

The silent worker in the lab.

Ian Olsen, scientific market sector manager for Edwards, looks at how vacuum and new pumps are improving mass spektrometry and SEM for drug discovery



Mass spectrometry and Scanning Electron Microscopy (SEM) are becoming increasingly important in drug discovery, with new uses ranging from the identification of pirated drugs, assessment of surface treatments on pharmaceutical actives and accelerated lifetime testing. Employed throughout the industry, both tools rely on high quality vacuum to operate effectively and efficiently.

Vacuum for pharmaceutical applications has undergone significant developments in recent years. Edwards, a specialist in vacuum technology, had paid specific attention to the issues that are of particular interest to the industry: quiet operation, control, serviceability, uptime and reduced footprint. Reduced maintenance has also been a main driver for design and is a key innovation in latest generation vacuum pumps.

In the past, traditional rotary vane and oil-flooded pumps were often used for primary vacuum generation. These 'wet' pumps contain oil that requires periodic changing, typically every two to six months. Once an oilchange has been completed it can take up to 24 hours to reestablish vacuum in the instrument before it is operational. Maintenance interventions, therefore, result in significant lost processing time.

With such technologies there also is a risk of oil spillage during oil changes and O-ring seal deterioration over time with resultant leaks, all of which are inconvenient, time consuming and messy. Used oil from traditional rotary vane pumps may become toxic, either as a result of the sample itself being trapped in the oil, the sample reacting with the oil or sample breakdown and recombination in the operating chamber forming toxic substances that contaminate the lubricating oil. Since it is not possible to detect whether or not this process has taken place, used oil must be disposed of appropriately – often at a cost.

Edwards nXDS is an environmentally friendly hermetically sealed pump that provides oil-free vacuum, eliminating the need for waste oil processing. Cleaner, greener and more reliable, it provides many advantages over older technologies, including extended service intervals of up to four years, thereby increasing uptime and

reducing cost. The nXDS tip seal has been designed to reduce wear significantly, minimising maintenance. Not only does the tip seal service take less than 10 minutes, but it can also be performed using simple workshops tools.

New developments in control systems mean that subsystems within an instrument – including the pumping equipment – can be controlled internally through the central communication bus and be accessed remotely. When maintenance visits are due it is possible to interrogate the system, establishing what actions will be required and, therefore, what spares etc. the engineer needs to bring. This reduces the number of maintenance visits to a client site, improving their equipment uptime and making more efficient use of service personnel.

In a normal set-up, vacuum is delivered to the SEM or mass spectrometer by way of a secondary vacuum system located externally. Traditional rotary vane pumps are frequently housed in external acoustic closures removed from the working area for noise management reasons. Edwards nXDS has been designed to be the quietest dry pump in its class: the low acoustic noise levels (of around 52dB(A)) and minimal vibration make it an ideal 'fit and forget' pump. Indeed, it is so unobtrusive it is usually operated in the lab environment.

Whether a tool is operating in a large pharmaceutical facility or a small university laboratory, the need for cost reduction continues to drive vacuum pump innovation. nXDS achieves this not only by requiring less attention during its use, but also by consuming less power. This in turn means that it produces less heat, which has a direct effect on reducing aircondition running costs.

The current trend in the field of mass spectrometry is to be able to detect increasingly small sample sizes. Edwards facilitates this through the use of unique turbo pump technology in conjunction with nXDS dry scroll pumps, helping to realise greater gas throughput and ultimately higher instrument sensitivity.

It is expected that scanning electron microscopy will continue to develop in the future, with increased analytic capabilities, improved instrumentation and higher resolution imaging for both small and bulk samples. Edward is committed to supporting such development with superior innovation and practical solutions.

This new generation of pump is a major step forward for vacuum pumping in scientific and related markets. The nXDS is based on some of the already proven technology of Edwards XDS dry scroll pump, brought right up to date with much improved performance and increased functionality. Its green credentials and low cost of ownership make it the small dry pump of choice for today's most advanced technologies, saving users time, energy and money.

The use of vacuum technology is not simply limited to scanning electron microscopes or mass spektrometry but also gives good results when used in other pharmaceutical applications, including extraction and filtration, freeze drying, solvent recovery and general laboratory bench top and clean pumping.

This trend for vacuum-reliant processes within pharmaceutical and other related industries looks set only to increase.