

Introduction

Tighter controls on the processes due to the higher levels of integration and increased productivity now require a greater control on the transfer of liquids from the distribution systems to the processing tools. Fluctuations in flow rate of wet bench recirculation applications and POU delivery applications in single wafer tools can lead to non repeatable processes and medium consumption can be increased.

- Levitronix pumps are centrifugal pumps with no pulsation and the lowest particle generation due to the bearing less pump design.
- An upgrade of older tools that are originally equipped with pulsating bellows pumps with non pulsating Levitronix pumps is a relatively straight forward process.
- Levitronix has developed a turn-key replacement set without requirement of tool software modification, minimizing retrofit downtime and costs.

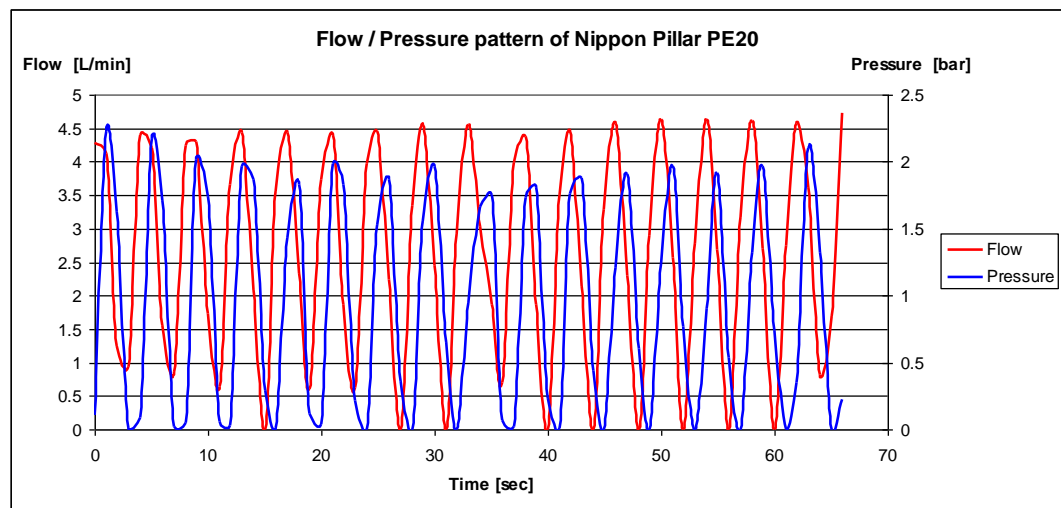


Figure 1: Typical fluctuating pressure and flow rate behavior of a bellows pump

Retrofit Advantages

- Continuous smooth process flow with no pulsation:
 - Increased process uniformity
 - Prevention of strain on piping system from vibration that can lead to expensive repair costs and tool downtime.
- Reduced particle generation:
 - Contact-free pump technology.
 - No mechanical wear of parts.
- Increased tool availability (up-time):
 - High MTBF of Pump (>30 years)
 - Increased time between preventative maintenance
- Higher repeatability of process
- Preventative Maintenance: easy, fast, cheap, safe and independent
- Low vibration, noise and energy consumption
- Possible increase in Filter Lifetime

Benefits with the “Flow controlled concept”

Levitronix provides a flow control system consisting of an additional flow meter to measure the flow rate and to feed back this information to the Levitronix controller. The controller automatically adjusts the speed of the pump to maintain a constant flow rate independent on viscosity, density, hydraulic restriction.

- Dynamic Condition Trending (DCT) allows simple observation of filter loading.
 - Filters won't be exchanged too late or too early any more.
 - Avoids flow reduction that can lead to process deviations.
 - Avoids increased cost of ownership from replacing a good filter.
- Closed-loop flow control system creates a consistent and stable flow and allows for user configurable flow alarms.
- Precise liquid flow control independent of
 - Filter loading
 - Viscosity and density of medium
 - Temperature of medium
 - Contamination of medium

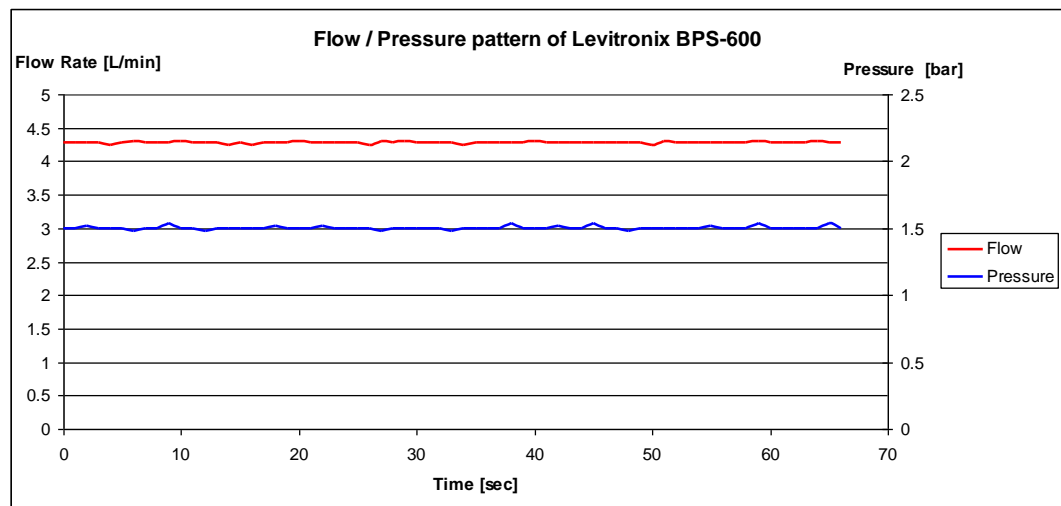


Figure 2: Typical fluctuating pressure and flow rate behavior of a Levitronix pump

Comparison of concepts

Bellow Pump: The controller is switching a pneumatic valve (PV) which supplies the pump with CDA. The CDA is moving the bellow, and as soon as the proximity sensor A is triggered, the valve is switched. Then it will move back until the bellow on the other side hits proximity sensor B.

Levitronix pump: Our centrifugal pumps are operating with a magnetically levitated impeller. It is suspended completely contact-free within a statically sealed casing. There are no bearings to wear out or dynamic seals to break.

Retrofit Options

Speed Controlled – The Levitronix Pump is running at a constant speed, either by pre-fixed or variable input signal from the tool or from the Levitronix controller (depending on the method chosen to transmit the input signal to the pump).

Flow Controlled – The Levitronix Pump, Controller and Flow meter are used together to deliver a closed loop controller constant flow to the process. This offers some additional advantages which are described on page 2.

Speed controlled concept

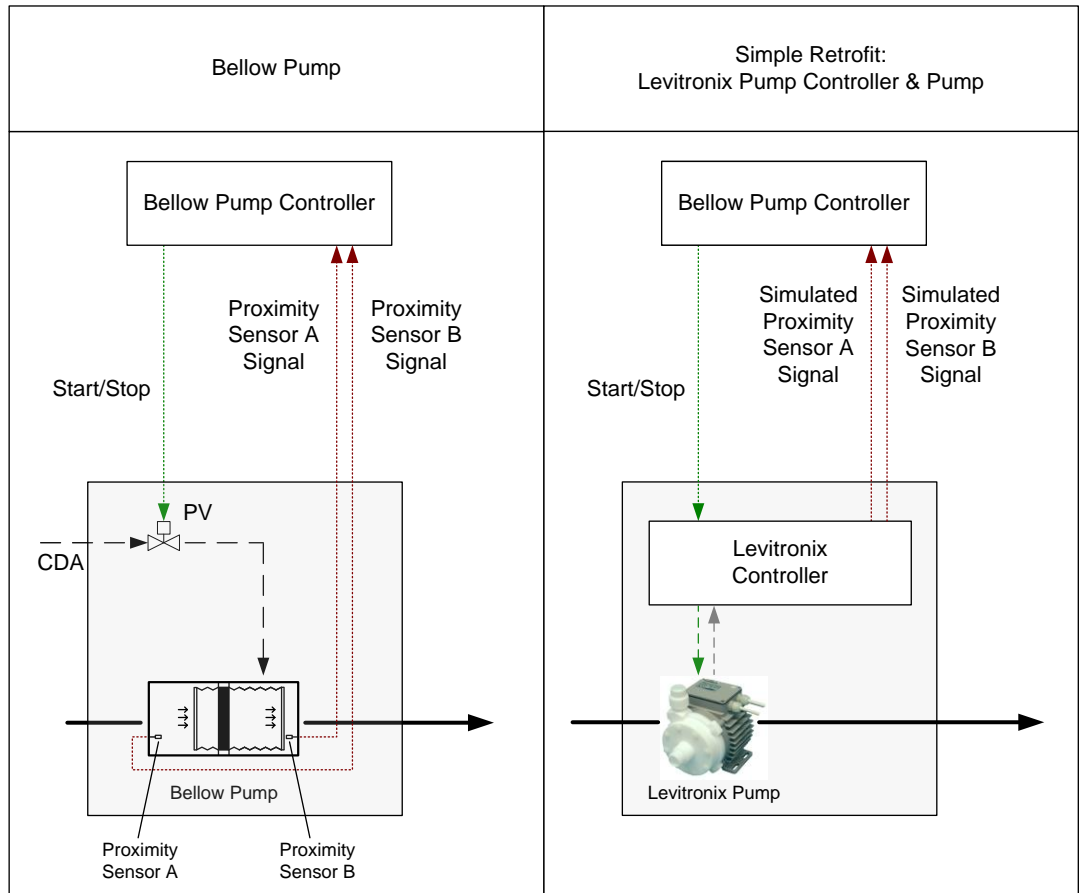


Figure 3: Speed controlled retrofit concept

Flow controlled concept

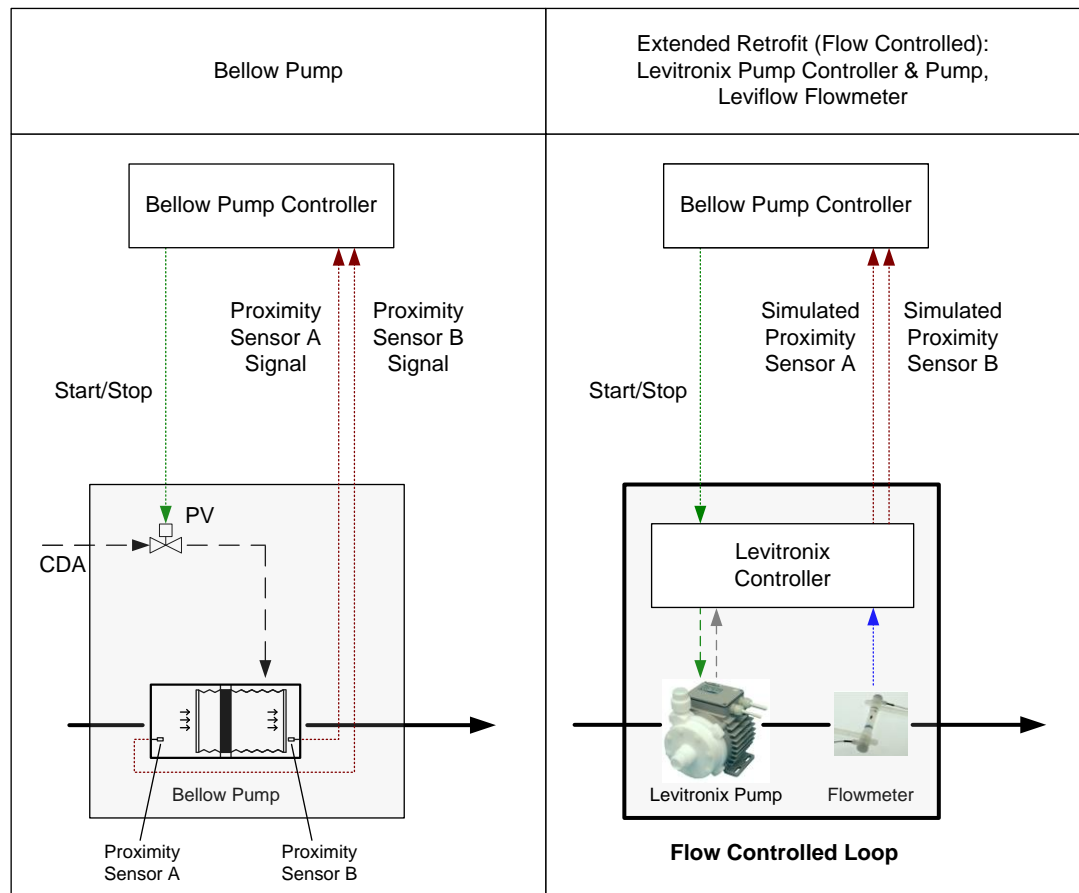


Figure 4: Flow controlled retrofit concept

Set point speed or flow rate

Setting the pump speed (for speed control) or set point flow rate (for flow control)

- Levitronix user interface (“LUI”)
- Analog signal input (4..20 mA or 0..10 V signals)
- Fixed value stored in EEPROM of pump controller (set by PC using Levitronix Service Software)

Explanation of the signal simulation

Why is it necessary to simulate the signals of the bellow pump’s sensors?

The bellow pump’s controller unit monitors the pump’s function. It considers the pump’s state as “running as designated” when it receives the signals of the proximity sensors on the regular basis of a certain interval. (For example once per second.)

By simulating these signals (as long as the Levitronix pump is also running as designated), there is no need to replace the bellow pump’s controller unit.

Explanation of the “Flow Controlled Loop”

What is the “Flow Controlled Loop” and what kind of advantages does it offer?

This is an automatic speed adjustment function of the Levitronix pump, using the Flowmeter’s measuring data to achieve a defined flow rate.

The observation function works indirectly by checking the speed of the Levitronix pump.

As the filter loads and limits the flow, the pump speed will be increased accordingly to compensate and maintain the desired flow rate.

The Levitronix Controller can be used to set a custom speed level flag ("speed trend warning"). As soon as this level is exceeded, the pump generates a warning signal. This allows you to prepare for a filter exchange in advance and therefore reduce system downtimes and prevent flow deviations that could impact the process.

A maximum tolerable change of the measured flow rate ("process alarm") can be set additionally to notify the operating staff of any deviation in the desired flow rate that could impact the process.

Technical Support

For troubleshooting, support and detailed technical information contact *Levitronix® Technical Service Department*.

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