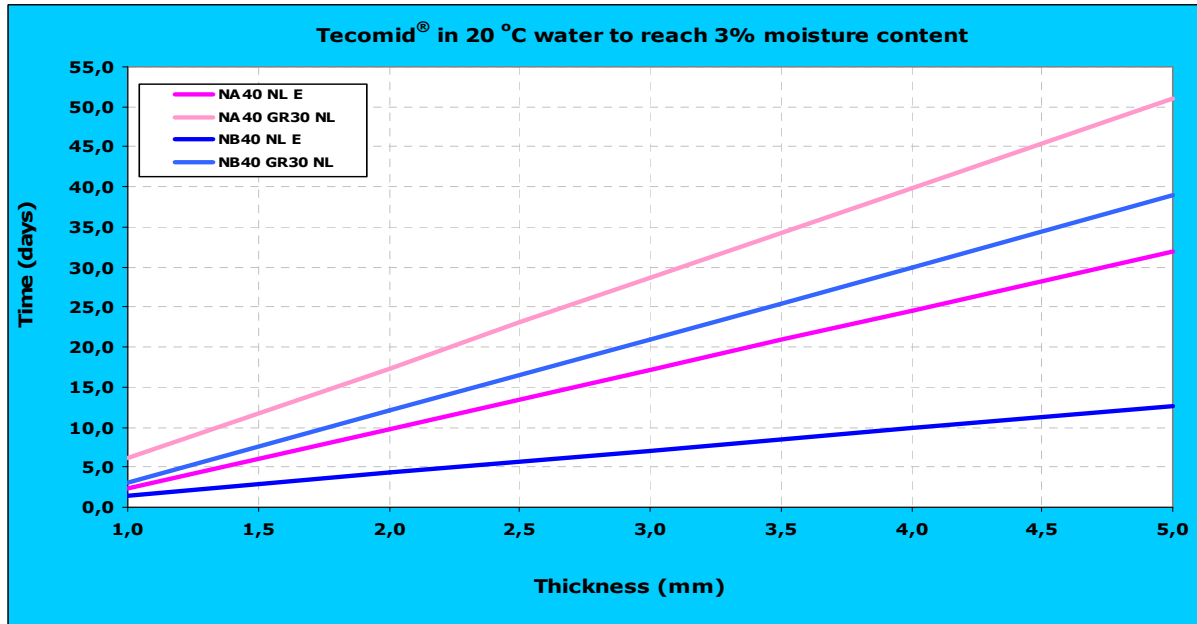


Figure 3. Average time to absorb 3% moisture in 20°C water at various thicknesses for Tecomid® un-reinforced and glass fiber reinforced grades.

Moisture absorption of un-reinforced Tecomid® NB40 NL E grade depending on environment conditions is shown in Figure 4. As temperature increases time to absorb moisture decreases considerably.



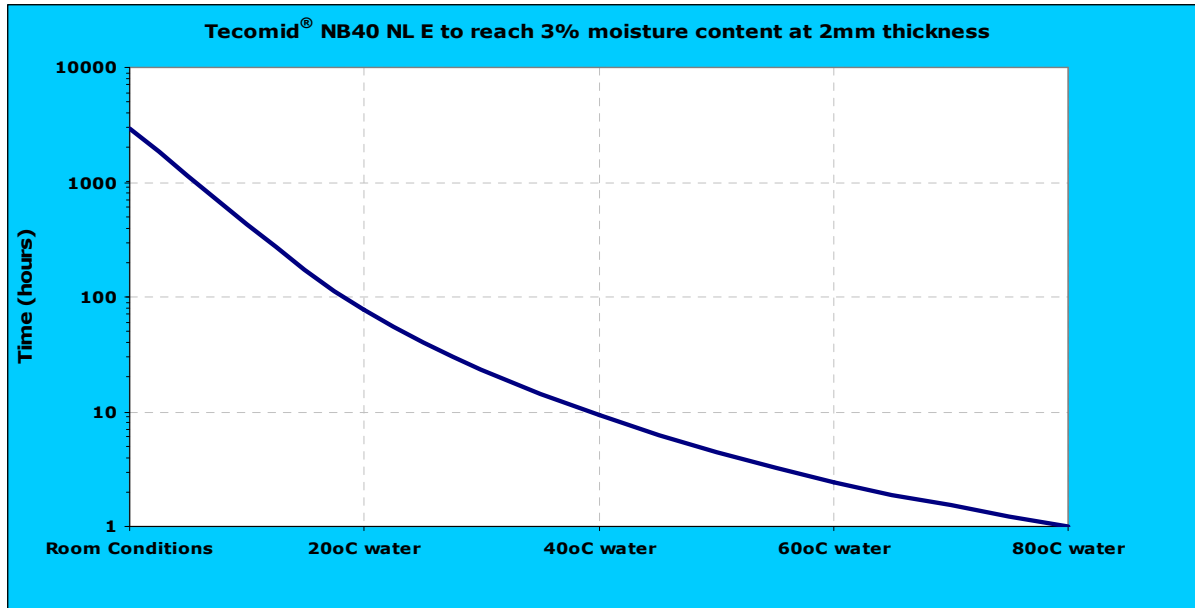


Figure 4. Average time to absorb 3% moisture at 2mm thickness in various conditions for Tecomid<sup>®</sup> NB40 NL E.

Finished parts made out of polyamide can be conditioned to balance the part in service conditions between 0°C - 100°C. As a results;

- Dimensions and weight increase slightly
- Impact strength and flexibility improves
- Strength and stiffness reduces
- Assembly becomes easy and break-free

Moisture absorption is a reversible process, which depends on temperature and humidity of the environment. Therefore application conditions of the part should be considered carefully. Considering the improvement in impact and flexibility, it is important to note that conditioning is not effective as using impact modified grades. Especially at low temperatures conditioning has no advantage as water may freeze within the polymer matrix.

As an approximate general rule, dimensions in the direction of flow increases by 0.2% for each 1% water absorbed for un-reinforced grades where this increase is 0.1% for glass reinforced types.



There are several methods for conditioning of Tecomid<sup>®</sup> resins.

Method	Application & Conditions	Advantage	Disadvantage
<b>Packing part in PE bags</b>	Add measured amount of water (i.e. 2%) by weight to molded parts and seal in PE bag	Low cost	No control on conditioning. Long time needed
<b>Tropical climate room</b>	Store parts in a room at 40°C and 100% RH	Fast conditioning	Investment cost
<b>Saturated steam room</b>	Store parts in a room at 100°C and 100% RH	Fast conditioning	Investment cost. Discoloration and deposits may occur
<b>Immersion in cold water</b>	Store parts in a container with water at 20 °C to 50 °C	Low cost	Longer time needed.
<b>Immersion in hot water</b>	Store parts in a container with water at 50 °C to 90 °C	Fast conditioning	Discoloration and deposits may occur

All above mentioned methods can be used for conditioning Tecomid<sup>®</sup> grades. Temperatures over 60 °C is not recommended due to the risk of discoloration, surface deposits and reduction in bond strength between polymer matrix and reinforcement.

