Stop Your Mag-Drive Pump From Wasting Your Money!

Levitronix Bearingless Pumps

The Ideal Solution For Gold Plating!

LEVITRONIX®

The Problem: Clogged Pumps In Gold Plating

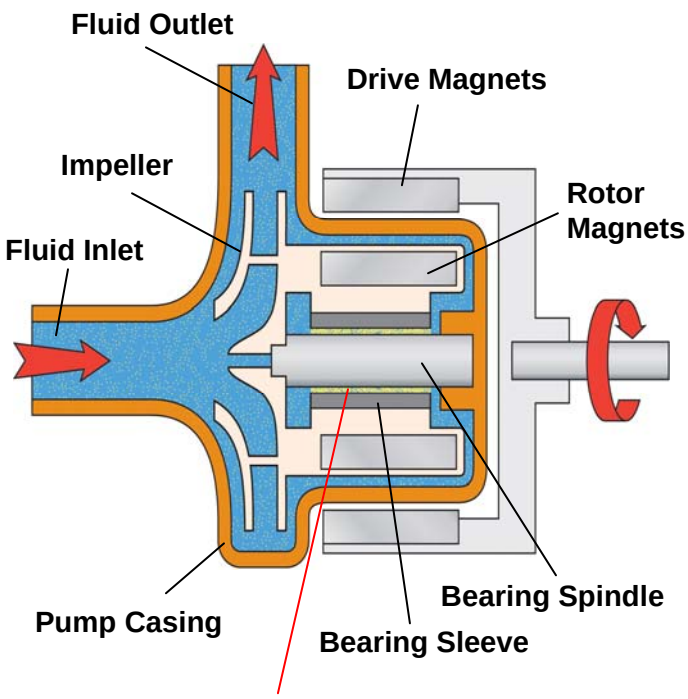

Figure 1: *Schematic of mag-drive pump*

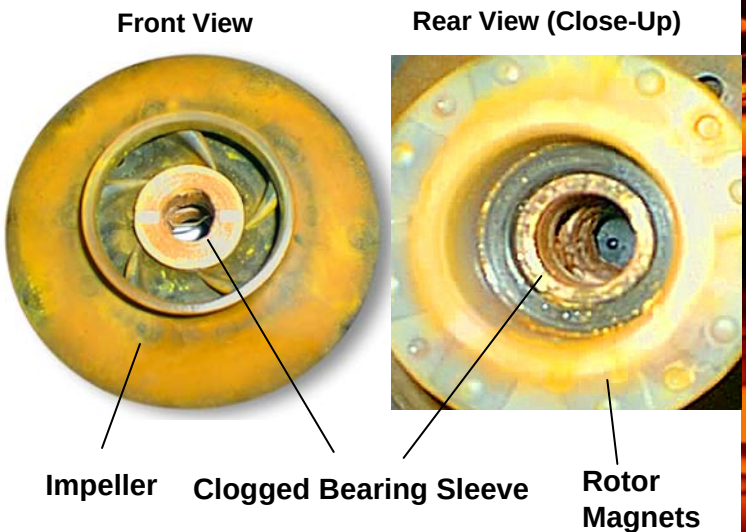

Figure 2: *Rotor of Mag-Drive pump after 3 weeks operation with gold sulfite with close up of clogged bearing (rear view)*

CHALLENGES WITH MAG-DRIVE PLATING PUMPS

Gold sulfite and gold thiosulfate solutions have been developed as an alternative to the highly toxic gold cyanide plating baths. A critical drawback to the use of cyanide-free alternatives is that bath stability is more difficult to control. It is imperative to avoid hotspots, dead-zones, extensive shear, rough surfaces, narrow gaps and fissures.

Magnetically driven plastic centrifugal pumps are widely used in metal plating because of their chemical resistance and leak-free design. In mag-drive pumps, the centrifugal rotor is driven by a magnetic coupling through the pump casing, enabling a seal-less design (Figure 1).

The principle limitation of the mag-drive design is the need of process lubricated slide bearings which are usually fabricated from carbon, silicon carbide or alumina ceramic. When operated with critical plating solutions such as gold sulfite, the metal tends to precipitate on the bearing surface. The precipitate ultimately fills the narrow gap between the stationary bearing spindle and the rotating bearing sleeve. In pump tests performed with gold sulfite solution at elevated temperatures, all mag-drive pumps failed within 3 to 17 weeks. In all cases, the slide bearings were completely clogged with gold which ultimately resulted in increased torque and complete bearing failure. Figure 2 shows the impeller and the bearing of a pump which ceased to function after only 3 weeks of operation.

The Solution: Levitronix Bearingless Pumps

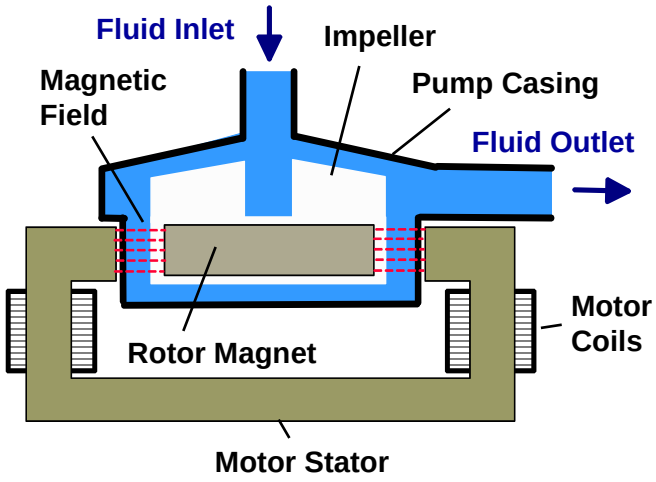

Figure 3: *Schematic of bearingless pump*

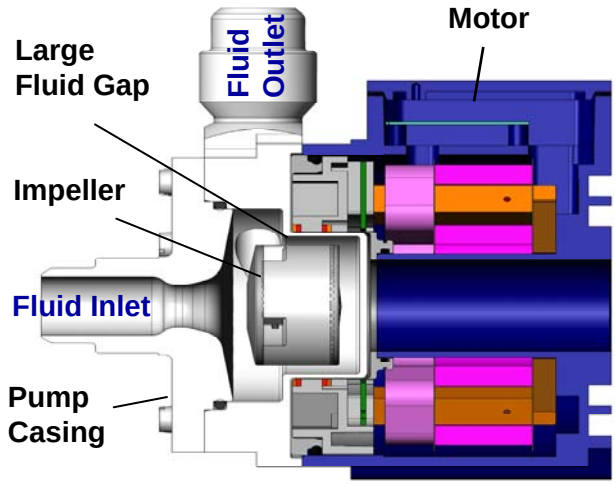

Figure 4: *Cross-section of bearingless pump*

Figure 5: *Levitronix pump after 6 month operation with gold sulfite*

REVOLUTIONARY MAGNETICALLY LEVITATED CENTRIFUGAL PUMP

Levitronix® has developed a revolutionary centrifugal pump that has no bearings or seals susceptible to wear or failure. Based on the principles of magnetic levitation, the pump's impeller is fully suspended inside a sealed casing and is driven by the magnetic field of the motor (Figure 3). The impeller and casing are both fabricated from chemical-resistant, fluorocarbon resins or polypropylene. The impeller with the embedded magnet reside within the outer casing to form the pump head.

By eliminating a mechanical bearing, no mechanical friction occurs that could cause local hotspots. Moreover, no narrow gaps exist where metal could precipitate. The low-shear, dead-zone-free pump design and the smooth, wetted plastic surfaces further aid in avoiding metal deposition in the pump (Figure 4).

In pump tests performed with gold sulfite solution at elevated temperatures, the Levitronix pump showed virtually no metal deposition after six months of operation (Figure 5). In contrast, when mag-drive pumps were tested under the same conditions, they showed heavy gold deposits on all wetted pump parts after significantly shorter operating times. The superior duration of operating time and performance of Levitronix pumps with gold sulfite solution and other critical plating chemistries has made Levitronix the market leader for plating pumps in the semiconductor industry with an installed base of more than 2000 units. Levitronix pumps have also been successfully used for plating of nickel, cobalt, ruthenium, rhodium, silver, palladium, platinum and other metals.

The Benefits Of Electronic Control

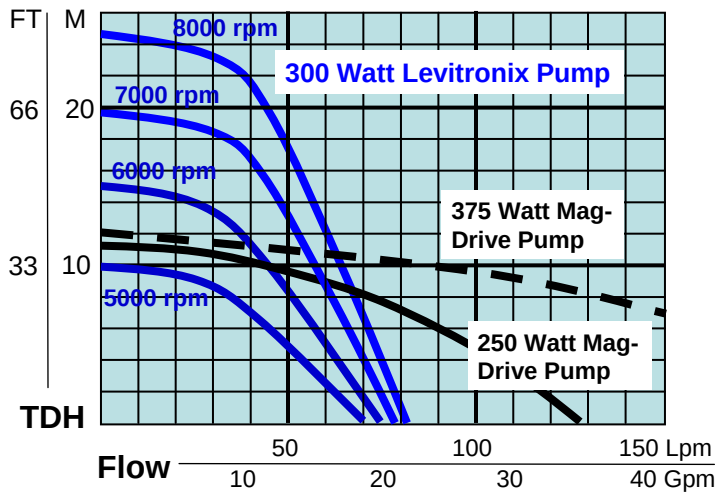

Figure 6: *Flow/Pressure curves of 300 Watt Levitronix pump compared to typical 250 Watt and 375 Watt Mag-Drive pump*

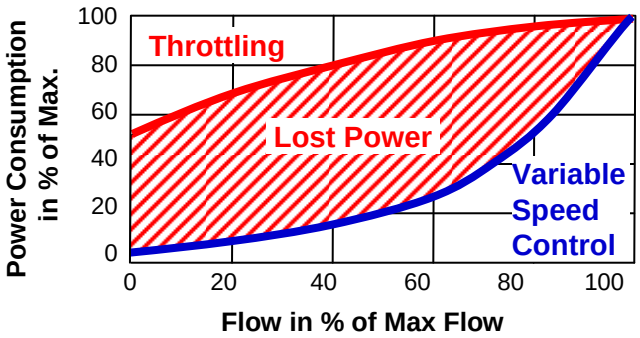

Figure 7: *Power consumption vs. flow rate for different flow control schemes*

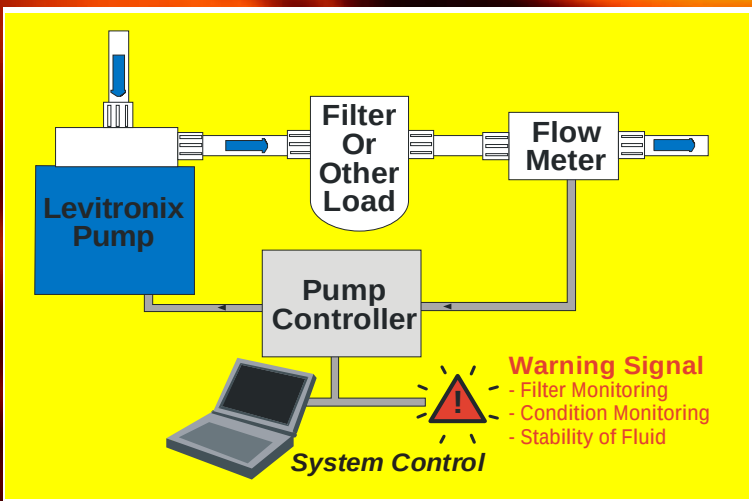

Figure 8: *Closed-loop flow control with Levitronix Pump*

PERFECT MATCH TO YOUR FLOW AND PRESSURE REQUIREMENTS

Levitronix bearingless pump systems all come with variable speed control so that the pump speed can be selected to optimally match your operating point. Compared to mag-drive pumps which are operated with a variable frequency inverter, significantly higher speeds can be achieved since there are no limiting mechanical slide bearings. This feature allowed Levitronix to design pumps with much higher pressure capabilities compared to mag-drive pumps (Figure 6). Levitronix pumps are ideally matched to the typical pressure requirements of filtered recirculation loops. This provides you with the reserves needed to run your filters up to the recommended change out pressure with the added benefit of significant cost savings.

SAVE ON YOUR ELECTRIC BILL

The optimal match between pump speed and pump operating point ensures that you are always able to operate your pump at the point of greatest efficiency. This can result in significant energy savings compared to the typical throttling control of a fixed frequency pump (Figure 7).

CLOSED-LOOP FLOW AND PRESSURE CONTROL

Selected Levitronix pump systems come with an integrated closed-loop controller enabling precise control of flow or pressure (Figure 8). These controllers also offer a wide range of interface options to communicate with a PLC, a systems controller or a computer.

Compact Size And Highest Reliability

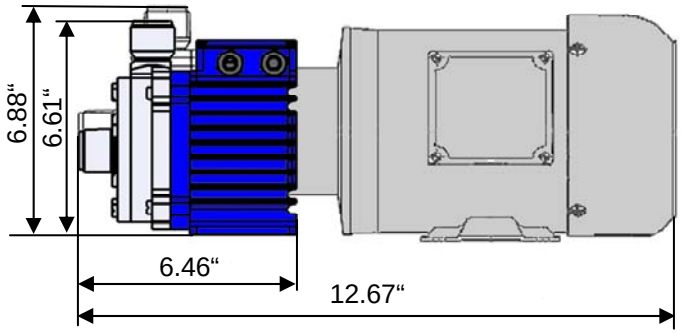

Figure 6: *Size comparison of Levitronix DuraLev 600 and typical 1/3 HP Mag-Drive pump*

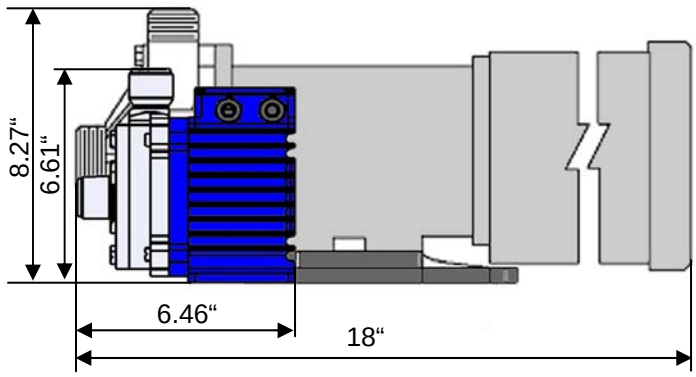

Figure 7: *Size comparison of Levitronix DuraLev 600 and typical 1/2 HP Mag-Drive pump*

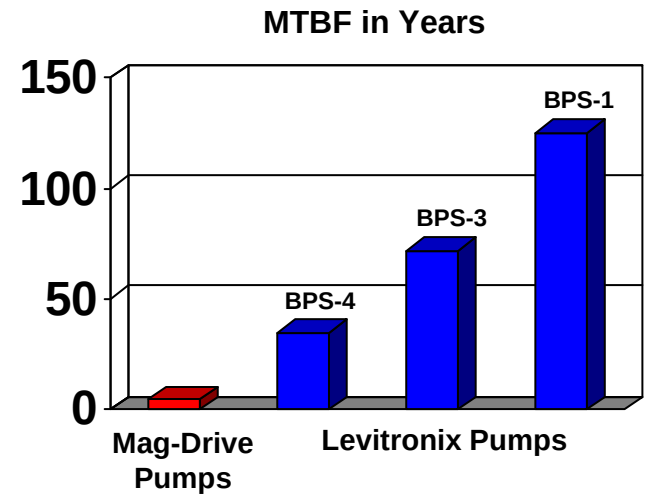

Figure 8: *MTBF comparison of mag-drive pumps and Levitronix BPS-1, BPS-3 and BPS-4*

THE SMALLEST PUMP

Mag-drive pumps have an inherently complex design, consisting of an electrical motor, a mechanical coupling between the motor and the magnetic clutch, the magnetic clutch and the pump. Each of the rotating elements including the motor, the magnetic clutch and the impeller require a separate set of mechanical bearings. These elements wear out and fail. Mag-drive pumps are also large compared to their hydraulic power. Levitronix pumps are 3-5 smaller than mag-drive pumps with comparable hydraulic performance (Figure 6 and 7). The highly integrated design of the pump and motor combined with the absence of mechanical bearings and bulky magnetic couplings, results in a system that greatly reduces the space requirements in your plating equipment. Since there are no mechanical bearings to clog or wear out, Levitronix pumps can also be placed at locations which are not readily accessible. The high reliability and small size of the Levitronix pumps allows you further freedom in the placement of the pump.

THE MOST RELIABLE PUMP

Based on data from more than 8000 pumps tracked in the field, the MTBF is greater than 35 years for all of the Levitronix pump models that have been on the market since 2003. This compares to an MTBF of 4.5 years for mag-drive pumps, calculated on the basis of 1027 installed units at a large chemical manufacturer. Levitronix pumps are more reliable, last longer and operate without the risk of clogging.

Product Range

Flow Rate: 20 LPM (5 GPM) to 300 LPM (80 GPM)
Pressure: 1.5 Bar (20 PSI) to 6 Bar (85 PSI)
Materials: PP, PVDF, PTFE or PFA

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