

# DUOMATIC



**AUTOMATIC PROCESS  
SELF CLEANING FILTERS**

## DUOMATIC FILTER SYSTEM

DUOMATIC FILTER SYSTEM is a tubular self-cleaning filter specifically designed to remove solids, iron sulfide, coke fines, dirt and other solid contaminants from oil feeds in refineries and petrochemical plants.

It is usually installed to protect the catalyst beds from contamination and plugging in HYDRODESULFURIZER, HYDROCRACKER and in PETROCHEMICAL REACTORS. Solid particles and dirt begin to plug catalyst bed before the catalyst is spent. This leads to a faster pressure drop increase inside the reactor. When the pressure drop reaches a value that cannot be tolerated, it is necessary premature bed changeout to regain process maximum performance.

DUOMATIC FILTER SYSTEM, by preventing solid particles from entering and clogging in the catalyst bed, reduces substantially bed changeouts and maintains optimum reaction parameters.

Extended catalyst life results in longer reactor run times, higher production rates and real savings in operating costs.

This system can be even used for clarification of a broad range of distillates and amine solutions used in sour gas sweetening plants.

## MODULAR SYSTEM

DUOMATIC is a modular system composed by one or more skid mounted units called BANKS.

A bank consists of a number of modules valved to common HEADERS:

- INLET HEADER
- OUTLET HEADER
- DRAIN HEADER
- EXTERNAL LIQUID HEADER (OPTION)

Each module contains slotted tubular filters with controlled filtration rate, designed to remove specific contaminants and to be easily regenerated by backwashing.

All modules are located on one side of the unit while the actuators and the control panel box are on the opposite side for easier inspection and maintenance.

## FEATURES AND BENEFITS

The installation of DUOMATIC FILTER SYSTEM gives the following benefits:

- Quick reduction of bed changeouts with important savings in running operating costs.
- Installation in remote unattended plant area due to the full automation of the system.
- Automatic adjustment of backwash frequency according to the level of feed solid loading.
- Only one couple of modules at a time is off-stream for backwashing to assure ongoing operation activity.
- Rugged and reliable construction provides low maintenance costs.

The number of modules assembled in each bank depends on the following process parameters:

- FLOW-RATE
- IN-STREAM SOLIDS CONTENTS
- VISCOSITY
- REQUIRED PRESSURE DROP

DUOMATIC major feature is to be an automatic backwashing filter system always on-stream because no more than one module is off-stream for backwashing at any time.

Two main options for backwashing are available:

### BACKWASHING WITH INTERNAL LIQUID

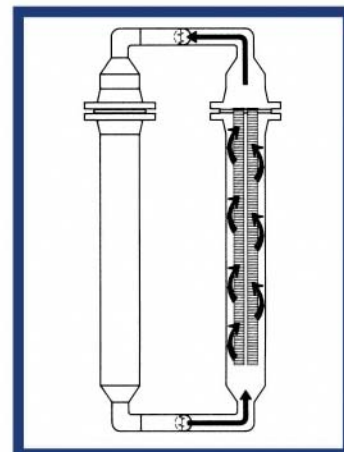
Use filtered process liquid in reverse flow to perform cleaning of filter elements.

### BACKWASHING WITH EXTERNAL LIQUID

A different liquid is used to remove accumulated solids from filter elements.



Fig. 1: DUOMATIC FILTER SYSTEM ready for delivery



Typical module scheme

## AUTOMATIC BACKWASHING

The backwashing cycle of filter elements is initiated in a fully automated mode by the PROGRAMMED CONTROL PANEL when a preset differential pressure drop is detected between inlet and outlet headers.

The differential pressure increase across the headers is caused by solid contaminants which build-up on the filter surface and reduce the effective open area. At a preset value, the differential pressure switch sends a signal to the logic of control panel.

According to a PROGRAMMED SEQUENCE the valve actuators of each module are activated step by step.

The feeding to each module is intercepted; a small quantity of filtered fluid is drawn from outlet header to backwash the isolated module, while all the other modules are in operation.

During backwashing the contaminants are totally displaced from slotted screen tubes thanks to the high liquid velocity and impact force.

To accomplish this effect no more than one module is off-stream at time. After the backwash cycle is completed the filter elements are restored to their original operating condition and the control panel returns to the rest-point, ready to start a new sequence.

When high flow rate and critical process conditions are present, a system composed by MULTIPLE BANKS with single control panels connected to a master main board is engineered.

In this way multiple concurrent operations of backwashing are avoided.

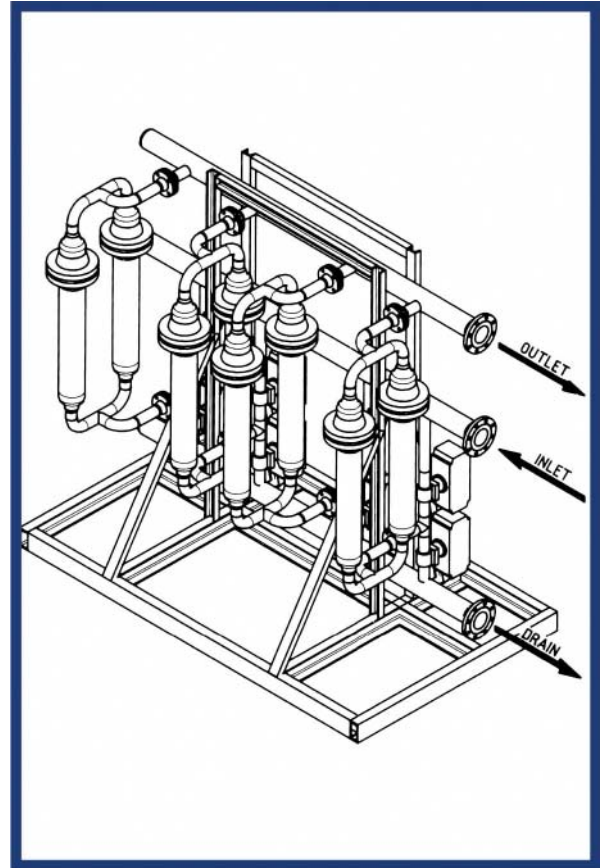
DUOMATIC SYSTEM automatically adjusts the frequency of backwash cycles to variations in feed solid content.

When HIGH-SOLID CONTENT LIQUIDS are fed, the intervals between backwash cycles are shortened to maintain filtered flow rate.

Fully automated running allows the location in remote plant areas.

In place FAIL-SAFE DESIGN include single-act valve actuators. If compressed air feed stops during backwashing all valves return to the filtration mode.

This arrangement prevents loss of filtered product to the drainage system and gives assurance of continuous process flow rate.



## BACKWASHING WITH INTERNAL LIQUID

Filtered process liquid is used to remove the contaminants from the outer surface of filter elements (fig. 2 and fig. 3). At backwash starting the valve (V1) is closed and the drain valve (V2) is opened.

A minimum quantity of filtered liquid, which is still at higher pressure, is diverted from the outlet header and flows in reverse through the filter elements flushing contaminants from the housing to the drain header.

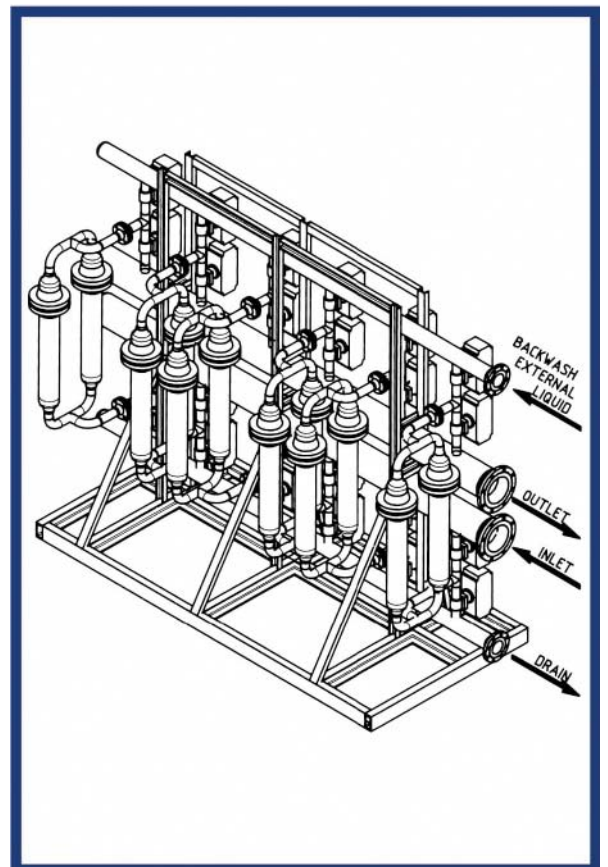
As backwash cycle stops the flow returns to filtration mode.

## BACKWASHING WITH EXTERNAL LIQUID

External liquid for backwashing is used when it is necessary to minimize loss of process fluid or when the pressure of the process fluid is not enough to guarantee an effective restoring of the filter screen (fig. 4 and fig. 5).

When backwash starts valve (V1) and valve (V2) are closed while valve (V3) and drain valve (V4) are opened.

The external liquid flows in reverse through the filter elements carrying out the contaminants to the drain header.



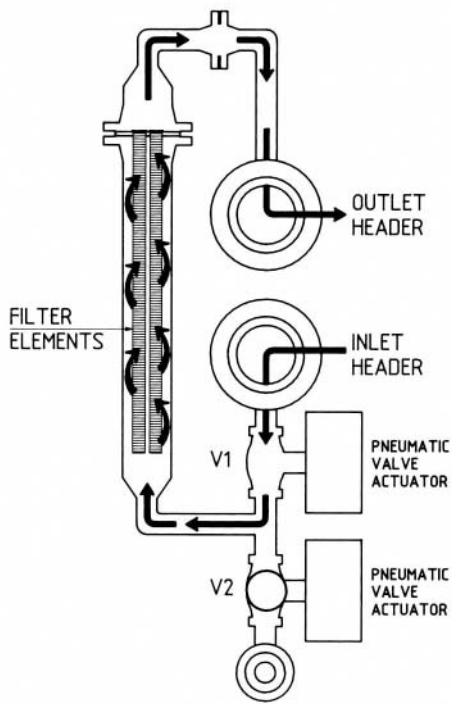


Fig. 2 Filtration mode

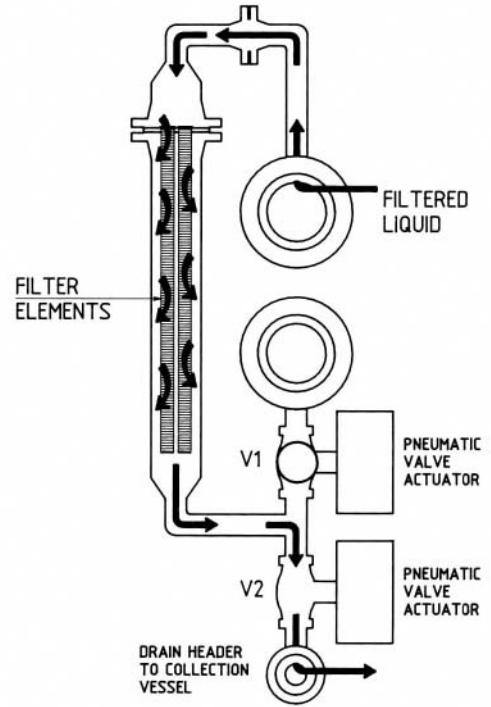


Fig. 3 Backwash mode

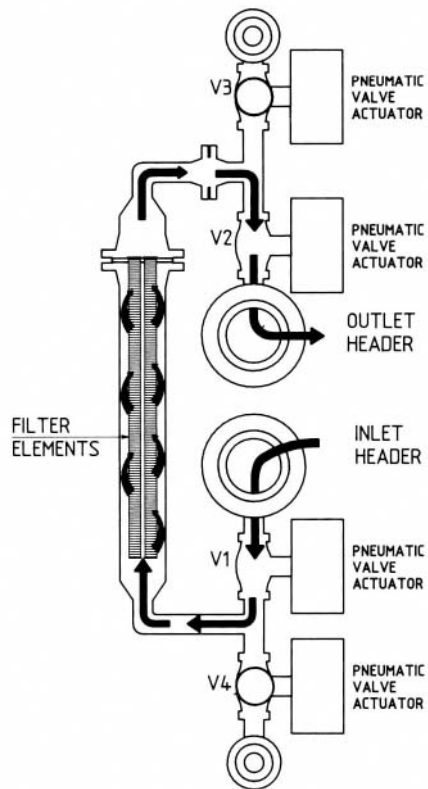


Fig. 4 Filtration mode

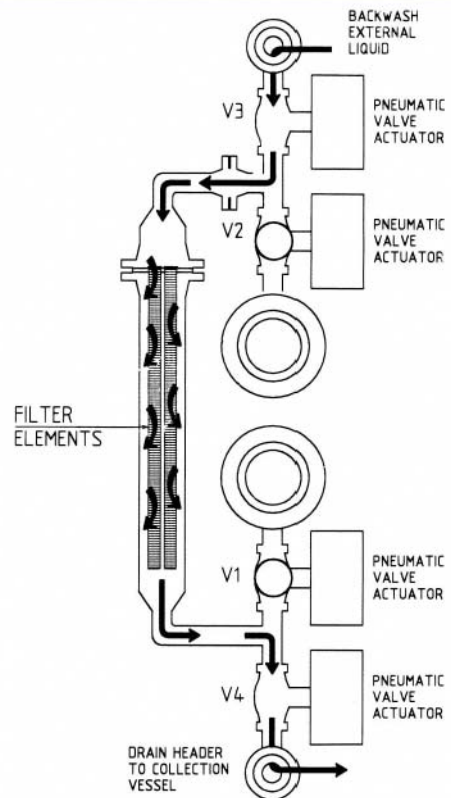


Fig. 5 Backwash mode

## QUADRI-FIL AND PLURI-FIL FILTER ELEMENTS

DUOMATIC is equipped with specifically designed filter elements manufactured by BEA Technologies to provide higher performances and effective regeneration (fig. 6). This element consists of several slotted screen tubes with one blind end and the open end welded to a support flange. The assembly is then hanged inside the module.

Each slotted screen is made with a triangular shaped-wire wound with precise dimensions and continuously welded to vertical support bars (fig. 7).

Due to this construction the elements can withstand a differential pressure over 10,5 bar (150 psi) without collapsing.

QUADRI-FIL and PLURI-FIL elements provide MORE OPEN AREA than similar filters with a RETENTION CAPACITY HIGHER than perforated plate or wire mesh.

- process flow rate is maximized
- operating efficiency is constantly maintained
- backwashing downtime is minimized

### FILTRATION MODE

During filtration mode the process liquid flows from outside to inside of the filter elements and solid particles are built up on the external surface of the slotted screens (fig. 7).

During backwashing the liquid flows from inside to outside being accelerated while passing through the screen due to the section of the triangular shaped-wire.

This hydrodynamic effect helps the solid particles to be effectively removed along the entire length of each slotted screen, thus shortening backwash time.

### FEATURES AND BENEFITS

- open area designed to give maximum operating performance.
- non-blinding and non-clogging design for a superior dirt holding capacity.
- high backwash efficiency to achieve effective cleaning of filter elements.
- rugged construction to withstand high differential pressure and turbulence.
- superior resistance to wearability and abrasion to assure a constant filtration rating through time.



Fig. 6: QUADRI-FIL filter elements

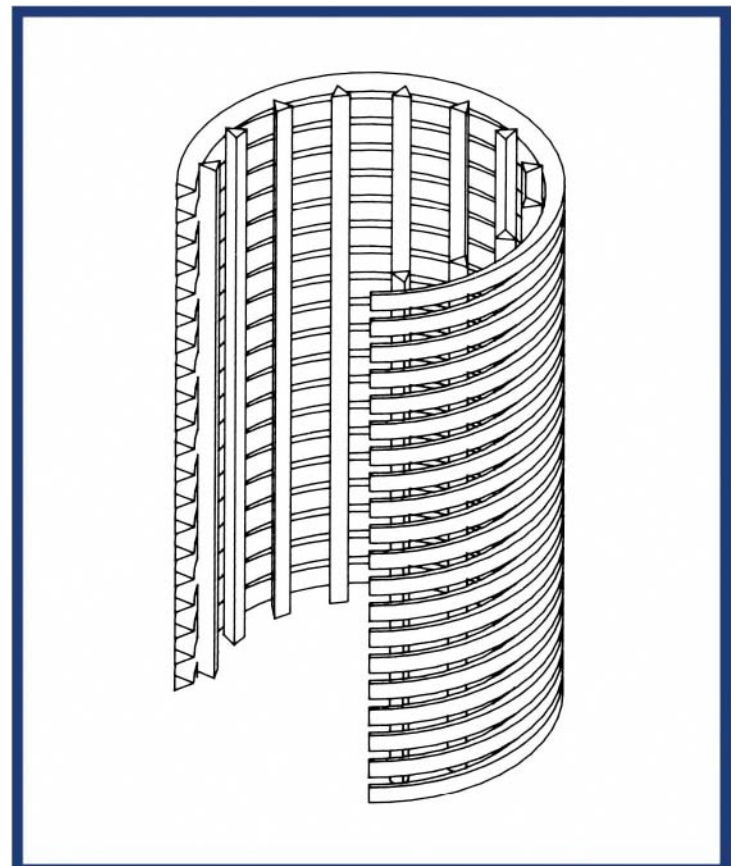


Fig. 7: Slotted screen tube section

## DESIGN AND SIZING

To determine the number of filter elements required to remove the amounts of solid contaminants contained in the process fluid, please feel free to contact BEA Technologies SPECIALISTS to assure proper sizing and provide a cost-effective system.

DUOMATIC SYSTEM is designed for continuous operation and its control panel can be interfaced to a main process controller.

The DUOMATIC system can be engineered to comply with explosion proof areas.

IN-LINE DESIGN reduces cost of installation and facilitates the insulation to maintain the operating temperature.

## STANDARD CONSTRUCTION

DUOMATIC is a skid-mounted fully assembled system supplied ready for start-up.

FILTER HOUSINGS can be manufactured in accordance with the latest edition of the main recognized international manufacturing codes.

A great experience in welding all types of materials is available to comply with customer's specifications.

Stress-relieving and NON-DESTRUCTIVE TESTING (as dye penetrate, ultrasonic, radiography) are performed under BEA QUALITY CONTROL SERVICE.

Installation and maintenance manuals supplied with the system provide all necessary information for the operations and BEA TECHNICAL SERVICE is available for ASSISTANCE and support during erection and start-up.

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