SURFACING SCIENCE

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COLLABORATION SOFTWARE: COMMUNICATING IN REAL-TIME

With so much going on at UPI, the exchange of information is essential. Successful interaction between teams, with members often located in multiple time zones, means accessing, sharing, and retrieving data in real-time. Enter *collaboration software* - helping people working on a common assignment to achieve their goals. UPI turned to collaboration software finding it a favorable alternative to the weighty process of back-and-forth email threads. Conversations, transactions, and collaborations, as they relate to specific projects, are shared with appropriate team members in real-time, assuring everyone who needs to be is *in-the-know*. With origins dating back to the 1950's, collaborative computing amped up in the 1970's with on line, multi-user gaming. By the early '90s the US Government was applying collaborative applications via the Navy's COMPASS system. Originally dubbed *group-ware*, it was first used by Boeing and IBM as electronic meeting systems for remote groups. UPI has chosen Slack, a real-time communication app that funnels messages into streams that everyone who works together can see. Like texting, Slack messages tend to be short and casual. Project teams "talk" about their work and can quickly respond to everything that is happening in real-time. Whether a mobile device or desktop computer, Slack alerts participants when they're away from the app or working in another application. "Providing a tool that is easy to use has made our project teams stronger and more productive", says Hernan Vinueza, Director Applications Development.

They've Got Their Nose On - #REDNOSEDAY

Our Vernon, New York team got their noses on for the second year in a row. As participants in the annual Red Nose Day, May 25, the company joined millions across the globe supporting projects that ensure kids are safe, healthy, educated, and empowered. 2,659,642 children's lives were impacted worldwide in 2016. In 1985, Comic Relief used the power of comedy to start the movement. The goal? To end child poverty one nose at a time. TV specials, ongoing fundraisers, corporate underwriting, and Red nose sales have raised over $1 billion globally. Red Nose Day in America funds programs in all 50 states. Since 2015, it has raised over $60 million. How does this help? Consider that our team's participation this year provided nearly 600 meals for hungry children through *Feeding America* food banks. Congratulations!

Security Solutions Creating Optics Boom?

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at a colossal 2500 mm (8.2 feet) OD, polish optics up to 37 inches in diameter. The system's many innovations enable polishing time reductions from days, even weeks, to mere hours. However, this will not be the largest double-sided machine for very long. UPI and SOMOS have a 4000 mm (15.75 feet) double-sided polishing system, capable of polishing parts up to 60 inches OD in the works. Whatever is driving the upturn, the optics industry is on the move. Global competition appears to be heating up, which

may drive cost and push companies to explore ways to hit the margins needed to remain competitive. Many OEMs looking to stay ahead of the curve say they are considering investments in capital equipment. Having the right capacity for an upturn will make all the difference.

WHAT'S NEW...

Are SECURITY SOLUTIONS Creating an Industry Boom?

Growing demands put the precision optics industry in the midst of a giant bubble. **Page 2**

CORROSION What you need to know...

Corrosion, a natural process, is almost impossible to prevent, but it can be effectively controlled. **Page 3**

3D SURFACE PROFILING Meets Hi-Tech Needs...

Industries requiring highly polished surfaces like optics and data storage, make micro-measurement of surface variations essential. **Page 3**

IS THIS THE RIGHT POLISH FOR MY APPLICATION?

Choosing the right abrasive and grit/particle size is essential. So, why the confusion when it comes to choosing an abrasive? **Page 2**

Ask An Expert: ON-SITE Q&A

Application engineers & polish technicians are on hand at every UPI trade expo to address all surfacing questions For upcoming shows visit: *www.universalphotonics.com/events*

LP Unalon w/PSA: NOW UP TO 96"

Expanded Capabilities Benefit LP Customers

The recent installation of a colossal laminating machine at our Vernon, New York LP Unalon manufacturing facility continues to expand plant production capabilities. This new machine handles the application of Pressure Sensitive Adhesive, PSA, to LP polishing material up to 96" wide.

LP Unalon, a micro-cellular foam elastomer, is the material of choice for precision optics, ophthalmic lenses, silicon wafers, in fact, any polishing application demanding unique contours and critical tolerances. Specially formulated pressure sensitive adhesive is engineered to adhere to all platen materials. It is resistant to most slurry mixes and is available in formulas ranging from High-Holding to Low Tack / Easy Release. *...Continued on page 2*

SURFACE APPEARANCE FUEL CONSUMPTION

And The NUVITE Connection

Fuel is one of the highest cost items of an airline operation. From the distance an aircraft can fly, the amount of cargo it can carry, to its environmental performance, fuel efficiency is a leading consideration. A major contributor to fuel consumption is an aircraft's surface characteristics. Paint, age, and condition weigh heavily on aerodynamic efficiencies. Enter NUVITE with products specifically engineered to maintain / restore a wide variety of exterior surfaces for optimal aerodynamics.

As an aircraft moves through the air, air resists motion and a resistance force, called drag develops, which impedes velocity and increases fuel consumption. One source of

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FLIPPING THE SWITCH ON CORROSION

Two Anti-Corrosion Products

UNIVERSAL PHOTONICS is now representing Lear Chemical Products worldwide with ACF-50® and CORROSION BLOCK®, two products that kill corrosion on contact. While ACF-50® is extremely popular with U.S. Government, FAA, commercial airlines, fleet operators, and airframe manufacturers, to name a few, CORROSION BLOCK® has a growing niche in marine and industrial settings where water intrusion can lead to damaged equipment. Both are recognized as proven solutions for corrosion protection/prevention in an ever-expanding list of industries: automotive, fleet vehicles, RV's, motorcycles, power sports, avionics systems, electronics, and more.

ACF-50®, a state-of-the-art, anti-corrosion lubricant compound, is an ultra-thin, fluid formula that acts as an "off-switch",

...Continued on page 3

SURFACE APPEARANCE FUEL CONSUMPTION
And The NUVITE Connection

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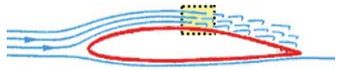
drag is skin-friction created by the viscosity of the air and resulting friction against the aircraft surface. As air moves past, molecules next to the surface "stick", collide, and slow down the molecules above them. Air flowing in this thin .02" – 1" deep layer, a.k.a. the boundary layer, travels in one of two states: laminar or turbulent flow. Laminar flow is supported closest to the aircraft surface. Assuming a flat, waxed, solid surface, air will flow smoothly, streamlines move parallel, and change is uniform.

TRANSITION POINT: Laminar to Turbulent



LAMINAR FLOW AIRPLANE WING

The turbulent layer is thicker, with an unsteady, swirling air flow generating more skin-friction drag. While speed increases evenly in a laminar layer, most of the airflow's speed reduction occurs right above the surface where air molecules are in direct contact with the aircraft surface. Any disturbances along this surface including erosion, oxidation, abrasion, parasitic deposits, no matter how microscopic, can turn laminar flow turbulent. "Surface roughness is a major factor in generating friction-drag. Carbon deposits and other debris that remain or embed the surface increase roughness," says Robert "Bob" McHugh, VP NUVITE Sales, "Think peaks and valleys. Irregular terrain obstructs, randomly channeling flow. To restore smooth, constant flow, you must have a level field."

Engineered to level irregular surfaces, products like NuPower II, NuPol, and Citricut Extra for painted surfaces and NuShine II, the graded system for metal polishing, actively lift dirt, remove debris, deoxidize, and fill and coat with protective sealants. In addition to delivering a "showroom shine", NUVITE's unique polishing formulations restore and maintain the right surface conditions for extended laminar flow, thereby decreasing turbulence and improving fuel efficiency.

LP Unalon w/PSA: NOW UP TO 96"

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Since the lamination process precisely syncs the joining of pad material and PSA, there is minimal chance of air being trapped. This is a particular concern when applying PSA to highly dense, low porosity pads where trapped air can cause bubbles, preventing the adhesive from bonding to the pad surface. The new machine alleviates any bonding issues. In the coming months this laminating system will be tested and qualified for every pad/PSA combination presently offered.

There exist limitless opportunities
in every industry.
Where there is an open mind,
there will always be a frontier.

Charles Kettering

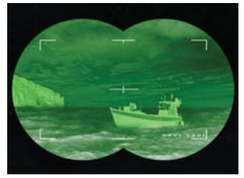
CHOOSING THE RIGHT ABRASIVE FOR YOUR SURFACING APPLICATION

It takes just the right abrasive to successfully deliver an angstrom-level surface finish. No matter where you are in the surfacing process, whether grinding, lapping, buffing or polishing, choosing the correct type of abrasive and grit/particle size is essential. So, it's rather surprising to find there's quite a bit of confusion and misunderstanding when it comes to choosing abrasive.

The first thing to consider is the type of material being polished and the basic mechanical properties associated with it. Is the material hard? What is its fracture toughness? The answers to these two questions are critical to determining how the material will withstand mechanical force. Most metals, glass, & plastics can be finished with hard (diamond), medium hard (alumina), or medium soft (cerium oxide) abrasives. Softer materials will require softer abrasives such as silica or calcium carbonate. Next, what is the starting surface and shape of the part material? If you are starting with a very rough surface finish or need to do a lot of shape correction, a hard abrasive with large particle size such as diamond, silicon carbide or alumina, is a solid choice as part of a grinding step and surface preparation for future finishing steps. Once the part's net shape is achieved, eliminating surface damage from grinding or other forming processes can begin. Typically, the abrasive used to initiate surface improvement for most materials is hard or medium. Again, the choice of abrasive at every step in the surfacing process is dependent on the mechanical properties of the material to be polished. Some will not tolerate a hard abrasive. The abrasives particle size should be large enough to remove gross surface damage, but small enough to begin to reduce the damage to finer extremes. Then, using one or more additional polishing steps with smaller and possible softer, abrasive particles, like cerium oxide (a preferred abrasive for glass finishing) or colloidal silica, the desired surface finish can be achieved. UNIVERSAL PHOTONICS has a complete line of different abrasives to achieve your desired surface finish on any material. Our engineering and R&D teams have the knowledge and experience to help you choose the best consumable set for your process.

IS THE SEARCH FOR SECURITY SOLUTIONS SECURING AN OPTICS BOOM?

The precision optics industry could be in the midst of a giant bubble. Growing demand for security solutions for home, commercial, and military, both national and global, has seen a rise in the many cameras & detectors used for surveillance, 3D monitoring, and imaging. This in turn, amps up production of IR & UV optics, which require appropriate materials in the form of optical glass, metalloids, etc., along with the respective, compulsory, critical surfacing processes. Our applications engineers report an uptick for processing materials and equipment for these applications. They also note increases in part size and quantities, which may be a natural offshoot of larger polishing operations accommodating such growth. From the equipment side, double-sided polishing is garnering greater interest, possibly in reaction to a spike in the demand for precisely parallel parts. In fact, UPI delivered the largest double-sided polisher built to date, to a North American customer. The polishing plates of this 100,000 lbs. system *...Continued on page 4*



FLIPPING THE SWITCH ON CORROSION - *Two Anti-Corrosion Products*

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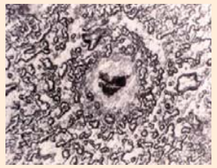
displacing moisture and other corrosive fluids, leaving a protective film that remains effective for up to 24 months.

CORROSION BLOCK® kills corrosion on contact and continues to protect metal and electronics from further corrosive degeneration by leaving a hydrophobic film. CORROSION BLOCK's® atmospheric barrier protects metal surfaces for up to 18 months. Brought to market via the NUVITE line, CORROSION BLOCK® and ACF-50® also have beneficial uses in the laboratory and optics shop, protecting machine connectors, knobs, dials, gauge, pumps, valves, screws, nuts and bolts, in fact anything that might get wet and rust. A thin coating will extend the life of tools and tooling, and valuable equipment being placed into storage.

Both products are finding uses at UPI with the ChillMate line of chillers, protecting connectors and electronic components, and in the QC Lab protecting sensitive equipment from unintentional water damage.

"Delivering top quality, high performance, task-specific products is the NUVITE standard." says Rich Nastasi, EVP, Sales & Market Development. "Partnering with companies who meet our level of commitment allows us to expand the product line and extend those benefits to our customers. Ultimately, it drives our success."

What Is Metal Corrosion? Why does it occur?



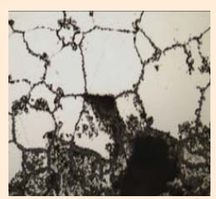
Corrosion, a natural process, is the gradual destruction of metals by chemical and/or electrochemical reaction with their environment. Prevention is almost impossible, but it can be effectively controlled, see *Flipping the Switch...*

For corrosion to form, three requirements must be present:

- An electrical potential difference on or within the surface
- A conductive pathway between two areas of potential difference
- Some form of electrolyte or fluid covering the two areas

Unless properly protected...

- Iron alloys (steel) will rust
- Aluminum & magnesium will form corrosion
- Paint will form an oxidized light form of surface corrosion



Corrosion engineering, the field dedicated to controlling and stopping corrosion, identifies types of corrosive attacks which can cover an entire surface or penetrate by forming pits. Corrosion attacks may follow grain boundaries on metallic surfaces or may penetrate a painted surface to travel at random.

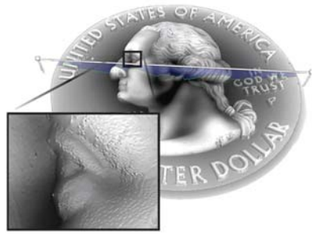
Standard classifications for identifying the cause of corrosion:

- Oxidation
- Pitting
- Intergranular
- Fretting
- Exfoliation
- Galvanic

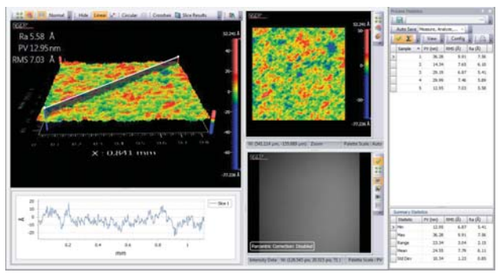
What can be done once structural corrosion has formed...

- Remove every trace of corrosion
- Retreat surface to form protective, non-porous barrier
- Restore protective / decorative finish

3D Optical Surface Profiling
Meets High Tech QC Needs



UPI's QC/R&D labs develop and evaluate specific processes, unique applications, and next generation products for advanced surfacing. A powerful tool in the metrology arsenal is the ZYGO NewView, a versatile, non-contact, 3D optical surface profiler. The ZYGO NewView allows the engineering team to view high resolution images of surface characteristics undetectable by other means.



Industries requiring highly polished surfaces like optics and data storage, make micro-measurement of surface variations essential. The ZYGO NewView measures, characterizes, and quantifies surface roughness, step heights, critical dimensions, and other critical topographical features, with excellent precision and accuracy.

The detailed data this 3D imaging software generates allows the team to closely monitor achievable surface changes, providing invaluable feedback in directing research.