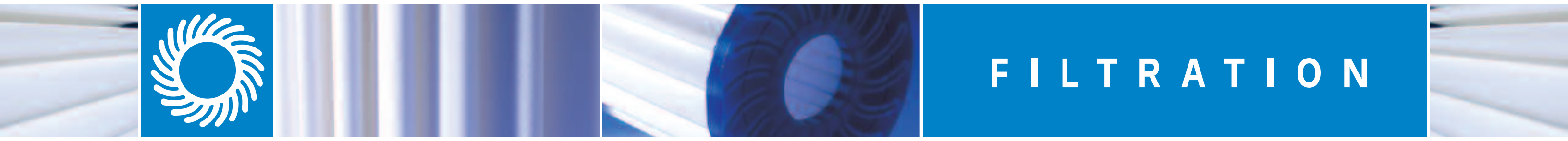

Target Market:

Refineries

Application:

Catalyst Recovery

Application Description

Catalysts are used in petroleum refining and organic chemical manufacturing to convert and/or purify organic chemicals into a more useable form. This process principally uses inorganic metals to facilitate the required chemical reaction. Valuable metals (such as platinum, palladium, rhodium, silver and nickel) are sometimes affixed to a substrate (activated carbon, alumina, silica, titania or calcium carbonate) and supplied in either a homogenous (dissolved) or heterogeneous (particulate) form. In the heterogeneous form, the metals are recovered for reuse by filtration. Depending on the type of catalytic process, the procedure is done under various operating conditions including temperature. The product's contact with the catalyst is enhanced in some cases by elevated temperatures. The recovery is often done at ambient temperatures. Some of the processes in the refining or petrochemical industry that use a catalyst are catalytic reforming of heavy naphtha, hydro-treatment with catalyst and hydrogen, fluid catalytic cracking of gas oil and light olefins, hydrogenation of acetylenes, olefins, carbonyls in aromatic aldehydes and ketones, aromatic and aliphatic nitrogen compounds, and isomerization catalyzation. Catalysts are also used in the polymer industry to assist in the polymerization of monomers.

Catalyst recovery (after it has been fouled) is another application related to this market. In some operations, the catalyst gets clogged and reduces activity. When this happens, the catalyst is regenerated either on site or at the catalyst's manufacturer. This generation can be done using solvents or thermal treatment. When solvents are used, the catalyst has to be recovered from the solvent/rinse fluid by filtration. In thermal treatment, the catalyst is often rinsed to remove contaminating residue and requires a subsequent filtration to recover the catalyst. Waste streams will also have trace amounts of catalyst that need to be filtered to recover the valuable catalyst.

Material: Porous Polyethylene

Types of Filters Used

Historically, the most common filters used in catalyst recovery are backflushable metal filters. Polyolefin filters are used in incineration applications.

Purpose of Filtration

The primary purpose of filtration is to remove the catalyst from the fluid stream to recover it for reuse or regeneration. Since the catalyst is frequently very expensive, the higher the percentage of recovery, the more economical the process. For less expensive catalysts, there is a point of diminishing returns where the cost of finer filtration overcomes the cost of catalyst loss and waste. Once the catalyst is recovered from the process fluid stream it has to be made available for regeneration or reuse. This can happen in two ways – backflushing to remove the captured catalyst or incineration to recover it from the incinerated ash. In the former case, the filter with the recovered catalyst is first cleaned (to remove residual organic contaminants), then flowed in the reverse direction to dislodge the catalyst from the filter so it can be put back into the process stream as a dry powder or suspended solid. In the latter case, the filter with the catalyst is incinerated and the ash is collected. The catalyst is then separated from the other ash components, washed and recycled. Eventually, the catalyst becomes less economical to use due to contaminants or damage. These catalysts are then regenerated, often at the catalyst manufacturer. This creates another filtration opportunity for catalyst recovery from the regeneration stream or from the waste stream.

Common Filtration-Related Problems

- Loss of Catalyst - Too large of pore size rating, too low an efficiency of filtration, or filter bypass cause catalyst lost to the process stream and/or subsequent cleaning. Catalyst degrades over time from the wear of processing creating fines that then pass through the originally working filter
- Poor Backflush Flow Recovery - The differential pressure was allowed to build to too high a level before backflushing. The backflush cycle is not appropriate for the process either due to a process change or poor initial design. The surface pore size is too large as related to the catalyst size (possible catalyst degradation) causing penetration into the filter structure that is difficult to backflush
- Short Filter Life - Poor dirt holding capacity as related to the contaminant level (surface area or capacity related)
- Low Flow Rate Starving Subsequent Stages - Poor capacity as related to contaminant level or too little initial flow rate for the fluid/contaminant volume
- Filter Contamination in the Ash - Non-incineratable components that end up in the ash
- High Incineration Fuel Consumption - Low burn efficiency requiring external sourced fuel to be combusted completely

Sintered High-Density or Ultra-High Molecular Weight Polyethylene

FEATURE	ADVANTAGE	BENEFIT
Rigid, Omni-Directional Pore Structure		
• Absolute Ratings	• Consistent pore structure minimizes performance changes caused by differential pressure	• Reproducible performance
• Narrow Pore Size Distribution	• Highly-effective surface filtration for particles larger than the filter pore size rating	• Allows for effective cleaning, backwash and reuse
• Thermally-Bonded	• Sintered omni-directional pore structure	• No media migration, bypass or unloading from 5 to 100 microns
• Excellent Chemical and Thermal Compatibility	• High chemical resistance of HDPE and UHMWPE • Completely incineratable with a high BTU output	• No chemical degradation resulting in bypass or contamination of the process fluid • No incineration residue
Unique, Molded Radial Design		
• High Surface Area	• Low pressure drop and higher flow rate	• Increased life or fewer filters results in lower filtration costs
• Open Channels	• Easy access to filtration area	• Effective filtration and cleaning
• Single-Layer Structural Media	• Eliminates unnecessary support materials	• Improves backwash and cleanability
• Rigid, One-Piece Construction	• Multiple diameters, lengths and end configurations	• Easily adapts to existing filtration systems

PERFORMANCE COMPARISON

Rigid, Omni-Directional Pore Structure

POREX Radial Cartridge Filter vs	Bags	Depth Cartridges	Pleated Cartridges	Metal Cartridges
Micron Rating	= / -	= / -	= / -	= / -
Absolute Filtration	= / +	= / +	= / +	=
Surface Retention	= / +	= / +	+	=
Classification Filtration	+	= / +	+	+
Sintered Process	+	+	+	=
Polyolefin Material	= / +	=	=	+
Chemical Compatibility	=	=	=	= / -
Thermal Compatibility	=	=	=	= / -

Unique, Molded Radial Design

POREX Radial Cartridge Filter vs	Bags	Depth Cartridges	Pleated Cartridges	Metal Cartridges
Backflushable	+	+	+	=
Surface Area	+	+	-	+
Molded Construction	+	+	+	+
Rigid Structure	+	= / +	+	=
Open Pleats	+	+	+	+
Disposal Cost	-	+	+	+
Performance Priced	+	+	+	+
Single Material	= / +	=	= / +	+
Vessel Seal	+	=	=	=
Housing Fit	-	=	=	= / -

Symbol Key: = Porex equivalent + Porex advantage - Porex potential limitation

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