

Parylene News

Keeping in Touch



By Bill Gleason,
General Manager

In the last issue of the Parylene News I discussed the universal importance of coating performance for every PTC customer. Parylene is a premier coating alternative, and the material of choice for critical medical, aerospace, military and industrial applications where its unique properties and performance are of special importance.

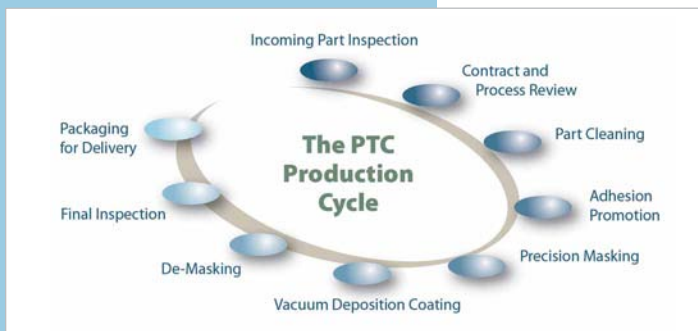


Figure 1 – The PTC Production Cycle

When it comes to PTC's performance as a coating service provider, our customers expect consistent engineering and coating excellence with timely delivery. These expectations drive everything that we do from application development to the

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Parylene Technology Advantages – Part 3

By Gustavo Arredondo, Technical Manager



Parylene coating is applied to substrates in a vacuum chamber.

Complex and relatively large substrates such as circuit boards are placed in fixtures during the process, and may require masking to protect selected areas from coating. However, smaller components such as elastomeric, plastic or metal parts can often be tumble-coated in bulk without fixturing or masking.

Tumble coating is efficient because it reduces the need for part handling and makes it possible to treat a relatively large volume of components per coating run. Treated parts are placed within a rotating fixture in the vacuum chamber (Figure 2) and kept in constant motion as the fixture rotates.

Tumble coating part quantities and rotation speed are adjusted on the basis of the properties of items being coated, and the chamber typically rotates at a rate of 3 to 5 RPM.

For example, relatively heavy parts having sharp edges can potentially abrade the coating on adjacent parts. Chamber loading and the rotation rate are adjusted to avoid this problem. In some cases it may be helpful to use a plastic media along with tumbled parts to reduce physical contact.

PTC's patented asymmetrical tumble coating chamber design (Figure 3) creates greater component movement

per chamber revolution, causing parts to roll and also move from end-to-end with each turn of the chamber. This complexity of movement results in greater surface exposure to the polymerizing monomer, and superior coating uniformity.

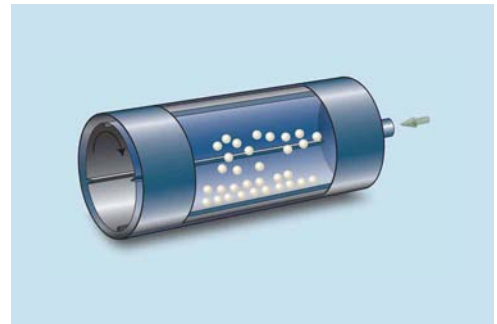


Figure 2 - Conventional Tumble Chamber Design

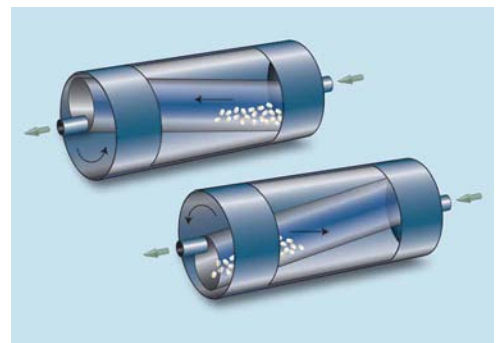


Figure 3 - PTC Patented Asymmetrical Tumble Chamber Design

The PTC 2000H tumble coating system available for on-site coating operations has a substrate capacity of up to 80 lbs. per cycle, and its coating chamber is mounted on a rail mechanism to speed loading and unloading.

Call (800) 999-4942 for more information on Parylene tumble coating and proprietary PTC processes. ■

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shipment of coated parts, day-after-day. We operate as an adjunct to your production, and are fully aware of the importance of our problem solving, training, quality assurance, and on-time production contributions to your operation.

For PTC, quality is a never-ending purpose, with ever-increasing standards. Our team operates in accordance with a systematic production cycle (Figure 1) that has been refined during more than 40 years of Parylene coating experience. Proprietary PTC production advantages such as our unique deposition control sequence, tangential monomer flow design and asymmetrical tumble coating chamber design are also key to our ability to deliver cost-effective Parylene coating services.

A successful production cycle is best achieved in an atmosphere of shared objectives, intentional collaboration and ongoing close and confidential communication. As you'll read elsewhere in this issue of the Parylene News, we've established a dedicated email address to facilitate sharing information and making requests.

This avenue of contact will not be a substitute for face-to-face visits or telephone conversations, but rather an added means of supporting important relationships. With your assistance, PTC will continue to organize, manage and operate all aspects of our business with the goal of supporting your success. ■

Parylene and the Cost Myth

Cursory analysis may lead design and production engineers to the conclusion that Parylene coating is an expensive coating option compared to alternate materials. The cost to prepare and Parylene coat a complex part is typically more than protecting it with a basic acrylic, silicone or epoxy coating.

However, a less expensive coating process may not provide the necessary combination of adhesion, conformability, thermal performance, solvent resistance, surface lubricity, bio-compatibility, abrasion or flex resistance that Parylene can.

While Parylene may be overqualified for relatively simple coating tasks, it has a cost advantage over alternate coatings in many applications. The real price of a conformal coating protection is based on total cost of application, which includes the value of the coated part or assembly, the coating process, and the cost to the customer should the coating fail in operation.



Parylene is commonly used in critical coating applications such as military equipment

There are also challenging coating applications where the ultimate cost advantage of Parylene may not be immediately clear. For example, one company recently found that a coated component in a military device was vulnerable to contamination and field failure, resulting in loss of a critical system function. While the selected liquid coating provided apparent protection, field experience showed that full system integrity required better coating performance.



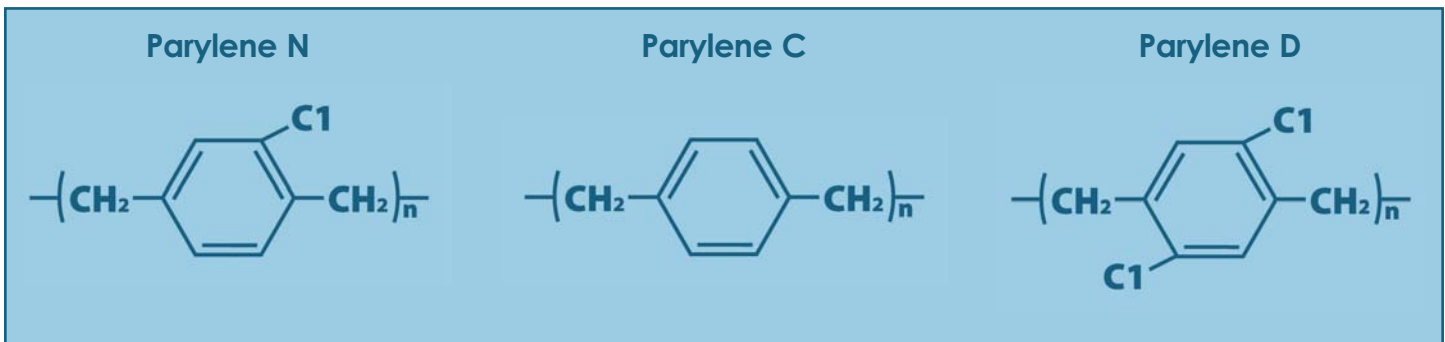
With proper masking, Parylene coating can be selectively applied to complex substrates.

Consequently, it was necessary to remove coated sub-assemblies in the field, ship them to PTC for disassembly, cleaning, Parylene coating, reassembly and transport back to distributed field locations for reintegration. Had more costly Parylene been specified at the outset, the expense, delay and logistical complications would have been avoided.

A recent medical coating project also confirms the ultimate economy of Parylene. In this case, the design called for a coated surgical device to withstand 100 or more autoclave sterilization cycles to make the part usable for at least 100 surgical procedures. The ability of less-costly alternate coatings to satisfy this demanding standard was marginal, and testing confirmed that Parylene could maintain protection for more than 1,000 autoclave cycles – well beyond the practical life of the coated device itself. While Parylene was more costly at the outset, it ultimately contributed significant savings in this medical coating application by greatly prolonging the productive life of a costly device.

Recent advancements in masking materials and methods, along with a trend to lower Parylene raw material cost make Parylene more and more competitive as a high performance coating alternative, even in applications that might previously have been considered inappropriate for this sophisticated process. Contact PTC for assistance in analyzing the total cost of coating for your product. ■

Understanding Parylene Dimer Options



There are three common variants of Parylene raw material or dimer: Parylenes N, C and D. As Figure 4 shows, these materials differ in molecular makeup, and these differences impact film properties and suit each type to particular application categories.

As the simplest molecule of the three, **Parylene N** is the most active in the gaseous monomer state, which is the form in which the material enters the vacuum chamber during deposition. This activity level during the polymerization stage gives Parylene N the greatest crevice penetration.

Parylene N also has the lowest coefficient of friction (or surface lubricity), the highest elongation ability, and the high-

est dielectric value and lowest dissipation factor. Deposition time required for Parylene N is the longest of the three variants, and it has reduced thermal stability, chemical resistance and moisture resistance compared to Parylenes C and D.

Parylene C has a single chlorine atom on the benzene ring, which results in slightly less crevice penetration ability and dielectric strength compared to Parylene N. However, this variant demonstrates good chemical and moisture barrier properties, can be deposited more rapidly, and has excellent film linearity.

Parylene D, with two chlorine atoms on the benzene ring, has the largest

Figure 4 - Each Parylene dimer variant offers specific performance benefits

Parylene molecule with the lowest monomer activity and thus the least crevice penetration ability. Its advantages include the greatest film hardness, highest thermal stability, most favorable chemical resistance ability and the least elongation value of the three, making Parylene D the first choice for applications requiring mechanical toughness, expanded thermal capacity and chemical resistance properties.

Visit www.parylene.com or contact PTC's engineering department at **(800) 999-4942** for additional information

Meet Our People

Meet Paul DeMattie, Site Manager for the PTC East Coast Coating Center in Middletown, CT. Paul and his staff provide Parylene coating services to customers on the East Coast with a full complement of production capabilities.



Paul joined PTC in early 2002 as Eastern Region Sales Manager and was promoted to Site Manager in 2004. Before joining PTC he was Sales Manager for a leading manufacturer in the access control

industry, working in their industrial product division, where he gained exposure to the benefits of Parylene conformal coating.

According to Paul, the PTC CT facility provides services for a full range of coating applications including static and tumble coating work for medical, military, and industrial customers. The East Coast Coating Center has experienced substantial business growth. Both the facility and staff doubled in size during 2006, and additional coating equipment was added. "We deem ourselves as an extension of the manufacturing process, and know that the benefit of service is peace of mind," Paul said.

Lab and engineering work for East Coast customers is accomplished by

PTC's California engineering center, and production work is transferred to the CT facility. This collaborative relationship gives East Coast customers the benefit of fast production response as well as extensive engineering and laboratory services. "Through this collaborative engineering development we strive to partner for success with our customers," he concludes.

Paul earned a BA degree in business administration at the University of New Haven, CT, and a graduate management degree from Albertus Magnus College, also in New Haven. He and his wife Maria have two young daughters, and Paul enjoys his busy family life, working in the yard, and playing in a softball league. ■

Your Comments Matter

By Erika Partida, Customer Support

PTC is dedicated to partnering with our customers to meet their conformal coating needs in a timely and cost-effective manner. We seek to constantly improve our performance, and communication is a crucial aspect of this effort. This newsletter is an example of our focus on communication with our valued clientele.



Likewise we encourage our customers to share thoughts, ideas, suggestions, complaints, and even compliments when the occasion arises. To facilitate this exchange of ideas, we have established an email address to which such messages can be directed. Messages received from customers and prospects will be directed to the appropriate person at PTC for a prompt response.

Feel free to call us any time at **(800) 999-4942** for an immediate answer to questions. But if you have comments or suggestions that you would prefer to write down, please send them to **yourcommentsmatter@parylene.com**.

We always listen. ■

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