CRITICAL PROCESS FILTRATION, INC.

Particle Removal and Prefiltration in Ink Jet Ink Formulation

For ink jet printing processes to work properly, regardless of the type of ink, unwanted particles must be removed from the ink. Particles can take any number of forms from solids to agglomerated particles to gels. All particles have the potential to clog ink jet print head openings and cause print defects.

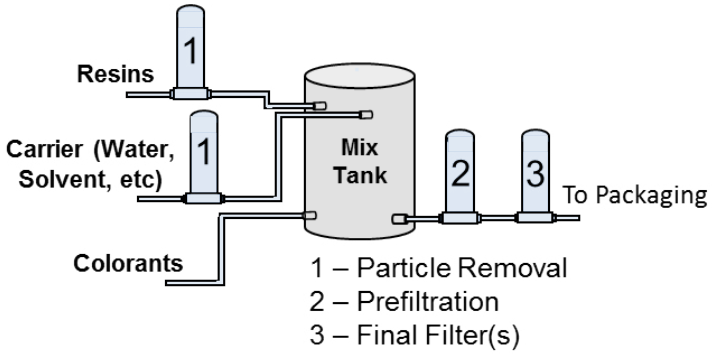
The particle sizes can range from visible (usually larger than 40 microns) to sub-micron sized. This paper focuses on removing larger, solid particles, which is usually done early in the process. Additional particle removal during a final filtration step is covered in another paper on final filtration for ink jet ink.

Prefiltration is usually defined as the removal of particles larger than those targeted by the final filtration step. There can be multiple filtration steps to remove particles in stages so as not to overload a particular filtration step. The filters can be located anywhere in the process, but are usually found at the introduction of ingredients before final filtration and packaging.

The housings marked "1" and "2" in the Figure show two possible locations of particle removal filters and prefilters. Assuring that ink components (colorants and carrier) do not contribute particles to the beginning of the process is also a possible step, as is particle filtration and prefiltration and after the mixing step. Though filter housing marked "2" is the only one shown for prefiltration in the schematic, multiple filters may be needed based on the filtration goal, type and quantity of particles in the stream at that point, and the size distribution of those particles. The goal of the prefilter is to protect the final filter (3).

The schematic in the figure is an example of a simplified ink jet ink formulation system. This simplified version shows one location for particle removal (housings marked "1"), just as raw materials are being supplied to the process, and a single prefiltration filter as housing "2".

Common Filtration Steps in Ink Jet Ink Formulation



Particles can certainly be introduced to the process with liquid ingredients such as dyes from outside sources. Though most liquid ingredients are concentrates and are usually not filtered, some operators may choose to use filters as a safeguard against premature clogging of final filters.

Considerations for Pigmented Inks

Pigments are solids added during the process. The solids are ground with pigment particles and impurities carried downstream further into the process. The biggest challenge in filtration of pigmented inks is removing unwanted large particles while allowing most of the small particles to pass through the filters and be properly dispersed through the final product. The housings marked "2" and "3" in the schematic represent a two-step filtration system to control particles. Depth filtration is used for pigmented inks, but the selection of the specific filters is critical. The filtration results depend upon grind, dispersive agents and the specific filters used. It is important to note that changing the grinding system may dramatically affect filter performance, result in excessive filter use and lower "small particle" yield. Contact Critical Process Filtration for assistance in evaluating filters that will work for your pigmented ink formulation.

Regardless of the type of ink produced, removing particles to levels required by your customers, no matter the source and no matter where it is done during product formulation, is a critical process that protects downstream efficiency, protects the quality of your final product and results in high quality images for your customers.

Application Summary

Choosing the Right Filters

Almost all particle removal filtration applications are done using depth filtration media. Cartridge filters use two forms of depth media. The standard depth filter is a self-supporting tube made using a polymer, most often polypropylene but also available in nylon. Standard depth filters take the form of a thick media tube made using the melt-blown or nano-spun process.

The other form of cartridge depth filter uses pleated flat sheet media, available in polypropylene or fiberglass. Polypropylene is the most widely used material for water and chemical filtration, but fiberglass has better filter efficiency and generally allows higher flows and throughput than polypropylene in prefiltration applications.

Standard depth filters will capture a range of particle sizes through the thickness of the media. Pleated media filters have the advantage of a large surface area that can hold a higher quantity of particles on that surface than standard depth filters.

Filter Options

Depth filtration products such as Critical Process Filtration Melt-Blown Polypropylene, Melt Blown Nylon or Nano-Spun Polypropylene cartridges are commonly used for particulate removal. These products will remove a large quantity of particulates from a variety of product chemistries before requiring replacement.

If smaller particles need to be removed from the fluid stream, an economical alternative to standard depth filters is pleated media filters. Pleated filtration products, such as pleated polypropylene depth filters, have several times more surface area than melt-blown or nano-spun depth filters and will hold a much higher quantity of particles. Pleated filters do generally cost more, but the increased life in high-particle-load applications and savings from the reduced number of cartridges required for batch processes often make pleated filters economically advantageous.

Contact Critical Process Filtration for help determining the best filter options for you, or visit us at www.criticalprocess.com for more information and to access data sheets with more detailed information on all of our products.

Figure 2 – Critical Process Filtration's Melt-Blown and Nano-Spun Polypropylene filters and pleated depth media filters are available in a wide variety of configurations to fit existing housings.

Filter Media Options for Particle Filtration in Ink Jet Ink Formulation

Process Area	Filter Application	Filter Function	Critical Process Media*
Particle Filtration	Particle Reduction	Reduce particulate load to protect performance of downstream water treatment processes	MB, NMMB, NS, PD, GD
Clarification, Prefiltration	Small Particle Reduction	Remove smaller particles that may cause printing blemishes or interfere with the print system. Prefiltration may also include removal of sub-micron size particles.	MB, NMMB, NS, PD, GD

*Media Codes
MB = Melt-Blown Polypropylene Depth Media
NMMB = Melt-Blown Nylon Depth Media
NS = Nano-Spun Polypropylene Depth Media
PD = Pleated Polypropylene Depth Media
GD = Pleated Fiberglass Depth Media

Visit our website or contact us for more information and to access data sheets on all of our products.

CRITICAL PROCESS FILTRATION, INC.

Critical Process Filtration, Inc.
One Chestnut Street • Nashua, NH 03060
Tel: 603.880.4420 • Fax: 603.880.4536
criticalprocess.com • sales@criticalprocess.com