PPG Aerospace

In-Flight

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In This Issue

Fighting Aircraft Corrosion: PR-2870, The Right Product At The Right Time

The battle to fight corrosion on metal airframes, historically, has been a major issue with which the aerospace community has had to contend. Over time, metallic structures corrode, resulting in more maintenance to ensure aircraft performance and operational readiness. Corrosion prevention requires continuous monitoring and action, and the associated costs can be significant. In 2000, NACE, a recognized global organization in corrosion, reported that , the estimated annual cost of corrosion for all North American aircraft was estimated at nearly US$13 billion*. If these costs are adjusted for inflation, costs escalate to US$18 billion in today's dollars. That is a significant amount of money to manage and mitigate corrosion.

PR-2870 Semkit® package

Over the years, multiple strategies have been used throughout the industry to address corrosion. One key area of focus for corrosion protection has been the use of advanced materials and processes. Traditionally, sealants containing soluble chrome have been used to fight corrosion. As a key aerospace supplier of materials to address corrosion, PPG Aerospace was the first supplier to introduce a family of polysulfide sealants. In 1968, we introduced PR-1436G, a two-part dichromate cured polysulfide compound, to fight corrosion. Later, we introduced PRO-SEAL™ 870, a two-part manganese dioxide cured polysulfide compound, that became an industry standard in polysulfide sealants. These products have been and continue to be used by the greater majority of aircraft OEMs as part of their corrosion prevention practices.

While chromium containing polysulfides have been the industry's recognized sealant to fight corrosion, there is increasing pressure to eliminate chrome. Environmental regulations and corporate responsibility for more environmentally sustainable products are driving the development of new products. According to John Sands, PPG Global Business Director, Aerospace Sealants, "As a global leader of aerospace sealants, we recognize our corporate and environmental responsibility to provide the next generation of environmentally acceptable, non-chrome corrosion inhibiting (NCCI) sealants."

PPG Aerospace has been at the forefront to develop non-chrome solutions. Early first generation manganese dioxide cure polysulfide NCCI sealants were good but were not equal to their chrome containing counterparts. Recognizing the need to develop better non-chrome materials, PPG extended our research as a collaborative partner on a project sponsored by the Strategic Environmental Research and Development Program (SERDP). SERDP is a U.S. Department of Defense (DOD) program that is planned and executed in partnership with the Department of Energy and the Environmental Protection Agency. The focus of this program is to harness the latest science and technology to improve the DOD's environmental performance, to reduce its costs, and to enhance as well as sustain mission capabilities. Through PPG's collaboration with SERDP, PPG continued to extensively invest in the next generation of eco-friendly, corrosion-inhibitive sealants.

Testing of PR-2870 demonstrates outstanding corrosion protection.

As a result of this work, PPG is proud to introduce PR-2870, the newest, chrome free, corrosion inhibitive (NCCI) fuselage and pressure sealant for the aerospace industry.

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This new sealant uses PPG's Permapol® P-3.1 polythioether polymer and a unique corrosion inhibition package. As a replacement option for chromate-containing sealants such as PRO-SEAL 870 sealant, PR-2870 sealant uses PPG-patented technologies to inhibit corrosion on metal. Its versatility allows it to be used in multiple aircraft applications for aerodynamic smoothing, structural surface sealing, fay sealing, and pressure fuselage sealing. PPG is the first sealants manufacturer to offer a fully qualified chrome-free, corrosion-inhibiting aerospace sealant in all three grades of sealants.

PR-2870 has completed full qualification of three grades to MIL-PRF-81733, the industry's standard for sealant qualification. Grade A offers a viscosity for aircraft personnel to apply using a brush. Grade B allows aircraft personnel to extrude using conventional methodologies. Grade C is a roller-grade version that can also be applied by brush, extrusion gun, or spatula. Additionally, Grade C is ideal for large, complex aircraft structures. According to Bill Keller, PPG global segment manager for aerospace sealants, "PR-2870 Class C-12/24 sealant has the potential to replace C-8, C-12 and C-24 to reduce inventory. It cures 70 percent faster than traditional interfay sealants at ambient conditions, reducing cycle time that offers aircraft manufacturers and maintainers the potential for significant cost savings.

PR-2870 sealant has received exceptional marketplace acceptance because of its light weight and process benefits as a viable alternative to chromated sealants for the commercial, general aviation, and military segments. Currently, we are working closely with several commercial and general aviation customers who are qualifying it. Additionally, it is available to aircraft OEM and maintenance, repair, and overhaul shops."

Corrosion is a malady that threatens the life cycle of all aircraft that use metal in any aspect of their structure. As an environmentally friendly alternative over legacy corrosion inhibitive sealants, PR-2870 NCCI sealant provides an effective means to mitigate corrosion, reduce weight and cycle time. It is the right product at the right time. Visit www.ppgaerospace.com for more information about PR-2870 sealant.

Customers may purchase PR-2870 through PPG's aerospace application support centers (ASCs).

**V.S. Agarwala: "Corrosion Detection and Monitoring - A Review", Paper No. 271, Corrosion 2000, NACE International, 2000.*

PPG Aerospace Completes Acquisition of Majority Interest in Sealants Business of Le Joint Français

Sealants Europe facility in Bezons, France

On October 1, 2015, PPG completed its acquisition of a majority interest in the aerospace and automotive sealants and adhesives business of Le Joint Français (LJF), a long-term licensee of PPG's aerospace sealant technology. LJF was part of the Hutchinson Group, a world leader in sealing systems, vibration, acoustic and thermal insulation, fluid transfer systems, transmission and mobility. LJF's aerospace and automotive sealants businesses employ more than 200 people and will continue its operations in Bezons, France. The new business is called Sealants Europe SAS and joins PPG Aerospace as part of the Aerospace Sealants business platform. According to Barry Gillespie, vice president of PPG Aerospace, "This acquisition brings PPG and LJF's combined strengths of sales, operations, technology, and logistics to the aerospace industry. We are excited about the opportunities that Sealant Europe SAS brings to our customers. Now, global aerospace customers have one point of contact for all their sealant needs."

The relationship between PPG and LJF is more than 62 years old, beginning in 1954 when LJF became an official licensee of Products Research & Chemical Corporation (PRC). When PRC first developed jet fuel-resistant sealants in the early 1950s, it was a small company and had a very limited global reach. For a company launching new products in aerospace, a global footprint was needed to support its plans for growth. To provide a global offering, PRC appointed a network of licensees around the world, LJF becoming one of the first official licensees. According to Sean Lambourne, PPG Segment Manager - Aerospace Sealants, EMEA, "The licensee relationship allowed us to serve our global customers with greater geographic footprint. The acquisition is a natural progression for PPG and LJF, capitalizing on the strengths of both organizations. This acquisition will deliver greater value as we collaborate with our aerospace customers." After the majority acquisition closed during the fourth quarter of 2015, PPG and LJF began integration activities. Dirk Thelen, former business manager of PPG's ASC in Gonfreville, has been appointed as the general manager and will lead all integration activities.

Dirk Thelen, General Manager, Sealants Europe SAS

The integration is well underway on combining all areas of the businesses with the focus on the customer. Thelen said, "The PPG Aerospace and LJF team is concentrated on delivering greater value to our global customers through advanced materials, global manufacturing, innovative supply chain solutions, and outstanding sales and services."

As the team moves forward, our customers will see growing benefits of the integration of these two aerospace leaders. We look forward to increasing our support to our customers and delivering the value in products and services to meet our customers' needs.

For any questions, please contact your PPG Aerospace sales representative.

- **Investment in new products, technologies, and people drive innovation at PPG.**
- **Customers identify rapid curing sealants and lighter weight sealants as top development priorities**
- **Cure on demand sealant utilizes PPG's Permapol P-3.1 polymer technology**
- **PPG qualifying next generation lightweight sealant for significant weight savings for customers**

EN ROUTE

By John Sands
PPG Global Business Director, Aerospace Sealants

Over the years, customer requirements for our aerospace sealants have been very consistent, even as new programs are rolled out globally by the growing number of commercial aviation participants. How air framers use our sealants to produce and enhance the performance of their new aircraft is very important to them. During our recent Aerospace Technology Symposium, polling questions enabled us to gain deeper customer insight on key sealants topics. First on our customers' "wish list" is a rapid curing sealant. New rapid curing sealants will enable our customers to seal parts faster and move them more quickly from station to station. Lighter weight products were rated a close second because improving the operating efficiencies of aircraft is very important. The polling results along with other customer feedback have helped us understand our customers' needs and priorities better. Today, our entire team is focused on developing new products and processing technologies to support our customers.

We continue to increase the investment in new products, technologies and our people to offer innovations that transform our customers' aircraft production and design. Today, we have more new sealant programs under development than ever before. Many of these developments are driven by the growing competition among OEMs to maximize the benefits of their aircraft for their customers. Our new Cure on Demand sealant, which addresses our customers' first priority, has generated tremendous interest. Based on PPG proprietary technology, our Permapol® P-3.1 polythioether polymer offers unique fast cure processes that provide very significant improvements on the production line or in maintenance areas. Our innovative UV cured sealant can be applied with almost an infinite work life and cures instantaneously with curing lights. This technology, as confirmed through discussions with our customers, creates tremendous opportunities for process improvements in their facilities.

To address the second priority for lightweight sealants, we have developed the next generation high performance sealant, Generation IV. This new technology has a specific gravity of 0.75 that offers significant lightweight advantages compared to current commercially available sealants which have specific gravities typically between 1.1-1.3. We are in the process of qualifying this new lightweight material to many different specifications. Generation IV sealant has the ability to reduce the weight of sealant on an aircraft by up to 42% depending on the aircraft type by transitioning from 1.3 specific gravity. For customers moving from 1.1 specific gravity to Generation IV sealant, the savings opportunity can be up to 30%. What does the change mean by aircraft type? For narrow body aircraft, the weight savings can mean up to 460 lbs. (209 kg). For wide body aircraft, it can mean as much as 1640 lbs. (745 kg) of savings. We are excited about our investment and are ready to complete the qualification testing so we can help our customers succeed in the marketplace.

In addition to these two new programs, our team continues to focus on other innovative technologies including non-chrome corrosion inhibiting sealants, spray applied lightweight sealants, and new conductive technologies. Because we understand that sealant technologies are not the only customer challenge, our development programs also include high efficiency application of our sealants, innovative packaging concepts, advanced dispensing equipment, and inventory management programs to reduce costs and complexity. All of these programs are available through our global network of 17 Application Support Centers (ASCs) around the world.

Faster curing, lighter weight, environmentally friendly, convenient and cost effective packaging, and local availability have always been part of our heritage and will continue into the future. We are excited about the future of sealants as we collaborate with customers. We look forward to discussing these opportunities with you.