PARTICLE GENERATION OF CAPACITORM® PUMPS.

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Introduction

Non Evaporable Getter (NEG) pumps are sorption pumps which capture gases by a chemical reaction on their active surface [1]. They find application in a variety of Ultra High and Extremely High Vacuum (UHV-XHV) systems encompassing scanning/transmission electron microscopes [2], photo cathode guns, load-lock and transportation systems [3, 4, 5] and portable mass spectrometers [6]. NEG pumps are also used in large research facilities such as particle accelerators and synchrotrons. Fusion machines or large physics experiments [7, 8, 9, 10]. Most of these applications are highly demanding not only in terms of the residual gas composition and pump down times but also with respect to particles which might be emitted by the pumping system into the vacuum envelope during their operation. The presence of particles can be highly detrimental to the successful operation of most of the vacuum systems mentioned above. In the case of accelerators, for example, particles can create a variety of issues. They cause beam instabilities and lifetime disruption or serious malfunctioning of superconducting cavities and other high RF-power components because of field emission. To prevent a degradation due to particle contamination, particle free sections of accelerators at DESY are specified to be compliant to ISO 5 [11] or even ISO 4 [11] for the case of superconducting accelerator modules.

In the present contribution the emission of particles generated during the use of a CapaciTorr® D400-2 NEG pump is measured by means of a sophisticated laser particle counter.

Preparation

Prior to investigation on particle emission in vacuum:
- In-vacuum particle counter HYT 70XE
- Evacuation and venting performed through the in-vacuum connection
- Designed for pressure between 10^-10 mbar and 7 bar
- After about half an hour the pump was compliant to particle cleanliness according ISO 4 and EN ISO 14644:1999.

Summary and Outlook

We have investigated the particle emission caused by a CapaciTorr® D400-2 in vacuum during the activation of the pump. The first two activations showed huge numbers of particles emitted from the pump. But already during the fourth activation no particles could be detected. The results show that after proper preparation the pump can be used in particle free vacuum systems of DESY.

References