

FILTRATION IN REFINERIES

**Overview** Filtration is a widely recognized technique for removing contamination from feedstocks to protect catalyst beds of hydroprocessing units, or to upgrade bottom products, such as slurry oil from FCCU's. For such challenging applications, backflush filtration, or so-called gas-assisted backwash filtration, is the technology of choice to achieve very low utility consumption and very long cycle times.

When solids concentrations are high and continuous operation for an extended period is required, static filters with disposable filter elements are not suitable. In this respect, an automatically regenerated filter is required, which can operate continuously, even during its cleaning sequences. By backwashing *in-situ*, downtime and related maintenance costs are reduced. Operator exposure to hazardous products and waste disposal is minimized.

Conventional automatic backwash filter systems typically only use the available process pressure as driving force for backwashing. For challenging applications, these filter designs are not sufficient to meet the modern refiner's demands. Heavier

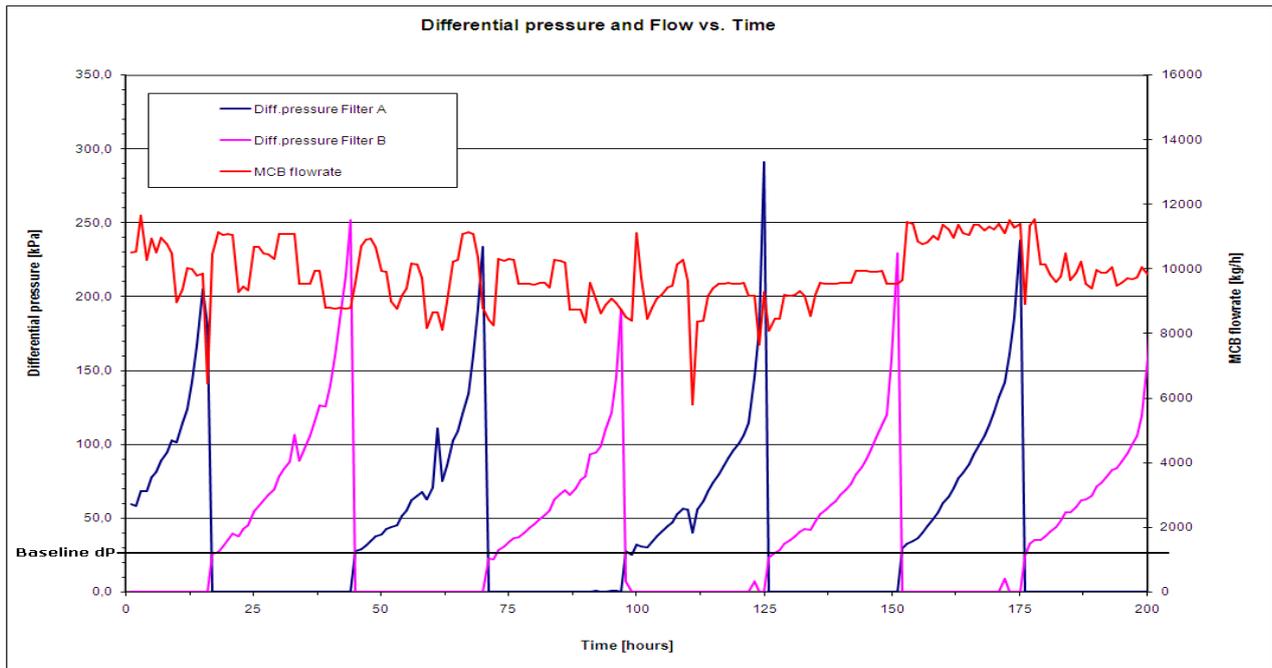
GAS-ASSISTED BACKWASH CLEANING

crudes require higher performance of existing, or newly installed processing units. As such, many of the conventional backwash systems suffer from a variety of operational problems:

- short cycle times;
- high pressure drops;
- continuous backwashing;
- plugging of filter media;
- clogging of filters.

These issues cause unnecessary operator headaches and high operational costs. Problems can be avoided by using improved filter element cleaning technology, based on more powerful backwashing that keeps the pressure drop just after backwash at a constant level (baseline dp).

For that reason Dahلمان has developed gas-assisted backwash technology that removes solids from filter media much more effectively compared to conventional technologies, even in challenging applications such as slurry oil, amine or heavy coker gasoil product filtration.



Excellent gas-assisted backwash cleaning characteristics: flat baseline dp (Dahلمان FCC Slurry Oil Filter Package)

**Process Description** Dahlman’s Gas-Assisted Backwash Filter Packages typically consist of 2 or 3 filter vessels (e.g. 2 x 100% or 3 x 50%), a backwash receiver vessel, a gas accumulator vessel and includes all controls, valves, instruments and piping, assembled in one complete skid mounted unit.

The filter vessels contain high quality filter elements, which we select for each specific application. During operation, solids are retained on the surface of the filter elements, while clean filtrate passes through the solids “cake” and filter medium. Once the filter’s delta P has reached its pre-set value after normal filtration mode, the cleaning sequence is automatically started. The feed and filtered product connections are both closed and subsequently, the valve connecting a gas accumulator will open towards the filter vessel. This results in pressurization of the liquid contained in the filter vessel. When a quick-opening valve installed below the filter vessel opens, the gas pocket, pressurizing the liquid from above, expands rapidly. This results in a reverse flow of the liquid through the filter media at high velocity.

As a consequence, the collected solids are dislodged

over the entire surface of the filter tubes. The filtered liquid is even forced further back by the expanding gas, transferring the separated solids to the backwash receiver vessel in a matter of seconds. The number of backwash cycles prior to element removal depends on several factors: backwash duration and pressure, flow rate, terminal pressure drop and physical properties of the contaminant being filtered.

Dahlman’s gas-assisted backwash filtration systems can easily handle process streams containing up to 10,000 ppm(w) solids and can be designed for each specific flow rate. As the backwash volume is significantly smaller in comparison with conventional, non-gas-driven backwash filtration units, utility costs are considerably lower and upgrade product quantity is increased. Next to the lower OPEX, a large variety of options are available to dispose of the backflushed solids / sludge.

Dahlman’s gas-driven backwash technology eliminates channeling and incomplete cleaning. It is considered to be one of the most effective and efficient *in-situ* cleaning methods.

Features	Benefits
Use of high-efficiency filter media suitable for surface filtration and optimal cleaning results	Maximum solids recovery -> optimal product upgrade or protection of downstream equipment
Highly effective <i>in-situ</i> element cleaning due to pressurized backwash	Minimized backwash volume -> minimized utility costs and increased upgraded product quantity
Elimination of filter plugging and consequently, <i>ex-situ</i> cleaning	Enhanced operational safety & reliability, and low OPEX
Non-stop operation	High reliability and availability (no unscheduled downtime)
Full automation by PLC or DCS control system	Operational cost savings and consistent performance
Compactly sized, fully dressed filter packages	Minimum floor space and low installation costs
Full process performance guarantee	Single point responsibility