Vacuum in Medical Applications Speaker Biographies.

Vacuum Technology in Proton Beam Therapy
Jinane Haddad, Atlas Copco

BIO- Prior to working in Atlas Copco, I was a Doctoral candidate at the research center in Juelich and the University of Cologne, where I worked in Perovskite Solar Cell research. I have a Diplome Ingenieur from the INP de Bordeaux in France where I graduated in 2015 as an Ingenieur de Chimie et Physique with a specialty in energy storage and conversion. I have been working at Atlas Copco since July 2020 as Global Applications Manager in the Scientific Vacuum Division, where I am mainly in charge of Leybold Cryogenic products.

Antimicrobial Protection to Reduce Hospital Associated Infections
Patricia Killen, Gencoa

BIO- First Class BEng (Hons) in Mechanical Engineering from Liverpool John Moores University. Started at Gencoa Ltd at the beginning of 2019 as a Process Development Engineer in the R&D Department. Main responsibilities include product testing, process development, coating analysis and customer support activities for the thin film and vacuum coating industry. Most recently focussed on the development of antimicrobial protection for touch surfaces in public sectors and hospital and healthcare environments.

3D digital tomosynthesis with Adaptix's novel flat-panel X-ray source
Jamie Cameron, Adaptix

BIO - Jamie Cameron CPhys is a Principal Scientist specialising in experimental physics in the fields of ultra-high vacuum, high voltage, and X-ray generation. Jamie has been with the Oxfordshire based Adaptix for over 7 years and he currently leads the development of their novel flat panel X-ray source. In previous roles with Adaptix, Jamie has conducted research into the development of silicon and tungsten based field emission arrays.

BIO - Dr Paul Edwards is a research scientist at Adaptix working on the development of their novel flat panel X-ray source. He completed a PhD in cybernetic Engineering working on Infrared filter multilayer filters for Astronomical telescopes and planetary probes. From there he worked as an experimental physicist research fellow at CERN, operating out of the vacuum group, he helped develop the low SEY a-C coatings for the LHC upgrade project.

A range of vacuum based sterilisation techniques for medical components
Andrew Chew, Rebecca Grinham and Pierre Lantheaume - Leybold Vacuum

BIOs – Andrew Chew: Global Applications Manager. Developing vacuum application solutions with a special focus on identifying vacuum industry trends and emerging technologies

Rebecca Grinham: Senior Systems Engineer. Originally a graduate scheme entrant and currently working on abatement technologies.

Pierre Lantheaume: Market Sector Manager with a is focus on rough vacuum (including the Food and Packaging sector) and medical technologies.

Comparison of vacuum-based leak testing methods – Packaging for pharmaceutical products
Andreas Schopphoff, Pfeiffer Vacuum

- Andreas Schopphoff
- Born 1963
- Holding a degree in physics
- Holding a degree in industrial engineering
- Have been with Pfeiffer Vacuum since 1995
- Starting off as a service engineer for high resolution mass spectrometer
- Product manager for mass spectrometer, leak detectors and gauges
- Till now Head of Market segment R&D. Leading a team which takes care of universities, institutes and larges research sites globally

Vacuum Technology in Proton Beam Therapy

Jinane Haddad
Atlas Copco

Proton beam therapy (PBT) is a particle therapy used in the medical field for cancer treatment. PBT principle works by delivering a beam of accelerated protons (mainly hydrogen protons), to the cancerous tumour. The advantage of PBT compared to other forms of radiation therapy is its capability to target with accuracy the tumour with minimal damage to the surrounding healthy tissue. A cyclotron is used to generate and accelerate the proton beam to energies up to 250 MeV, that is then delivered to the gantry for patient's treatments. In this talk we highlight the importance of vacuum technology and cryogenic cooling that enables this technology.

Antimicrobial Protection for Touch Surfaces to Reduce Hospital Associated Infections

Patricia Killen[1], Dermot Monaghan[1], Víctor Bellido-Gonzalez[1], Lara Maroto-Diaz[1], Tommaso Sgrilli[1], Gavin Ackers-Johnson[2], Adam P. Roberts[2]*

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Touch surfaces play a crucial role in the transmission of bacteria and pathogens. The ESKAPE pathogens (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *and Enterobacter spp*) in particular are the leading cause of Hospital Associated Infections (HAI). It is estimated that there are at least 100,000 cases of hospital acquired infections in England each year. Contracting a HAI can often lead to increased morbidity and can have a devasting effect on physical, mental and financial health. In addition to this, HAIs cost the healthcare system billions of dollars a year in added expenditure. Recent research suggests that a growing number of HAIs are caused by pathogens that have become resistant to the antimicrobial medications typically used to control them.

Now, more than ever, there is an urgent need for self-sanitising, antimicrobial surfaces throughout healthcare settings. A novel, magnetron sputtered coating has been developed with very high levels of biocidal efficacy (LOG6, 99.9999% kill). The antimicrobial coating can be applied to 2D flexible films for touch screen application or other 2D parts like push pads/panels or directly sputtered onto other complex 3D touch surfaces such as door handles. The deposition process can be altered in a way, with use of feedback control or doping agent, to enhance the mechanical properties or optical properties without reducing the biocidal ability of the thin film.

Different coated components will be deployed in a healthcare setting and regularly monitored. The effect against the ESKAPE pathogens will be tested and the results presented.

Comparison of vacuum-based leak testing methods – Packaging for pharmaceutical product

Andreas Schopphoff
Leybold Vacuum

Repeatable and accurate testing of the integrity of primary packaging is essential to ensure the quality and effectiveness of pharmaceutical products. For decades, the main methods used have been the blue dye test and the microbial ingress method. Recently, official guidelines such as USP <1207> have been pushing for the use of deterministic and non-destructive methods. In a comparative study, the well-known studies of Kirsch and Burrel have been brought together. More than 500 glass vials have been prepared with defects (microtubes and glass micropipettes). The samples have been tested with three vacuum-based leak test methods in addition to the blue dye test: Helium Leak Test, Optical Emission Spectroscopy and Mass Extraction. The study results compare the vacuum-based methods with the blue dye test and form a decision support to change the method and comply with the new guidelines.

3D digital tomosynthesis with Adaptix's novel flat-panel X-ray source

Jamie Cameron, Dr Paul Edwards
Adaptix

X-ray imaging is an important technique used regularly in modern healthcare. Imaging in 2D has inherent limitations due to the lack of depth information, which can lead to incorrect or missed diagnoses, and often still requires the patient to be referred for 3D imaging. Computed tomography (CT) is the most common 3D X-ray imaging method, but requires very costly equipment, takes up a large space, is not portable, and is also associated with a high radiation dose. Adaptix aims to bring digital tomosynthesis (DT), a lesser-known 3D imaging method, to regular clinical use through the development of a portable DT system. Their intention is to replace the 2D X-ray as the standard diagnostic tool. This would allow for more expedient and accurate diagnoses, and prevent the need for some referrals to CT, thereby reducing the radiation dose necessary for a sound diagnosis in certain cases. Adaptix has recently received FDA 510(k) approval for their orthopaedic imaging system suitable for human hand and foot imaging, but too small and low energy for the large-area human chest scan, which is the largest sector of the commercial market. Their product roadmap includes higher X-ray energy systems capable of imaging shoulders, chests, and hips, as well systems intended for veterinary applications. The novel flat panel X-ray sources are based on an array of semiconductor field electron emitters housed in an ultra-high vacuum enclosure, along with integrated electronics which generate the high voltage and allow the individual emitters in the array to be addressed.

A range of vacuum based sterilisation techniques for medical components

***Andrew Chew**, Rebecca Grinham and Pierre Lantheaume*
Leybold Vacuum

Sterilization techniques are applied in a range of industries but the largest market for sterilization is in the medical/pharmaceutical industry. This paper will discuss the range of locations where this takes place, the objects sterilized and the range of vacuum based techniques employed.