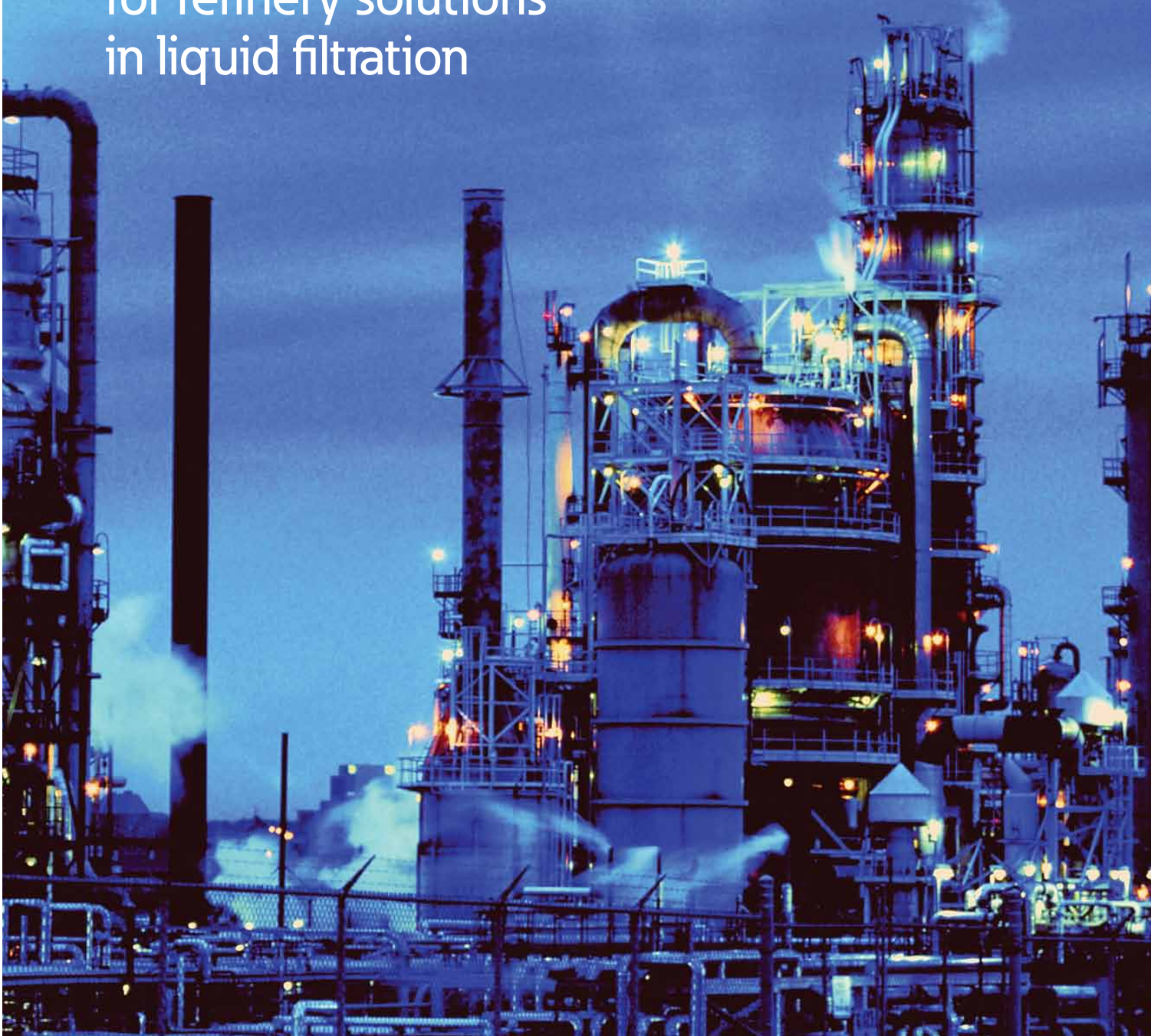


ReactoGard® V

Your industry partner
for refinery solutions
in liquid filtration



EATON

Powering Business Worldwide

System

New generation filtration technology

ReactoGard® V

With more than 500 Eaton ReactoGard® units throughout the world, this family of liquid filtration systems is an acknowledged leader in the protection of fixed bed catalytic reactors and related refinery operations. Using refinery-proven AccuFlux™ media, ReactoGard V automated backwashing systems offer significant advantages in all types of refinery applications.

Vacuum residuum (VRDS)

Atmospheric residuum (ARDS)

Coker Gas Oils (CGO)

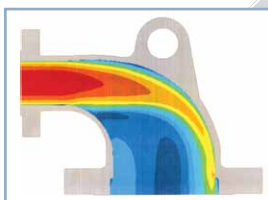
Vacuum Gas Oils (VGO)

ReactoGard V systems are engineered to produce cleaner, more efficient low flux operation, a goal achieved through improved media materials and new AccuFlux element designs that increase filtration area by as much as 300% over previous standards. In addition, a new multi-bank system and controls approach eliminates the headers and reduces the number of valves up to 85%.

The Standard in Refinery Filtration

ReactoGard V system enhancements deliver the following advantages:

- Improved filter productivity
- Complete media cleaning
- Superior mechanical integrity resulting in enhanced serviceability and reduced maintenance
- Reduced product loss through less frequent backwashing
- Reduced cost of installed filtration capacity
- Reduced space requirements



Inlet and outlet heads are designed using CFD improving backwash effectiveness and reducing ΔP .



The advantages of lowering flux rates

As flux rate—flow through a specific filter area—is lowered, so is the velocity of the liquid and solids going to the filter media. As a result, the solid particles lie on the surface of the media and create a porous particulate cake. This improves efficiencies in particle removal while allowing liquid to pass, providing longer periods between filter cleanings.

Design flux rates are application specific. When filtering heavy feedstocks, flux rates of 1 to 2 gpm/ft²

(40 to 80 lpm/m²) are recommended. When filtering lighter hydrocarbons, flux rates are generally higher. Eaton provides the application experience to help you develop the optimum flux rate for your application.

Operating at low flux rates improves filtrate quality since contaminants are less likely to be forced through the media. This also reduces the likelihood of particles being wedged into media. This allows for

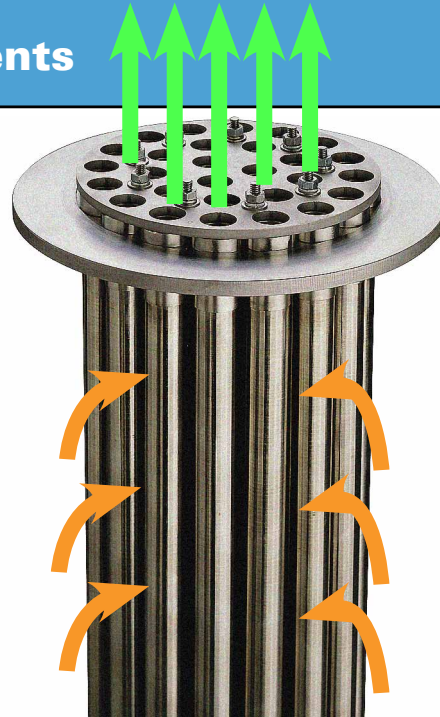
easier filter cleaning and decreases the frequency of backwashings.

The most efficient way to achieve a low flux rate is to increase active filter surface area. This has been achieved with Eaton's AccuFlux elements featuring ultra-high surface area, clustered element designs, and superior quality media materials.

Controlled Velocity, Consistent Separation with AccuFlux™ Elements

Unique element design multiplies surface area

AccuFlux elements are available in configurations with 8, 19 or 28 individual, replaceable filter tubes offering media area of 6.3 ft² (0.6 m²), 15 ft² (1.4 m²) or 22 ft² (2.0 m²). The AccuFlux 28 elements are shown on the right. Elements are available in 2 to 40 micron woven wire and 23 to 150 micron slotted wedge wire to meet varying particle retention and application requirements.



Contaminated material flows from the outside of the filter tubes and the cleaned fluid is expelled to the top. The direction of flow is reversed during the backwashing phase.

Accuflux™ filter media elements

Media

Woven wire media increases open area, improves flow for enhanced cleanability and longer life

For less rigorous applications or cases where finer filtration is required, AccuFlux elements with woven wire media represent a major improvement over previously available designs.

This is because AccuFlux media designs feature a greater open area for

enhanced forward flow and backwashing. In addition, AccuFlux replaces the traditional five-to-seven layer structure with an uncomplicated, efficient single woven wire filtration layer sintered to an underlay and overlay of open stainless steel mesh. Structural integrity is provided by a perforated stainless steel inner support tube with approximately 50% open area. The filter media is efficient at removing

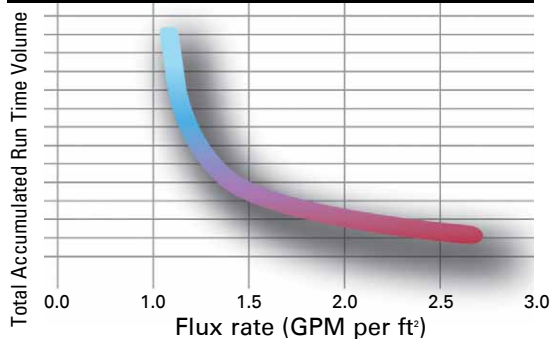
contaminants in the 2 micron to 40 micron range and the elements have a burst and collapse rating of 150 psid.

AccuFlux woven wire designs optimize flow rates and provide superior cleanability since particles do not become locked into or between multiple layers. These elements provide a higher structural rating than multi-layered designs, contributing to longer service life.



High-performance Media Options for Discrete Applications

Flux Rate vs. Cumulative Filtered Volume of Residuum AccuFlux™ Elements



Graph illustrates the effect of lowering flux rate of residuum. The vertical axis is total volume run through the filter until a 15 psid (1.0 kg/cm) drop initiates a backwash cycle. The horizontal axis is the flux rate (flow per unit area). As the data shows, substantial gains in run time (volume) are achieved by reducing flux rate. In every case, reductions in flux rate result in exponential gains in run time (volume) between backwashings.



Wedge wire media approved for use on vacuum resid service.

Wedge wire media is a durable, easy-to-clean solution for heavy-duty applications

Eaton wedge wire media is the superior choice for filtering heavy, corrosive feedstocks with high contaminate loading. These elements feature a nominal rating of 23 microns that effectively remove particles typically found to plug fixed catalyst beds in hydro processing reactors. Slot widths of 23-150 microns are available for specific applications.

GO WITH THE FLOW

Make the best choice for your filtration application. Eaton systems provide superior durability, cleanability, filtration performance, and operational flexibility.



Eaton's ReactoGard V system consists of multiple banks of filter elements with valves at the inlet and outlet of each bank. Filter banks run in parallel, with each bank handling a portion of the total process flow. Unfiltered liquid enters each bank via the inlet and is distributed evenly to each filter housing. The liquid flows from the outside of the element to the inside, collecting

contaminants on the outside. Clean liquid exits each bank via the outlet. As contaminants collect on the filter elements, the differential pressure increases. When the pressure differential reaches a controlled set point a signal is generated and the system controller begins the backwash cycle. Systems are backwashed using filtered liquid or by introducing a separate clean backwash fluid.

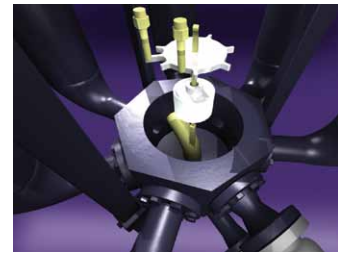
During the backwash process, the system operates without interruption. A single

filter bank is momentarily isolated from the feed flow and purged if the application requires. Then, each filter element on that bank is individually cleaned. This method assures that the total backwash energy is directed to individual elements, thereby providing a more thorough cleaning. The remaining banks are cleaned sequentially. Complete element regeneration is the key to longer runs between cleaning cycles and greater productivity. Cleaning cycle times of less than one minute per bank assure that high

productivity is maintained. The ReactoGard V system design reduces the number of valves by up to 85% and eliminates headers, dramatically reducing installation costs and maintenance requirements.

Simplicity of System Design

The Key to Low Installed Cost and Reduced Maintenance



Diverter chamber with precision proximity switch efficiently distributes material flow with fewer moving parts.

Other system features include:

- Flanged valves (vs. socket welded valves) in standard ANSI dimensions simplify serviceability and replacement
- Hardened alloy valve seats offer 4–5 times the life of carbon graphite
- Actuators are located on valves so there are no mechanical linkages to maintain or adjustments to make
- All components are flanged for enhanced serviceability
- Systems are easily forward purge adaptable for maintaining low sulphur backwash fluids
- Programmable Logic Control (PLC) with electronic interface to control rooms provides control flexibility and reliability

Multiple units can be connected for a complete system solution.



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