MICROPUMP®

TECHNOLOGY BRIEF | PRINTING

Ink Supply Systems for Recirculating Inkjet Printheads

Introduction

Printers are increasingly being designed to recirculate ink between the main ink supply and the inkjet printheads. These systems circulate ink through the printheads, at roughly ten times the volume required for printing, and return it to the ink supply reservoir. The advantages of continuous circulation include carrying away and filtering out any particles or air bubbles introduced by the nozzles, keeping the solids of pigmented inks suspended, and keeping the ink temperature and viscosity uniform. The results are improved printing quality, reliability and performance.

Over the last few years recirculating ink supply systems have evolved from complex systems containing multiple printhead reservoirs, pulsation dampeners, flow restrictors, weirs, and an abundance of tubing, to the comparatively simple system shown in the figure below. The designs have changed, but the objective remains the same: circulate ink from the main supply to the printheads and back, with smooth pulseless flow and constant positive pressure at the inlet manifold and constant, but slightly negative pressure at the outlet manifold.

Magnetically driven gear pumps offer longer life, greater control, pulseless flow, and system simplification for ink supply systems for recirculating inkjet printheads.

Operation

Figure 1. below shows a simplified version of a typical ink supply system for a printer with recirculating inkjet printheads. Filtering and heating elements have been omitted from the diagram, but it should be pointed out that pulse dampeners are typically not required when gear pumps are used. Pumps A & B control the flow through the printheads and the pressure at the inlet and outlet manifold. Adequate flow should be maintained, as recommended by the printhead manufacturer, to assure removal of particles and air bubbles blocking printhead nozzles, and to assure the ink is homogeneous and at constant temperature.

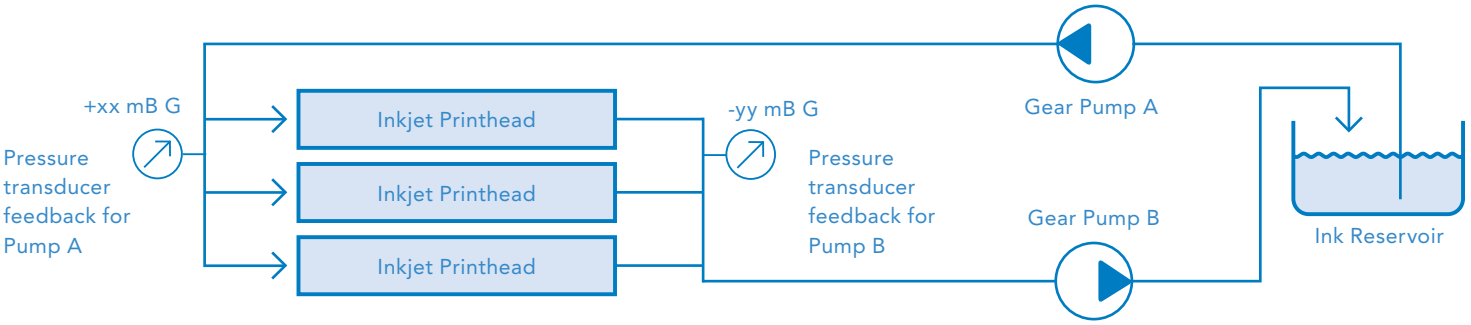

Figure 1. Ink Supply System for Recirculating Inkjet Printheads

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System Requirements

Precise flow and pressure requirements are driven by the design of the printheads. In "Drop On Demand" inkjet printing, ink drops are ejected from a printhead "on demand" by one of a variety of physical processes, often using piezoelectric materials to force ink from the printhead. Between drops the ink is held in a nozzle by surface tension forces, forming a meniscus. The stability of the meniscus is important to drop placement accuracy and the resulting print quality. Any pulsation in the recirculating ink stream can result in an unstable meniscus, thus a pulseless flow is very important.

Magnetically Driven Gear Pump Advantages

Micropump's magnetically driven gear pumps are very well suited for this application. Their advantages include:

- **Pulseless flow** – no pulse dampeners required…simpler, lower cost.
- **Precise pressure and flow control** – the positive displacement of the gear pumps enable firm and precise control of ink flow.
- **No leaky dynamic shaft seals** – magnetically driven pumps have no drive shafts penetrating the pump wall, thus dramatically reducing the number of possible leak paths.
- **Long life with abrasive inks** – Micropump has many years of experience developing pumps for abrasive fluids, including pigmented inks. You can select from a range of pumps with different cost/length of life combinations.
- **Small size** – The integrated electromagnetic drive provides a smaller package compare to a gear pump that requires a separate magnet hub and motor, and significantly smaller than the combine diaphragm pump and pulsation dampener used in some systems.
- **Fast response times** – The low inertia (the electromagnetic drive has no moving parts) of the drive/pump combination allow for fast response times to changes in flow or pressure. This reduces the risk of oscillations due to delay in the pressure feedback loops.
- **Linear control response** – The nearly linear response to control input changes enables simple and reliable control systems.
- **Low power** – the electrical efficiency of the integrated drive, and the hydraulic efficiency of the gear pump can reduce overall power requirements.

MICROPUMP®

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