productfocus

Can cast nylon parts really be used in a wet environment?

NYLONS AND ACETALS

by Greg Waack

The broad size range availability and low cost of cast nylon make it the material of choice for a wide variety of applications. But can cast nylon parts really work effectively in a wet environment?

The answer is yes! If you design the part knowing the appropriate conditions, cast nylon can perform very well in moist environments. Selecting the right grade of cast nylon may also improve the performance of your part.

Cast nylon does experience expansion due to moisture absorption. This absorption factor affects your part's mechanical properties. Tensile strength, compressive strength, hardness and friction coefficient will all decrease as moisture content rises. It is interesting to note that parts which require higher notch impact strength or resilience will perform *better* if they have absorbed moisture, since those properties increase as moisture content rises.

Depending on the moisture content, dimensional changes may also occur. The expansion of cast nylon due to moisture absorption is approximately 0.15 to 0.20 percent per 1 percent absorbed moisture.

In normal ambient conditions (70°F/21°C, 50 percent RH) cast nylon absorbs 1.5 to 2 percent moisture to a depth of 0.040" to 0.080" over the course of approximately 40 days. That means that by the time the material arrives on your dock, it will usually not absorb any more ambient moisture. This initial absorption occurs fairly quickly, but additional absorption slows progressively with the depth of penetration.

When submerged in water, cast nylon can absorb up to 6.5 percent water at saturation. The table below lists examples for cast nylon submerged in water.

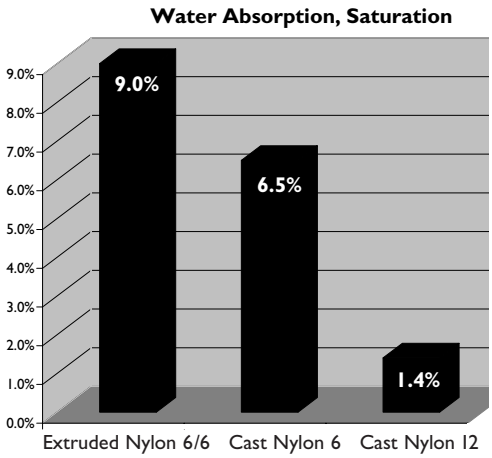
EXAMPLES OF CAST NYLON SUBMERGED IN WATER

Depth of Penetration	Time to 2.5% Absorption	Time to Saturation
0.040"	2 days	20 days
0.060"	4 days	30 days
0.080"	8 days	100 days
0.100"	11 days	180 days

Designing cast nylon parts for use in a moist environment

In order to minimize the effects of moisture absorption, several steps can be taken. One simple step is to switch from regular cast nylon to cast nylon 12. Cast nylon 12 absorbs only 1.4 percent at saturation.

Gears machined from ZL™ 250 and ZL™ 1100 nylon stock shapes are used in the moisture-rich environments of the food processing, food equipment and paper processing industries.



Split bearings and various size bushings machined from ZL™ 1100 nylon stock shapes.

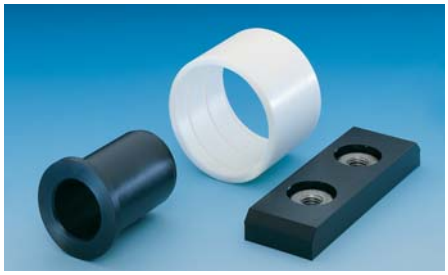
Long wear strips should be secured with one fixed hole and all other holes slotted (elongated). This allows linear expansion of the strip as moisture content increases.

Bushings will tend to expand toward the ID, resulting in the need for increased bearing play as moisture content rises.

In severe cases, conditioning of the material may be required. During conditioning, parts are rough machined, then submerged in warm water for one to two weeks. During this time, the parts will generally be saturated enough so that they can then be machined to their final dimensions and will absorb very little additional moisture.

Wet service parts in use today

Cast nylon machined parts can be found today in many wet service applications. The marine industry uses cast nylon for a variety of wear applications such as rudder bushings, sheaves, wear pads and even for rollers used for boat lifts. The logging industry puts cast nylon parts to work as clam buckets and in other miscellaneous bearing and wear parts. Parts



Wet environment parts used in the construction and marine industry include nylon wear plates and bushings.

made of cast nylon are broadly used in the construction equipment industry as sheaves and wear pads where they are exposed to wet and abrasive conditions.

Don't be afraid to recommend cast nylon the next time someone needs parts that can stand the test of wear and water! ■

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