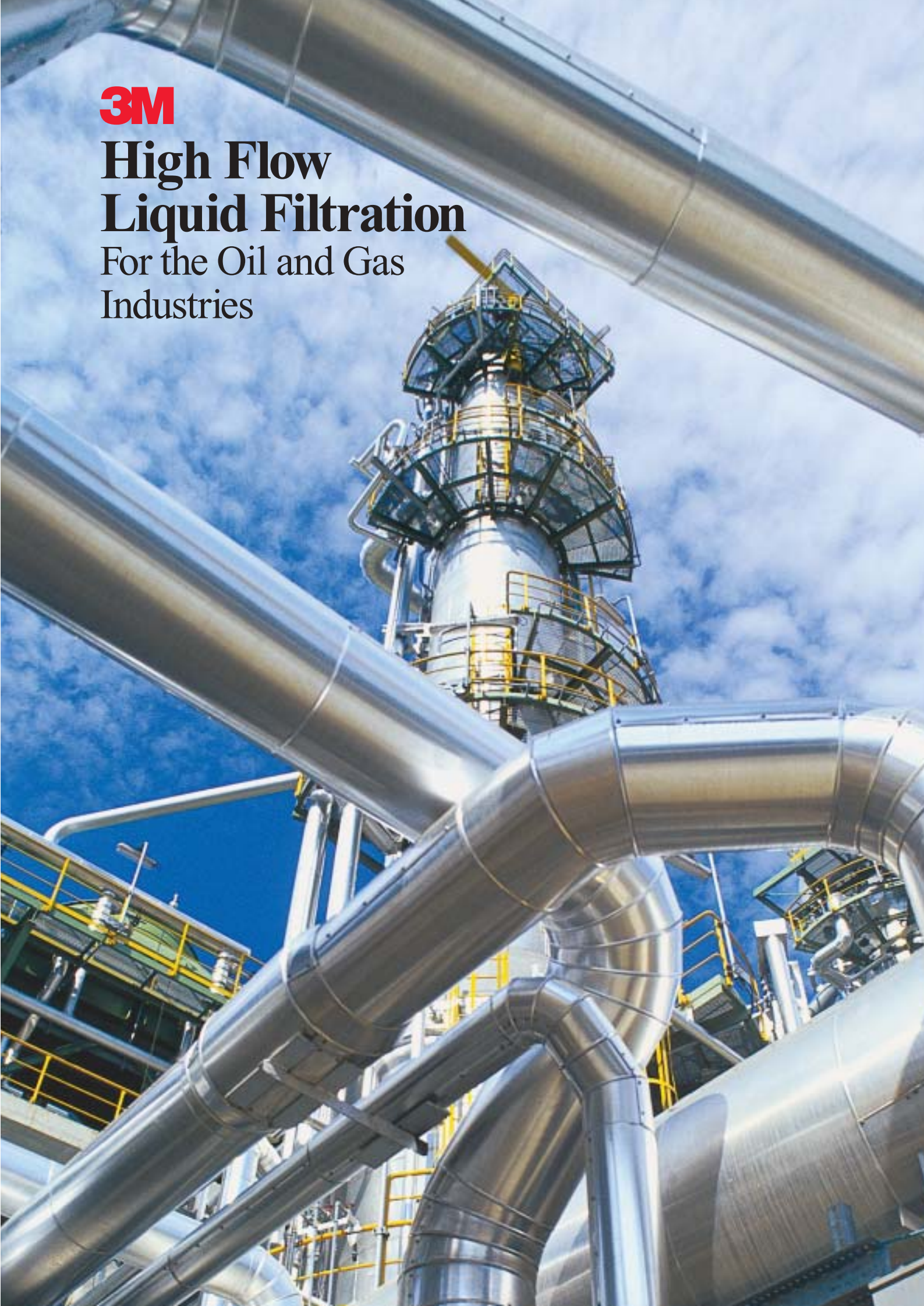


3M

High Flow Liquid Filtration

For the Oil and Gas Industries

Upstream.

At every stage of the oil and gas extraction and refining cycle, particulates and other impurities can slow down production, impact quality and cause costly downtime. That's why we invite you to learn more about 3M™ High Flow Liquid Filtration—proven technologies designed to help keep your products, and your profits, flowing.

3M™ High-Flow Liquid Filter Cartridges and Bags are specially designed for purifying/recycling critical process fluids used throughout the production cycle—from brines and completion fluids found in downhole environments to amine solutions, naphthas, glycols and other fluids at the refinery.

These advanced, high-performance filters are designed to help you maintain continuity of operations and maximise your production potential.

Downstream.

The secret to the high efficiency of 3M liquid filters lies in their advanced design and construction. 3M technology gives 3M liquid filters more surface area to a given volume than many other types of conventional filters. This feature provides high levels of dirt and oil holding capacity.

Keep your product flowing—with high-performance

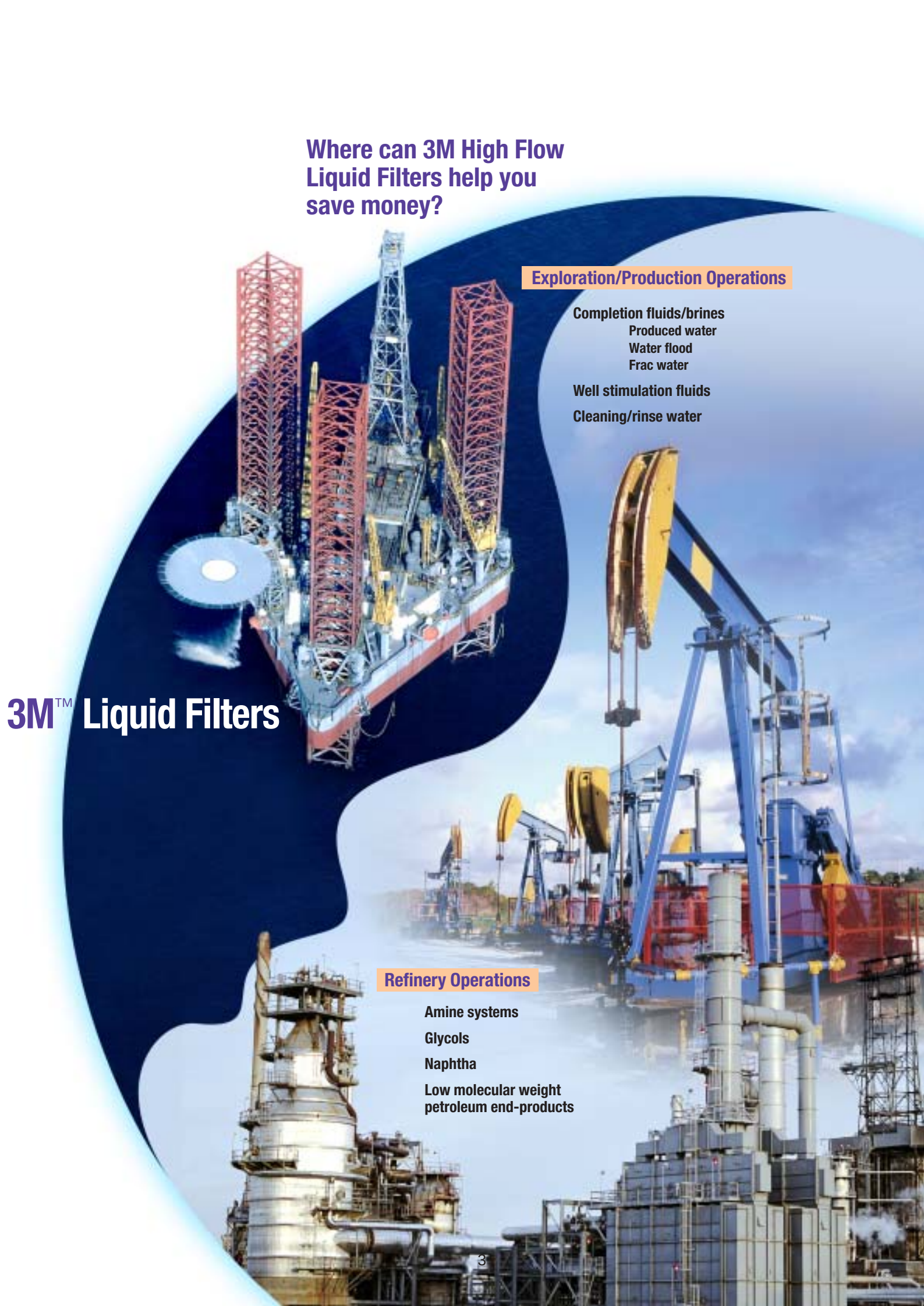
Comparison Facts

3M vs. the Competition

(Costs shown in $ U.S.)

Comparative Measure	Typical Filter Cartridges Rated at 5 Microns		
	3M™ HighFlow Filter System	String Wound	Pleated
Typical number of cartridges to handle 110 m^3/hr (484gpm)	11 each x 1 m (40") length	54 each x 1 m (40") length	54 each x 1 m (40") length
Expected dirt holding capacity	110 kg (242 lb)	6.4 kg (14 lb)	19.5 kg (43 lb)
Typical total cost of cartridges per filled vessel	$4,037	$432	$1,458
Cost per kilogram of dirt captured	$36.74	$67.50	$74.77
Typical time/labour needed for change-out	0.5 operator hours	2 operator hours	2 operator hours

Where can 3M High Flow Liquid Filters help you save money?



3M™ Liquid Filters

Exploration/Production Operations

- Completion fluids/brines
  - Produced water
  - Water flood
  - Frac water
- Well stimulation fluids
- Cleaning/rinse water

Refinery Operations

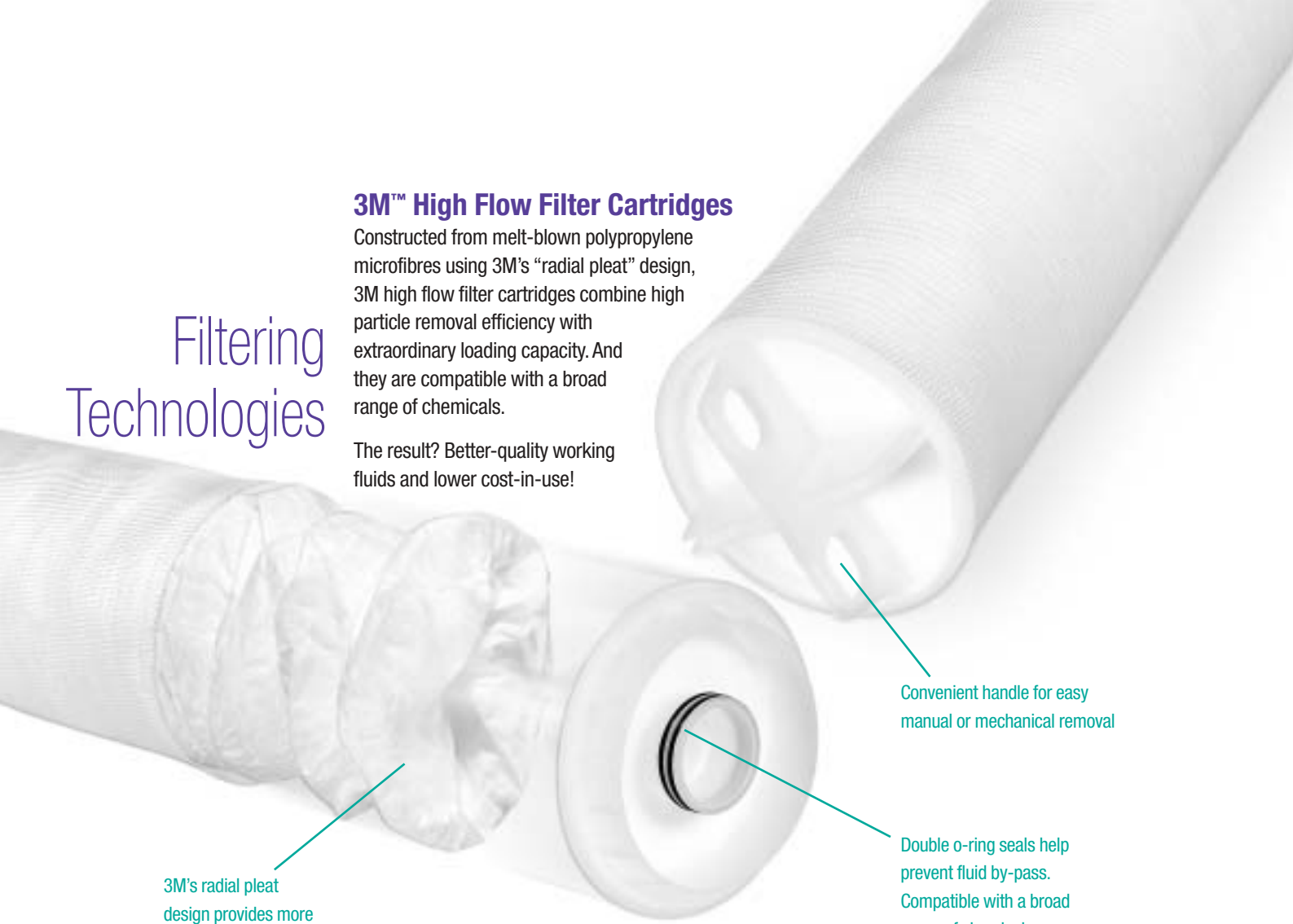
- Amine systems
- Glycols
- Naphtha
- Low molecular weight petroleum end-products

Filtering Technologies

3M™ High Flow Filter Cartridges

Constructed from melt-blown polypropylene microfibres using 3M's "radial pleat" design, 3M high flow filter cartridges combine high particle removal efficiency with extraordinary loading capacity. And they are compatible with a broad range of chemicals.

The result? Better-quality working fluids and lower cost-in-use!



Convenient handle for easy manual or mechanical removal

Double o-ring seals help prevent fluid by-pass. Compatible with a broad range of chemicals.

3M's radial pleat design provides more surface area, to trap more impurities

Case Study

Many so-called "low-cost" filters can actually end up costing you far more in actual use, because they must be replaced more often, require more labour for changeouts and increase disposal costs. Here's an example of how much one of our customers has saved by switching to high-performance 3M liquid filters:

(Costs shown in $ U.S.)

	Conventional String-Wound Filters	3M™ 746B Cartridges
Annual Cost of Filters	$53,372	$40,275
Annual Disposal Cost	$21,580	$2,590
Annual Labour Cost to Replace	$5,110	$100
Total:	$80,062	$42,964

In this example, the customer saved over $37,000 in the first year with 3M liquid filters!

3M high flow filter cartridges install easily, with no loose parts, springs or caps.

3M™ High Performance Liquid Filter Bags

Designed for applications involving high flow rates—up to 11.4 m^3/hr (50 gpm) per bag. 3M's bypass/transport layer filter bag design maximises the amount of surface area in each bag—up to 3.5 m^2 (38 ft^2) of usable filter media, compared to only 0.4 m^2 (4.4 ft^2) in most competitive filter bags. This results in longer filter life, higher loading capacity and more complete particle removal. Bag design captures contaminants inside, for cleaner, easier handling and faster changeout, helping to reduce labour costs. And it is compressible, for easier and less-costly disposal.

Exploration/ Production Applications

From the North Slope to the South China Sea, 3M™ High Flow Liquid Filter Cartridges and Bags are the filtration media of choice for a variety of fluids used in completion, waterflood and well stimulation operations.

The high performance and low cost-in-use of 3M high flow liquid filters helps get new wells up and running faster and more economically–and helps reduce the cost of reworking on older wells.

Water Flood

The rugged construction, filtering efficiency and high loading capacity of 3M high flow liquid filters makes them ideal for filtering water flood systems. They eliminate more contaminants to help you achieve higher re-injection rates and maintain proper wellhead pressures. And they can save you money and reduce downtime, with faster and fewer change-outs…lower energy usage…and reduced disposal costs.

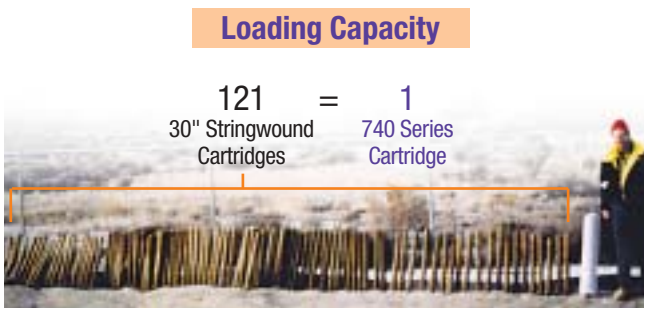
3M high flow liquid filters help maintain water quality in waterflood systems, reducing need for reservoir stimulation.

Completion Fluids

3M high flow liquid filters are used extensively for filtering a variety of low viscosity fluids, including cleaning/rinse waters and brines used to balance pressure. Their high loading capacity gives them more surface area than many other types of conventional filters. And by removing more particulates, they help maintain the life of pumps and other fluid handling equipment.

Well Stimulation

3M high flow liquid filters help remove more contaminants from frac water, acids, surfactant solutions and other fluids used to stimulate formations—helping to prevent capillary blockage and increase recovery. Plus their higher loading rates mean fewer changeouts in the field—less costly downtime!



3M high flow liquid filters give you more loading capacity than many other types of conventional filters – reducing your cost of materials, labour and disposal.

Refining Applications

Because crude oils vary so widely in their composition, refineries employ a number of processes to remove contaminants such as water, salts, dirt, rust and reactive sulfur compounds. 3M™ High Flow Liquid Filters help improve the quality, extend the life and reduce the cost of filtering the fluids used in these processes.

Amine Solutions

Amine scrubbing solutions, used to remove hydrogen sulfide and other contaminants from gas and liquid hydrocarbon streams, can quickly become contaminated with dirt and other particulates. Over time, these contaminants can collect on heat exchangers, contactor trays, reboilers and other system components—to the point where separation of acid gases from the sour gas stream falls to unacceptable levels. In some cases this condition—known as an "upset"—can cause uncontrollable foaming of the amine solution.

Taking your amine system offline because of an upset is extremely costly, both in terms of lost production and additional maintenance. Filtering your amine system with 3M™ High Flow Filter Cartridges can quickly restore a system to operating capability. More important, it can help prevent costly upsets from happening in the first place.

3M high flow liquid filters last longer and capture more contaminants than many other types of conventional filters, to maintain peak amine sweetening efficiency and help support a trouble-free operation. And they make it cost-effective to filter your entire amine stream, rather than just a portion of it. Ask your 3M representative for more information.

Glycols

3M high flow liquid filters offer more complete filtration of glycol solutions used to remove sulfur, water and other impurities from oil and gas streams. This helps extend solution life, for lower material costs and less downtime for maintenance.

End-Products

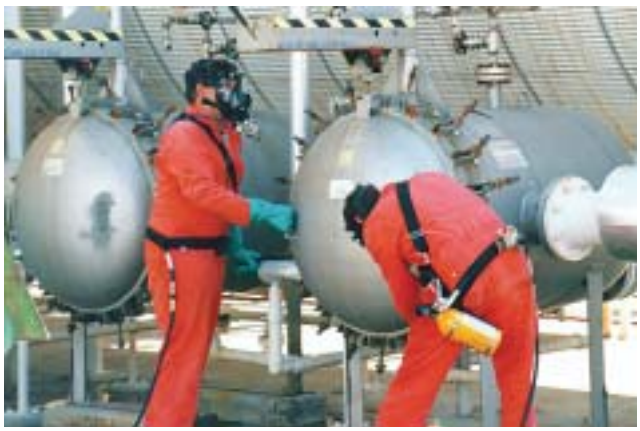
By providing excellent particle removal efficiency–even at high flow rates–3M high flow liquid filters are an ideal choice for filtering lower molecular weight petroleum products, including naphthas, kerosenes and gasolines.

Engineered with more surface area than many other types of conventional filters, 3M high flow liquid filters provide greater loading capacities, for longer filter life. And they are compatible with a broad range of chemicals.

When you purchase any 3M™ High Flow Liquid Filter product, you can take advantage of a wealth of value-added services—designed to help you achieve the highest possible performance while enjoying the greatest possible savings.

With 3M, you get more than great science.

Technical Support Engineering will assist you with filtration system design and equipment sourcing. Advise you in selecting just the right filters for your applications. Provide on-site system inspection and troubleshooting. And—depending where your facility is located—provide free access to our "loaner fleet" of filtration vessels, to prove value in your own production environment. Ask your 3M representative for complete details.



3M

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