

Nylon vs Polypropylene Selection Guide

Dedicated engineering reference guide for buyers, engineers, and sourcing teams

Based on article:

<https://nylonplastic.com/nylon-vs-polypropylene-industrial-applications/>

Quick Overview

Nylon (PA) and polypropylene (PP) are the two most widely used engineering and commodity thermoplastics respectively, together accounting for roughly 35% of all injection molded parts by volume. They often compete for the same applications — automotive under-hood components, consumer goods housings, and industrial containers — but their performance profiles diverge sharply once you look past the datasheet headline numbers.

Choosing between them comes down to a three-way trade-off: nylon offers higher strength, temperature resistance, and wear properties; polypropylene delivers better chemical resistance, lower moisture absorption, and a 30-50% cost advantage per kilogram. This comparison maps the differences across eight key performance dimensions to help you make a data-driven material selection.

Nylon dominates applications requiring mechanical load-bearing at elevated temperatures. At 80°C, dry PA66 retains 60-70% of its room-temperature tensile strength; PP drops to 30-40%. For gears, bearings, and structural brackets, nylon's 2-3x higher flexural modulus means thinner walls for the same stiffness — reducing part weight even though nylon is 25% denser than PP. In wear applications (gears, sliding surfaces), unfilled nylon has a PV limit of ~0.09 MPa·m/s versus ~0.03 for PP, and adding internal lubricants (MoS₂, PTFE) can push nylon's PV limit above 0.2 MPa·m/s.

Engineering Notes

Head-to-Head Property Comparison

Notched Izod Impact (kJ/m²)

When Nylon Wins: Strength, Temperature, and Wear

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When PP Wins: Chemical Resistance, Moisture, and Cost

Polypropylene is virtually immune to moisture absorption (<0.01% at saturation), making it the default choice for underwater, humid, and chemical-exposure applications. Nylon absorbs 2-8% moisture at saturation (depending on grade), losing 30-40% of its dry strength and swelling 0.5-1.5% dimensionally. PP also resists most acids, bases, and organic solvents at room temperature — nylon is attacked by strong acids, phenols, and oxidizing agents. In chemical tank applications, PP's chemical resistance alone eliminates nylon from consideration. On cost, PP at \$1.50-2.50/kg runs 40-60% cheaper than PA66 at \$3.00-4.50/kg. For high-volume consumer goods where strength over 30 MPa is unnecessary, this cost gap is decisive. PP's lower density (0.90 vs 1.14 g/cm³) stretches the per-part cost advantage further: a 100g PA66 part weighs 79g in PP — 21% less material per part.

Design Rules for Material Selection

Use nylon when continuous temp exceeds 80°C: PP's HDT drops to 50-60°C under load. For engine bay, power tool, or any application near a heat source, nylon (PA66 or PA6) is the floor — PPA or PPS may be needed above 130°C. Use PP for outdoor and wet environments: UV-stabilized PP grades (with 2-3% carbon black or HALS) handle years of outdoor exposure. Nylon requires UV stabilization and will still lose surface quality faster. For submerged or high-humidity parts, PP's zero moisture absorption eliminates dimensional change. Run the density-adjusted cost comparison: Per-part material cost = (part volume in cm³) × (density in g/cm³) × (resin cost \$/kg) ÷ 1000. A PP part at \$2/kg × 0.90 density costs \$1.80/L of material; PA66 at \$4/kg × 1.14 density costs \$4.56/L — a 2.5× difference that surprises designers comparing per-kg prices. Consider glass-filled grades for the middle ground: PP-GF30 reaches tensile strength of 70-90 MPa — approaching dry PA66 at 80 MPa — at roughly \$2.50-3.50/kg. GFPP cannot match nylon's temperature resistance but closes the strength gap significantly for ambient-temperature structural parts.

Industry Application Matrix

Engine covers, intake manifolds, radiator tanks Food containers, caps, closures Cost <\$2/kg + food contact approval Housings, gear cases, fan impellers Impact at -20°C + heat from motor Tanks, fittings, pump housings Chemical resistance across pH 1-14 range

Cost Decision Framework

Raw material: PP is \$1.50-2.80/kg; PA66 is \$3.00-4.50/kg; PA6 is \$2.50-3.50/kg. The gap widens for specialty grades — glass-filled PP adds \$0.50-1.00/kg; glass-filled nylon adds \$1.00-2.00/kg over unfilled base. Processing cost: PP cycles 10-20% faster than nylon (lower melt viscosity, faster cooling). For a 50g part, PP at 20s cycle vs nylon at 24s cycle saves ~\$0.02/part in machine time at \$30/hr. Over a million parts, that is \$20,000 in cycle time alone. Cost-of-failure consideration: If a nylon part absorbs moisture and swells out of tolerance, the rework cost dwarfs the material savings. Conversely, if a PP part creeps under sustained load and a product fails in the field, the warranty cost makes the nylon premium look cheap. Choose based on the application's dominant failure mode, not just the per-kg price.

Common Defects by Material

Part bows or twists after demolding Uneven cooling; anisotropic shrinkage Optimize cooling layout; verify wall thickness uniformity <15% Part snaps with no yielding Nylon: molded too dry. PP: degraded by UV/heat Nylon: condition to 1.5-2.5% moisture. PP: add UV stabilizer Contamination; incompatible regrind; mold release buildup Purge barrel; limit regrind to <20%; clean mold surface Part deforms under sustained load Insufficient modulus for load level Switch to GF grade; add ribbing; specify creep modulus, not short-term

RFQ Checklist

- Application environment: temperature, moisture, UV, chemicals, sterilization, or outdoor exposure.
- Mechanical requirements: load, stiffness, impact, wear, friction, creep, and fatigue life.
- Drawing requirements: tolerance class, critical dimensions, surface finish, threads, inserts, and inspection method.
- Production needs: prototype or production quantity, expected annual volume, target unit cost, and lead-time window.
- Material notes: preferred grade, color, reinforcement, flame rating, certification, and substitute-material flexibility.

Need manufacturing support?

Share your drawing, target material, working environment, tolerance requirements, and quantity. Nylon Plastic can help evaluate manufacturability, material alternatives, and production quotation details.

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