



Specialty CASE Products | Millathane® Millable Polyurethane
Plastic Fabrication & Machining | Rubber Molding & Extrusion

#PASSIONFORPOLYMERS



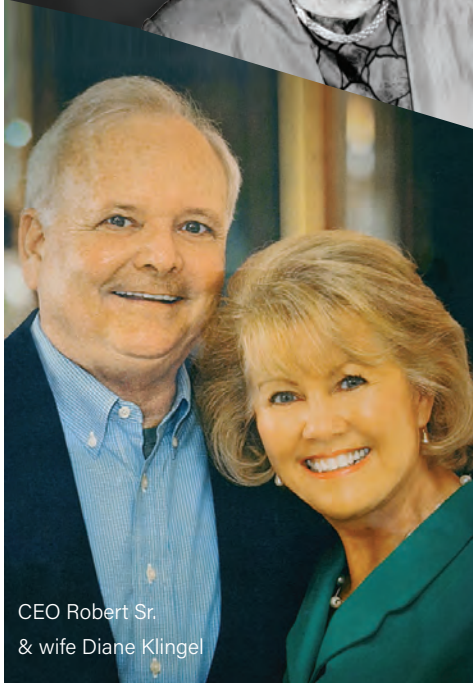
Since 1962, we've had a **Passion for Polymers**

WHO WE ARE

TSE Industries was founded in 1962 when Walter and Helen Klingel began purchasing and reselling industrial plastic materials. Based in Clearwater, Florida, we are a family-owned, global manufacturer of Specialty Chemicals and Millathane® millable polyurethane rubber, as well as a fabricator of polymers including custom molded, injected, and extruded rubber and plastic components. Now, Walter and Helen's son, Robert Sr., is Chairman and CEO, while the third-generation of Klingels serve in leadership roles of TSE Industries and its two subsidiaries, WHK BioSystems and Duro-Glide® Polymer Sheets. Everything the TSE Family of Companies manufactures and fabricates is done with care, confidence, and the utmost attention to detail. We've had a true #PassionForPolymers since we started, and the certifications and registrations we've received reinforce our commitment to customer service excellence.



Founders, Walter
& Helen Klingel



CEO Robert Sr.
& wife Diane Klingel



ecovadis

OUR MISSION

TSE Industries was built on one simple value that has withstood the test of time – treat customers and employees the same way we would want to be treated. This core value has served us well, and it accounts for our growth from a small “mom and pop shop” to an industry leader in polymers and other specialty chemicals. Our management team and employees take great pride in the quality services we provide. We've worked hard to become that business partner you can trust with your most critical products and components.

OUR COMMUNITY

In 2002, TSE Industries established the Klingel Family Foundation to increase corporate giving by facilitating philanthropic donations to a wide range of deserving organizations. Since its inception, the Klingel Family Foundation has given well over \$6 million to various charities within the state of Florida.

We also work closely with local technical schools and training programs to enhance students' educational experience in the hopes of creating a pipeline toward future job opportunities for students in manufacturing.



Robert Jr. Klingel
President
WHK BioSystems

Richard Klingel
President
TSE Industries

Brad Klingel
President
Duro-Glide®

Table of Contents



(800) 237-7634 | www.tseind.com

2

CONTRACT MANUFACTURING OF SPECIALTY CASE PRODUCTS

Coatings | Adhesives | Sealants | Elastomers

3

MILLATHANE®

Millable Polyurethane Rubber

4

THANECURE®

Reactive Additives

THANECAST®

Prepolymers

5

POLYASPARTIC COATINGS

TSE-EZASP™ | TSE-EZNATE®

POLYURETHANE & POLYUREA COATINGS

For Expanded Polystyrene (EPS) & Industrial Markets

6

CUSTOM PLASTIC FABRICATION

CNC Routers | Mills | Lathes | Doweling

7

CUSTOM RUBBER MOLDING

Compression Molding | Injection Molding | Extrusion

8

DURO-GLIDE® POLYMER SHEETS

Compression Molded UHMW-PE Sheets

A TSE Industries Subsidiary

9

WHK BIOSYSTEMS

Contract Manufacturer of Medical Device

Components & Single-Use Assemblies

A TSE Industries Subsidiary



Contract Manufacturing of **Specialty CASE Products**



COATINGS | ADHESIVES | SEALANTS | ELASTOMERS

(800) 237-7634 | www.tseind.com

TSE Industries is a full-service chemical provider of various CASE products, or Coatings, Adhesives, Sealants, and Elastomers. We operate an ISO 9001:2016 certified facility and can manage all phases of production, from handling raw materials all the way through to packaging and blind-shipment of goods. As your tolling partner, TSE will offer you complete confidentiality in working with the quality polyurethane products your customers have come to expect from you.

Our team of chemists, engineers, and operators have manufactured hundreds of millions of pounds of polymers for the world's largest chemical providers. We supply consistent and reliable contract and toll manufacturing through our global network that includes North America, Asia, Europe, and South and Central Americas.

PRODUCT DEVELOPMENT

TSE chemists and engineers from the on-site Development and Analytical Center (DAC) perform product development and testing, as well as statistical process and quality control. Our reactors are designed to allow for near seamless scale-up activities for any polyurethane chemistry needs. Our technical team will scale-up your product from development quantities to full-scale commercial production with speed, accuracy, efficiency, and consistency.



MANUFACTURING EQUIPMENT
Production Reactors: 4,800 Gal (2) 3,750 Gal (4) 1,500 Gal (2) 700 Gal
Scale-Up Reactors: 500 Gal 250 Gal 25 Gal 15 Gal 5 Gal
Reactors are 316 Stainless Steel, Full Vacuum, Pressure Rated
In-line Filtration (10-800 micron) with Jacketed Draw-Off Lines
Operate Under Closed Conditions
Charge from Bulk, Drum, Tote, Bags
Full Heating and Cooling Systems
NMP Process Cleaning System
Solvent Distillation and Recovery System

POLYURETHANE CHEMISTRY
Reactive Hot Melt Adhesives
Urethane Prepolymers (MDI, TDI, Aliphatics)
Pigmented, Filled Polyurethanes/Polyol
Thermoplastic Polyurethanes (TPUs)
Epoxies
Polyurea and Polyaspartic Coatings
Polyurethane Systems
Liquid Urethane Adhesives
Cast Urethanes

COMING SOON!

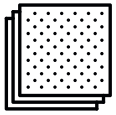
Capabilities are increasing starting in late 2021 with the addition of three new reactors including a 25 Gallon and two 70 Gallon!

Packaging Capabilities		
Full Tanker Trucks	55 Gallon Drums	Slugs
275 Gallon Totes	5 Gallon Pails	Cartridges



TSE Industries is one of the world's largest manufacturers of Millathane® millable polyurethane. From airplane deicing bladders to athletic shoes, Millathane is the polymer of choice for demanding applications requiring superior abrasion resistance and mechanical strength, as well as oil and ozone resistance. Millathane millable polyurethane rubbers (millable gums) are solid polymers that can be processed on internal mixers and rubber mills. For ease of processing on rubber mills, it is sold in bales and/or premilled sheets.

Millable urethane rubbers possess a combination of physical properties not found in natural or synthetic rubber.



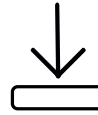
OUTSTANDING
ABRASION
RESISTANCE



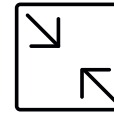
EXCELLENT
OIL, OXYGEN, OZONE
RESISTANCE



LOW TEMP FLEXIBILITY,
WITHSTANDS TEMP
UP TO 120°



DYNAMIC
LOAD BEARING
ABILITY



EXCELLENT
RESISTANCE TO
COMPRESSION SET



EXCELLENT
RESISTANCE TO
GAS PERMEABILITY

MILLATHANE® GRADES

TSE offers 10 different grades of Millathane polyurethane, each one possessing key properties and characteristics that make it distinct. We have also developed a Millathane UV curing system as an alternative to traditional peroxide and sulfur cures.

POLYETHER GRADES	
Millathane 26	Millathane E40
Millathane 55	Millathane E34
Millathane 97	Millathane CM

POLYESTER GRADES	
Millathane 66R	Millathane 5004
Millathane 76	Millathane HT

COMMON APPLICATIONS

Popular uses for Millathane millable polyurethane rubber:

- Electronics
- Athletic Shoes
- Industrial Tires
- Medical Devices
- Military
- Oil / Fuel Resistant Uses
- Rollers / Belting
- Aeronautical



Thanecure® T9 (dimer of 2,4-toluene diisocyanate) is an adhesion promoter developed for high-performance products to keep them operating through temperature extremes, fatigue, moisture, and stress. It allows products to perform longer without fear of adhesion failure.

THANECURE® T9 APPLICATIONS

- Crosslinker for heat-activated adhesion, coating, or elastomer systems.
- Vulcanizing agent for isocyanate-curable polyurethane rubbers, particularly when a high hardness is desired. Applications include industrial molded parts, rollers, and ceramic tile molds.
- Adhesion promoter for rubber-to-fabric and PVC-to-fabric bonding (polyester, aramid, polyamide). Applications include tire cords, conveyor belts, drive belts, industrial hoses, and coated fabrics.

Thanecure® ZM is a cure activator/accelerator for sulfur cured Millathane® polyurethane rubber. It consists of a partial complex of zinc chloride and MBTS. Increasing the amount increases the rate and state of cure and improves the compression set resistance.

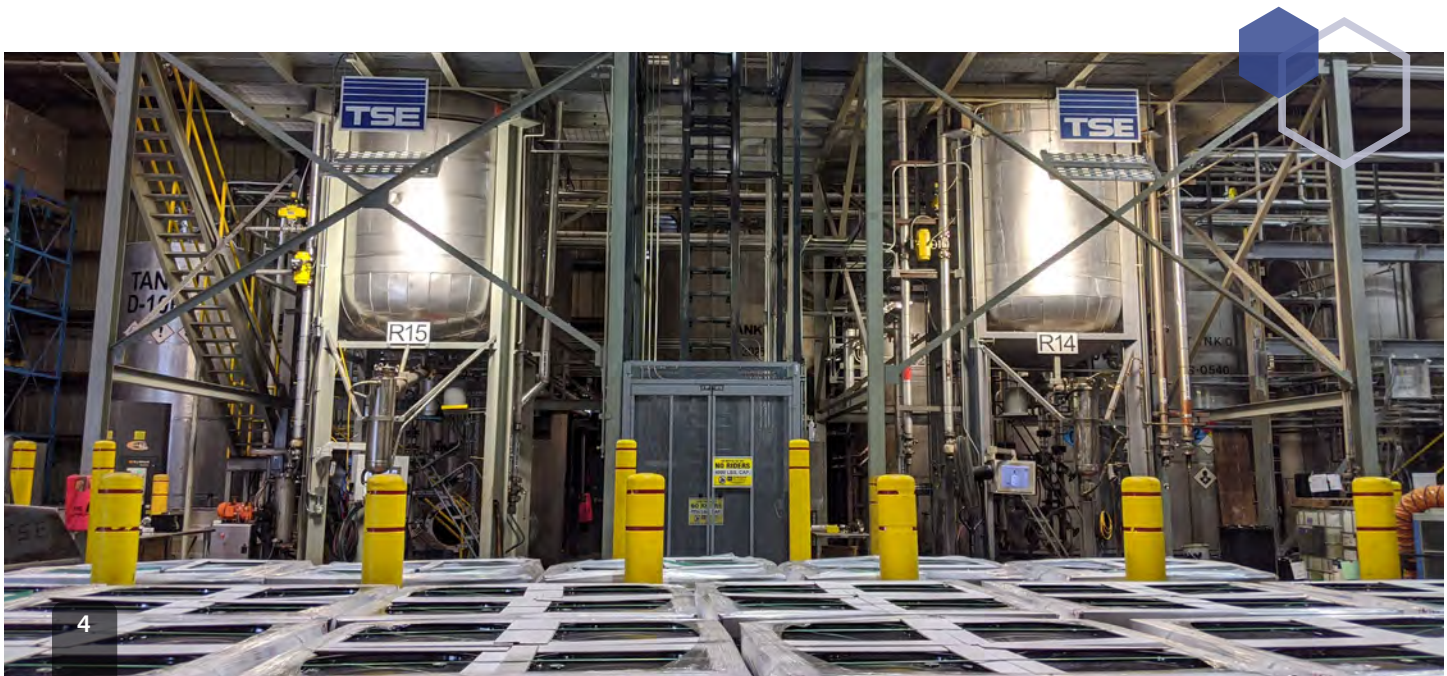
Thanecast® Prepolymers

PREPOLYMERS FOR CASTABLE POLYURETHANE SYSTEMS

Over the last 60 years, TSE Industries has perfected the manufacturing processes of specialty chemicals, expanded our capabilities, and increased our available production scale. We now offer a line of Thanecast® Prepolymers for the Castable Polyurethane market.

Thanecast® Prepolymer Offerings
Polyester / TDI Grades
PPG / TDI Grades
PTMEG / TDI Grades
Custom Grades
Future Grades to Include MDI-Based Prepolymers

Packaging Capabilities
Full Tanker Trucks
275 Gallon Totes
55 Gallon Drums
5 Gallon Pails
Custom Packaging Available



TSE-EZASP™ polyaspartic resins are amine-functional resins for use with **TSE-EZNATE®** aliphatic polyisocyanates (or other polyisocyanate hardeners). These coatings are used in indoor/outdoor applications to protect concrete and steel. These resins are mixed at a 1:1 ratio with an aliphatic polyisocyanate hardener to form a two-part system that can be easily applied with a roller, squeegee, or sprayer. The end product is a hard, clear, non-yellowing protective layer. Color chips can be added for extra grit and customization.

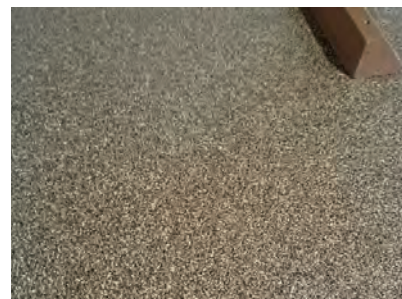
Type	Name	Properties
Resin	TSE-EZASP™ 7980	Very fast-curing aspartic ester, medium viscosity
Resin	TSE-EZASP™ 7981	Medium-curing aspartic ester, medium viscosity
Resin	TSE-EZASP™ 9033	Slow-curing aspartic ester, low viscosity
Resin	TSE-EZASP™ 8443	Aspartic ester used to lower viscosity
Hardener/Curative	TSE-EZNATE® 1100	Aliphatic polyisocyanate hardener

ADVANTAGES FOR INSTALLERS

- High durability, excellent abrasion and weather resistance
- Good chemical resistance, UV stability
- Thick layers means fewer applications (jobs typically done in one day)
- Reduced cure times means increased productivity, reduced cost
- Net Zero VOC

COMMON APPLICATIONS

- Commercial and residential garages
- Warehouses
- Industrial and commercial spaces
- Bridges and roofs
- Light poles and rail cars



Polyurethane & Polyurea Coatings

SPRAY-APPLIED COATINGS FOR EXPANDED POLYSTYRENE & INDUSTRIAL MARKETS

POLYUREA COATINGS

Spray-applied coatings used in the industrial market due to their excellent chemical and abrasion resistance. Applications include secondary containment, waterproofing, lining. With excellent adhesion to concrete and steel with proper primer and surface treatment, this fast-setting coating can be spray applied smoothly without seams.

ADVANTAGES FOR INSTALLERS

- Fast setting (2-5 mins. cure time) based on formulation
- Excellent abrasion, scratch, chemical resistance
- Very stable in all weather and environmental conditions
- Effective bonding for surfaces: cement, concrete, metal

POLYURETHANE COATINGS

Spray-applied protective coatings for Expanded Polystyrene (EPS) are mainly used on foam architectural moldings and in the theme industry. It was developed to replace polyester in FRP applications. Its superior adhesion to foam applications and non-brittle nature mean no more broken edges or flying debris during cutting.

ADVANTAGES FOR INSTALLERS

- Fast setting, tack-free handling in seconds
- Easily accepts primer and finish
- Offers cost-effective EPS foam protection

Since 1962, we have been providing customers with excellence in custom plastic fabrication and CNC machining. Our fabrication engineers are skilled in CAD/CAM programs so you can bring us your tightest tolerance or oddest profiles and we will fabricate your parts to your exact requirements. Production-run quantities are fulfilled without the up-front cost of custom molding or tooling, and parts are cleaned, de-burred, and ready to install. From 3-axis CNC routers with multiple active tool changers to 3D measurement tools that provide inspection and analysis of components during manufacturing, we provide the very best in plastic fabrication.



CNC ROUTERS

3-Axis Routers | Dual Router Beds
5' x 10' Beds | 12 Active-Tool Changers
Maximum 4" Thick Material



LATHE MACHINES

Max. 7" / Min. 2" Stock
Sheaves | Idles
Bearings | Sprockets



MILL MACHINES

Secondary Processes
Chamfers | Stepped Edges | Bevels
Grooves | Pulls | Side Holes

MATERIAL CHOICES

Acetal: High compression strength, stiffness make it good for high-load applications

Nylon: Common in industrial components. Excellent wear resistance, tensile strength

Polytetrafluoroethylene PTFE: Chemical, electrical, mechanical, thermal properties

UHMW (Duro-Glide®): When abrasion, impact, or chemical resistance is desired

COMMON APPLICATIONS

- Chain Sprockets and Gears
- Chain Tracks and Guides
- Food Processing Components
- Wastewater Treatment Part
- Conveyor Components



TSE has been perfecting custom rubber molding and extrusion through our staff, equipment, and expertise to produce your rubber parts. We can extrude custom profiles for food, beverage, airport baggage handling industries, and more. We manufacture these products, on-time, within specifications, with extremely tight tolerances. From injection to compression to extrusions, we will walk you through every type of rubber molding until we find the model that works best for you.

RUBBER BELTS

Custom rubber belts can be made in a variety of materials for many applications. Our belts last under the most demanding conditions, including our Kevlar® reinforced components.



RUBBER ROLLERS

Rollers can be found in the manufacturing of textiles, film, sheet, and paper. They can be seen in point-of-sale printers, press/paper path functions, and labeling operations.



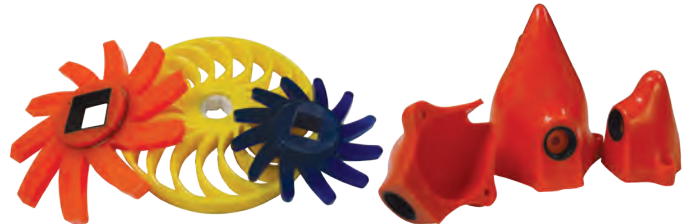
RUBBER CONVEYOR GRIPPERS

Conveyor grippers are incredibly tough, with a tear strength increase of 100% over conventional rubber grippers and a tensile strength of 70% over conventional rubber grippers.



CAST URETHANE PARTS

Cast urethane parts offer a longer service life compared to metal or plastic. The hardness varies from very soft to rock hard. They can also be approved for FDA food contact uses.



MATERIAL CHOICES		
Butyl	HNBR	Polybutadiene
EPDM	Natural Rubber	Polyurethane
Fluorosilicone	Neoprene	SBR
FKM	Nitrile	Silicone

COMMON APPLICATIONS

- ATM Replacement Parts
- Covered Bearings
- Light Seals
- Vibration Dampeners
- Driver or Idler Wheels
- Suction Cups
- Footpads
- Baggage Line Bumpers
- Crush or Picker Wheels
- Diaphragms or valves

On-Site **Mold Shop**

With our on-site mold shop, we can create any form out of steel or aluminum for life-long use of the mold. We perform soft tooling out of urethane or plastic for prototyping of molds or short-run manufacturing of parts. TSE also offers rapid prototypes of custom rubber parts in days by utilizing our in-house lab with our 3D printers.



Duro-Glide® POLYMER SHEETS

A TSE Industries Subsidiary

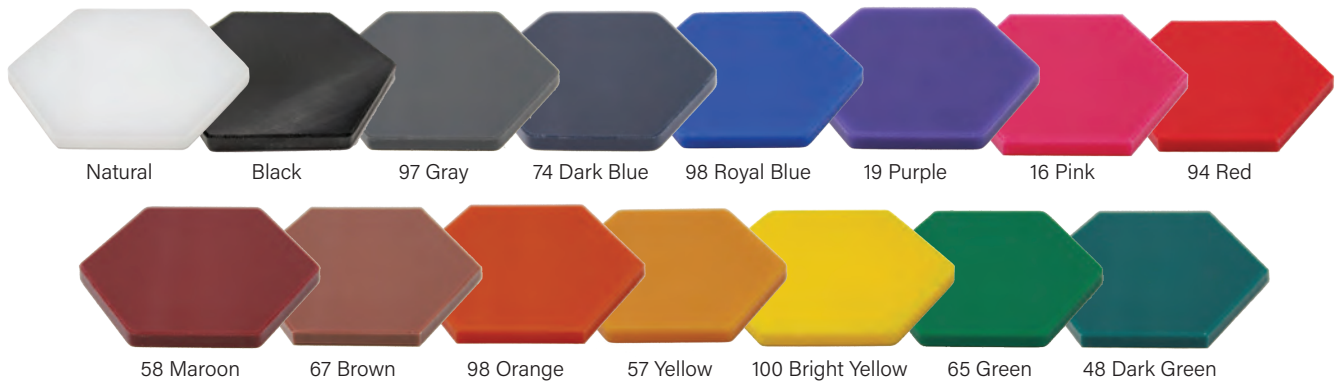
ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMW-PE) SHEETS

www.duroglide.com

Since 2002, Duro-Glide® Polymer Sheets has been manufacturing UHMW from its 50,000-square-foot facility in Clearwater, Florida. The plant is home to state-of-the-art sheet molding equipment that is capable of blending and compressing a wide range of polymers into large, 4'x 10' sheets. Certain polymer formulas are available in 80" x 160" and 80" x 240".

DURO-GLIDE® VIRGIN COLORS

Virgin UHMW Colors meet FDA regulations for food industry applications on most colors (excluding pink). They offer good sliding properties and a low coefficient of friction. Uses include the conveyor industry, machine construction, and the food industry.



DURO-GLIDE® ENHANCED

Enhanced UHMW is the high-performance version of Virgin Colors. These sheets are more impact and wear-resistant than the standard sheets, and they feature additives that target specific properties to meet the toughest and most demanding uses.

FEATURED ADDITIVES: Internal Lubrication • High-Heat Resistant • Impact and Wear Resistant • Special Applications

DURO-GLIDE® REPROCESSED

Reprocessed UHMW is manufactured from recycled UHMW pieces. With a minimum molecular weight of 3.1 million, these sheets offer a less expensive alternative when sheet color isn't a priority. Sheets are for non-FDA applications.



WHK BioSystems is a contract manufacturer of single-use process components and assemblies for the biopharmaceutical, life sciences, and medical industries. We are an FDA registered facility and maintain an ISO 13485:2016 certified quality management system. WHK also offers Class 7 cleanrooms and controlled environment production.

We provide a wide array of manufacturing capabilities, including TPE and silicone injection molding, TPE extrusion, laser cutting, machining, assembly, 3D printing, and RF welding.



SERVICES

- Cleanroom Injection Molding
- Medical Tubing Extrusion
- Device Design and Production
- Medical Device Assembly





PRODUCTS

- Single-Use Assemblies
- Transfer Bottle Assembly
- W-TPE® Tubing
- Custom Tube Kits



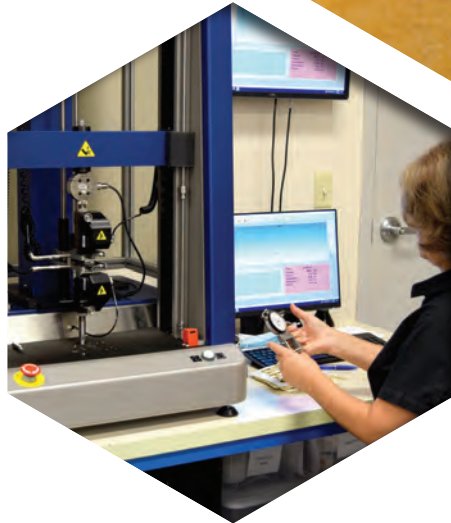


CAPABILITIES

- RF Welding Technology
- Precision Plastic Machining
- Rapid Prototyping
- Laser Cutting and Engraving







TSE INDUSTRIES, INC.

5180 113th Avenue North | Clearwater, FL 33760
(727) 573-7676 | (800) 237-7634 | www.tseind.com