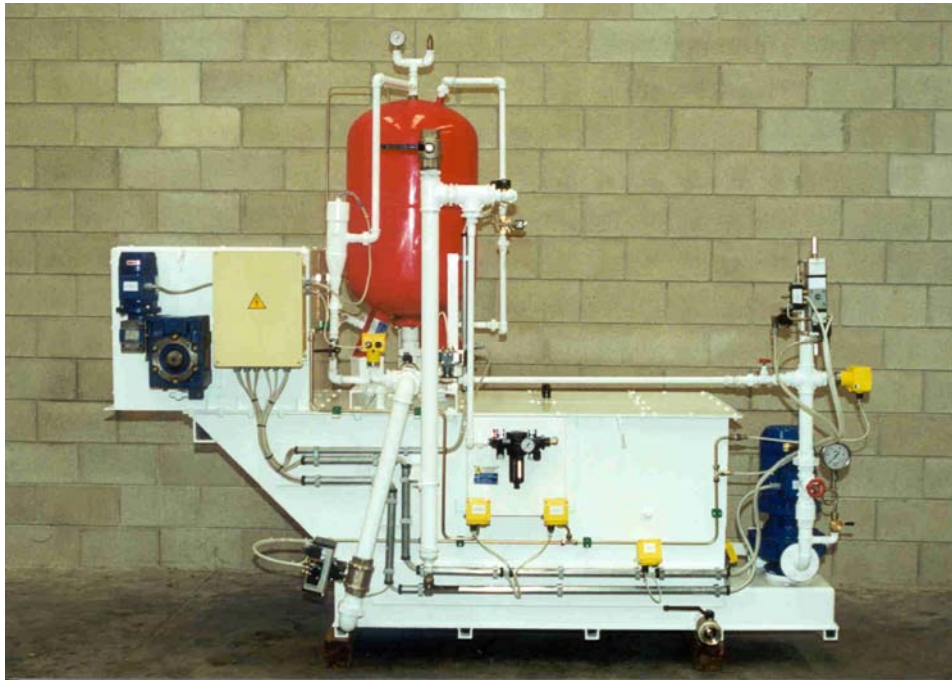




Water and Mechanical Technology s.r.l.



LIQUID VACUUM FILTER PRESENTATION

PATENT Nr. 01273048

PATENT Nr. 01254551

W.M.T. was founded in 1977, when Hydromation Italy was closed, and it is the licensee of HYDROMATION FILTER Co. from which takes all the know-how in making filtration.

Nevertheless W.M.T., through its engineering dept., has developed new kind of applications especially regarding the environmental impact and the coolant duty.

In doing that W.M.T. has patented in 1994 a new kind of vacuum filter, called LIQUID VACUUM, that is able to have a lower environmental impact due to the fact that filter media (disposable or T.B.F.) is no longer present.

W.M.T. engineering dept. is also always up to date regarding the new technology using only worldwide recognized partner.

For these reasons we proposed ourselves like the best partner for both engineering and filtration problems.



resident

PRODUCTION AND TRADING LINES

IN MACHINES TOOLS FIELD

- *Filtering system for soluble or emulsified oil with permanent and disposable media, filtering degree from 3 to 100 microns*
- *Conveyor system, oil-skimmer, crushing, briquetting and chips storage*
- *High pressure liquid system to remove trimmings and hydraulics shot-peering until 45 MPa*
- *Medium and high pressure system for work processing with Mapal and gun drilling*
- *Valves for low viscosity liquids or water valves for high pressure until 45 MPa and relative system*

IN SIDERURGIC FIELD

- *Coolant system for all type of hot and cool rolling mill*
- *Descaling system*
- *Filtering system with permanent filter media for Sendzimir rolling mill (filtering degree from 3 to 5 microns)*
- *Filtering system with permanent media for aluminium rolling mill*
- *Coolant filtering system for Wet Tempering rolling media*
- *Descaling, mandrel lubrication, antioxidation system for pipe rolling mills (Expander pipe mill and M.P.M.)*
- *Cooling system with water curtains for hot rolling mills and continuous castings*
- *Hydraulic system and valves for low viscosity fluids*
- *Electrostatic oilers for sheets plates, tubes and sections*
- *Static washing system with high pressure and temperature for strip and tubes*
- *Conveyor system, dosing and dust mixing (graphite compound) for tube rolling mills*

IN HOT-PRESS FIELD

- *Hydraulic power system with low viscosity fluid (soluble oil 95-5)*
- *Inert-gas control power system for plasma pressing*

IN ECOLOGIC FIELD

- *Treatment and potabling water plants for domestic use with flow from 85 to 125 L/day*
- *Water drinkeabling system for caravans and camper with 100 L/day flow*
- *Water drinkeabling system for small boats with 100 L/day flow*
- *Water treatment system with ultrafiltration and revers osmosis*
- *Water treatment system with macro and microflottation, coalescente oil removal*
- *Ultrafiltration and reverse osmosis systems*

IN OIL INDUSTRY FIELD

- *Water injection plants for well and off-shore petroleum platforms*
- *Treatment plants for exhaust water and ballast water for oil tanker*

IN ENGINEERING AND SOFTWARE FIELD

- *Practicable project*
- *Executive project*
- *Pipeline*
- *Electrical plants and relative software*
- *Software support to realize pipeline and structure*

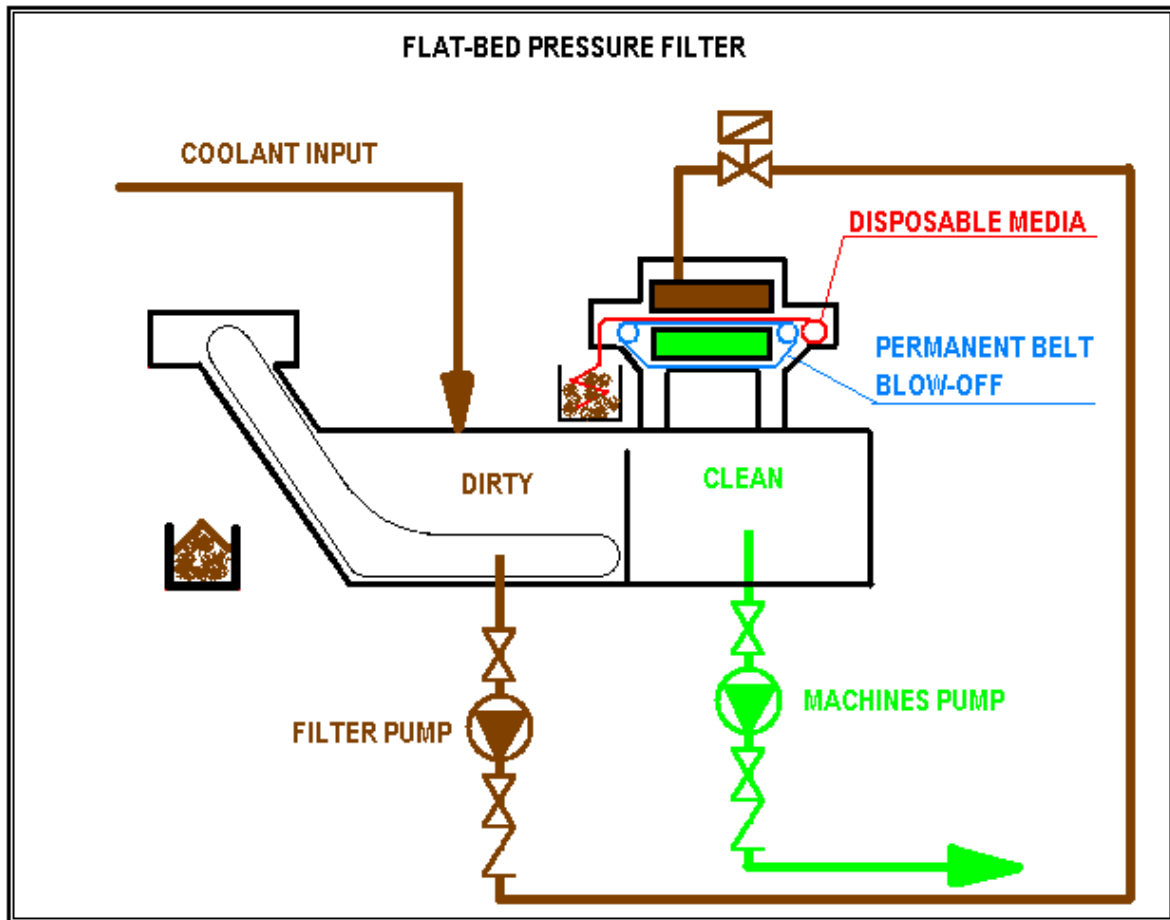
LABORATORY FOR TESTS AND ANALYSIS

- *Qualitative and quantitative tests on every kind of liquids*
- *Corrosions tests*

MISCELLANEOUS

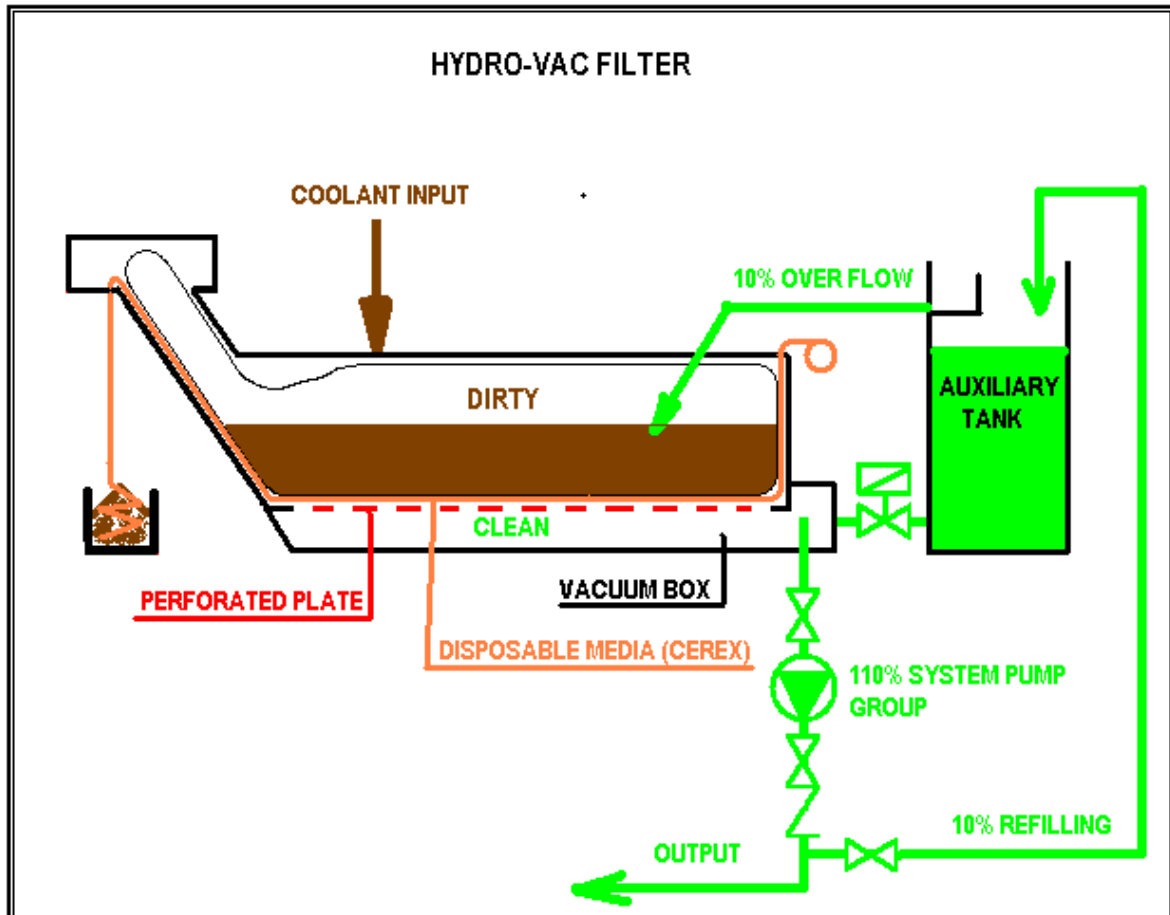
- *High efficiency nozzles for washers*
- *High impact nozzels for discaling*
- *Self extensive nozzles to clean and dry blind holes*
- *Laminar flow nozzles for flow-coating and cooling hot strips*
- *Nozzles with on-off valve incorporated for fractionate control of mill cylinder swell*
- *Refractometers to control the percentage of oil in the emulsion*

TRADITIONAL FLAT-BED PRESSURE FILTERING SYSTEM



NORMAL SYSTEM MADE UP OF:
DOUBLE SYSTEM TANK (DIRTY AND CLEAN)
DOUBLE SYSTEM PUMP (DIRTY AND CLEAN)
PRESSURE FILTER (FLAT-BED) WITH DISPOSABLE OR PERMANENT MEDIA.

CHANGES IN FILTERING FIELD WITH THE INTRODUCTION OF THE VACUUM FILTER: HYDRO-VAC

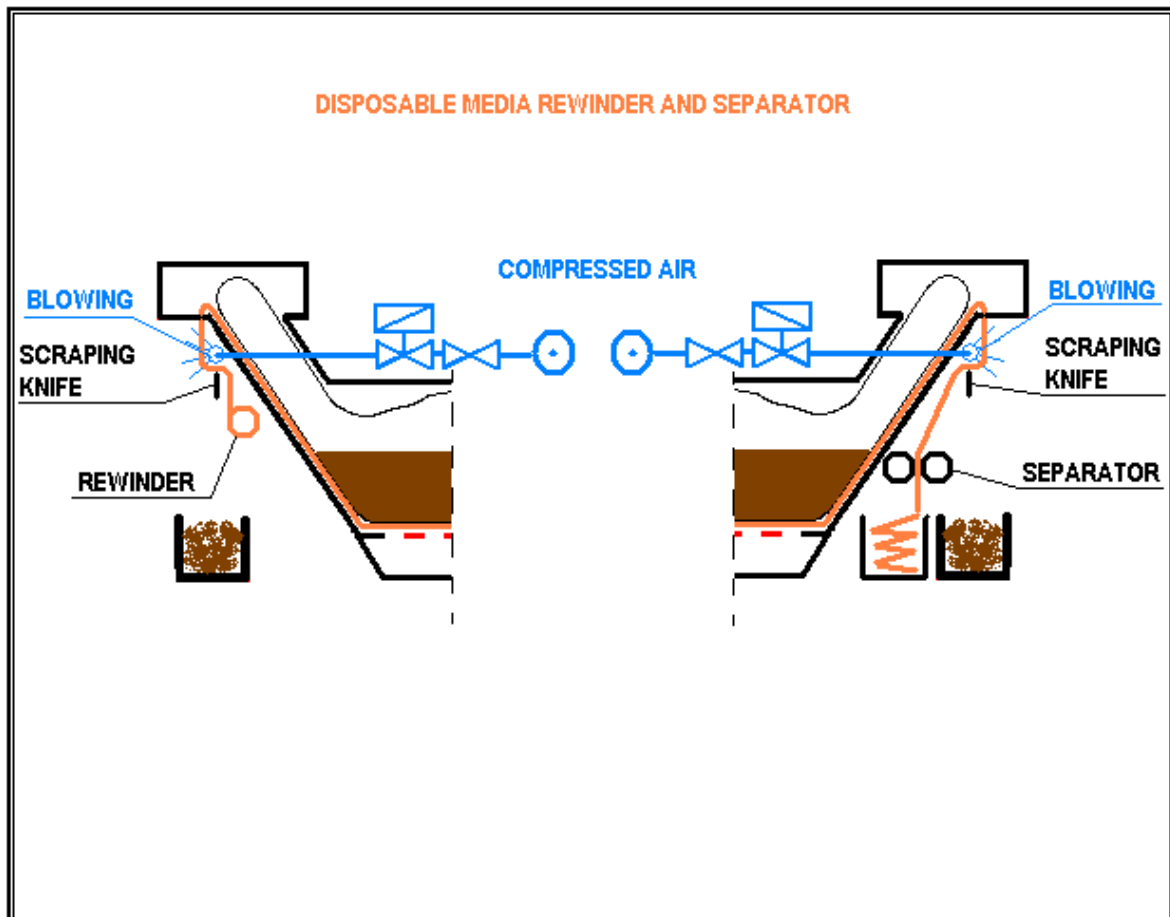


CHANGES:

- ONLY ONE SYSTEM PUMP.
 - LOWER USED POWER.
- THE PUMPED COOLANT IS FILTERED.
 - LOWER PUMP CONSUMPTION AND HIGHER PUMP LIFE.
- LOWER TANK VOLUME.
 - LOWER REFILLING AND WASTING COOLANT COST.
 - LOWER AREA NEEDED.
- DRAG CONVEYOR INTERMITTENT WORKING, ONLY DURING THE FILTER INDEX.
 - LOWER MAINTENANCE AND HEAVY DUTY

LOWER SYSTEM PRICE THEN THE PRESSURE ONE.

CHANGES DURING YEAR ON VACUUM FILTER
HYDRO-VAC:
REWINDER—SEPARATOR

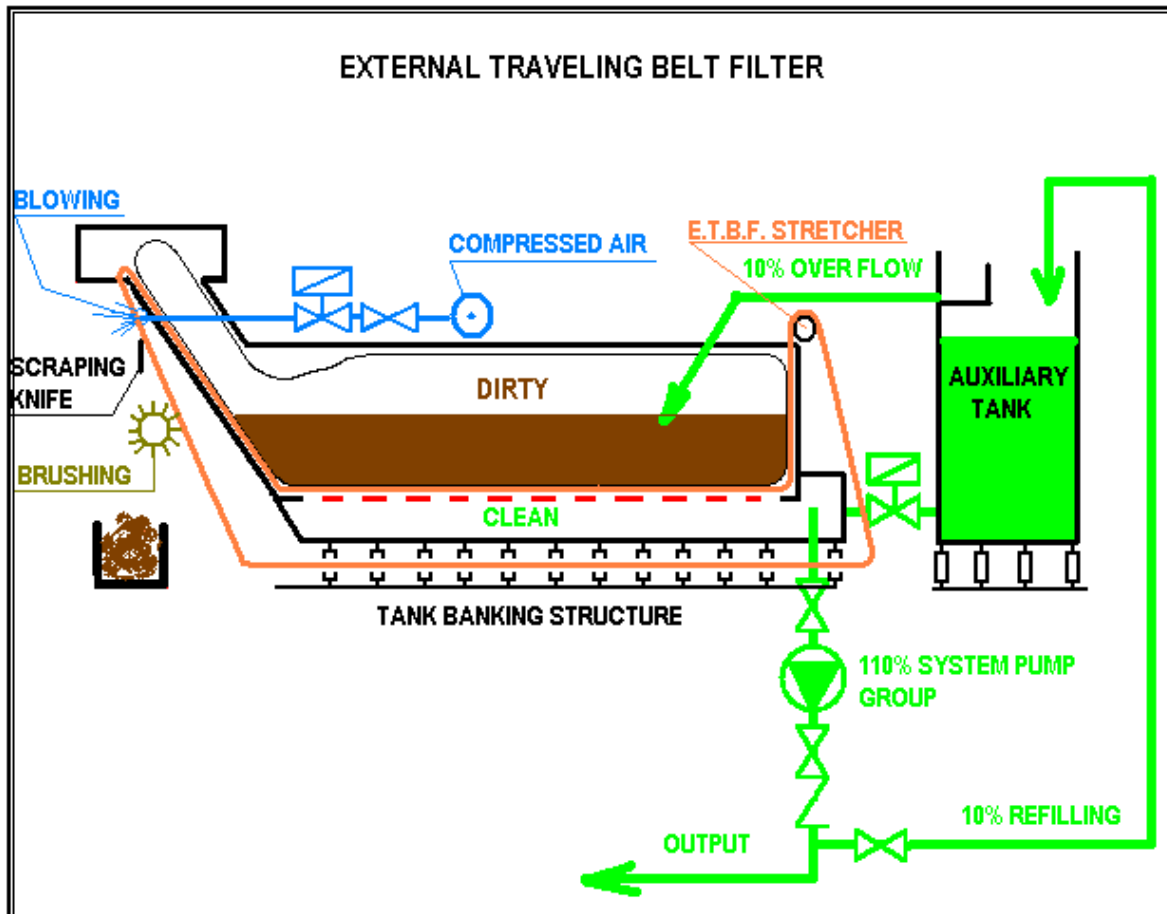


THE MEDIA REWINDER AND SEPARATOR INTRODUCTION WAS NECESSARY TO SOLVE THE CHIP MOVING AND TREATMENT PROBLEM, ALSO IN FOUNDERY.

CHANGES DURING YEAR ON VACUUM FILTER

HYDRO-VAC:

E.T.B.F.—EXTERNAL TRAVELING BELT FILTER



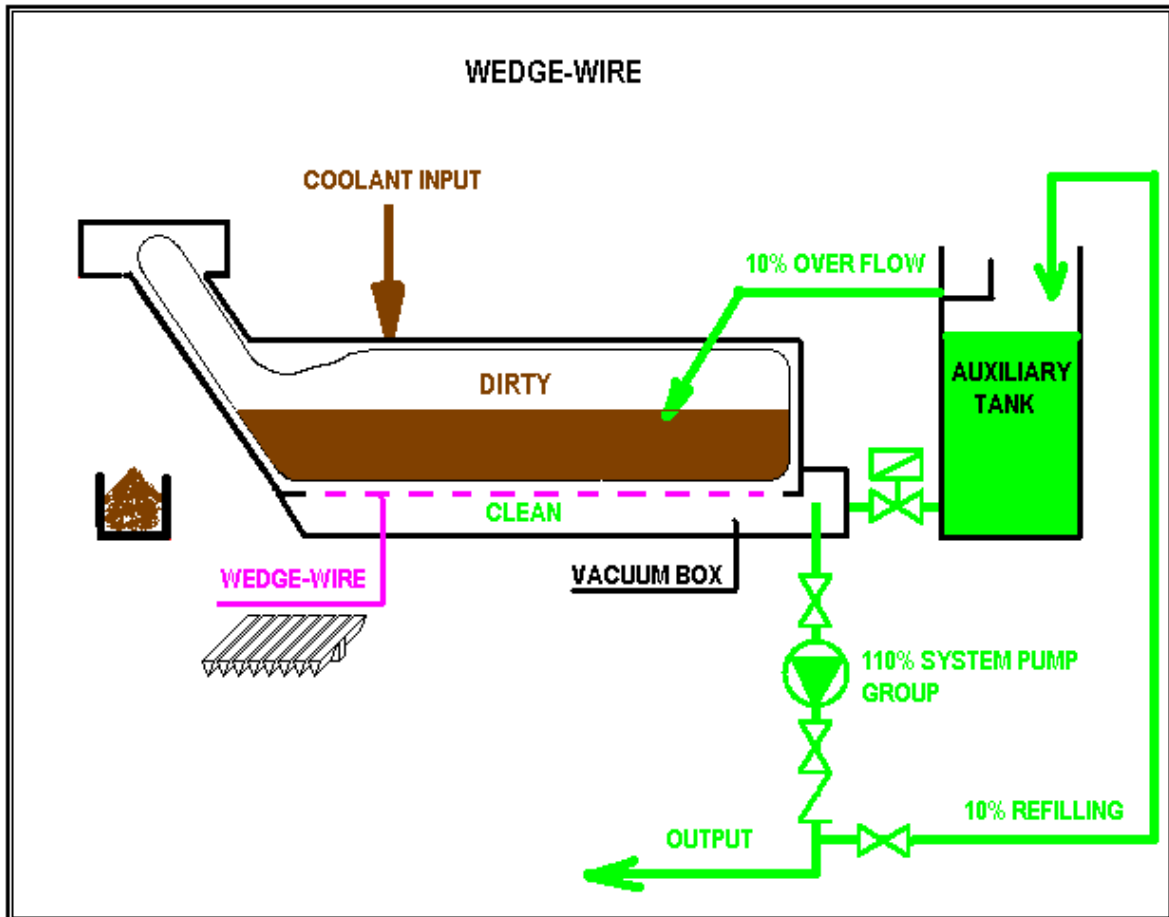
ADVANTAGE:

- ELIMINATING BUYING, MANAGING AND DESTROYING COSTS OF DISPOSABLE MEDIA (CEREX).

DISADVANTAGES:

- HIGHER COST DUE THE ADDING OF THE STRUCTURE NEEDED TO BANK THE SYSTEM TANK.
- MANAGIN EXPECIALLY IN THE JUNCTION POINT FOR THE CORRECT ALIGNMENT.
- EXTERNAL T.B.F. LIFE DUE TO THE VERY LONG TIME FROM THE DISCHARGE RAMP TO THE INLET SIDE DURING WHICH IT DRY KEEPING INSIDE TRAMP OIL AND CHIP NOT ELIMINATED FROM THE T.B.F. BLOWING.
- CHIP MIGRATION IN BREAKING EVENT.

CHANGES DURING YEAR ON VACUUM FILTER
HYDRO-VAC:
THE WEDGE-WIRE



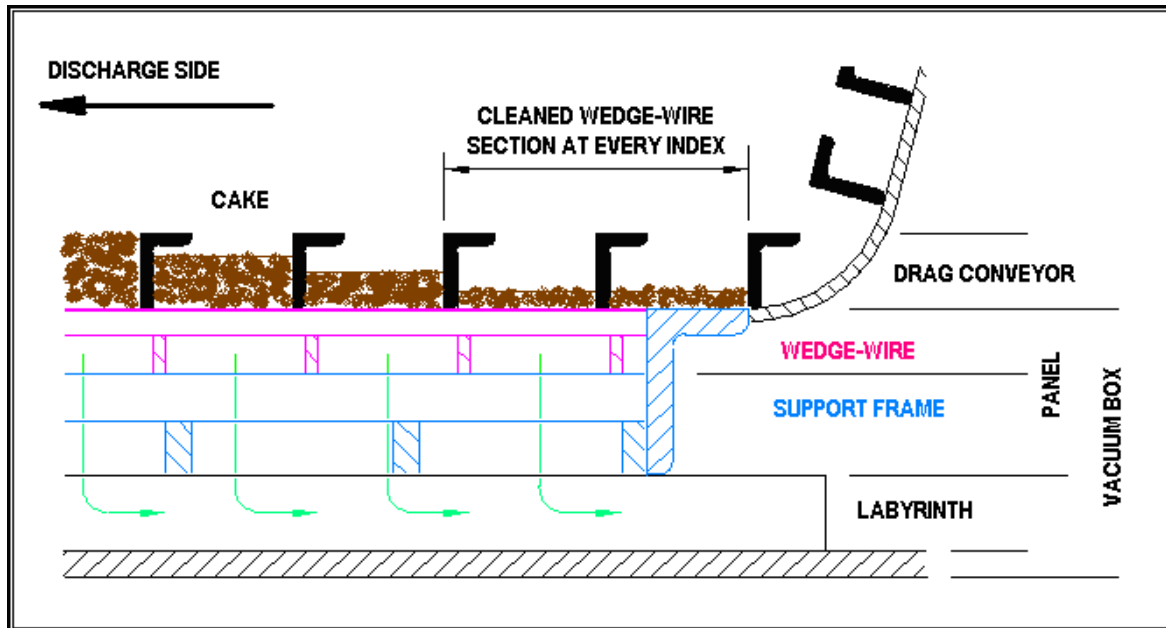
ADVANTAGE:

- **DISPOSABLE OR PERMANENT FILTER MEDIA NO LONGER PRESENT.**

DISADVANTAGES:

- **0.1% CHIP, BIGGER THAN 30 μm , MIGRATION DURING THE INDEX TIME.**

0.1% CHIP MIGRATION DURING THE INDEX TIME



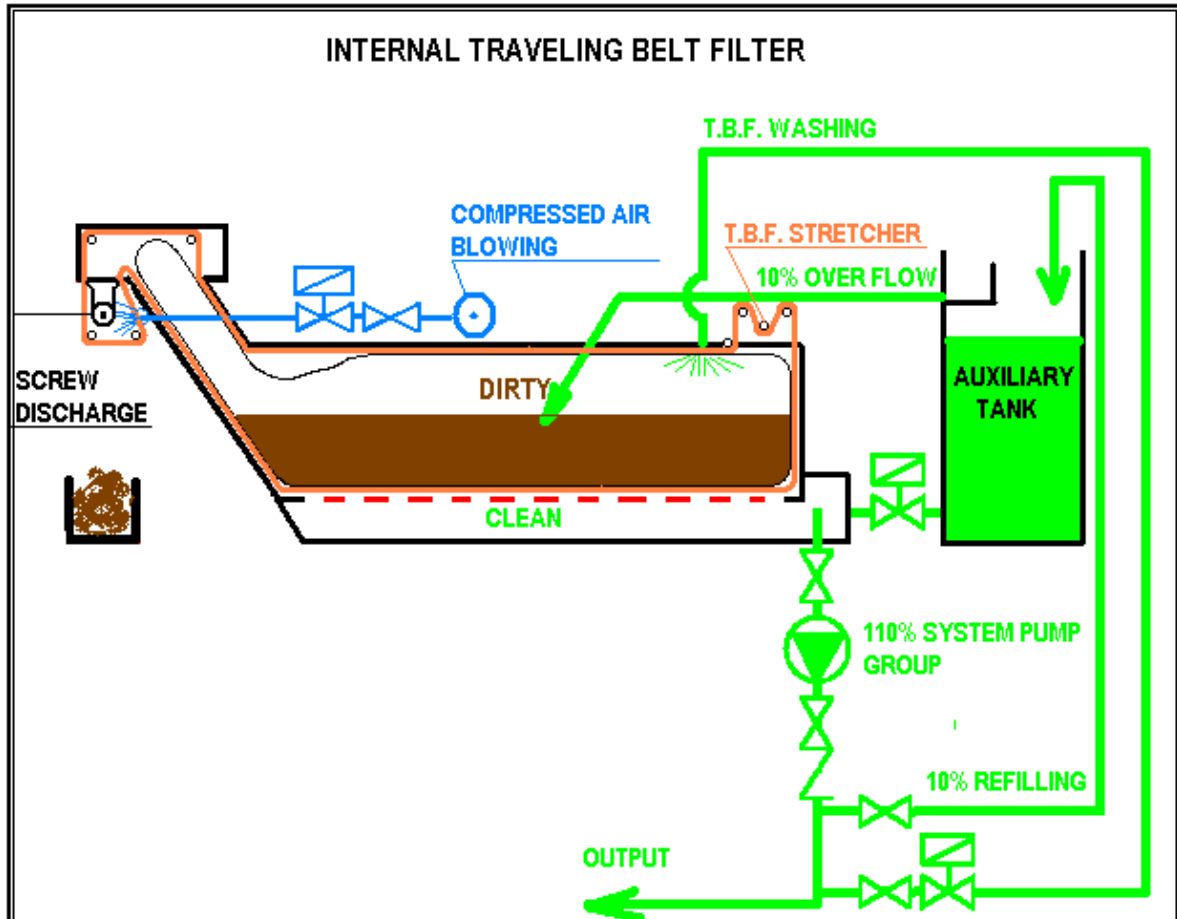
THE AVAILABLE SPACE FOR CHIP MIGRATION IS THE WEDGE WIRE OPENING SECTION $250 \mu\text{m} \times 38$ o 70 mm (depending on the support distance) CLEANED AT EVERY INDEX.

AFTER EACH INDEX, THAT WEDGE-WIRE SECTION IS FREE AND THE CHIP WILL COVER IT IN ABOUT $30 \div 45$ SECONDS, NEVERTHELESS DURING THIS TIME YOU CAN HAVE A CHIP MIGRATION OF ABOUT 0.1% (DUE TO HYDROMATION AND W.M.T. STATISTICAL EXPERIENCE IN OVER 17.000 INSTALLATION).

CHANGES DURING YEAR ON VACUUM FILTER

HYDRO-VAC:

I.T.B.F.—INTERNAL TRAVELING BELT FILTER



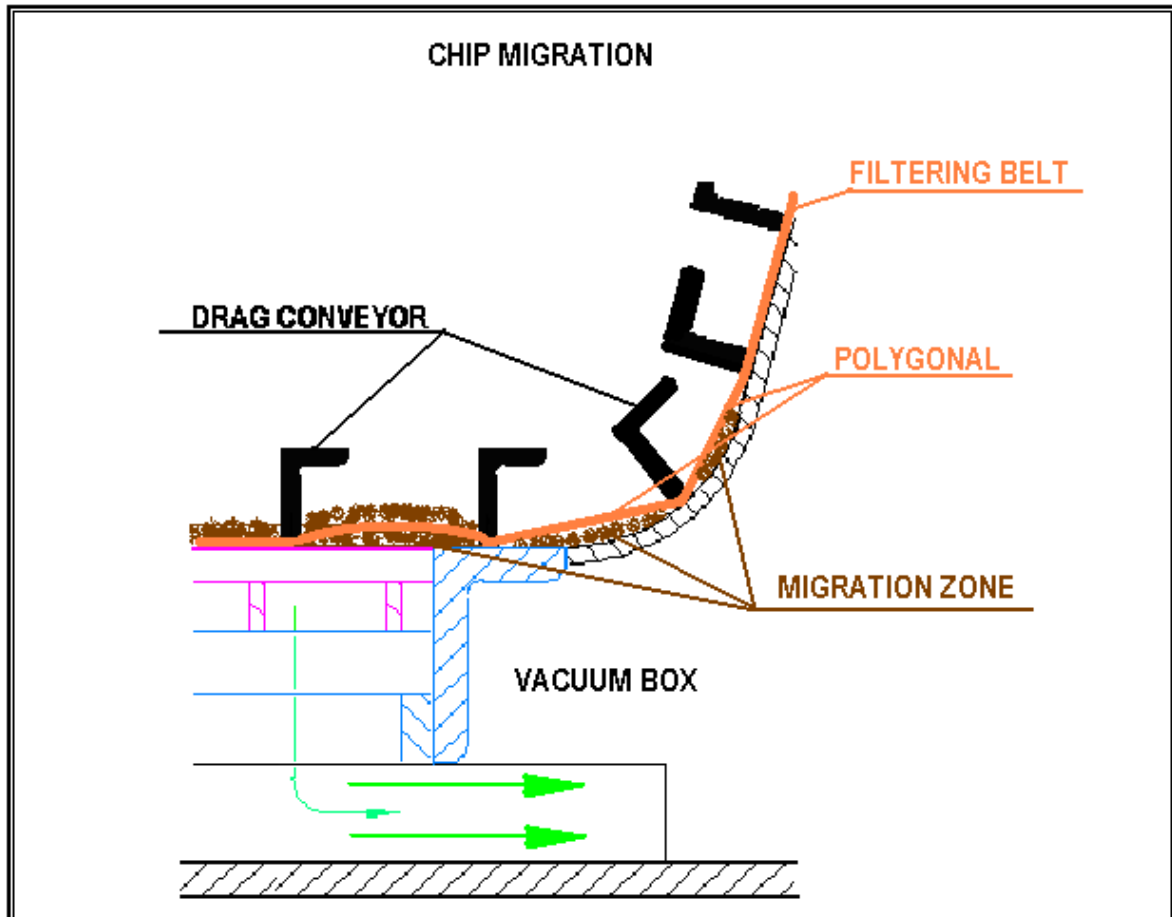
ADVANTAGES:

- ALMOST TOTAL ELIMINATION OF CHIP MIGRATION
- DOUBLE DISCHARGE POINT DUE TO THE CHIP DISCHARGING SCREW.
- T.B.F. LONGER LIFE BECAUSE THE T.B.F. COMING BACK BRANCH IS IN A WET ATMOSPHERE.

DISADVANTAGES:

- VELOCITY TRENCH LATERAL INLET.
- MANAGIN EXPECIALLY IN THE JUNCTION POINT FOR THE CORRECT ALIGNMENT.
- BUYING AND THROWING COST..

CHIP MIGRATION IN ALL THE PRESENT FILTERING SYSTEM



HYDRO-VAC PRESENT CONFIGURATION

THE PRESENT FILTERING SYSTEM ARE MADE ACCORDING THE FOLLOWING USUAL CONFIGURATION:

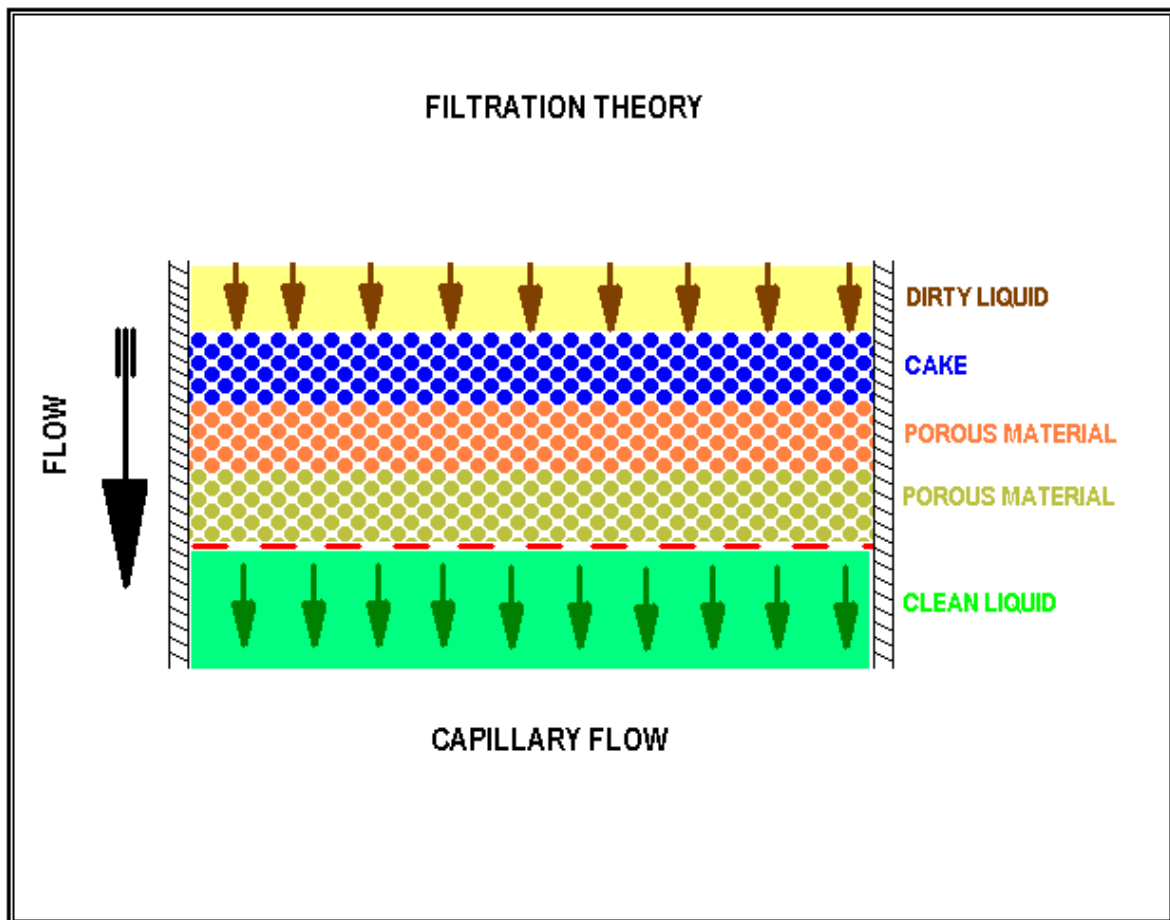
1. USING OF WEDGE-WIRE PERMANENT FILTERS.
2. USING OF INTERNAL OR EXTERNAL T.B.F.
3. DISPOSABLE MEDIA CAN BE USED FOR EVENTUAL T.B.F. BREAKAGE OR FOR A COOLANT HARD CLEANING.
4. USING OF MEDIA REWINDER OR SEPARATOR .
5. T.B.F. BLOWING, BRUSHING OR BEATING WITH SLUDGE DRYING DEVICE
6. TAIL SLOPING PLATE WITH BULKHEAD TO PREVENT CHIP MIGRATION DURING THE FILTER BELT IMMERSION TIME (BEFORE IT REACHED THE WEDGE-WIRE PANEL) DUE TO THE POLYGONAL IT MADE.

THE REASONS WHY THE LIQUID VACUUM FILTER WAS DEVELOPPED.

- **TO SIMPLIFY THE SYSTEM**
- **TO IMPROVE FILTERING DEGREE WITH NO MIGRATION PHENOMENON.**
- **TO REDUCE BUYING AND MANAGING COST.**
- **TO ELIMINATE THE THROWING MATERIAL WITH A CONSEQUENT LOWER ENVIRONMENTAL IMPACT.**

FILTRATION THEORY

FILTRATION IS THE FLOW RESULT OF A DIRTY LIQUID THROUGH SUBSEQUENT POROUS MATERIAL STRATUM OR LEVELS IN A CAPILLARY WAY.



PERMEABILITY CONCEPT

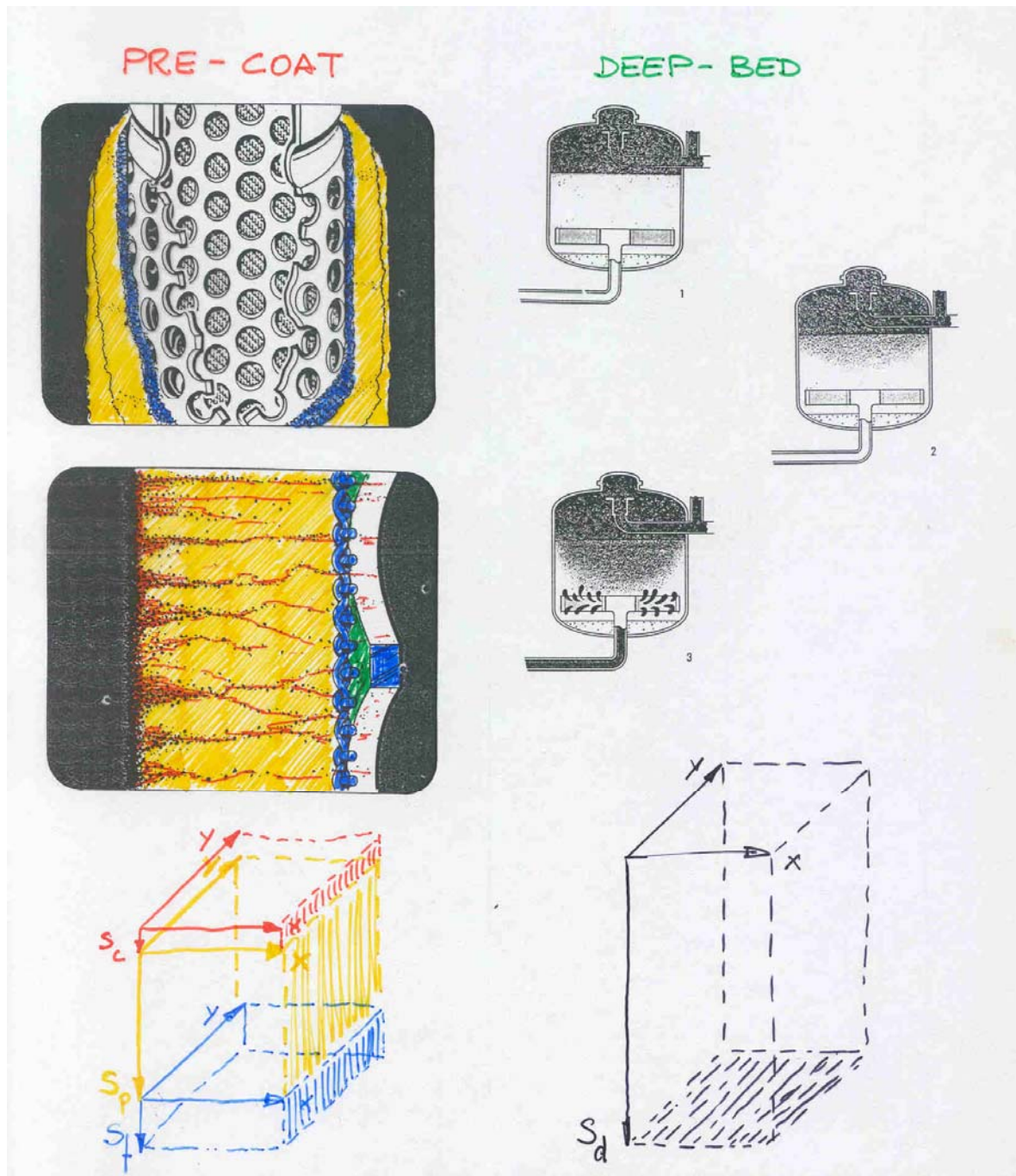
THE SYSTEM FLOW RATE IS PROPORTIONAL TO THE FILTER SEPTUM THICKNESS.

IN SUCH WAY TO IMPROVE THE FLOW RATE WE HAVE CHANGE THE FILTRATION FROM A TWO DIMENSIONAL WAY TO A THREE DIMENSIONAL FILTER WAY INTRODUCING A PANEL.

MAX PANEL CLOGGING

WHEN THE WASTING PARTICLES FULFILL THE PERMEABLE SPACES OF THE FILTER SEPTUM. AT THE END, WHEN ALL THE PERMEABLE SPACES ARE FULL, THERE IS AN INCREASING OF SUSPENDED SOLID IN THE COOLANT, WITH THE NECESSITY TO REGNERATE THE FILTER PANEL.

EXISTING HIGH PERMEABILITY FILTERING SYSTEM EXAMPLES.



THEORY CONCLUSIONS

1) PERMEABILITY CONCEPT

WITH A THREE DIMENSIONAL FILTER MADE WITH ONE OR MORE POROUS MATERIAL FILTER BED IN CAPILLARY FLOW WE OBTAIN AN EXCELLENT FILTERING DEGREE TILL $0.5 \mu\text{m}$ ON SMALL FILTER AREA.

2) CLOGGING CONDITION

TO REALIZE A PERMANENT FIXED, SELF CLEANING AND SELF REGENERABLE THREE DIMENSIONAL FILTER MADE WITH ONE OR MORE POROUS MATERIAL FILTER BED IN CAPILLARY FLOW.

1) INTERCHANGEABILITY, UP-GRADE

NEW SYSTEMS, LVSP, HAVE TO BE REALIZED WITH THE POSSIBILITY TO UP GRADE THE EXISTING SYSTEM WORKING WITH THE OLD CONCEPT (FOR EXAMPLE ALL THE HYDRO-VAC SYSTEM).

2) COSTS REDUCTION

TO CUT OUT ALL THAT IS UNNECESSARY.
TO OPTIMIZE SOME PHASES LIKE SELF CLEANING AND CHIP EVACUATION.

PRACTICAL REALIZING

A) LIQUID VACUUM FILTER (**PATENT Nr. 01254551**).

NEW LIQUID VACUUM FILTERING SYSTEM WITH THREE DIMENSIONAL PANELS SELF CLEANING WITH PRESSURIZED BACK-WASH AND REGENERABLE DURING TIME.

B) FILTERING PANELS (**PATENT Nr. 01273048**) WITH THE FOLLOWING TYPE:

MP—MULTIPLATE PANEL

SP—SANDWICH PANEL

CP—CHIPS PANEL

SI—SPHERICAL INSERT PANEL

HT—HIGHT TEMPERATURE PANEL

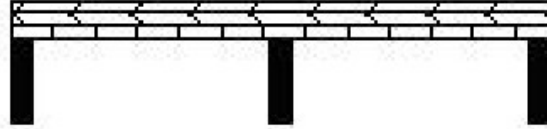
NEW CANDLES, TUBES, PLATES, PANELS, CARTRIDGES, ETC ... THREE DIMENSIONAL FIXED FILTER IN A CAPILLARY FLOW MADE WITH ONE O MORE POROUS MATERIAL FILTER BED, SELF CLEANING AND REGENERABLE DURING TIME WITH PRESSURIZED, ULTRASOUND OR SOLVENT BACK-WASHING.

FILTER PANELS TYPOLOGIES

(PATENT Nr. 01273048)

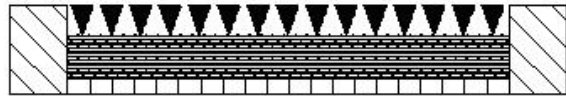
MP - MULTIPLATE PANEL

FILTER PANEL MADE WITH SUPERPOSED PRESSED, PRESSED AND SINTERED, SINTERED WIRE GAUZE WITH A FILTER DEGREE OF 1 , 5 MM, REGENERABLE WITH 200 , 300 BAR BACKWASH OR WITH ULTRASOUND WASHING.



SP - SANDWICH PANEL

FILTER PANEL MADE WITH: WEAR SLIDING MATERIAL (USUALLY WEDGE-WIRE); PRESSED, PRESSED AND SINTERED, SINTERED POROUS MATERIAL SUCH AS METALLIC, ANIMAL, VEGETABLE OR SYNTHETIC MATERIAL; SUPPORT STRUCTURE. THIS PANELS ARE REGENERABLE WITH 200 , 300 BAR BACKWASH OR BY CHANGING THE INSIDE POROUS MATERIAL.



CP - CHIP PANEL

FILTER PANEL MADE WITH: WEAR SLIDING MATERIAL (USUALLY WEDGE-WIRE); PRESSED, PRESSED AND SINTERED, SINTERED POROUS MATERIAL SUCH AS METALLIC, VEGETABLE OR SYNTHETIC CHIP; SUPPORT STRUCTURE. THIS PANELS ARE REGENERABLE WITH 200 ÷ 300 BAR BACKWASH OR BY CHANGING THE INSIDE POROUS MATERIAL.



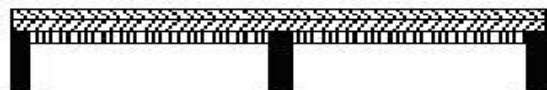
SI - SPHERICAL INSERT

FILTER PANEL MADE WITH: WEAR SLIDING MATERIAL (USUALLY WEDGE-WIRE); PRESSED, PRESSED AND SINTERED, SINTERED POROUS MATERIAL SUCH AS METALLIC, VEGETABLE OR SYNTHETIC GRANULATED MATERIAL; SUPPORT STRUCTURE. THIS PANELS ARE REGENERABLE WITH 200 ÷ 300 BAR BACKWASH OR BY CHANGING THE INSIDE POROUS MATERIAL.

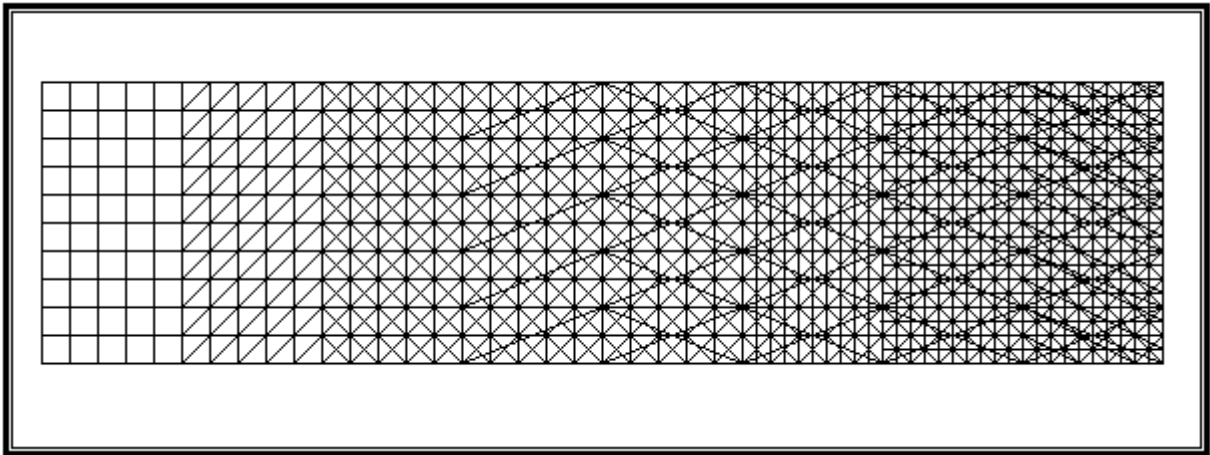


HT - HIGHT TEMPERATURE PANEL

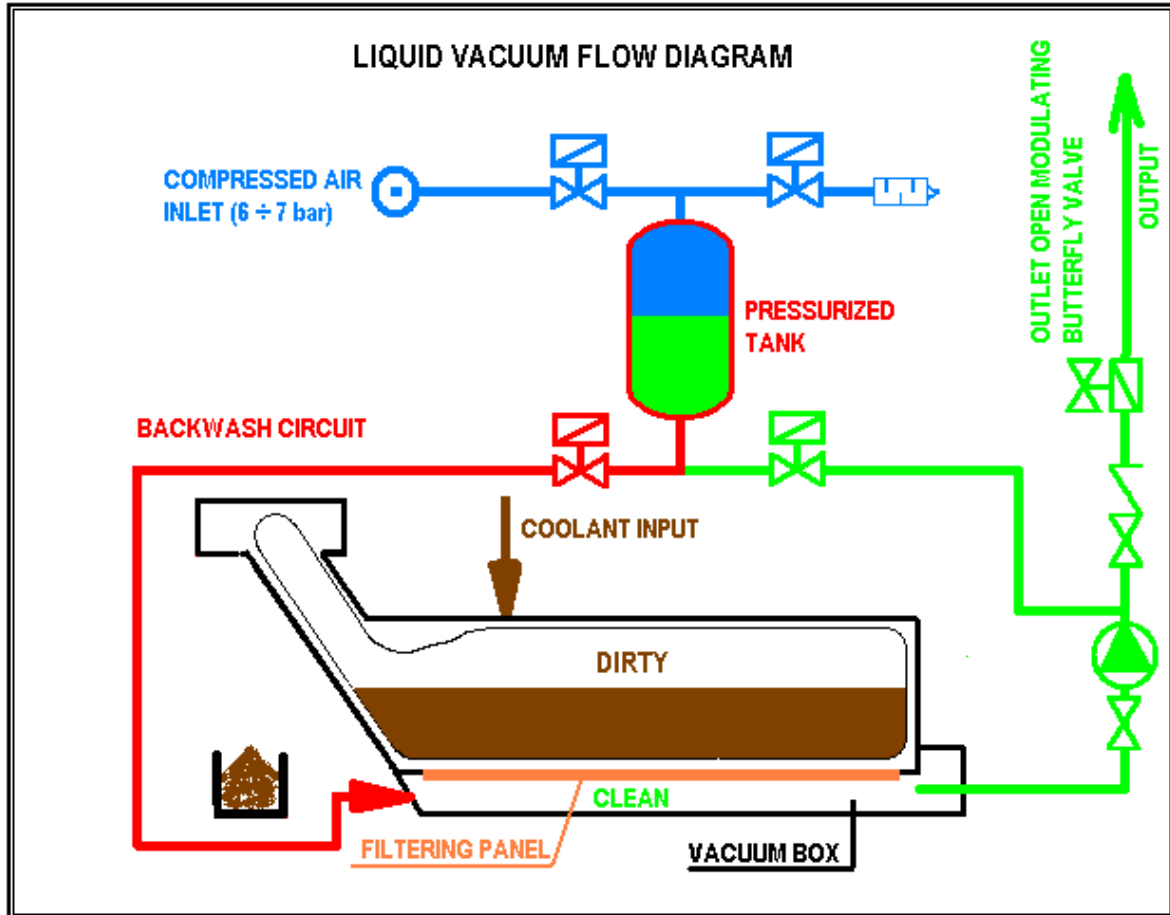
FILTER PANEL MADE WITH SUPERPOSED PRESSED, PRESSED AND SINTERED, SINTERED TITANIUM WIRE GAUZE WITH CERAMIC INSERT WITH A FILTER DEGREE OF 1 ÷ 5 μ M, REGENERABLE WITH 200 ÷ 300 BAR BACKWASH OR WITH ULTRASOUND WASHING.



FILTER STRUCTURE



LIQUID VACUUM FLOW DIAGRAM (PATENT Nr. 01254551).



NEW LIQUID VACUUM FILTER (PATENT NR. 01254551), SHOWN IN THE ABOVE DRAWING, IS MAKE UP WITH THE FOLLOWING PARTS:

- SYSTEM TANK WITH DRAG CONVEYOR.
- THREE DIMENSIONAL PANEL.
- SYSTEM PUMP GROUP.
- OUTLET OPEN MODULATING BUTTERFLY VALVE.
- PNEUMATIC CONTROL PANEL.
- BACKWASHING PRESSURIZED TANK.
- BACKWASHING CIRCUIT.

LIQUID VACUUM WORKING CONDITION (PATENT Nr. 01254551).

THE SYSTEM WORK AS FOLLOW:

- COOLANT TO BE FILTERED IS INSIDE THE SYSTEM TANK.
- ON TANK BOTTOM THERE'S THE THREE DIMENSIONAL FILTER PANEL.
- THE COOLANT IS SUCKED BY THE SYSTEM PUMP GROUP AND SEND TO THE MACHINE.
- DURING THE INDEX THE CHIP IS DISCHARGED FROM THE DRAG CONVEYOR WHILE THE MACHINE FEED IS GUARANTEED BY THE COOLANT PREVIOUSLY CHARGED IN THE PRESSURIZED TANK.
- DURING THE START UP TIME THE SYSTEM MADE, USING THE MAXIMUM AVAILABLE BACKWASH PRESSURE, THE NUMBER OF SELF CLEANING INDEX SETTLED BY THE OPERATOR AFTER WHICH THE OUTLET OPEN MODULATING BUTTERFLY VALVE BEGINS TO OPEN TO LET THE COOLANT REACHED THE MACHINES. THE FOLLOWING FILTER INDEX ARE RELATED TO THE COOLANT CONTAMINATION, CHIP OR TRAMP OIL.
- DURING THE STOP TIME THE OUTLET OPEN MODULATING BUTTERFLY VALVE IS CLOSED AND THE SYSTEM MADE, USING THE MAXIMUM AVAILABLE BACKWASH PRESSURE, THE NUMBER OF SELF CLEANING INDEX SETTLED BY THE OPERATOR, RELATING TO THE COOLANT CONTAMINATION, CHIP OR TRAMP OIL, AFTER WHICH THE SYSTEM IS STOPPED.

LIQUID VACUUM BACKWASH CONDITION (PATENT Nr. 01254551).

THE BACKWASH INDEX ARE MADE AS FOLLOW:

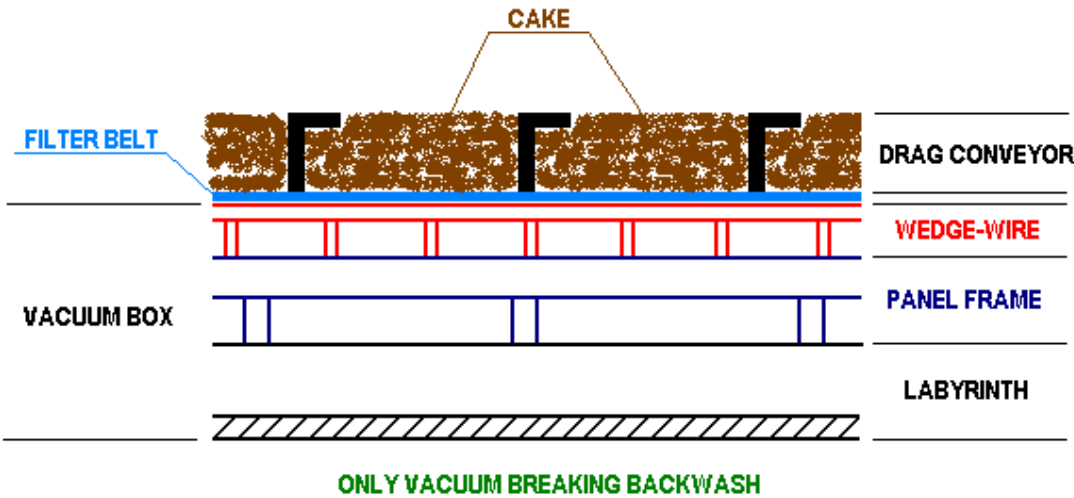
- THE PRESSURIZED TANK IS PRELOADED WITH COMPRESSED AIR AT HALF SYSTEM PUMP GROUP COOLANT PRESSURE.
- AFTER THAT IT IS LOADED WITH COOLANT. IN SUCH WAY INSIDE THE PRESSURIZED TANK WE HAVE HALF VOLUME OF COMPRESSED AIR AND HALF VOLUME OF COOLANT AT THE OUTLET COOLANT PRESSURE.
- A FURTHER COMPRESSED AIR LOADING INCREASE THE INSIDE PRESSURE TO THE MAXIMUM DISPOSABLE VALUE, USUALLY THE COMPRESSED AIR WORKSHOP NET PRESSURE.
- WHEN THE INDEX TIME BEGIN THE BACKWASH BUTTERFLY VALVE OPENS AND AT THE SAME TIME THE OUTLET OPEN MODULATING BUTTERFLY VALVE CHOKES AND THE DRAG CONVEYOR RUN TO DISCHARGE THE CHIP. IN SUCH WAY THE VACUUM BOX PRESSURE CHANGE FROM NEGATIVE, DUE TO THE PUMP SUCTION AND TO THE PANELS CLOGGING, TO POSITIVE FOR THE COOLANT INLET FROM PRESSURIZED TANK. THIS PRESSURE CHANGING IS GUARANTEED BY THE OUTLET OPEN MODULATING BUTTERFLY VALVE CHOKED THAT ALLOWS TO GRANT THE ASKED FLOW TO THE MACHINES.
- AFTER THAT THE SEQUENCE ABOVE DESCRIBED START AGAIN WAITING FOR ANOTHER FILTER INDEX.

THREE DIMENSIONAL FILTER PANELS IN A CAPILLARY FLOW GRANT AN INCREASING FILTERING DEGREE DURING THEIR LIFE DUE TO THE CLOGGING CONDITION. THERE'S TWO POSSIBILITY:

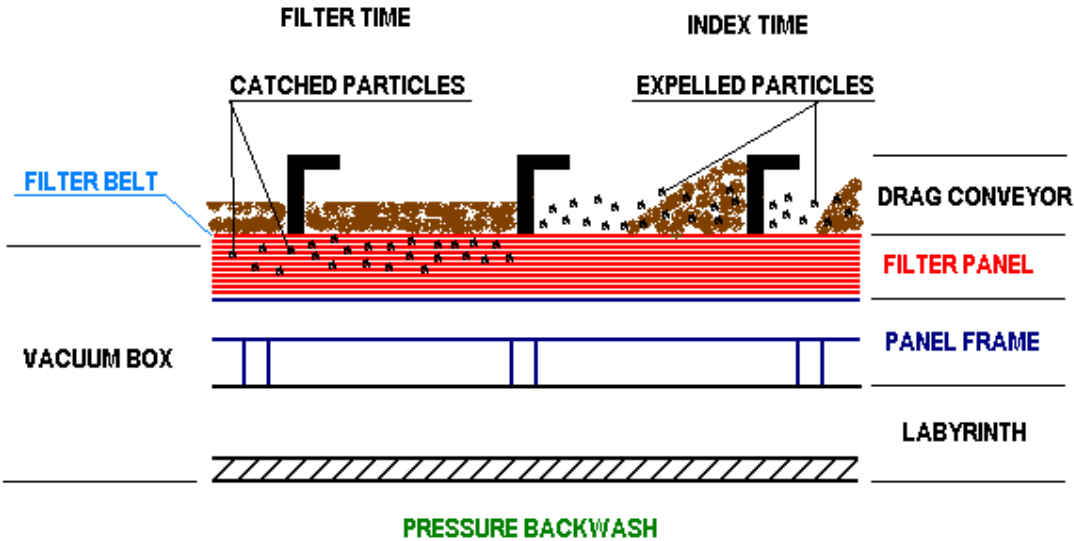
- TOTAL CLOGGING WITH NO FLOW.
THIS CONDITION IS FORESEEN BY THE ANALOGICAL SELF-REGULATION SYSTEM THAT ADVISE IN ADVANCE OF THE CRITICAL FILTER PANELS CONDITIONS IN ORDER TO PLAN THEIR REPLACEMENT.
- TOTAL CLOGGING WITH A SUSPENDED SOLID, BELOW μM , INCREASING.
IN ORDER TO PREVENT THIS CONDITION A WEEKLY LABORATORY TEST IS NEEDED TO FIND THE COOLANT SOLID CONTAMINATION EXPRESSED IN P.P.M.

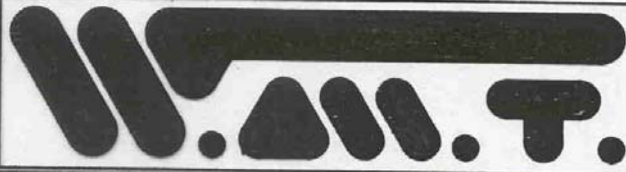
FILTER SELF CLEANING:

IN THE TRADITIONAL SYSTEM WITH DISPOSABLE OR PERMANENT MEDIA

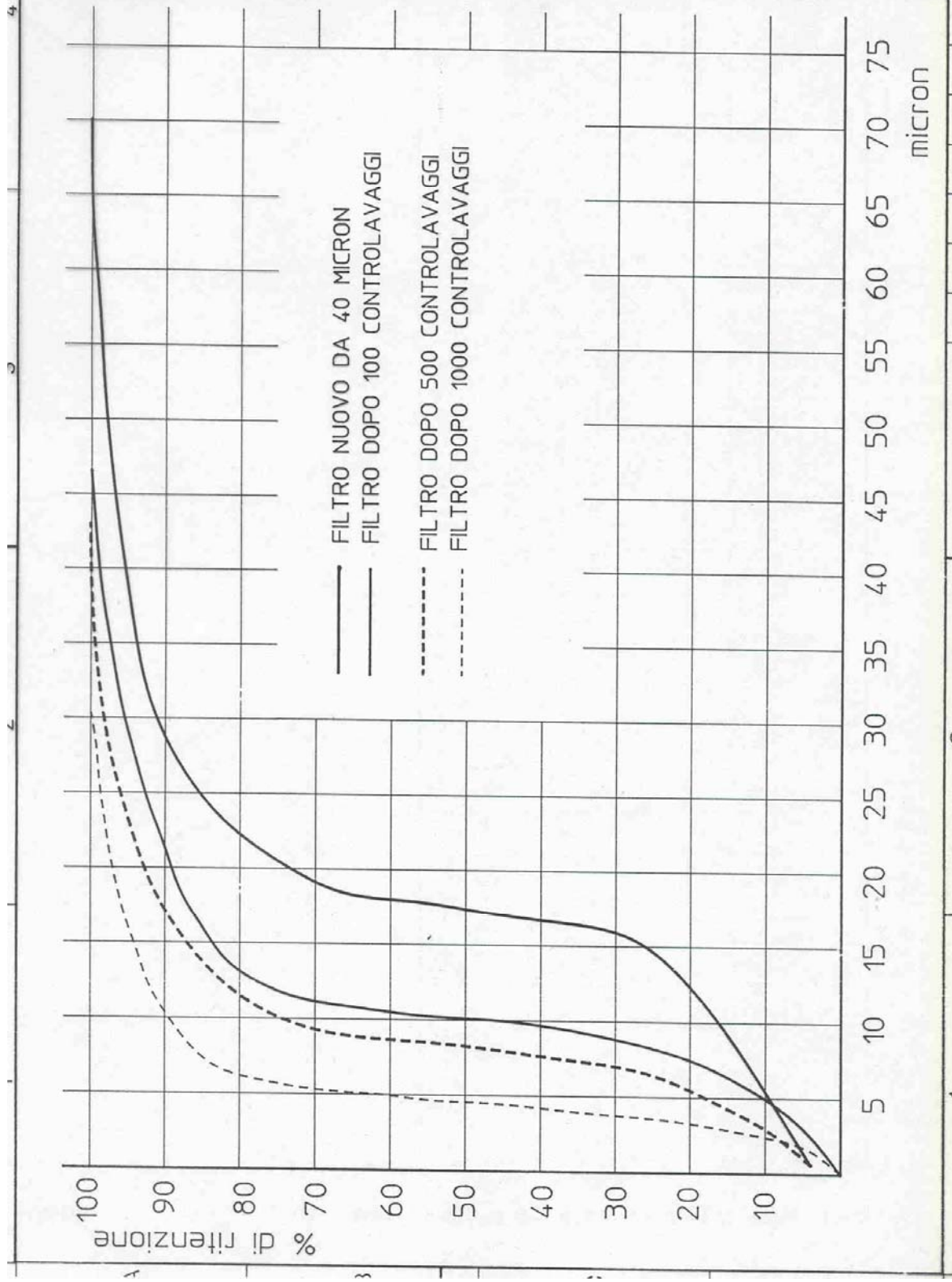


IN THE NEW LIQUID VACUUM SYSTEM





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