

BENEATH THE SURFACE

The Value of Expertise and Support
in Paint Protection Film Manufacturing

LUBRIZOL ENGINEERED POLYMERS



BENEATH THE SURFACE

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CHAPTER 1

TPU: Going Beneath the Surface

The world's polymers are both manmade and naturally occurring. In nature, cellulose, the most abundant organic polymer on earth, was actually used to produce the first engineered thermoplastic polymers. Polymers are prized materials because of their astonishing ability to transcend the properties of traditional materials in end-use applications of every conceivable type. Comprised of long chains of molecules with repeating units, the limits of polymers stem only from the limits of the imagination and the determination to fulfill their endless possibilities.

The polymer known as thermoplastic polyurethane (TPU) was invented in 1959 and commercialized as ESTANE® TPU by BFGoodrich's specialty chemicals business, which became part of The Lubrizol Corporation in 2004, complementing Lubrizol's long legacy in specialty polymers and formulating know-how. Harnessing deep materials science expertise, Lubrizol's Engineered Polymers business has led the advancement of TPU to elevate the performance of industrial

and consumer goods through surface protection and other key applications. ESTANE® TPU revolutionized the market by bridging the gap between flexible rubber and rigid plastics, and is widely recognized as the benchmark for TPU performance in terms of long-lasting beauty and surface integrity.

TPU has application in a wide range of products and industries. For more than 30 years it has been a key performance-enabling ingredient in paint protection film (PPF). Across the world, PPF is used to protect automotive exterior surfaces from weathering, scratches, chips from flying rocks and road debris, corrosive pollution such as acid rain, and daily wear and tear. But TPU is not a one-size-fits-all solution; it is carefully customized for the applications it serves.

For PPF manufacturers in particular, it is important to understand the value of working with a TPU supplier who has advanced materials science capabilities and can look “beneath the surface” to drive innovation. There are important advantages for product developers in partnering with an “inventor-supplier” with broad experience, deep market expertise and supply chain reliability. These capabilities can help manufacturers expand existing markets, build their brands and develop new applications. The advantages of supplier specialization and know-how are the subject of this guide.





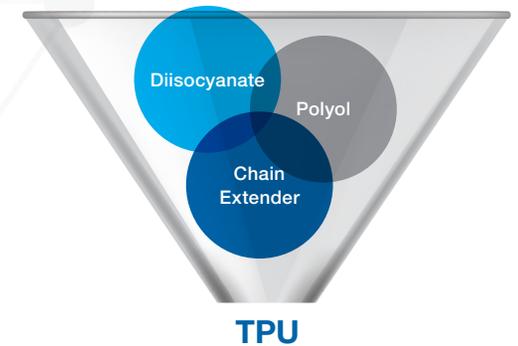
CHAPTER 2

The Versatile Chemistry of TPU

TPU is a class of polymer that bridges the gap between flexible rubber and rigid plastics. It can be custom engineered to be as soft and stretchy as a rubber band or as hard as a construction hard hat. This makes it ideal for automotive, specialty industrial, electronics, footwear, performance apparel and consumer goods applications.

TPU is versatile because it is a block copolymer that consists of alternating sequences of hard and soft segments along with a highly reactive chain extender. Specialized materials scientists can engineer the proportion of hard and soft segments, as well as the individual segment chemistries, to precisely result in the desired performance attributes. Endless variations are possible by changing mixture ratios, chemistries and process parameters.

For instance, a greater ratio of hard to soft segments will result in a more rigid TPU. Harder segments provide extra resistance to stains, chips and other surface damage that a vehicle can encounter. But the hardness must be balanced with enough softness to ensure ease of installation, especially around the complex geometries common with front bumpers, side-view mirrors and more intricately designed



vehicle surfaces. This is where the soft segments come in, to provide PPF the flexibility to stretch and conform to surfaces for a perfect balance of toughness and conformability.

THE BASICS OF TPU CHEMISTRY

There are several recognized building blocks for the chemistries of hard and soft segments. Hard segments can be either:

- **Aromatic**, which are typically used when durability and strength are paramount but extreme UV resistance with non-yellowing performance is not essential to the application.
- **Aliphatic**, which will not yellow or become brittle as a consequence of long-term UV exposure and which are capable of exceptional transparency, self-healing properties and chemical resistance.

BENEATH THE SURFACE

Soft segments can be either:

- **Polyester-based**, which provides excellent fuel, oil and chemical resistance in addition to abrasion resistance, adhesion and barrier properties.
- **Polyether-based**, which offers advantages in low-temperature properties and resistance to hydrolysis and improved UV and fungal resistance.

- **Polycaprolactone-based**, which is a combination of polyester-based and polyether-based segments providing optimal properties from each.
- **Polycarbonate-based**, which offers high performance in applications requiring high temperature resistance, durability and UV resistance.

Applying the principles of materials science, this adaptable polymer can be custom engineered to meet the multitude of demanding properties required of surface protection applications. Typical properties that can be optimized through polymer design include:



PROPERTIES OPTIMIZED THROUGH CUSTOMIZATION

ABRASION RESISTANCE	IMPACT RESISTANCE	PUNCTURE RESISTANCE	UV RESISTANCE AND/OR FILTERING
CHEMICAL RESISTANCE	HYDROLYSIS RESISTANCE	HARDNESS [52A → 85D]	THERMAL EXTREMES
BARRIER PROPERTIES	FUNGAL RESISTANCE	OPTICAL CLARITY	POLYMER COMPATIBILITY
STATIC DISSIPATION	ANTIMICROBIAL PERFORMANCE	FLAME RESISTANCE	COEFFICIENT OF FRICTION

CHAPTER 3

The Benchmark of Performance in Paint Protection Films

Used as an essential ingredient in PPF, TPU is historically specified to protect vehicle surfaces that are susceptible to damage, including the front bumper, hood, quarter panels, doors and mirrors. In a growing number of instances, it is installed over the entire vehicle to provide additional protection and a nearly maintenance-free vehicle surface. For this ingredient to perform to the level of which it is fully capable, TPU must deliver on three primary performance attributes:

- **1. AESTHETICS** to ensure a “like new” vehicle finish even after years of exposure to the environment and harsh road conditions. Key attributes:
 - **Optical clarity.** The film must be crystal clear to let the beauty of the original surface shine through, enabling retention of the pristine showroom appearance without discoloration or yellowing.
 - **Visual appeal.** The film can also be tuned to achieve desired surface effects, from high gloss to a satin or matte finish; colorants can also be added.

2. DURABILITY to provide exceptional long-term performance. Key attributes:

- **Impact resistance.** The formulation of the polymer dictates how well the PPF will prevent paint chips by withstanding flying debris and other impacts.
- **Weatherability.** The TPU must enable the PPF to stand up to the harshest weather conditions, particularly extreme UV and heat exposure. At the same time, these conditions must not compromise the PPF’s original optical clarity or its stretch properties. This allows for trouble-free removal without breaking or tearing into small pieces, avoiding additional labor costs and risk of damage to the original underlying finish.
- **Self-healing and resistance to stains.** When the PPF consists of a hard TPU surface layer (instead of being topcoated), it can impart stain resistance and the ability to erase fine scratches through exposure to heat, such as from sunlight.

3. CONFORMABILITY to ensure the PPF has consistent stretch properties for mating to the surface with ease, accommodating the most complex and intricate vehicle geometries. Key attributes:

- **Ease of installation.** The TPU works to ensure the PPF is flexible and reliably easy to install without accidentally overstretching the topcoat. This maintains efficient use of labor resources during installation and minimizes unintended waste or impact to quality of the finished installation.
- **Low-temperature flexibility.** The TPU can ensure that the PPF conforms easily to complex shapes and surfaces in the absence of a temperature-controlled installation environment.



CHAPTER 4

The Value of Deep Materials Science Expertise



Both expertise in materials science and immersion in the industries that use TPU are essential to formulating a TPU for downstream use where its unique polymeric properties can shine in the particular application. Knowledge of process technologies and how to control them is crucial to the scale-up of every new TPU product introduction to the industry. A supplier expert in processing across a range of different equipment and strong industry relationships is also essential.

Materials science expertise comes from a fundamental understanding of molecules, how they can perform and interact, and their behavior in applications. Having ready access

to sophisticated analytical testing capabilities helps synthesis scientists and applications engineers collaborate effectively to refine product formulations and deliver precisely the right effects in demanding applications such as PPF.

That's why having access to materials science expertise, advanced analytical tools and the ability to customize test methods is so important when specifying a TPU supplier. Through mixture ratios, chemistries and new building blocks, materials scientists can custom engineer material solutions for a specific application and/or real-world challenge. The possibilities are unlimited

for pushing the envelope on ever-greater performance metrics, or perfecting existing ones.

In essence, when materials scientists have the benefit of a deep understanding of the needs for the end-use application, which comes from years of dedication to that application space, they can use their expertise to quite literally change the TPU's microstructure to suit that need. With properly equipped labs, materials scientists can also leverage the power of state-of-the-art equipment for arriving at solutions to achieve challenging objectives. Let's look at how super-accelerated UV testing and analytics helped meet a critical deadline.

Accelerated QUV and xenon arc testing are widely accepted methodologies that supply critical data to demonstrate the effects of weathering. While these methods are accelerated simulations of real-world exposure, months of testing are still required to make meaningful predictions of years in the field. Recently, the emergence of a new capability provided an opportunity to significantly shorten test cycles when compared to the standard methodologies.

Providing a step-change to predictive weathering testing, Lubrizol scientists armed with expertise in UV weathering and polymer chemistry harnessed their understanding of this new capability to enhance their R&D lab with an EYE Super UV Tester from Iwasaki Electric Co., Ltd. It's a formidable tool for understanding TPU's behavior with respect to the ASTM standards governing (1) the outdoor weathering of plastics, and (2) in using this apparatus to induce material property changes in plastics for simulation of weathering conditions from sunlight, heat and humidity.

Using the EYE Super UV Tester, Lubrizol materials scientists can generate iterative data that they in turn correlate to standard testing methods for granular insights – all in a fraction of the time required for traditional methods. The ability to compress years of damaging UV radiation effects into just weeks of testing time allows product developers to quickly confirm data through iterative development with high relative predictability to real life outdoor exposure.

The EYE Super UV Tester played a critical role in helping to modify a TPU for qualification testing on a tight deadline. In the European Union, a widely-used additive ingredient within a TPU formulation became listed on the

REACH Candidate List of Substances of Very High Concern (SVHC). It was imperative to move fast to qualify an alternative, positioning it to meet the regulatory and performance expectations of a newly formulated TPU product. In just six weeks, the EYE Super UV testing capability provided all the data needed to identify a compliant next-generation solution through development and validation.

Relying only on the traditional accelerated testing methods, this speed and confidence

would not have been possible for even the most experienced R&D scientists. Collecting data and making formulation decisions using traditional accelerated test methods can take months or even years. Lubrizol's investment in this resource makes it possible to use statistical analysis to conduct a design of experiment (DoE) that encompasses numerous relevant variables while minimizing the number of experiments and resources required to isolate the data that unlocks the solution.



ACCELERATED UV TEST DURATION BY TEST METHOD*

EXPOSURE	STANDARD	TEST TIME
South Florida	ASTM D1435	1 year
QUV	ASTM G154	1200 hours
Super UV	Custom	2 days

Image courtesy of Iwasaki Electric Co., Ltd.

* Correlation of exposures based on best estimation from scientific testing

The Broad Spectrum of Measurement Science

Lubrizol's Measurement Science team provides the analytical chemistry expertise that enables the organization to deliver the high performance and reliability that PPF customers expect, plus industry-leading technical support valued by extruders of film and coaters who apply the adhesive and topcoats. The team's resources include:

- More than 400 combined years of professional experience
- Multimillion-dollar annual investments in analytical testing instrumentation and other assets

Analytical testing often utilized to support the development and commercialization of PPF include:

PHYSICAL TESTING – This encompasses typical testing protocols for ensuring the physical and mechanical properties of a material are suitable for the intended end use, such as measuring tensile strength; resistance to tear and impact; and stress relaxation (the tendency for a material to return to its original shape after

a load diminishes or is removed). Standard testing protocols include:

- Tensile Strength of Thin Plastic Sheeting (ASTM D882) for determination of tensile properties for films that are less than 1.0 mm (0.04 in.) in thickness.
- Tear Strength of Thin Films by Trouser Tear Method (ASTM D1938) for determination of the force necessary to propagate a tear in thin plastic film of a thickness of 1 mm (0.04 in.) or less.
- Stress Relaxation of Thermoplastic Elastomers (ASTM D6048) provides a measure of the viscoelastic response of a material over a period of time. Both the instantaneous and time-dependent response to an applied deformation are measured and can be used to examine a material's reaction to different process conditions.
- Dynamic Mechanical Properties in Tension (ASTM D5026) for determination of the viscoelastic properties. This is an especially important indicator of performance.



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MICROSCOPY – Both optical and scanning electron (SEM) microscopies can be employed to examine multilayer constructions, such as those incorporating topcoated films, to understand the impact of these combinations on the performance of TPU-based films.

For example, optical microscopy provides thickness and location information of the layers within multilayered films. Unique aspects include the ability to use multiple illumination types on the same sample field to bring out different layers that might not be completely resolvable using just a single illumination. On the other hand, SEM produces images

of a sample through interaction of a high energy electron beam in a vacuum with a material, either incident upon or transmitted through, to reveal structures less than 1 nm in size.

SPECTROSCOPY – The use of electromagnetic radiation literally sheds light on how the compositions of materials will react to a stimulus, provided by either Fourier transform infrared (FT-IR) or nuclear magnetic resonance (NMR). FT-IR spectroscopy provides information on the functional groups present within a sample to help understand the mechanisms that influence the physical properties and performance of PPF materials.

GEL PERMEATION CHROMATOGRAPHY –

This separation method used for chemical analysis enables the study of TPU aging and degradation following UV exposure.

ACCELERATED WEATHERING –

Xenon and QUV weather-o-meters are widely accepted approaches, with established ASTM, to accelerated weathering testing for validation of the outdoor durability of materials. More recent approaches have been pioneered by Lubrizol, and fast track accelerated UV testing and analytics by orders of magnitude. (See success story in Chapter 4: [The Value of Deep Materials Science Expertise](#))



CHAPTER 5

Supply Chain Reliability: Key to Downstream Customer Satisfaction

For PPF manufacturers, ensuring consistent quality in performance and aesthetics is critical to keeping downstream customers satisfied – and protecting a brand's reputation by proclaiming assurances of quality and performance with confidence. Part of that equation is access to dedicated technical service and support to address the complexities of processing aliphatic TPU first into film and then into a multilayer structure comprised of adhesives and high-performance topcoats. Factors to consider include:

- **Consistent performance.** A TPU supplier must deliver consistent, high-quality materials designed to support a PPF manufacturer's production processes and technology.
- **Continuity of resin supply.** A TPU supplier should have diversified geographic capability to supply resin and compounds when and where they are needed.
- **Global and local support.** To ensure smooth manufacturing and timely consultative support, a TPU partner should have a supply chain and network of local sales, distribution and technical centers that are globally aligned.

Lubrizol's customers in more than 100 countries are currently supported by a network of local sales and technical support teams and a global supply chain that assures service, speed and reliability. Lubrizol is well positioned to support customers globally with technical centers in the United States, Spain and China. Growing demand for TPU was addressed when Lubrizol added state-of-the-art resin manufacturing and processing capabilities in Montmeló, Spain, to augment its longtime U.S. manufacturing capability.



CHAPTER 6

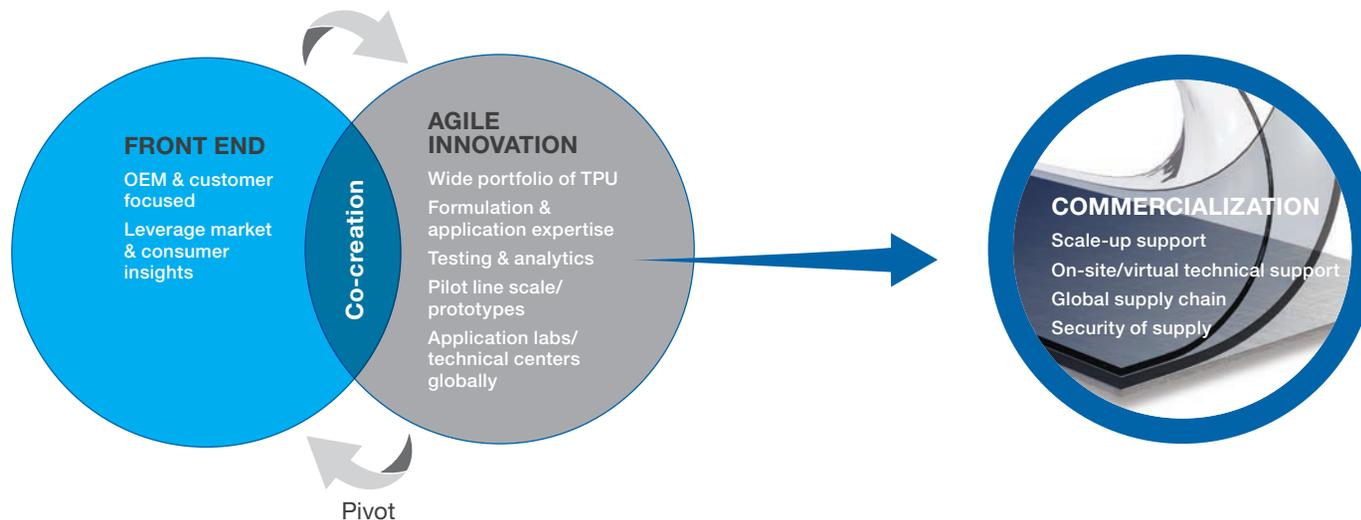
The Advantages of a Solutions Partner

A TPU supplier with specialized materials science capabilities employs inventors who are always thinking of the next advancement on behalf of downstream customers. Beyond merely providing a top quality product, such a supplier is in a position to help open, expand and continue to grow markets, working collaboratively with customers and value chain partners.

If that supplier also has the advantage of working across diverse industries around the world, it possesses valuable perspective gained from designing applications to meet myriad end-use challenges. To that end, PPF manufacturers seeking to stretch their

capabilities and extend their value proposition are afforded a distinct competitive advantage. Through collaboration, a solutions partner can bring:

- A strong track record of continuous innovation to unlock the most advanced performance characteristics for TPU in PPF.
- Extensive background in custom engineering TPU for unique challenges and applications.
- Applications expertise where material and process compatibility is critical to functionality and technical coordination is the key to integrating solutions.
- Consumer and market insights on applications and industry trends that can support concept creation and development of new market strategies.
- Technical centers that enable laboratory and pilot-scale prototyping prior to scaling up to commercial production.
- An eagerness to collaborate in the optimization of TPU properties as needed for custom high-performance applications.



CHAPTER 7

Accelerating Innovation and Product Development

Lubrizol was founded on a commitment to unlock science to improve lives. As a solutions partner, Lubrizol brings market and consumer insights, material science expertise and technology know-how to the table to expand the possibilities and drive new innovations. Lubrizol views innovation as a progression, perpetually pushing forward from the current generation to advance materials and elevate performance well into the future with a strong focus on creating smarter solutions for customers and value chain partners.

Collaboration with customers and value chain partners is crucial in key phases of innovation, from discovery of unmet needs to new product development and commercialization. A TPU solutions partner will have the technical expertise in-house to accelerate development cycles – specifically, a center that houses extrusion, lamination and coating operations for rapid prototyping that can be transitioned from laboratory-scale to downstream manufacturing, along with custom applications testing and validation capabilities, the very resources that can help drive innovation, discover new markets and nurture a competitive edge.



BENEATH THE SURFACE

Here's an overview of an approach to collaborative innovation – how a TPU partner can dovetail its areas of expertise with a PPF innovation team.

As part of the front-end innovation process, the Discovery phase focuses on uncovering unmet needs in the market as well as exploring new technologies. Opportunities can arise in two areas: the demand side (what is wanted),

and the design side (what is possible). A third element that is also considered is the market dynamics and ecosystem that could influence outcomes and effects.

MARKET-DRIVEN DISCOVERY: DESIRED OUTCOMES

As the world turns, markets and consumer preferences change, and new opportunities

emerge for those who seek them. Lubrizol continually invests in consumer and market research to better understand consumer and installer preferences, influencers, satisfaction gaps and emerging needs. This, in turn, enables the development of new insights on what is wanted in the market, and desired outcomes along the value chain.

JOBS

THE “WHAT’S WANTED” COUNTERPART TO EFFECTS

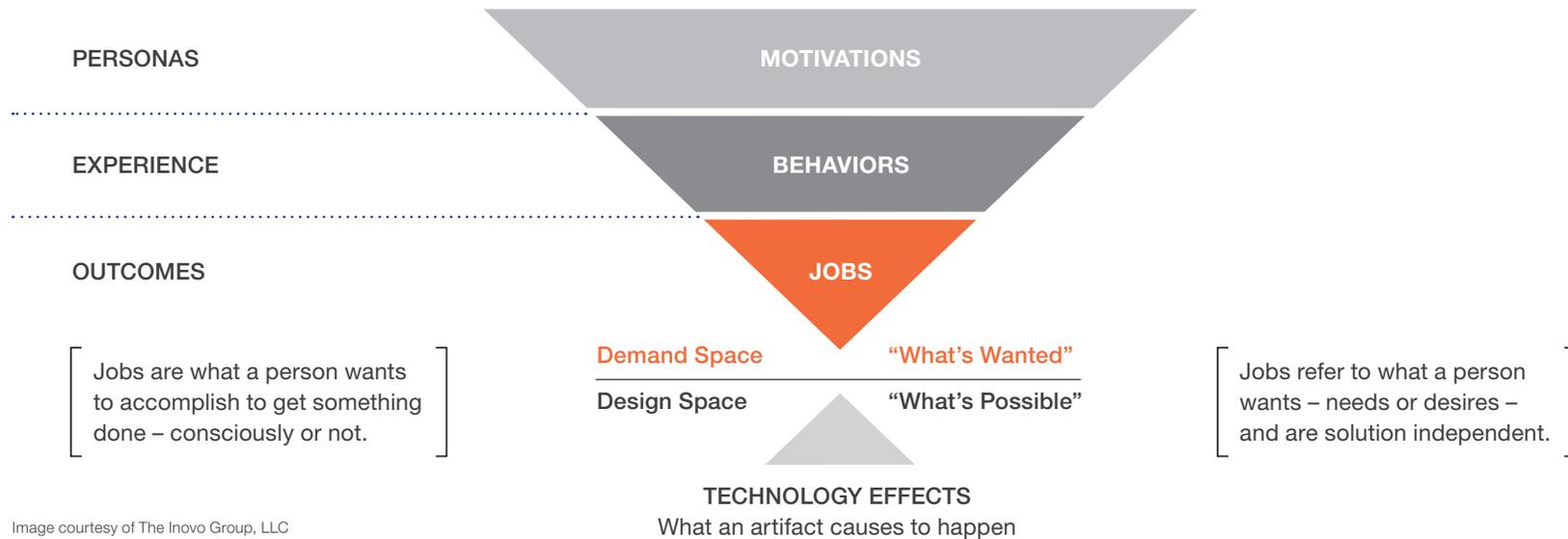


Image courtesy of The Inovo Group, LLC

BENEATH THE SURFACE

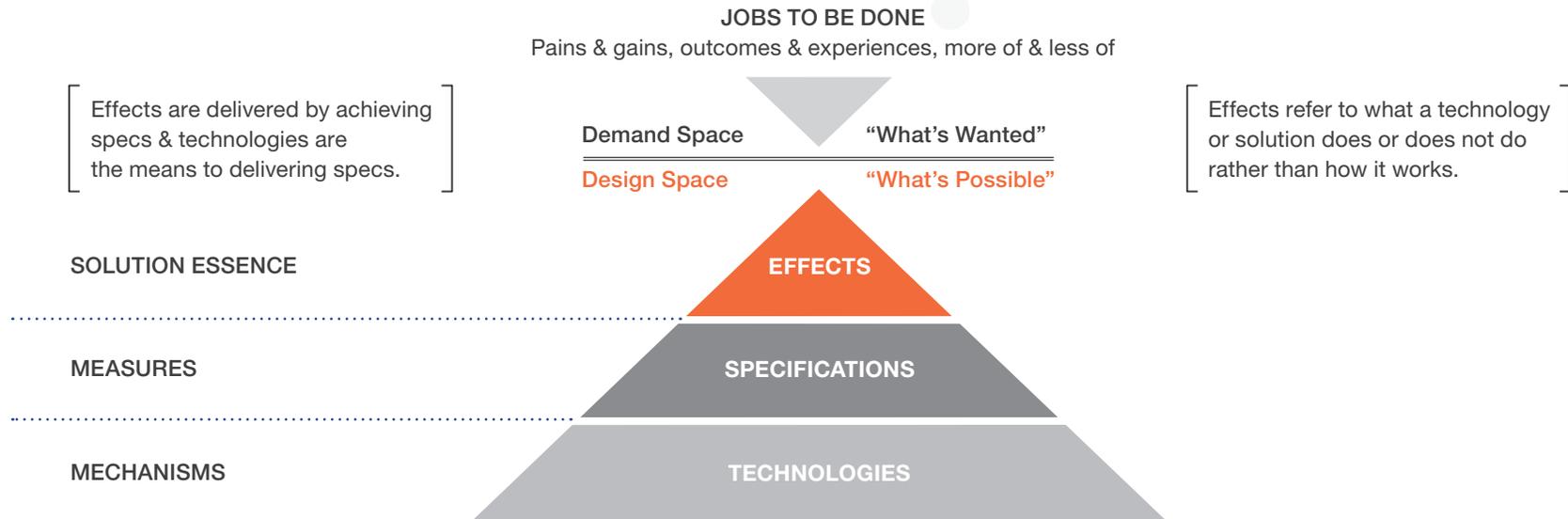
INNOVATION-DESIGN DISCOVERY: DESIRED EFFECTS

The desired effects, or the solution space, is delivered by achieving specifications, and technologies are the means to delivering this.

Delivery against specifications is strongly supported by measurement capabilities, while technologies are dependent on mechanisms of performance.

EFFECTS

THE “WHAT’S POSSIBLE” COUNTERPART TO JOBS





IDEATION TO COMMERCIALIZATION: AGILE PRODUCT DEVELOPMENT

Creativity and discipline go hand in hand to assure effective product development. A solutions partner understands the complexity of the innovation process and works collaboratively with customers and value chain partners to progress through the stages of development from scope to product launch. This includes a good understanding of unmet needs and translating these into measurable performance attributes. Scale-up and pre-launch work includes product registrations in the markets in which the product will be consumed or sold.

A solutions partner like Lubrizol also understands that innovation is oftentimes not a straight line from scope to launch, and uses a collaborative and agile approach with customers to optimize desired effects and outcomes, make and test prototypes, and accelerate the learning cycles to drive speed and agility.

TESTING BEYOND THE SURFACE: APPLICATIONS ENGINEERING

Development of test methods is as important as the testing and interpretation of results. In innovation work, standard tests don't always

exist, and the wrong tests, even if well executed, can waste time or throw an initiative off track. A solutions partner with an extensive array of capabilities can provide the right methods, data and interpretations to accelerate innovation and speed to market. This capability is also important when troubleshooting and resolving customer challenges with products or applications. (See [The Broad Spectrum of Measurement Science](#))

LOOKING BEYOND THE OBVIOUS: CONSUMER & MARKET INSIGHTS

A differentiator for Lubrizol in the specialty chemical market space is having a robust strategic consumer and market insights (C&MI) capability, a practice common among consumer-facing companies but atypical of business-to-business enterprises. Not strictly

“voice of the customer” research, C&MI entails moving several rungs down the value chain to explore the needs of the consumer using Lubrizol products in their final form.

A key objective of conducting C&MI primary market research for PPF, for example, is understanding end user and installer preferences, recognizing key influencers, and pinpointing satisfaction gaps between the stated importance of an attribute versus its actual performance. In addition, C&MI can help identify unstated or emerging needs in PPF and other forms of surface protection that can fuel innovation and commercialization strategies. An example might be leveraging distinct market insights in a region to enable new product innovations that are most relevant.



CHAPTER 8

A Winning Combination of People, Purpose and Capabilities



Lubrizol's Engineered Polymers business is the home to the globally renowned specialists in TPU chemistries and applications know-how. They have a formidable capacity and passion for innovation, complemented by a rich legacy of expertise across the company in polymer technology, rheology modification, surface science and film technology. They are also a business comprised of a talented and committed global workforce with the capacity to spur growth by harnessing a broad spectrum of skills, subject matter expertise and an extraordinary ability to imagine.

Years of primary research and proven experience in the PPF market have afforded Lubrizol a deep understanding of performance requirements, market trends and emerging areas of opportunity. These insights are applied to the design of performance characteristics for custom engineered polymer solutions that customers can use to differentiate their products. Lubrizol is at its best when collaborating with customers and specifiers who appreciate that the global markets it serves will continue to grow and prosper through the application of advanced chemical

technologies that produce unique, hard-to-duplicate formulations with differentiated features and benefits.

Lubrizol has a well networked global structure, with multiple technical centers, manufacturing sites and sales offices – allowing them to be close to their customers and value chain partners, wherever they are, and to support them effectively across regions.

Value Chain Collaboration Hits the Jackpot

Lubrizol demonstrated the power of data-driven marketing to a graphics wrap film producer following extensive research within the value chain for printed graphic wrap films, which share TPU chemistry and many performance attributes with PPF. The space had long been dominated by PVC, but more recently TPU entered the market bringing a number of benefits including durability and the ability to remain flexible at low temperatures.

While the newer, TPU-based films hadn't yet gained wide acceptance at the installer level, they were widely promoted from a sustainability-focused PVC-free perspective. Meeting with a number of installers, Lubrizol learned that customers would really value a durable, ultra-high performance and self-healing film offering an extended lifecycle and warranty. The original PVC-free message alone did not justify the premium price compared to incumbent PVC-based films.

COMPETITOR BENCHMARKING AND THE VALUE OF PARTNERSHIP

Lubrizol developed a plan for more in-depth market research in collaboration with a graphics wrap film manufacturer and installer. The study

was designed to capture real-world weathering performance data comparing configurations of graphic film that were commercially available. To that end, Lubrizol designed a performance benchmarking project using a fleet of taxicabs in Las Vegas, Nevada. Las Vegas was considered representative of those most aggressive environments because of its extreme UV and thermal conditions.

The research compared data from real-world exposure with accelerated test data generated from the widely accepted xenon arc method. Taxicabs outfitted with the films included an all-ESTANE® TPU solution (print media and laminate); a hybrid system comprised of PVC print media and ESTANE® TPU laminate; an industry-leading all-PVC configuration; and an alternative PVC-free construction.

For a year, a total of twelve taxicabs (three cabs per configuration) took the beating of aggressive UV and thermal exposure while making daily rounds in Las Vegas. After that, the wrap films were carefully removed and sent back to Lubrizol for evaluation against specimens that remained in pristine condition within a controlled environment in the laboratory. The results from the taxicab specimens





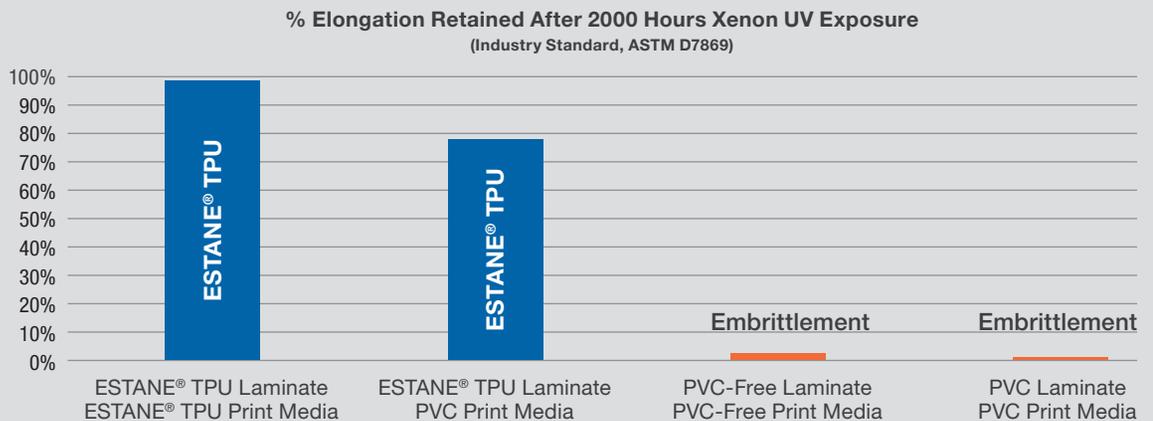
correlated very well to the original results of accelerated testing. In fact, the rate of physical degradation observed after only one year for products not containing ESTANE® TPU configurations was even more significant than originally hypothesized.

It is a well-recognized problem that film installers endure time-consuming challenges with breakage during removal of PVC wrap films. This phenomenon is the result of chemical decomposition as a consequence of prolonged exposure to heat and UV. Because it is formulated precisely to resist such degradation, the wrap films made from ESTANE® TPU retained more than 95% of their ability to

stretch without tearing or breaking. The hybrid ESTANE® TPU laminate with PVC-print media retained nearly 80%. The others suffered significant losses to their original elongation, with less than 5% of the original properties retained after only one year of exposure.

Seeing the value in a long-lasting, self-healing TPU, the graphics film manufacturer changed its marketing strategy and warranty program, and repositioned the ESTANE® TPU-based product offering as a premium solution within their overall portfolio for long-lasting performance, well aligned with the strength of its claims.

WEATHERING – GRAPHICS FILMS



CHAPTER 9

About The Lubrizol Corporation

The Lubrizol Corporation began in 1928 as The Graphite Oil Products Company in Cleveland, Ohio, founded by a small group of local entrepreneurs led by Albert Kelvin Smith and his brothers Kent and Vincent. The company's first product, a graphited lubricant and applicator for car springs, was a rapid success and foreshadowed the company's ability to adeptly identify meaningful market opportunities and advance science for good.

The belief that "good science leads to a better life" heralded continued success for Lubrizol, with a series of important innovations supporting the global transportation, industrial and consumer markets. Building on decades of knowledge, a powerful global organization and leading positions in the markets they serve, Lubrizol offers customers optimized solutions to the challenges of a complex and ever-evolving marketplace. Today, The Lubrizol Corporation is owned by Berkshire Hathaway Inc. and is one of their largest industrial enterprises.

Because Lubrizol's science touches billions of people every day, the opportunity to make a difference is immense. Lubrizol is committed to improving lives and enabling a sustainable future, driving measurable results to help the world Move Cleaner, Create Smarter and Live Better.

- **Move Cleaner:** Helping enable a >50% reduction in vehicle emissions by 2040 – with Lubrizol lubricant and fuel technology making the difference.
- **Create Smarter:** Improving the circularity of its products by 25% by 2028 – by intentionally designing sustainability into products and processes.
- **Live Better:** Improving at least 2 billion lives by Lubrizol's centennial in 2028 – through solutions for health, beauty, cleanliness, wellness and fitness.

In fact, improving lives in the communities in which Lubrizol employees work and live has been a core value of Lubrizol since its beginnings. The Lubrizol Foundation was officially established in 1952 and has donated more than \$90 million to organizations with missions focused on education, health and welfare. In 2019, the Foundation donated more than \$3 million in grants and matched employee contributions in excess of \$800,000, and in 2020, when the COVID-19 pandemic hit, Lubrizol mobilized its resources to support and protect those on the front lines working tirelessly to combat it. In fact, Lubrizol surpassed its \$2 million donation commitment to support COVID-19 needs, aligned with its community affairs strategy of supporting global needs with local actions.

Learn more about Lubrizol and its commitment to sustainability [here](#).



YEAR
FOUNDED
1928

HEADQUARTERS
**Wickliffe,
OH**

COUNTRIES IN
WHICH WE SELL
100+

FACILITIES
100+

EMPLOYEES
WORLDWIDE
8,800

The Value of Expertise and Support in Paint Protection Film Manufacturing

Expand existing markets
Build your brand
Develop new applications



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