THE PUREST PUMP SYSTEM IN SEMICONDUCTOR MANUFACTURING

The Levitronix® pump system is a revolutionary pump that has no bearings that wear out or seals that break. Based on the principle of magnetic levitation, the pump's impeller is suspended, contact-free, inside a sealed casing and is driven by the magnetic field of the motor. The impeller and pump head casing are both fabricated from chemical-resistant, high purity fluorocarbon resins which together comprise the pump head. A continuous flow rate and pressure are precisely controlled by electronically regulating the impeller speed, which eliminates any pulsation. Thanks to the absence of a mechanical bearing and the self-contained pump head design, the risk of contamination is drastically reduced. The absence of narrow gaps between the impeller and pump head casing plus the low-shear pump design allow for gentle and smooth pumping of sensitive liquids.

Technical Benefits
of the Levitronix® Pump System

The purest pump
Proven by industry Experience - The purest pump within semiconductor manufacturing (and beyond)! Since there is no mechanical coupling between the impeller and the pump head casing, there is no wear and therefore virtually no particle generation.

Pulsation Free Flow
Accurate, stable and reliable flow and pressure for your process. The open pump head design, high flow resolution, centrifugal pump principle and the absence of valves lead to a completely pulsation-free flow.

Low Shear Design
Ideal for Slurry and delicate plating liquids. The smooth wetted plastic surfaces and the absence of a mechanical bearing, narrow gaps, fissures and dead-zones allow for gentle processing of sensitive liquids.

High Controllability and wide flow range
No more flow throttling – highly accurate flow and pressure. Due to its variable speed and high resolution, the Levitronix pump allows precise control of flow or pressure over a wide operating range.

Highest MTBF (>100 years)
Extremely high reliability. There are no bearings to wear out or seals to break down, therefore equipment uptime increases massively, which extends the life of the process equipment and reduces maintenance costs.

Highest Turndown Ratio
Widest flow range – From ultra low flow to maximum flow. The high speed and resolution of a Levitronix pump allows to control and maintain the flow from a few ml/min up to the maximum flow rate.

Small Footprint
Substantially smaller than air operated pumps. The highly integrated design of the pump and motor combined with the absence of a mechanical bearing results in a system that greatly reduces the space requirements and allows for installation in confined spaces.

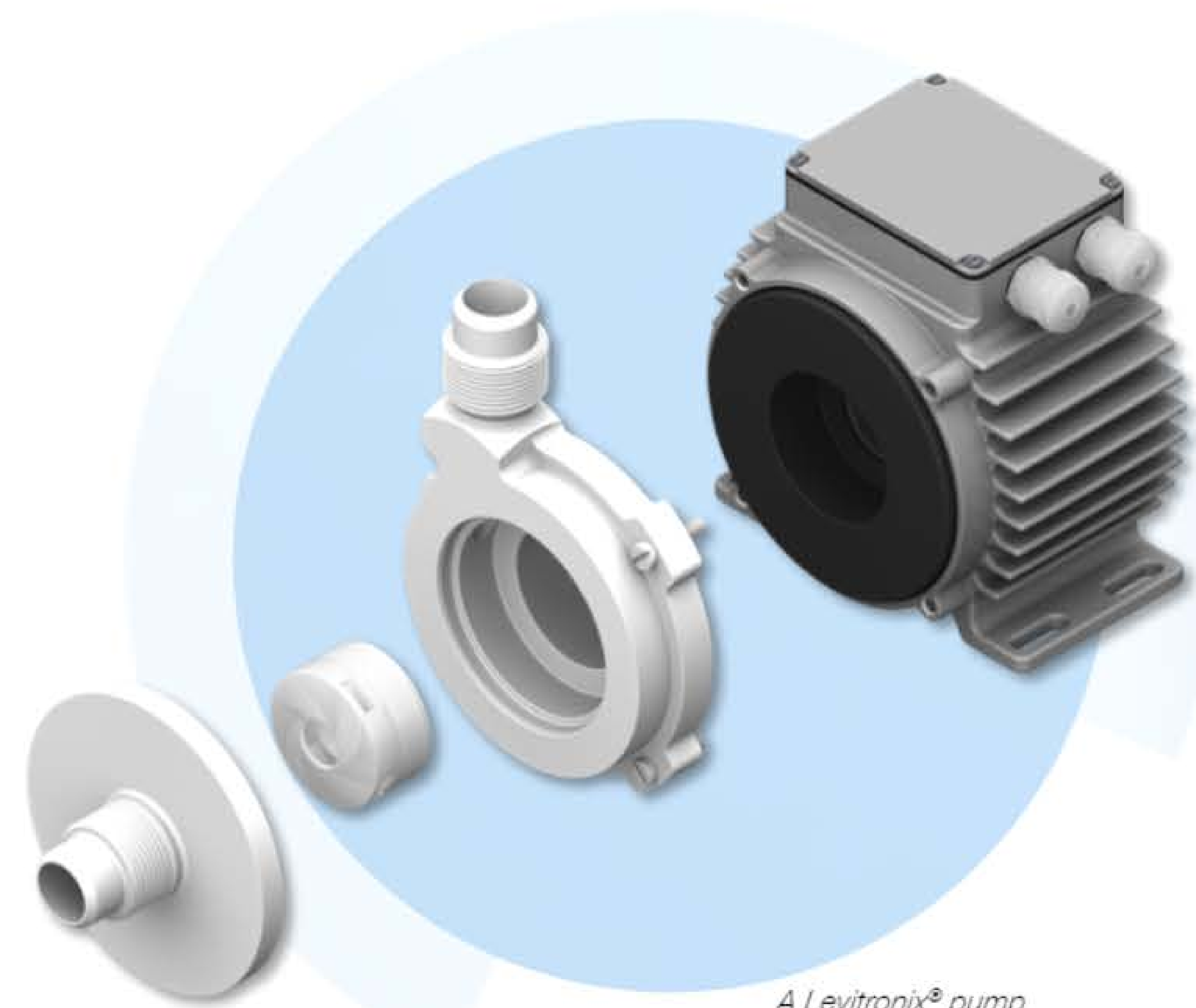
Long history proven technology
More than 25 years experience. Levitronix pumps are firmly established in highly demanding industries beyond semiconductor manufacturing such as biopharmaceutical production.

Constant delivery of equipment data
Smart Pumps for Smart Manufacturing. Levitronix® pumps allow high-performance data acquisition, ideal for predictive maintenance and for factory wide system integration.

Low noise and low vibration
Substantially less noise than with pneumatic pumps. Since there is no mechanical coupling of the impeller and the pump casing, the pump produces virtually no vibrations resulting in a very quiet operating pump system.

LEVITRONIX®

PRODUCT OVERVIEW



A Levitronix® pump systems consists of the motor and pump head

Simple Pump Head Design

A Levitronix® pump head consists of the magnetically levitated impeller, a bottom casing and a top casing. All wet materials meet the highest industry requirements and are fabricated of either chemical resistant high-purity fluoropolymers, stainless steel or other high-performance plastic resins. The pump head can be configured with tube end or common semiconductor fittings such as Flaretek or Pillar.

Bearingless Pump Motor

The Levitronix® pump is comprised of a single motor/bearing unit that provides both drive and magnetic bearing functions simultaneously. Selected motors are ATEX/IECEx or Hazardous Location NRTL certified and can be operated in explosive environments.

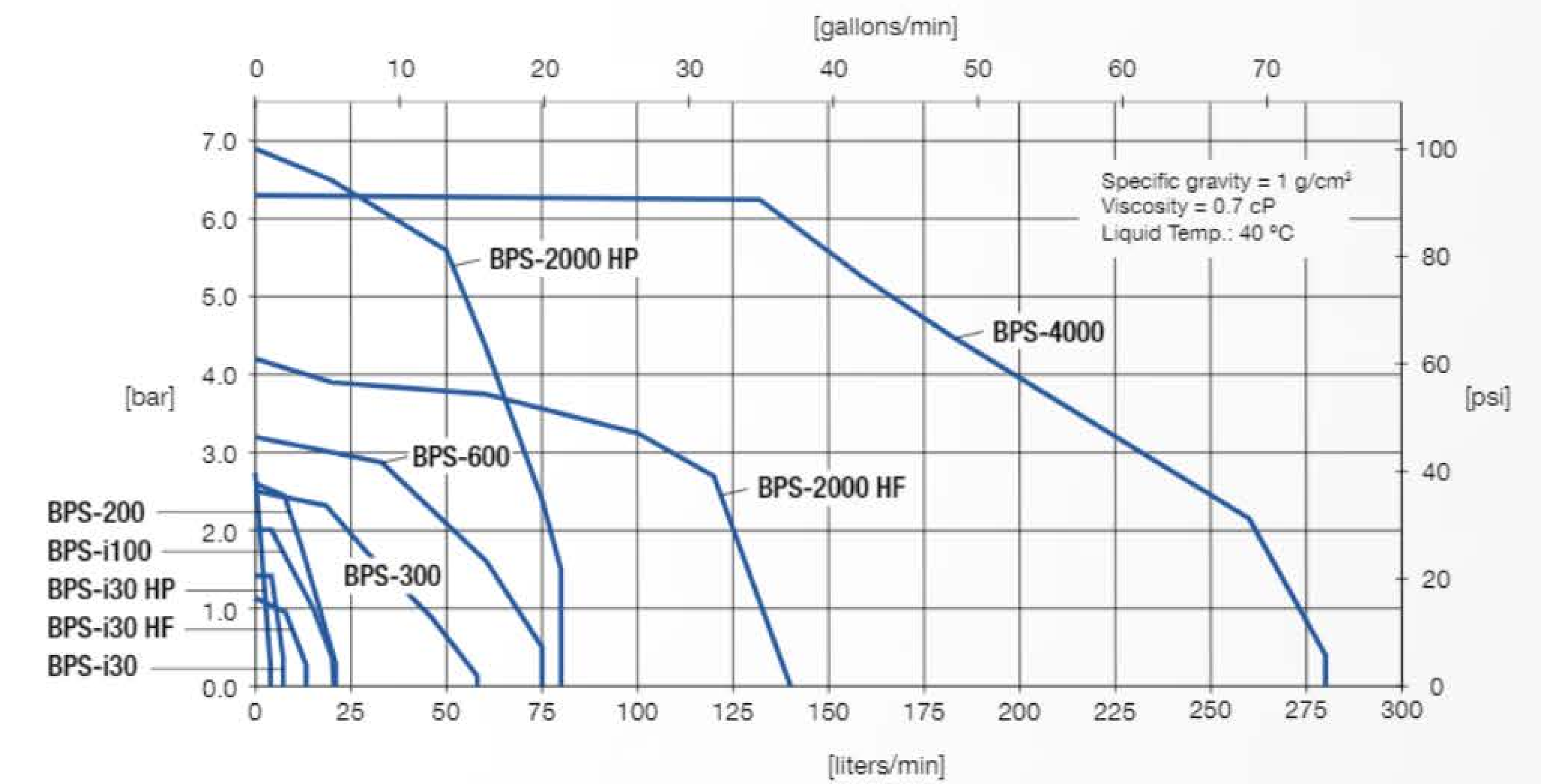
Standalone and Extended Controller

Two basic systems are available. The standalone configuration includes an integrated user panel to set the speed manually. The extended version includes a PLC interface, which allows to set a process set point with automatic closed loop speed regulation via an external control signal such as a flow or pressure sensor.

iF Series

Selected pump systems are available with integrated flow sensor electronics. This allows for a direct connection of a Levitronix® flow sensors to the pump, which rduces the footprint and simplifies installation.

Selected pumps are available with integrated flow sensor electronics such as the BPS-iF30



BPS-i30 Standard
1.5 bar (22 psi)
7.4 l/min (2 gpm)

BPS-i30 High Pressure
2.8 bar (40 psi)
3.8 l/min (1 gpm)

BPS-i30 High Flow
1.1 bar (16 psi)
14.7 l/min (3.9 gpm)

BPS-i100
2 bar (29 psi)
20 l/min (5.3 gpm)

BPS-200
2.6 bar (37.7 psi)
21 l/min (5.5 gpm)

BPS-300
2.5 bar (36.2 psi)
58 l/min (15.3 gpm)

BPS-600
3.2 bar (46 psi)
75 l/min (20 gpm)

BPS-2000 High Pressure
6.9 bar (100 psi)
80 l/min (21 gpm)

BPS-2000 High Flow
4.2 bar (61 psi)
140 l/min (37 gpm)

BPS-4000
6.3 bar (91 psi)
280 l/min (74 gpm)

LEVITRONIX®

HOW DO LEVITRONIX PUMPS BENEFIT YOUR PROCESS

Photo Chemical Handling

A uniform photo resist thickness without any contamination is of great concern to the lithography process. Levitronix® pumps convey photo resist, developer and cleaner in the most accurate, reliable and purest way possible.

Bulk Chemical Delivery

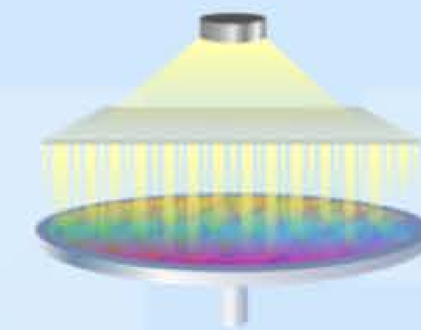
Managing process integrity starts with the chemicals that come into direct contact with the wafer. In comparison to pumps, pressurized vessels can cause water hammer that leads to particle release and safety concerns. Furthermore, pressurized vessels bear the risk of microbubbles at the point-of-use. Levitronix® is the purest pump throughout and therefore the ideal choice in delivery of bulk chemicals.

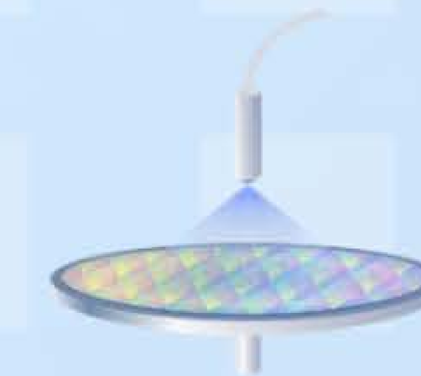
Wet Etching

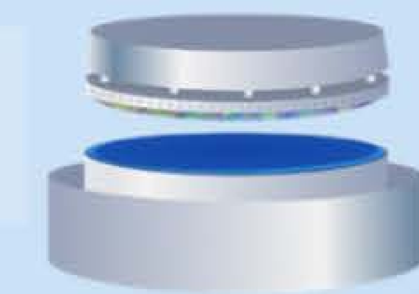
Selectivity and anisotropy are of great concern to the etching process. Due to the high controllability and pulsation-free flow, Levitronix® pumps convey etchants in the most accurate, reliable and purest way possible.

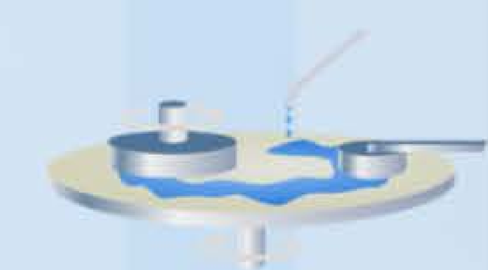
Metal Plating

Levitronix® pump systems provide a very consistent electrolyte flow which is one of the key drivers for the plating uniformity. In Levitronix® pumps, there are no bearing surfaces where metal can plate out and stop the pump.









Cleaning

Highest purity is the major goal in batch- and single wafer cleaning. Levitronix® is the purest pump system throughout and therefore industry standard in ultrapure cleaning applications.

CMP Slurry Delivery

When conveying slurries, high shear forces caused by Diaphragm or Bellows pumps result in particle agglomerations. Micro-scratches originated by these oversized particles or particle agglomerations lead to wafer defectivity. Due to their low shear force design Levitronix® pumps can reduce micro-scratches in CMP applications by up to 80%.

LFS Series Sensor

LEVIFLOW® LFS-008
LEVIFLOW® LFS-04
LEVIFLOW® LFS-08
LEVIFLOW® LFS-20
LEVIFLOW® LFS-50
LEVIFLOW® LFS-80

Flow Sensors

The LEVIFLOW® inline and clamp-on flowmeters are designed for non-invasive flow measurements of high purity fluids.

Two piezoelectric transducers, mounted in the sensor housing, generate and receive an ultrasonic wave. The wave going in direction of the flow is accelerated and the wave going against the flow direction is slowed down. The difference between the transit time of both waves is proportional to the velocity and therefore the flow of the fluid.

Facts

- Ultrasonic transit time measurement
- High precision flow measurement (inline sensor accuracy 1%, clamp-on sensor accuracy 1%-3%)
- Wide flow range
- Highly dynamic flow control with Levitronix® MagLev pumps
- No contamination due to non-invasive flow measurement
- No moving parts -> no particle generation
- All wet materials are fabricated from PFA

Clamp-on Sensor

LEVIFLOW® LFSC-06D.1
LEVIFLOW® LFSC-09D.1
LEVIFLOW® LFSC-11D.1
LEVIFLOW® LFSC-17D.1
LEVIFLOW® LFSC-23D.1
LEVIFLOW® LFSC-30D.1
LEVIFLOW® LFSC-35D.1

Converter

LEVIFLOW® LFC-1C
LEVIFLOW® LFC-6CIO

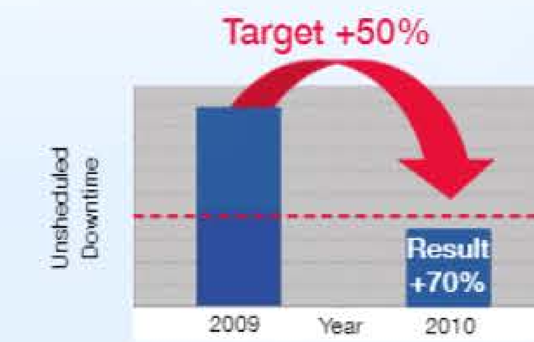
Customer Success with Levitronix®

Project Scope //
Improvements of wet chemical etch equipment to support Infineon Zero Defect Strategy

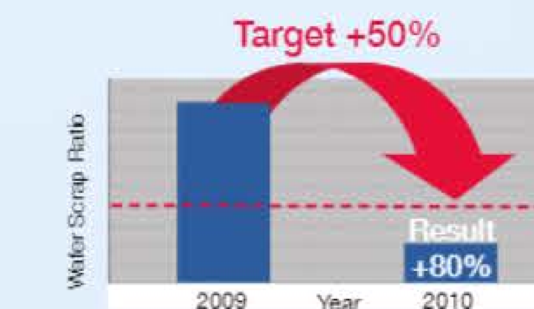
Key Drivers //
Process Stability, Equipment Stability and Wafer Scrap

Results //

Equipment Performance before and after tool modifications



Wafer Scrap before and after tool modifications



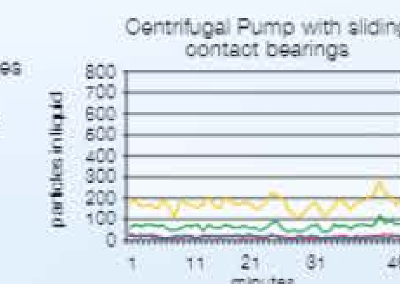
Source: INFINEON Austria AG

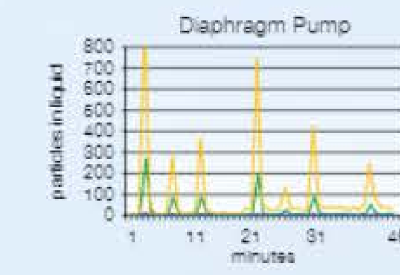
Project Scope //
Influence of different pumping technologies on the particle emission during wet processing of GaAs wafer

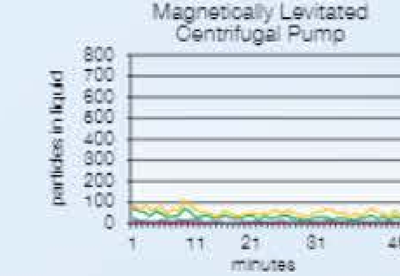
Key Drivers //
Decreasing the number of particles on wafer surface by reducing particles in critical process steps of wet cleaning

Results //

Different size particles added by different pump systems to a liquid loop system







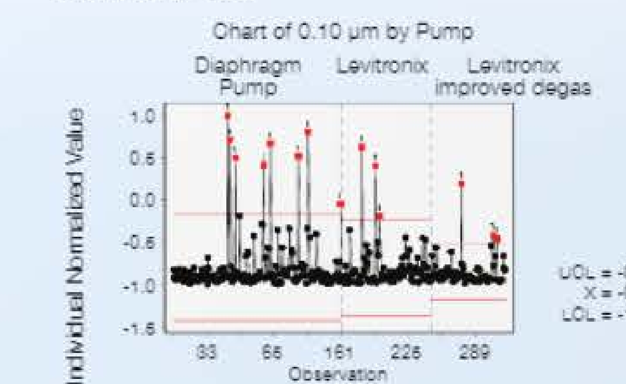
Source: Freiberger Compounds Materials GmbH

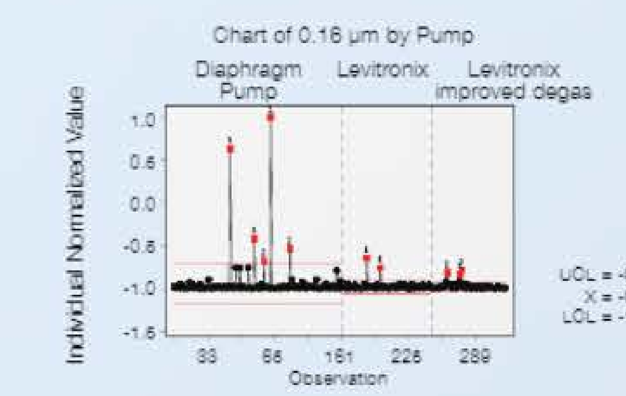
Project Scope //
Retrofit of the SC1 Module with Levitronix® Pump in Final Clean Wetbench. Pump comparison: Bellows pump vs. Levitronix®

Key Drivers //
Constant flow, increased flow rate, low particle concentration

Results //

Particle concentration comparison Bellows Pump vs. Levitronix® BPS-600





Source: OKMETIC

Project Scope //
Retrofit of SAT Tools to reduce wafer scraps and EPD aborts

Key Drivers //
Stable flow and reduced maintenance costs

Results //

Wafer scrap and EPD aborts with Pneumatic Pumps vs. Levitronix® BPS-4

Source: NXP