

Boedeker Plastics Case Study

BOETEK® POK Polyketone Replaces Type 6/6 Nylon in Food & Pharmaceutical Mixing Applications, Increasing Uptime and Enhancing Food & Product Safety

Intro

Mixing equipment is used throughout food and pharmaceutical manufacturing processes. This equipment blends and processes liquids, powders, pastes, and other ingredients. These systems often use engineered plastic parts such as scrapers, mixing paddles, guides, and wear components that come into direct contact with the product.

Materials like UHMW, Acetal, Nylon, PBT, PET, and PEEK are often used for these applications because of their wear resistance, chemical resistance, temperature resistance, and food/product-contact requirements.

Because many of these components are in direct food/product contact, excessive wear or breakage can also risk foreign-material contamination, making material selection important for both equipment reliability and product and food safety.

In this case study, we will examine how Boedeker Plastics helped a mixing equipment OEM replace Nylon Type 6/6 with a material better suited for overall scraper requirements across many food and pharma mixing equipment applications.

Challenge: Replace Nylon 6/6 Scrapers with Metal-Detectable Plastic for Higher Temperature, Improved Toughness, and Better Chemical Resistance.

An equipment OEM had been using injection-molded Type 6/6 Nylon scrapers (*Figure 1*) that became brittle and broke apart in some applications. The OEM approached Boedeker Plastics to identify a more durable overall material solution for this equipment.

In wet conditions, Nylon 6/6 absorbs moisture. This initially makes the material more flexible and less stiff. Prolonged exposure to hot water, steam, or repeated COP and CIP washdown cycles can cause hydrolysis and chemical attack, reducing strength and embrittling the material. Higher temperatures accelerate hydrolysis and chemical attack.

In mixing and kettle-cooking applications, scrapers are in direct contact with the product or food; foreign contamination from plastic fragments in pharma and food applications risks compromising product and food safety.



Figure 1 – Original Type 6/6 Nylon Scraper

Solution: Injection Molded BOETEK® POK Polyketone FDA Blue Metal-Detectable Scrapers

Team Boedeker's technical staff considered several materials as potential replacements. The main parameters were injection moldability; excellent overall chemical resistance (hot caustic and chlorinated washdown exposure from CIP & COP); an operating temperature up to 240°F; hydrolysis resistance; high impact strength; low moisture absorption; good wear properties; and the ability to be compounded with an additive for metal detection. Below is a chart (Figure 2) highlighting the main materials and key properties considered, along with the existing Nylon Type 6/6, to show how the different material options compare across all key parameters.

PROPERTY	BOETEK® POK POLYKETONE	NYLON TYPE 6/6	ACETAL POM-C	PET-P / PBT-P POLYESTER	PEEK POLYETHERETHER- KETONE
IMPACT STRENGTH IZOD IMPACT NOTCHED (VALUES IN FT-LB/IN)	BEST 10 (4.49)	LOW 5 (0.60)	GOOD 7 (1.00)	LOWEST 2 (.50/.70)	LOW 5 (0.60)
LOW WATER ABSORPTION (SAT.)	GOOD 7 (2.10%)	LOWEST 2 (7.00%)	EXCELLENT 9 (0.90%)	BEST 10 (.90/.25%)	EXCELLENT 9 (0.50%)
MAX CONTINUOUS TEMPERATURE °F	GOOD 7 (248°F)	LOW 5 (210°F)	LOW 5 (180°F)	LOW 5 (210/221°F)	BEST 10 (480°F)
HYDROLYSIS RESISTANCE >200°F	EXCELLENT 9	FAIR 6	LOW 5	LOWEST 2	BEST 10
CIP / COP RESISTANCE HOT CAUSTIC + CHLORINATED CLEANERS	VERY GOOD 8	LOW 5	FAIR 6	LOWEST 2	BEST 10
WEAR RESISTANCE SLIDING + ABRASION	EXCELLENT 9	BEST 10	FAIR 6	VERY GOOD 8	VERY GOOD 8
COST: HIGHER NUMBER = LOWER RELATIVE COST	GOOD 7	BEST 10	BEST 10	GOOD 7	LOWEST 2

Figure 2 – Material Comparison Chart – Note: all materials listed are for virgin unfilled materials.

After reviewing the requirements, Team Boedeker recommended BOETEK® POK Polyketone with FDA-compliant blue pigment and Metal-Detectable additives because it provided the best balance of impact strength, hydrolysis and chemical resistance, wear, temperature capability, and cost. Boedeker then supplied injection-molded scrapers for prototype and production use.

Result: Increased Uptime & Enhanced Food & Product Safety

The BOETEK® POK Polyketone FDA Blue Metal-Detectable Scrapers (Figure 3) have performed successfully in ongoing production and addressed the caustic washdown and hydrolysis conditions associated with premature cracking and failure of the Type 6/6 Nylon Scrapers. The result is a more durable scraper solution that supports greater uptime and enhanced food and product safety across food and pharmaceutical mixing applications.



Figure 3 – BOETEK® Polyketone Scrapers