Advances in Vacuum Technology

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This presentation will review the current status of vacuum technology with an emphasis on medium and high vacuum pumping options.

It will contrast and compare medium and high vacuum pumps with specific reference to application and process requirements.

The final part of the presentation will focus on possible future developments in the near term to pumps and their performance.

“Time-of-flight spectroscopy as turn key technology for process monitoring”

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In terms of increasing complexity of industrial vacuum processes the quality of the vacuum itself gains more and more impact. To deal with this challenge one crucial aspect is the necessity of in-situ monitoring and control of process parameters like pressure and residual gas composition. With this it is possible to minimize production errors and avoid failures or major damage. Unfortunately, the capabilities of hot cathodes or quadrupole mass spectrometers are not sufficient for this task.
One answer to this challenge is our novel ion source NOVION®, which combines the well-known technology of time-of-flight spectroscopy with our patented ion trap to an industrially available gas analyzing application.

In this talk we present the new fundamental physical principles of the novel ion source and discuss advantages and limits in different use cases. On the one hand we demonstrate the capability of precise total pressure measurements over a wide pressure range. On the other hand, we show the available possibilities to use the novel ion source in partial pressure measurement mode. Besides the simple use case as He-leak detector to identify air leaks of the vacuum system, the novel ion source is able to quickly capture the complete gas composition at every stage of the process line.

Is the "Entrance Correction" real or just a convenience?

R Gordon Livesey
Consultant

Although some vacuum users are aware that the so-called 'entrance correction' is no more than a useful approximation, many appear to think that there is a physically real entrance effect. It is shown that there is no such effect so that deriving the transmission probability of a duct does not require some special treatment of its entrance.

Comparison of a new kind of ionization gauge and extractor gauge as transfer calibration standards

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A new ionization gauge was recently realized within the framework of the European project EMPIR 16NRM05. The goal of this project was to develop a stable ionization gauge that would be suitable as a calibration reference standard in vacuum metrology. The design of the gauge is based on the straight path of the primary electron beam through the ionization region, which ensures a well-defined path length and electron energy distribution. As a result, the new design has a much smaller spread of sensitivity compared to classic hot cathode ionization gauges. Results of nitrogen sensitivity measurements for 10 gauges from two manufacturers were within 2.5%. The robust design of the gauge ensures good transport stability, which is required for transfer standard gauges.

The lecture will outline the new design, describe its development and main metrological properties. Furthermore, the linearity of sensitivity in the range from 10^{-7} Pa to 10^{-2} Pa will be compared between the new design and the classic extractor vacuum gauge.

Due to the success of the development, the new design was proposed for standardization at the ISO level as a reference vacuum gauge. It is also attractive for industrial use, as the reproducibility of the sensitivity allows changing the gauges without re-adjusting the process parameters.