Backflushing

Backflushing Description

Backflushing, simply defined, is a process used to clean filters by reversing the flow of fluid through the system. Effective, economical backflushing can be difficult to achieve since no two filtration operations are alike and the amount and type of contaminant pressures, pumps, housing, etc. all vary. System design and backflush principles are predominantly the same, but operational parameters must be tailored to the application by field trials (at a pilot plant, side stream or full operation).

Backflushing is a potentially powerful sales tool in virtually all filtration markets. Unfortunately, most filtration systems are not set up for backflushing. Since most of the currently used filters are not effectively backflushed, most operators of the most popular filtration devices and systems are unfamiliar with how to implement backflushing; and therefore, unaware of the potential advantages of this technique.

Existing filter hardware can be used for backflushing in many applications. Though not always the most effective method, existing filter hardware can prove economical either as a permanent solution or for trial to show the economics of a more effective process.

Types of Filters Used

Current Backflush Systems – Typically, sintered stainless steel, stainless steel mesh, wedge wire screen or ceramic cartridges

Non-Backflush Systems – Bags, depth cartridges, pleated cartridges and others

Purpose of Backflushing

The purpose of backflushing is to remove accumulated particulate from the filter to extend its life, recover filter cake and/or reduce operational costs.

Potential Customers

- All customers who have a valuable product, either filter cake or filtrate
- High cost or hazardous waste filter disposal
- High solids liquid filtration
- Economics of backflushing are less than the cost of filter replacement, disposal and labor

Backflush Operation Variables:

- **Hardware and System Design** – Standard hardware or backflush specific hardware
- **Backflush Fluid** – Air, water or clean filtrate
- **Backflush Program** – Maximum differential pressure, reverse pressure/flow rate, duration, speed, frequency, acceptable recovery, manual or automatic
- **Filter Type** – Ceramic, metallic, Porex, or others; Surface, classification, layers
- **Contaminant Concentrate** – Reuse, dispose, wet, dry, further concentration

Common Backflushing-Related Problems

- **Current System Design** – Not originally designed for backflushing, but most can be adapted
- **Ineffective Cleaning** – Differential pressure too high prior to backflush, multiple layer filter, inaccessible pleats, poor reverse flow, insufficient duration
- **Backflush Solids** – Volume, wetness, transportation, hazardous materials
- **On Restart, Filters Plug Quickly** – Ineffective backflush did not get contaminant out of the system
- **Operator Intensity or Dependence** – Automate the system
- **Economics Visualization** – Field trial with pilot (side stream or existing system)
- **Cartridges Dislodge from Seal Plate** – Install a hold down device or locking mechanism to keep cartridges in place

Recommended Backflush Parameters:

Pressure Differential for Backflush Initiation – 5 to 10 psid (over clean pressure differential)

Air Reservoir Pressure – No more than 50 psi

Backflush Rate – 1.5 to 2.0 times forward flow rate

Backflush Valve Open Rate (Trial and Error) – The faster the better without damaging or dislodging cartridges

Backflush Time – Sufficient to remove all upstream fluid volume

Maximum Clean Water Pressure Differential – Starting differential plus 50% or when time between cycles is too short

The information contained in this report is meant to be a generalization on how to design a backflushing process and not a specific design. Answers to preferences in operational variables will better allow the engineer to design a specific system to an application.

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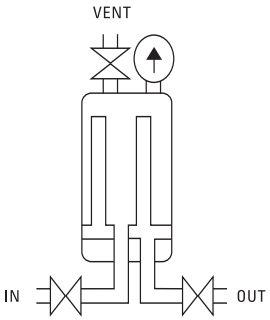
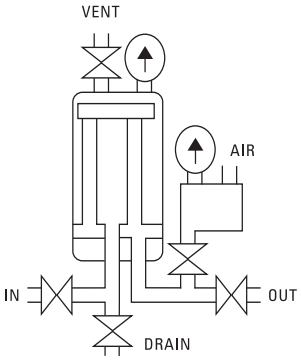
Backflush System Design Consideration

Modify Existing Non-Backflush System

General filter system layouts are shown below. To convert a standard filtration system to a backflush system, add:

- **Inlet tee** (with drain valve)
- **Outlet tee** (with backflush drain valve)
- **Hold down plate** (if not provided)
- **Air reservoir** (with filtered air source and backflush valve)

Standard Non-Backflush System	Backflush System
	

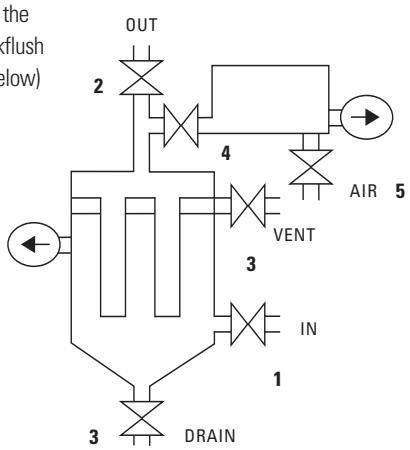
Recommended Backflush Procedure:

1. **Shut inlet valve** (during filtration when differential pressure reaches a predetermined maximum)
2. **Close outlet valve**
3. **Open drain valve**
4. **Pressurize air reservoir** (to a predetermined pressure)
5. **Open backflush valve** (at a predetermined rate* – do not overpressure the cartridges)
6. **Close backflush valve** (after a predetermined time)
7. **Close valve** (when flow stops from drain valve)
8. **Open vent valve**
9. **Open inlet valve slowly** (until liquid comes out of vent)
10. **Crack open outlet valve**
11. **Close vent valve**
12. **Open outlet valve fully**
13. **Measure clean pressure drop**
14. **Continue filtration**
15. **Repeat** (until clean pressure drop reaches a predetermined point)

** Backflush Rate = Air Flow Rate + Expansion (due to pressure change)*

New Backflush Installation

To maximize the effectiveness of the backflushing process, a new backflush installation and design (shown below) is recommended.



Alternative Backflush Procedure

- Follow steps 1 through 3
- Set up a separate tank and pump system (instead of using air to backflush clean water or filtered fluid)
- Turn on pump at a rate of 1.5 to 2.0 times the forward flow and open the backflush valve (instead of pressurizing the air reservoir)
- Flow until twice the upstream volume of the housing has been replaced
- Proceed from step 7 through 15

Recommended Backflush Procedure:

1. **Shut off inlet valve** 1 (during filtration when differential pressure reaches a predetermined maximum)
2. **Close outlet valve** 2
3. **Open drain valve** 3
4. **Pressurize air reservoir** (to a predetermined pressure through air valve 5)
5. **Open backflush valve** 4 (at a predetermined rate* - do not over pressure the cartridges)
6. **Close backflush valve** 4 (after a predetermined time)
7. **Close valve** 3 (when flow stops from drain valve)
8. **Open vent valve** 6
9. **Open inlet valve** 1 **slowly** (until liquid comes out of vent)
10. **Crack open outlet valve** 2
11. **Close vent valve** 6
12. **Open outlet valve** 2 **fully**
13. **Measure clean pressure drop**
14. **Continue filtration**
15. **Repeat** (until clean pressure drop reaches a predetermined point)

** Backflush Rate = Air Flow Rate + Expansion (due to pressure change)*

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