TELEVAC®
THE FREDERICKS COMPANY

CASE STUDY: ARGONNE NATIONAL LABORATORY

Industry leading vacuum measurement solutions

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ANL APS, APS-U, and Televac®

Televac® partnered with Argonne National Laboratory (ANL) with their Advanced Photon Source (APS). At APS there is a synchrotron where electrons are accelerated to near the speed of light for experimentation. The synchrotron facility includes a linear accelerator, booster synchrotron, and storage ring. In the linear accelerator there's a hot cathode which produces electrons, and using the different accelerators (linear and synchrotron), the electrons are accelerated to 99.999+% the speed of light. In the linear accelerator the electrons reach an energy of around 450 MeV prior to being injected into the booster synchrotron where they reach an energy of around 7 GeV.

The linear accelerator, booster synchrotron, and storage ring are kept in ultra-high vacuum (UHV) at all times to prevent the accelerated electrons from colliding with other particles as they travel at close to light speed. APS was originally brought online in 1995, and significant technological advancements have taken place since the original installation. In 2020, APS launched a project called the APS-U (Advanced Photon Source - Upgrade) to upgrade the accelerators and storage ring with all new equipment. This included the vacuum gauging, with hundreds of new vacuum controllers and vacuum gauges needed to measure across the massive facility that has a storage ring circumference of around 1.1 km or 3,600 feet.

The Challenge and The Solution

APS-U had stringent vacuum measurement requirements for the upgrade with a tight schedule, and that's where Televac® came in. Working directly with the APS-U team, Televac®'s versatile MX200

Argonne NATIONAL LABORATORY

Challenge

Stringent ultra-high vacuum measurement requirements for the APS-U upgrade

Solution

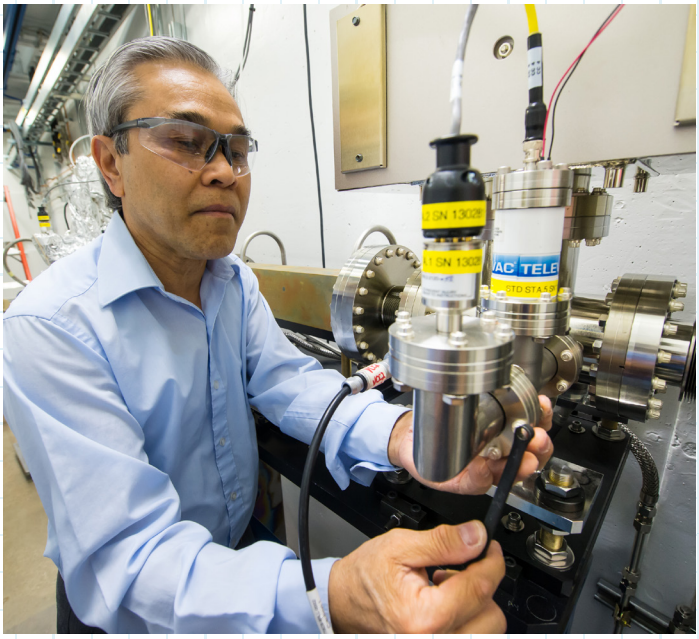
Televac® MX200 controller with 4A convection and 7FCS cold cathode vacuum gauges with radiation resistant cables

Results

A vacuum measurement system that offers high accuracy measurements from atmosphere to UHV with EPICS and synApps compatibility

vacuum controller was selected along with our industry-leading convection vacuum gauge (the Televac® 4A) and double-inverted magnetron cold cathode vacuum gauge (the Televac® 7FCS). This vacuum gauging configuration allowed for wide range, high accuracy vacuum measurement from above atmosphere (1000 Torr) down to UHV or $1*10^{-11}$ Torr.

The unique design of the Televac® 7FCS cold cathode was well-suited for the APS-U requirements for three reasons; it includes a thermionic emitter, it has a double-inverted magnetron design, and it's cleanable. The thermionic emitter, or starter filament, allows the cold cathode to start quickly in UHV, solving challenges related the APS-U requirement for starting cold cathodes in UHV. The double-inverted magnetron design reduces stray magnetic fields and provides a wider measurement range



than typical cold cathodes (down to $1*10^{-11}$ Torr), allowing accurate UHV measurement critical to APS-U. The easy cleanability means that the gauge will last indefinitely in an application like that of APS-U, where equipment must remain in operation for decades at a time with little or no intervention from operators.

Other unique design features of the vacuum measurement system offered by Televac® included radiation resistance of the gauges and cables, EPICS/synApps compatibility via RS-232 communications, ultra-fast sampling and response times of the vacuum gauges down to ≤10 ms, up to 8 process control relay set points that can be assigned to any of the connected vacuum gauges, and up to 8 vacuum gauges simultaneously controlled and displayed by a single MX200 vacuum controller. The flexibility and fast lead times of Televac® also allowed us to meet all delivery requirements for APS-U. To read more about our vacuum gauging solutions for particle accelerators and synchrotrons, visit our dedicated page for this market and application.

Televac® Summary

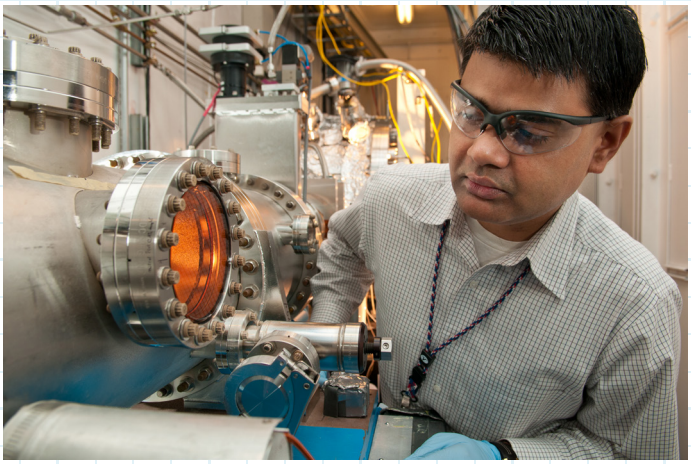
The Televac® brand of The Fredericks Company manufactures high-quality vacuum sensors, gauges, and control instrumentation with extremely fast lead times of 2 weeks or less, with in-stock items shipping next day. Our extensive vacuum measurement product line features industry-leading cold cathode gauges, thermocouple gauges, and precision-manufactured hot ionization gauges, along with the most modern digital communication protocols like EthernetIP. We guarantee customer satisfaction and our "not too big, not too small" operation is what enables us to offer a true partnership experience. Covering the entire practical vacuum range from 10^{-11} to 10^{4} Torr, our products deliver rapid response vacuum readings, superior sensitivity, and unparalleled contamination resistance.

Televac® MX200 Vacuum Controller with the 4A Convection and 7FCS Cold Cathode vacuum gauges.

Customer Service and Support

Even though timely customer service and expert product support should be a standard for doing business, more recently it seems to be the exception instead of the rule. Getting the quick, ongoing support you need is especially critical when you have time sensitive engineering challenges to work through. At that point, you don't just need a part - you need a partner, and expert product support is something you can rely on from Televac® with anytime access to our product specialists, engineers, and leadership team.

At Televac®, our heritage of support and partnership goes back more than 85 years, working side-by-side with research institutions and OEM customers globally in various markets and literally hundreds of applications.



In that time, we've amassed a great deal of industry knowledge about vacuum gauging and advanced manufacturing techniques. Our team of designers, engineers, and support specialists are at your disposal to bring that knowledge and experience to the most complex (or the simplest) projects you bring to us. We develop high quality, cost-effective products and components that are critical to meet your most challenging design requirements.

More About Televac®

The Televac® brand of The Fredericks Company is proud to be a Women-Owned Small Business (WOSB). We are ISO 9001:2015 certified and registered with the U.S. State Department as ITAR compliant. All of our products are designed and manufactured at our facility in Huntingdon Valley, PA.

For more information, visit our website for an online chat or video chat at www.frederickscompany.com, send us an email at sales@frederickscompany.com, or call us at +1 215 947 2500. We look forward to working with you!