Vacuum Technology
Room 205 ABCD W - Session VT-TuA

Novel Vacuum Methods and Application

Moderators: Freek Molkenboer, TNO Science and Industry, the Netherlands, **Alan Van Drie**, TAE Technologies

2:15pm **VT-TuA-1 Advanced UHV Sealing Solutions with HELICOFLEX® TEXEAL®**, ***Ryan Widejko,*** Technetics Group - An Enpro Company **INVITED**

As a leader in high-performance sealing for demanding environments, Technetics Group is consistently pushing the boundaries of Ultra High Vacuum (UHV) sealing technology. This presentation focuses on the development and application of HELICOFLEX® TEXEAL®, a patented texturized technology integrated into metallic seals, designed to lower the required seating load and enhance UHV performance. By applying TEXEAL® technology to its HELICOFLEX® metal seals, Technetics has achieved a significant reduction in clamping load while maintaining superior sealing integrity, even under extreme conditions.The HELICOFLEX® TEXEAL® solution minimizes the contact area without reducing the seal track width, promoting optimal conformity to flange roughness. This approach eliminates the need for softer sealing materials by selecting materials with better thermomechanical properties. Comparative test data indicate that the texturized seal exhibits lower linear loads (lbs/inch) and improved sealing rates compared to non-texturized and traditional seals. Additional benefits include improved reusability, lower sensitivity to surface defects, and minimal requirement for flange redesign, resulting in increased equipment uptime and simplified assembly processes. These innovations render the HELICOFLEX® TEXEAL® ideal for applications in semiconductor manufacturing, accelerator and fusion research, and other areas that demand ultra-high vacuum stability and reliability.This discussion will detail design principles, test methodologies, and performance metrics associated with HELICOFLEX® TEXEAL®, while outlining manufacturing capabilities and real-world applications. The session aims to provide UHV professionals with novel insights into reducing hardware stresses and operational costs, thereby advancing the state-of-the-art in UHV sealing technologies—a critical component in today's increasingly demanding vacuum systems.

3:00pm **VT-TuA-4 Helium-3 and the Lunar Vacuum: Framing a $17 Trillion Opportunity*, Chris Salvino,*** Lunar Helium-3 Mining, LLC

Helium-3, implanted into lunar regolith by the solar wind, represents a resource with transformative potential: a $17 trillion annual market spanning future nuclear fusion and quantum computing applications. Unlike terrestrial mining, any attempt to recover helium-3 and other volatiles must operate entirely within the hard vacuum of the lunar surface. There is no atmosphere for heat transfer, no fluid dynamics to aid separation, and abrasive dust complicates all surface interactions. These realities mean that lunar resource recovery is not simply a mining challenge, but fundamentally a vacuum science and engineering problem. Approaches to heating, capturing, and storing gases must be compatible with an environment where vacuum is not a laboratory condition but the baseline operating medium. This presentation will frame helium-3 extraction as a problem domain where vacuum expertise is essential. The goal is to highlight the scale of the opportunity, the centrality of vacuum in making it possible, and the need for collaboration between the space resource and vacuum science communities to advance solutions.

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