ttpventus
PART OF THE LEE COMPANY

TN013: PULSATION FREE OUTPUT

Introduction

Airflow pulsation is a challenge faced by many designers. In measurement instrumentation (such as for gas analysis), pulsation often limits the signal-to-noise ratio and the resulting sensitivity. For microfluidics systems (such as point-of-care diagnostics), pulsation can cause poor flow control. To deal with these issues, designers often have to include baffles, accumulators and other damping hardware to reduce pulsation. This adds cost, complexity and size to the system.

Ultrasonic Operation

Conventional pump technologies typically operate at speeds of up to 50 Hz (3000 RPM). LEE Ventus' Disc Pump cycles more than 400 times faster, at 21000 Hz (1.26M RPM). Each cycle of the pump displaces a tiny quantity of air, typically in the range of 10s to 100s nanolitres. The resulting airflow is ultra-smooth and creates negligible pressure pulsation within the system.

Figure 1 shows the pressure pulsation generated by a Disc Pump, a diaphragm pump, and a rotary vane pump[1]. The diaphragm pump creates large, low-frequency pressure oscillations. The rotary vane pump produces smaller, higher-frequency oscillations; however, the pulsation is still readily apparent—despite this, rotary vane pumps are often sold as "low pulsation" solutions. Disc Pump, on the other hand, produces very little pulsation at all; no pulsation is observed above the background noise floor of the measurement sensor.

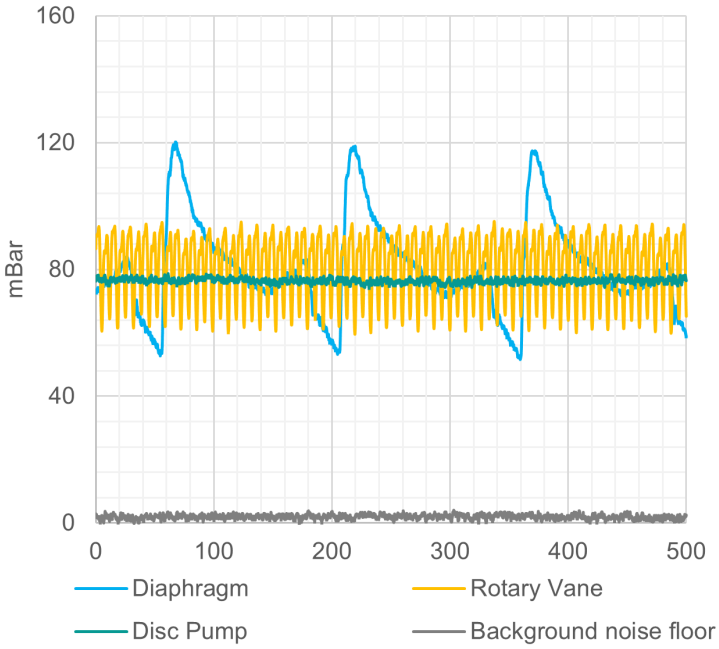


Figure 1: output pulsation for three pump types, and background noise floor

Benefits

- Compact and lightweight
- Low cost
- Precise and accurate
- Wide dynamic range
- Millisecond response speed

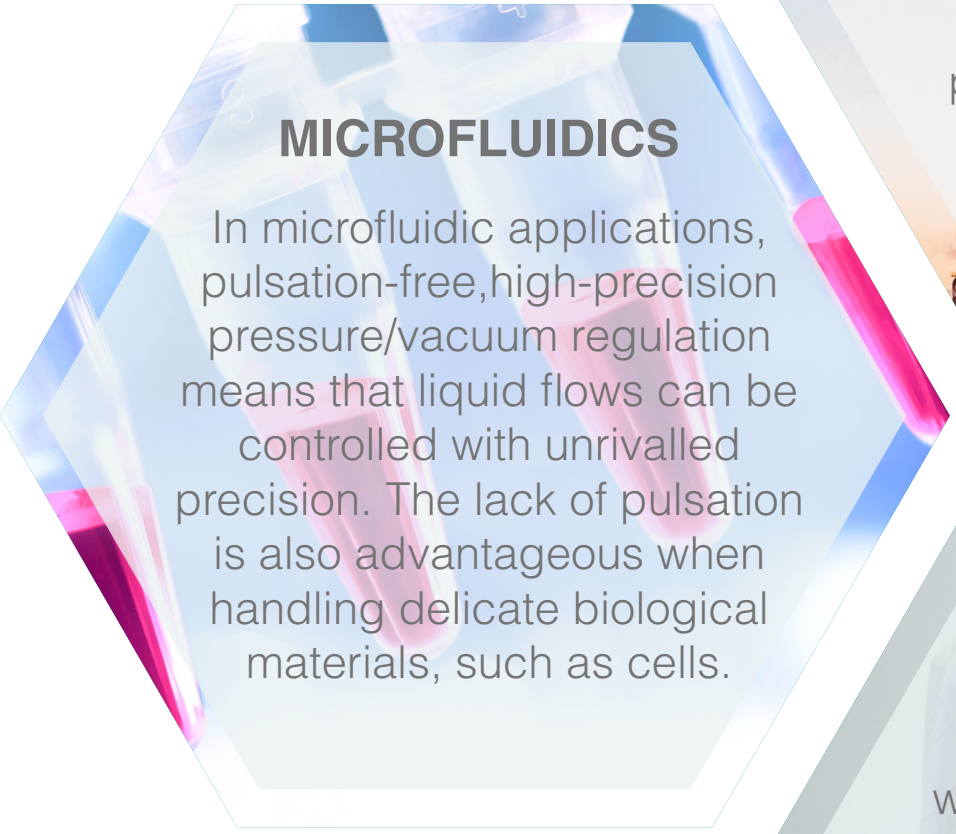
[1]Pumps driven to deliver approx. 80 mbar against a 30k Lohm flow restriction. Pressure output measured with a high-frequency pressure sensor sampling at approx. 60 kHz.

Applications

With its ultra-smooth, pulsation-free output, Disc Pump offers superior performance to conventional pump technology, whilst at the same time eliminating the need for damping hardware, enabling designers to create simpler, more compact products. These benefits apply to a wide range of applications.

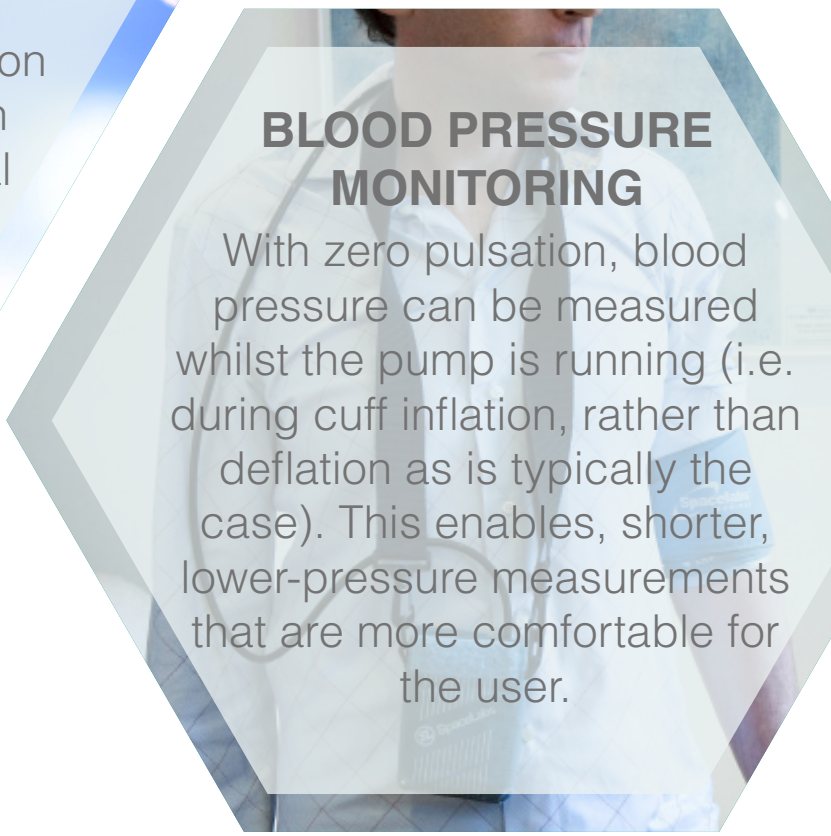
GAS ANALYSIS

Disc Pump's ultra-smooth output can enhance a wide range of gas analysis systems. For gas detection instruments, Measurement noise is reduced, increasing sensitivity. For particle detection systems, the lack of flow oscillation means that double counting can be avoided.



MICROFLUIDICS

In microfluidic applications, pulsation-free,high-precision pressure/vacuum regulation means that liquid flows can be controlled with unrivalled precision. The lack of pulsation is also advantageous when handling delicate biological materials, such as cells.



BLOOD PRESSURE MONITORING

With zero pulsation, blood pressure can be measured whilst the pump is running (i.e. during cuff inflation, rather than deflation as is typically the case). This enables, shorter, lower-pressure measurements that are more comfortable for the user.

Learn More

The LEE Ventus website provides a range of resources including Technical and Application Notes, Datasheets, Reference Designs and more.

For any additional support, please contact us at: support@ttpventus.com.