Specialty Compounds for

PUMPS

Technical Brief

A Step-by-Step Specification Guide

Thermoplastic Compounds

- **Increase product reliability**
- **Simplify product maintenance**
- **Reduce costs**
- **Extend product life**
- **Reduce weight**
- **Resist corrosion**
- **Improve wear properties**
- **Reduce static buildup**

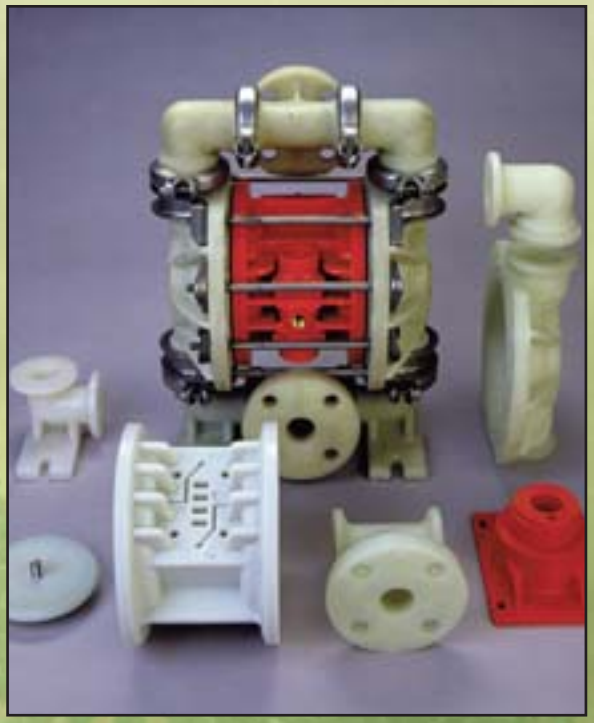
Fluid handling pumps are a common piece of industrial equipment, second only to electric motors. The market has enjoyed steady growth over the last decade, since many industries rely on pumps to move water, acids, lubricants, solvents, chemicals, and fuels.

Metals have been the traditional choice of pump manufacturers for housings, impellers, seals, and other elements.

However, the desire for improved manufacturing efficiencies has led designers to thermoplastic compounds as excellent candidates to replace metals or unfilled resins.

Plastic compounds offer a combination of physical strength, wear resistance, self-lubrication, and cost effectiveness (both material and processing costs). They are superior to metals in corrosive environments, and they are chemically resistant. Smooth surfaces for better wear performance are achieved without secondary operations.

Choosing the right thermoplastic for your pump application depends on several factors, which can vary significantly, such as pressure, temperature, and speed. Additionally, the corrosive nature of many chemicals, the abrasive characteristics of liquids or slurries, the degree of contamination that can be tolerated, and projected uses for the pump must also be considered.



The chemical resistance of an RTP Company glass fiber/polypropylene compound provides security against corrosion for parts used in fluid handling pumps. The pump is lightweight, weighing 18 pounds. Metal versions of the same pump weigh up to 42 pounds. There are no secondary finishing operations needed.

▶ *Choose RTP Company specialty compounds for:*

- Pump Housings
- Propellers
- Impellers
- Diffusers
- Rotors and Vanes
- Housing Liners
- Rotary Pump Lobes and Gears
- Seals
- Containment Shells
- Bushings
- Flow Control Valves

Specialty Compounds For

PUMPS

There is no one material – either plastic or metal – that is perfect for all pump environments. As a privately-owned specialty compounder, RTP Company develops solutions that meet your unique requirements. We independently select from a wide range of resins and additives to give you the optimum balance of cost and performance.

Resins

Semi-crystalline resins are an excellent choice for pump applications due to their combination of chemical resistance, fatigue resistance, and high duty cycles.

General Purpose Resins

Polypropylene (RTP 100 Series) - Economical industry standard with superior resistance to strong oxidizing acids and a broad range of waste streams. Good abrasion resistance; relatively high temperature tolerance; good choice for process fluids, and industrial effluents.

Nylon 6/6 (RTP 200 Series) - Low coefficient of friction; excellent chemical resistance and electrical properties.

Nylon 6/12 (RTP 200D Series) - A low moisture-absorbing nylon with high strength, heat resistance, and chemical resistance.

High Density Polyethylene/HDPE (RTP 700 Series) - Good chemical resistance and electrical properties. Glass reinforcement improves its thermal expansion, strength, rigidity and temperature resistance.

Acetal (RTP 800 Series) - Rigid, creep resistant and strong. Low coefficients of friction; stable in elevated temperatures; good resistance to hot water environments.

Polybutylene Terephthalate (RTP 1000 Series) - Crystallizes rapidly, so mold cycles are short and molding temperatures can be lower than for many engineering plastics. Very good dimensional stability, high heat resistance, chemical resistance and good electricals.

Polyphenylene Sulfide/PPS (RTP 1300 Series) - High temperature resistance; flame retardance; chemical resistance; dimensional stability; good electrical characteristics.

Polyetheretherketone/PEEK™ (RTP 2200 Series) - High temperature thermoplastic with excellent chemical resistance; high strength; non-flammable.

Fluoropolymers

Perfluoroalkoxy/PFA (RTP 3100 Series) - High temperature capability (up to 500°F/260°C); excellent chemical resistance (including oxidizing agents); excellent solvent resistance; non-flammable; low coefficient of friction.

Ethylene Tetrafluoroethylene/ETFE (RTP 3200 Series) - Abrasion resistance with outstanding impact strength and fatigue resistance. High resistance to aggressive chemicals. Heat resistant with a maximum temperature exceeding 400°F (205°C). Low coefficient of friction.

Polyvinylidene Fluoride/PVDF (RTP 3300 Series) - Tolerant of high sustained temperatures; excellent for handling process fluids that are extremely corrosive or abrasive; high strength; excellent weatherability; good solvent resistance; non-flammable.

Fluorinated Ethylene-Propylene/FEP (RTP 3500 Series) - Excellent chemical resistance (including oxidizing agents); excellent solvent resistance; non-flammable; low coefficient of friction; low dielectric constant; low water absorption.

Additives

Graphite - Ideal lubricant for many underwater applications.

Short Glass Fiber - Improves mechanical and thermal performance of compound. Increases coefficient of friction and mating surface wear.

Long Glass Fiber - Dramatically increases impact strength without sacrificing flexural modulus. Improved mechanicals over short glass fibers, particularly in pump housings. Excellent alternative when short glass fiber fails to provide sufficient performance.

Carbon Fiber - Improves mechanical and thermal performance. Provides best stiffness. Lowers coefficients of friction. Softer and less abrasive than glass fiber. Helps dissipate static electricity.

PTFE - Lowest coefficient of friction of any internal lubricant. Forms a lubricious film on part surface. Modifies mating surface after initial break-in period. Facilitates higher dynamic load bearing.

This chart is intended as a starting point for materials development. RTP Company can modify and customize materials to meet your demands for precision motion control, load carrying ability, temperature resistance, color, geometry, and other requirements.

This all-plastic control valve for high-pressure fluids is completely corrosion resistant and reduces weight by more than 50% over metal versions. All the black components, including the bonnet, pneumatic actuator, and T-intersection, are molded with an RTP 4000 Series reinforced PPA compound. The shell and core design provides tremendous strength and impact resistance while preventing the white PTFE parts from creeping under excessive temperatures and pressure.

The material is heat stabilized and displays tensile strength of 34,000 psi (234 MPa), notched IZOD impact strength at 1/8 in of 5.0 ft lbs/in (267 J/m), and flexural modulus of 2.50 psi x 10^6 (17225 MPa).

Wear resistance data on these and other RTP Company compounds are available on our website at www.rtpcompany.com/info/wear.

RTP Company utilizes a broad range of injection molding, thermoforming, extrusion, and testing equipment for product and process evaluations. Our Technical Service department provides expert assistance in processing considerations, molding trials, troubleshooting, and other customer needs. Arrangements for on-site visits can be scheduled through your sales representative or directly with our Technical Services group.

The Global Leader In Specialty Compounding

▶ *Representative Compounds*

Successful pump applications rely on the right choice of materials to optimize your design. Instead of offering off-the-shelf commodity products, RTP Company's engineers work closely with you to develop a unique compound that delivers just the right combination of performance and price.

Resin	RTP Product	Typical Applications	Design Considerations
Acetal	ESD 800 TFE 10	Housings related to fuel pumps	Low moisture absorption. Dissipates static buildup. Wear resistant.
ETFE	RTP 3283	Impeller and containment shell for magnetic sealless pumps	Low coefficient of friction. Carbon fiber increases strength and rigidity. Excellent resistance to acids and corrosives.
HDPE	ESD C 703	Nozzle holder between vacuum breaker and pump	Chemical resistance to fuel. Conductive to bleed off static charges. Reinforced to withstand vacuum pressures.
Nylon	RTP 80207 EM HS (Long Fiber)	Impellers, housings, propellers	Better mechanical and impact properties. Long-term creep and fatigue resistance. Stabilized for elevated temperatures. Dimensionally stable.
Nylon 6/12	RTP 207 D	High pressure housings	Chemical resistance. Good for water applications. Mechanical properties a plus.
PBT	RTP 1001 GB 15 TFE 5	Impellers, diffusers, housings	Compatible with potable water. Low water absorption and low shrink. Good chemical resistance.
PEEK	RTP 2282 LF TFE 15	Scroll tip seal in air conditioning compressors	Wear resistance and stiffness. Superior high temperature performance to prevent leaking.
PEEK	RTP 2285 TFE 15	Bushings, impellers, rotor vanes, lobes, and gears in rotary pumps	Wear and chemical resistance. Superior high temperature performance. Dimensional stability. Long lasting, even with mating surface contact. Reduced noise. High Pressure*Velocity capability.
PP	RTP 105 CC	Housings, diaphragm pump components	Good balance of cost and chemical resistance. Impact strength. Compatible with broad range of fluids including potable water. Better mechanical properties compared to unfilled resins. Colorable.
PP	RTP 80107 CC (Long Fiber)	Impellers, housings, propellers, flow control valves	Good mechanical and impact properties. Long-term creep and fatigue resistance. Cost effective and chemically resistant.
PPS	RTP 1307	Housing, impellers	Chemical and creep resistant. High strength and modulus. High temperature performance. Dimensional stability.
PPS	RTP 1385	Impellers, housings, rotary pump components	Chemical and creep resistant. Extra strength and modulus. Low coefficient of friction. High temperature performance. Dimensional stability.

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