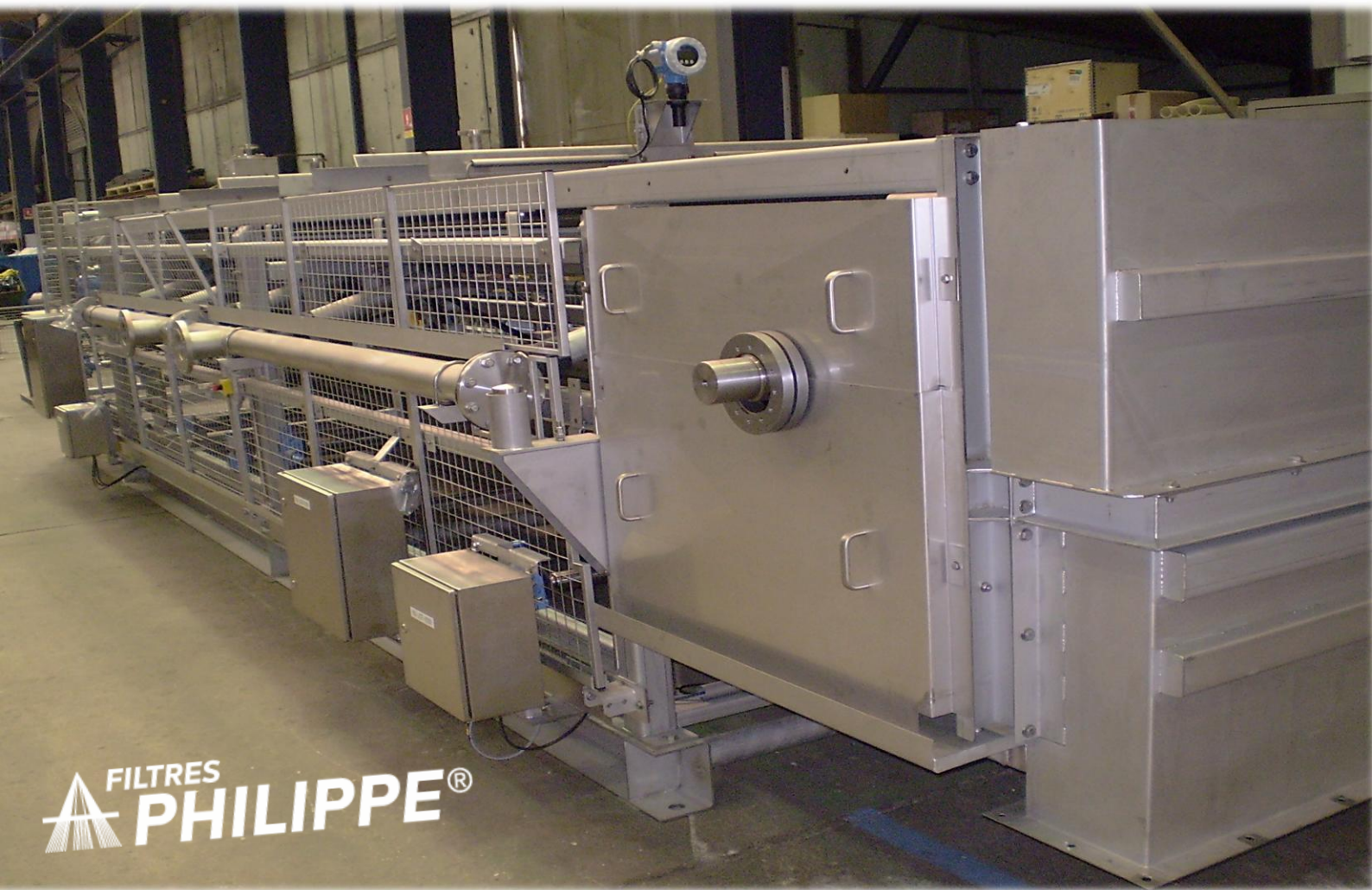




Horizontal Vacuum Belt Filter

Technical offer n° 726789_01rev4

Project : PrNd/Nd slurry filtration

Client Reference : CAREMAG

For CARESTER

31/01/2025

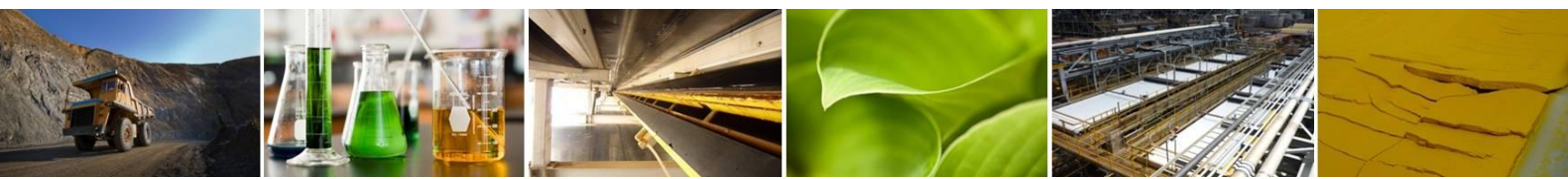
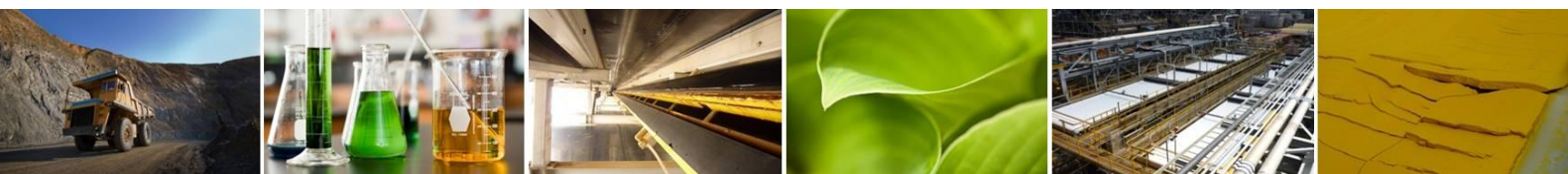


Table of Contents

Table of Contents	2
I. YOUR REQUIREMENTS.....	3
II. PROJECT BACKGROUND.....	3
III. HASLER GROUP SOLUTION.....	4
a. A solution optimized for your project	4
b. Key points of our design	5
IV. A peace of mind solution	8
V. A solution that complies with the highest HSE requirements.....	8
VI. HASLER GROUP always with you.....	9

PrNd / Nd slurry filtration	
Slurry flowrate	1,274 m ³ /h
Solids in slurry	11,7 %
Slurry density	1,137 t/m ³
Moisture	40 – 60 %
Temperature	50°C



I. YOUR REQUIREMENTS



You are about to build one of the first clean, innovative plants for **recycling permanent magnets and processing rare earths**. For processing these materials, **several stages are necessary** to obtain the right product quality (**chemical reaction, filtration, agitation, etc...**).

You consulted us on the supply of **5 filters and their accessories** (pumps, tanks, protections) to separate and wash different materials :

- PrNd/Nd : Neodyme
- Dy : Dysprosium
- Tb : Terbium
- Ho-LuY : Holmium – Lutétium - Yttrium
- SEG : Samarium – Europium – Gadolinium

So, you requested HASLER to design the appropriate vacuum belt filter that will **suit your specific needs**.

We propose the following design : it is a **reliable, efficient, and proven filtration system** that will handle your production requirements.

II. PROJECT BACKGROUND

In July 2022 you sent us a request to make a budget quotation for a belt filter to be able to filter rare earths (PrNd/Nd).

Following this initial budget offer, you came back to us in December 2022, having developed the project further, this time for the costing of **5 belt filters**.

As a result, over the last two years we have developed the project in two distinct directions :

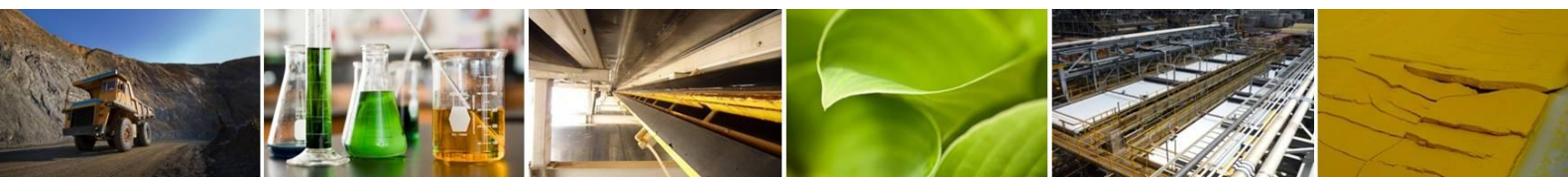
- **The technical and commercial side**
- **The process side**

As far as the technical sales side is concerned, we had a lot of discussions, both online and face-to-face.

Mr JOUAN (sales representative), Mr ROUDAUT (filtration expert) and Mr GILBERT (tender engineer in charge of this project) visited your offices at the Tour Part-Dieu several times in 2023 and 2024 to **discuss the overall project, present the various bid revisions and decide on any changes to be made**.

Mr MENIGOZ (commercial director) and more recently Mr DELATTRE (sales representative in charge of this project) also came to meet you to discuss the project.

On the process side, Mrs BALGUY, laboratory technician at Hasler France, came **to carry out trials**, with your support, in September 2023 on Processium's premises. These tests enabled us to validate certain data together, such as **the size of the various filters**.



What's more, in early 2024, you visited one of our customers, together with Mr JOUAN and Mr ROUDAUT, in eastern France, to get a better idea of **what equipment we can offer**.

Finally, you sent us the final request for proposals in November 2024. These documents contain the **completed process data**, and all the **mechanical changes** required to ensure **optimum operation** of the filtration unit.

All these discussions have enabled CARESTER and HASLER to **move forward** and **make the necessary changes** to this project, to **identify potential bottlenecks** and come up with **concrete and constructive solutions**.

III. HASLER GROUP SOLUTION



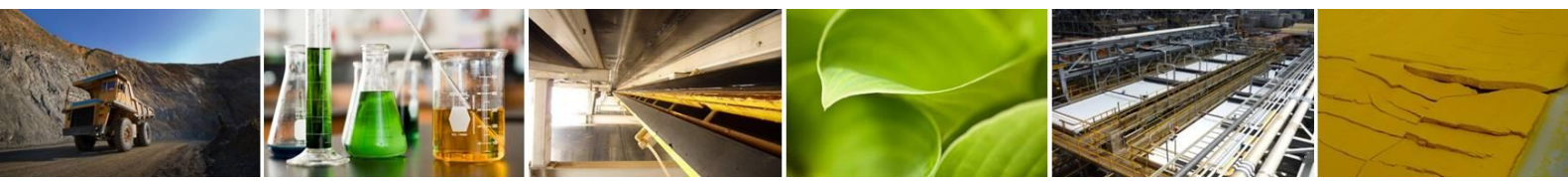
a. A solution optimized for your project

Thanks to our worldwide references in filtration, our equipment is recognized for its efficiency, capacity, and robustness.

The HASLER Group is a leader in the field of vacuum belt filtration with our brand Filter Philippe, we have **more than 100 references worldwide** and in **several applications** such as hydrometallurgy, phosphoric acid, soda ash, ...

The layout and scope of supply have been adapted to your process requirements for your plant. Moreover, our filters will be equipped with specific protection (special hood and panels) to **keep a clean and safe** work environment. We selected specific material of construction (304L, ...) for all the parts in contact with the product to prevent and avoid corrosion effects due to the slurry characteristics.

HASLER Group has been working for decades in developing and maintaining a high level of service expertise. During erection and commissioning phasis, our service technicians will supervise and assist your team. Your operational teams will benefit of our expertise and will be quickly efficiently running your unit.



b. Key points of our design

Our equipment is described in technical specifications in part VII of this technical offer.
The main operational advantages of our design are listed here below:

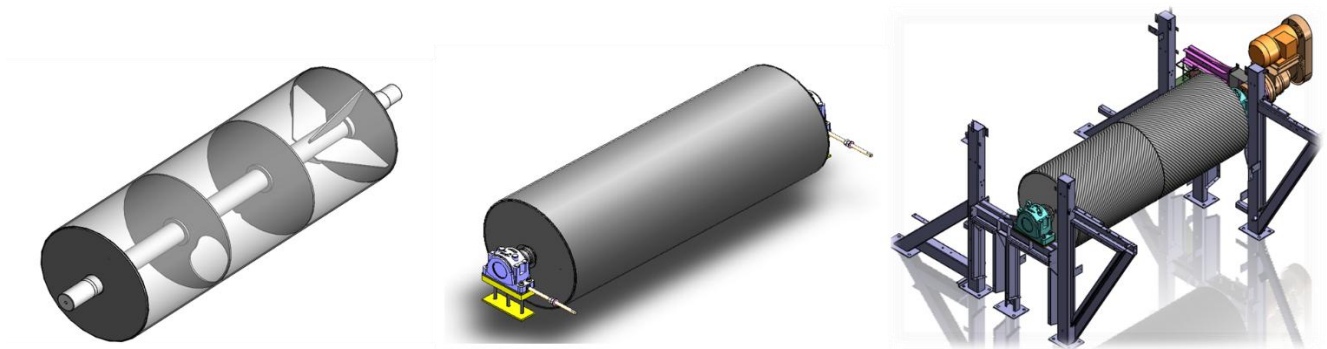


Frame

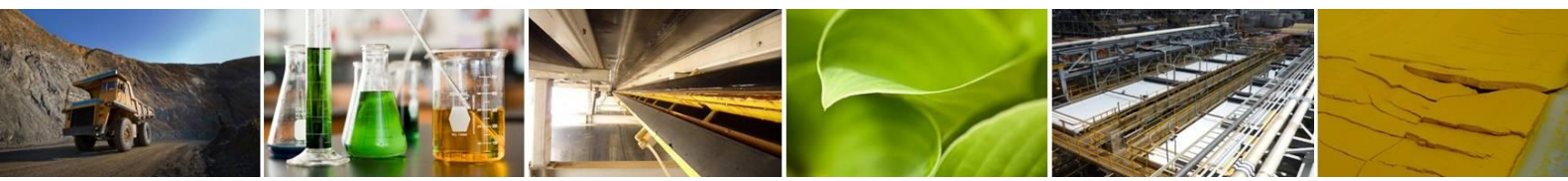


- Frame and internal parts of filter are completely bolted:
 - Easy mounting and unmounting of internal elements of the filter. It also allows to integrate an **endless belt**
 - The frame can be mounted and unmounted **without risking the flatness** of the frame.
- Optimized height between upper part of frame and ground level: **Easy access for maintenance operations**

Drive and head Pulleys



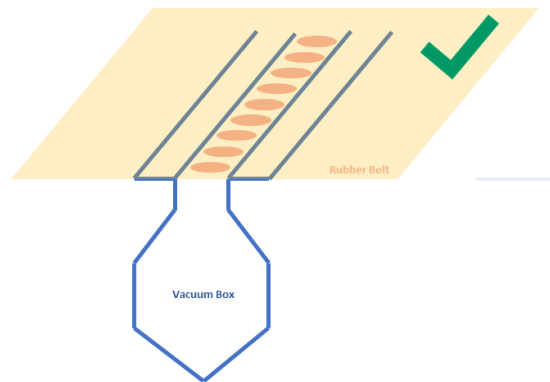
- **High rigidity design** : erases bending phenomenon on external surface
- Rubber lining on drums, flanges, and shaft offering:
 - **Durability of rubber adherence**. It limits the risk of slipping between the belt and the drums
 - Excellent **protection against corrosion** and abrasion.
- Chevron pattern on rubber lining, on drum cylinder
 - **Water evacuation** is optimized to limit belt slipping
 - Increased adherence coefficients between belt and drum

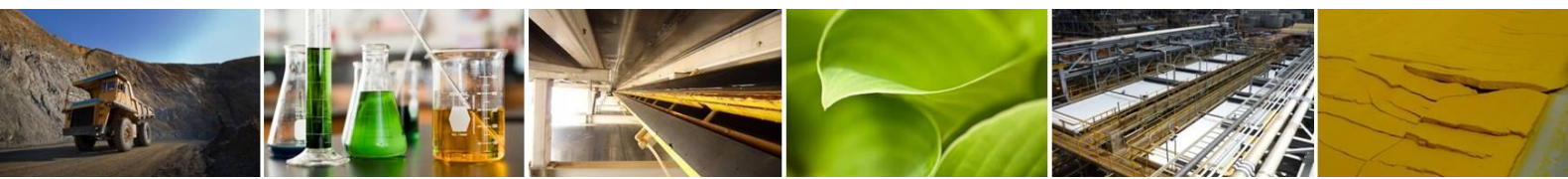


Belt

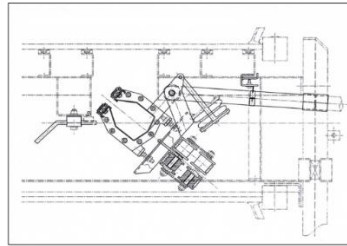


- Stabilizing, edge cutting, grooving and hole punching are done in Hasler Group French factory :
 - Endless belt ready to be installed **without any onsite stabilization**
 - **Holes on belt are perfectly aligned with vacuum box**
- Grooves sloped towards the center of the belt: **Filtrate's flow is optimized**
- Curbs have an "accordion" type profile: **No vacuum loss** and excellent cake and slurry containment



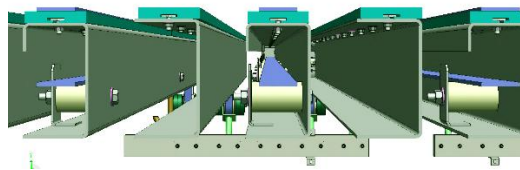


Vacuum box



- Internal movable dams allow **quick and easy set-up** in case you adapt the process
- Opening angle of 60°-65°: **Easy access and maintenance**
- Automatic opening by pneumatic jacks: vacuum box opens and tilts in 45 sec.
Inspection of vacuum box can be done in **under 30 min** without any need of special tools

Support table

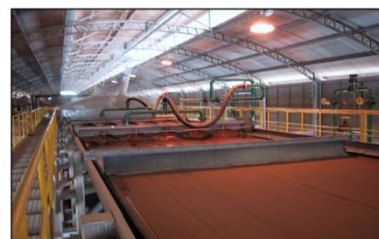


Wear Belt Table support (**Filtres Philippe Patented Design**)

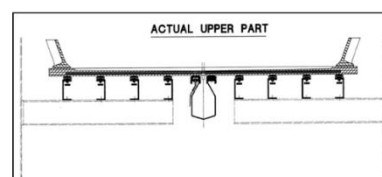
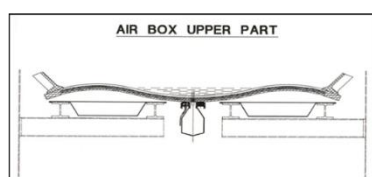
- Excellent flatness (+/- 1mm)
- No friction between table and belt with wear belt design
- **Uniform cake thickness** on all length of filter, **washing efficiency** and **filtrates recovery** are optimized

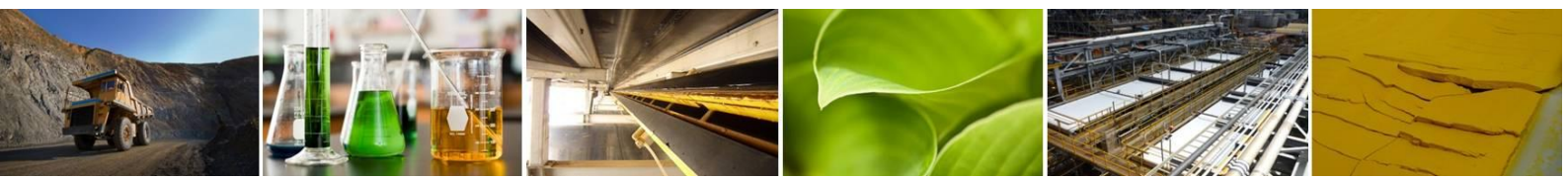


Other's design



Hasler's design





IV. A peace of mind solution



- **High availability, made for continuous processes.**

An equipment designed to reduce downtime:

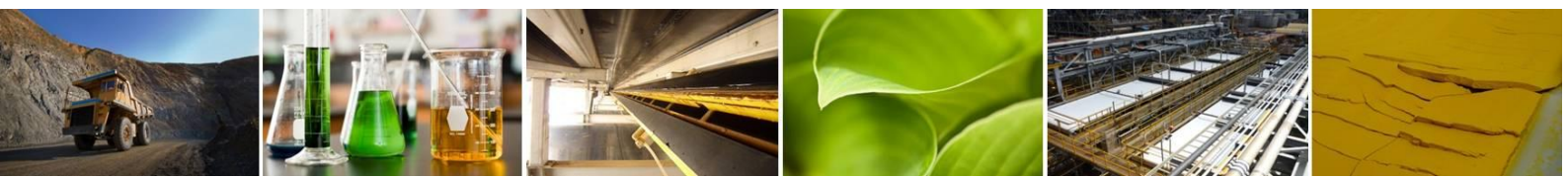
- Easy access to all the parts for **fast maintenance or process flexibility**
 - Vacuum Box **Tilting System**: access under 60 seconds with one operator
 - Belt support: **Wear Strips + Wear Belt** guaranteeing **low wear part consumption**
 - Fully **automated** (System controlled by PLC "Maintenance", Cloth Guiding & Tensioning Automatic Systems, Automatic Lubrication Units).
-
- **The complete filtration unit is designed to keep operating costs to a minimum:**
 - Low **water** consumption that can be reduced with a high-pressure cloth washing ramp
 - Low **energy** consumption: Variable speed drives, table support systems
 - Low **wear part** consumption: Table support system
 - Low **maintenance**: Fast & Easy Maintenance
-
- **Use a filter that is safer for users and more respectful of resources :**
 - Presence of a hood over the entire filter to **protect operators** (smoke, toxic fumes, etc.)
 - Splash protection (**clean working environment**)
 - Recycling of all drippings via drip pan under the filter
 - Use of counter-current cake washing to limit the quantity of washing agent required

V. A solution that complies with the highest HSE requirements



Your **health & safety** is our concern.

Safety guards are installed around the unit to prevent any risk of accident.



VI. HASLER GROUP always with you



At HASLER Group we take time to understand our activity's evolutions and to listen to our customers. Our philosophy is to focus on our customer's needs and to work with them on solutions. Services include:



**Worldwide
Support**

Local support and field engineers available worldwide



**Equipment
Upgrade**

Retrofit, Revamping of « Filtres Philippe » and Competition filtration units



**Laboratory
Tests**

Laboratory Tests in our research centre or at customer's site
Sizing of filtration units



Spare Parts

Fast & Worldwide Supply of high quality OEM spare parts



**Process
Optimization**

Process Audits performed by engineers to troubleshoot, debottleneck or optimize the equipment



Training

Training centers, On Site Training and Webinars



TECHNICAL SPECIFICATION FOR "PHILIPPE" VACUUM BELT FILTER

CLIENT	CARESTER
JOB REF	CAREMAG
QUOTATION N°	726789_2B5-01rev4
PRODUCT	PrNd/Nd slurry filtration
SELECTED FILTER	VACUUM BELT FILTER 2 m ²
WIDTH	500 mm
TYPE	2B5 - SERIE 2
DATE	31/01/2025

TABLE OF CONTENT

TECHNICAL DESCRIPTION OF PHILIPPE FILTER

Design features
Painting
Limit of supply

COMPLEMENTARY EQUIPMENTS AND SERVICES

Appendix "Fume Hood"
Appendix "Drip Pan"
Appendix "Filtrate receiver"
Appendix "Cyclone"
Appendix "Vacuum Pump"
Appendix "Filtrate Pump"
Appendix "Splash protection system"
Appendix "Steam Box"
Appendix "Local Control Panel"
Appendix "Erection on site"
Appendix "Commissioning on site"
Appendix "Site Acceptance Test"

DRAWINGS FOR "PHILIPPE" VACUUM BELT FILTER

PFD
General assembly drawing for information only



TECHNICAL DESCRIPTION OF "PHILIPPE" VACUUM BELT FILTER

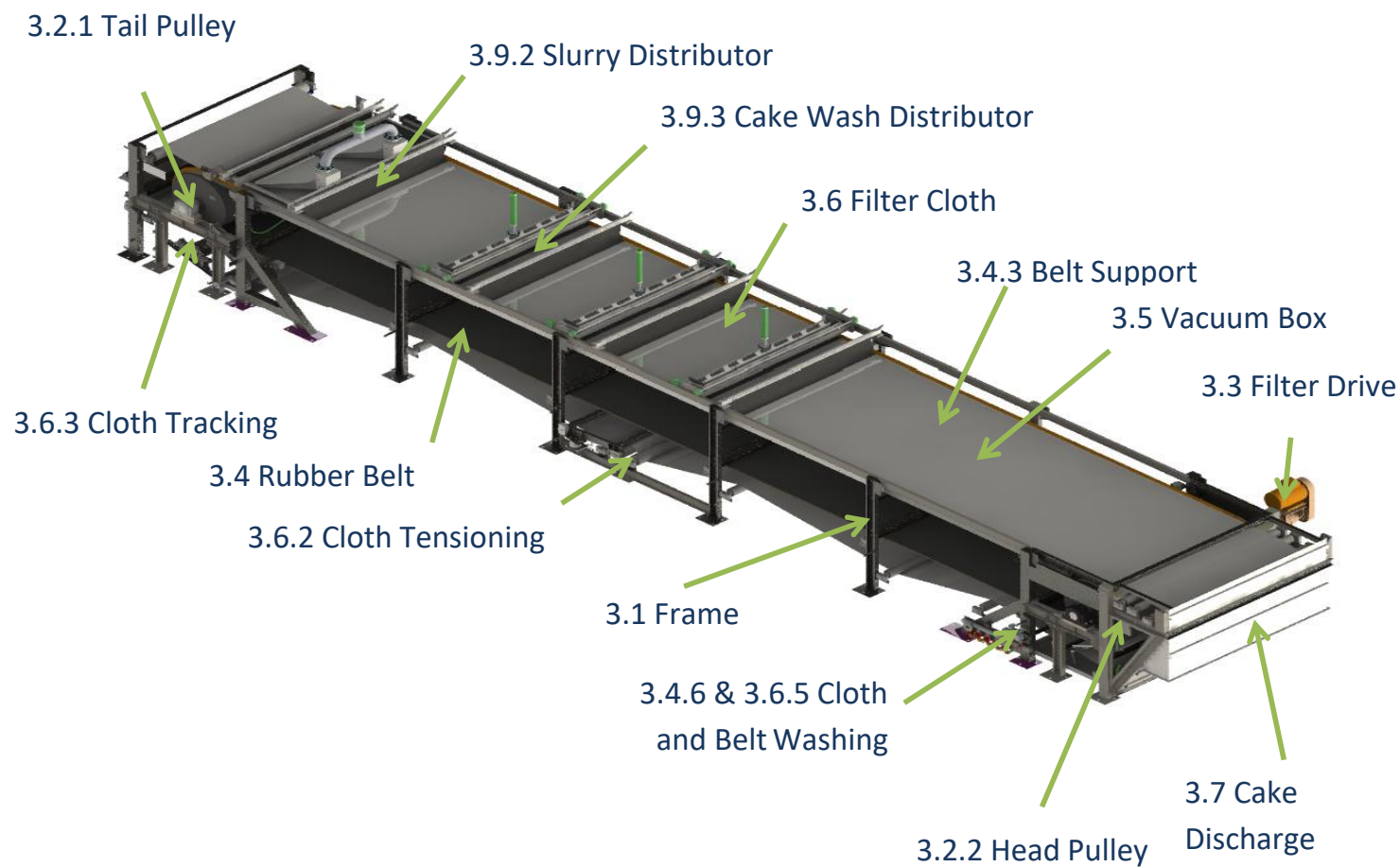
CLIENT	CARESTER
JOB REF	CAREMAG
QUOTATION N°	726789_2B5-01rev4
PRODUCT	PrNd/Nd slurry filtration
SELECTED FILTER	VACUUM BELT FILTER 2 m ²
WIDTH	500 mm
TYPE	2B5 - SERIE 2
DATE	31/01/2025

TABLE OF CONTENT

1. Main features
2. Utilites
3. Filter specifications
 - Frame
 - Pulleys
 - Drive
 - Rubber belt
 - Vacuum box
 - Filter cloth
 - Cake discharge
 - Fluid distribution
 - Process equipments
 - Electric & control equipments
 - Standard for connection
4. Painting specifications
5. Battery limits & exclusions
6. EC declaration of integration & safety personal protections



TECHNICAL DESCRIPTION OF "PHILIPPE" VACUUM BELT FILTER





1. MAIN FEATURES

1.1. ACTIVE FILTERING AREA: 2 m²

1.2. GENERAL DIMENSIONS

- Width under vacuum: 500 mm
- Length under vacuum: 4000 mm
- Total width (without drive unit): 1150 mm
- Total length: 7130 mm
- Total height (without slurry distributor): 1560 mm

1.3. WEIGHT

- Weight of the filter: See General Assembly

2. UTILITIES

2.1. ELECTRICITY

Belt drive electrical motor

- Voltage: 3 x 400V (HASLER' standard)
- Frequency: 50 Hz (HASLER' standard)
- Control/instrumentation voltage to be confirmed Refer to the part "LOCAL CONTROL PANEL"

2.2. WATER

- Filter cloth washing. Three spray bars in operation.
- Minimum pressure at manifold: 3 bars
- Flow in operation:
 - Cake side flow: 1,54 m³/h
 - Opposite side flow: 0,58 m³/h
 - Rubber belt washing: 0,86 m³/h
 - Vacuum box wear belts lubrication (1 bar): 20 L/h to 80 L/h
 - Belt support wear belts washing (1bar): 55,2 L/h

NOTE: For belts lubrication, free solids clean water is required.



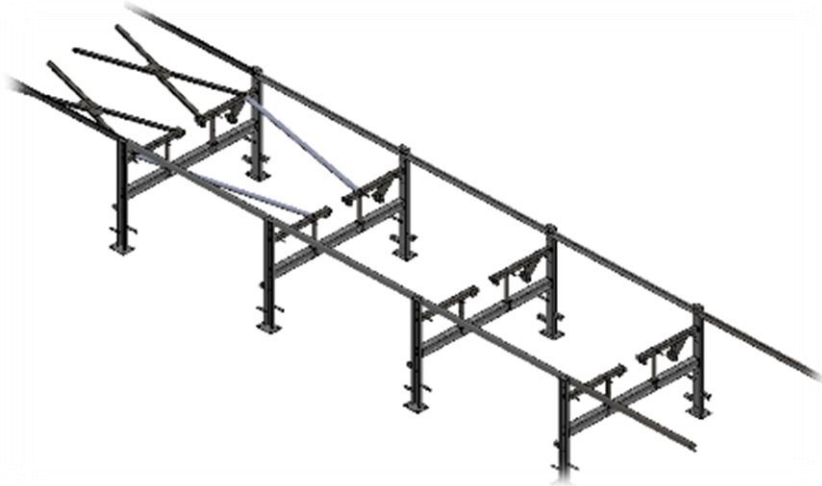
2.3. COMPRESSED AIR

Vacuum box tilting, cloth guiding and tensioning

- Flow: 4 Nm³/h - Pressure 5 bars
- Quality: filtered - oil free

3. **FILTER SPECIFICATIONS**

3.1. FRAME



The filter included consists of a high quality steel frame constructed of standard structural sectional members and sheet steel sections bolted and welded to form a composite structural framework.

- Material of the frame: 304L
- Material of the sheet: 304L
- Material of the bolt and nuts: 316

The frames includes:

- Two modules at each end of the filter support the head and tail pulleys, the drive unite, the cake disposal elements, the cloth and belt washing system, the cloth tracking equipment.
- Intermediate frames evenly spaced support the belt support table, the vacuum box and its tilting system, the filter cloth and belt return rollers, guide and rails for the movable devices (feed distributor, dams, wash throughs).

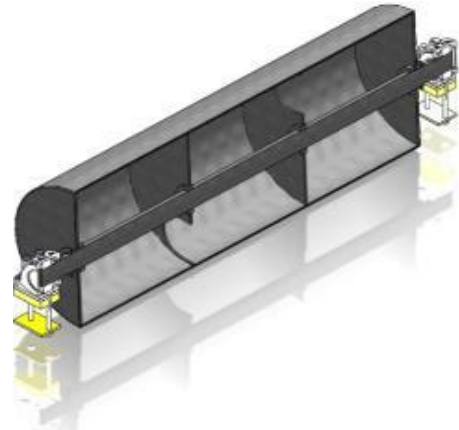
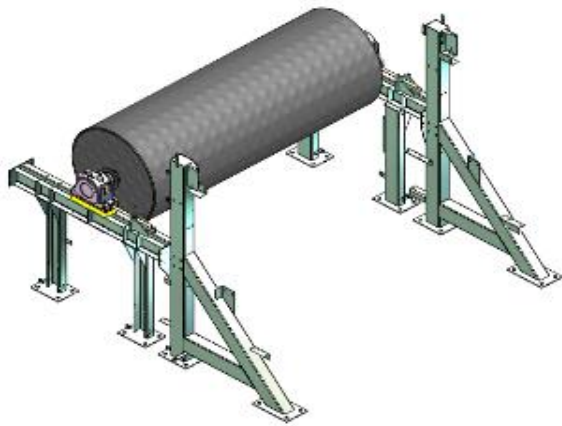
Special features

- **The frame is made of standard profiled structural steel and is fully bolted. This allows the easy replacement of structural members if needed.**
- **Frame can be mounted and dismantled without any risk of change in final result.**
- **This technology allows the supply of an endless belt for the first mount as well as replacement.**



3.2. TAILS AND HEAD PULLEYS

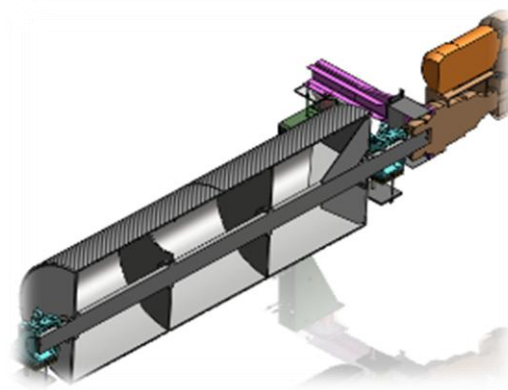
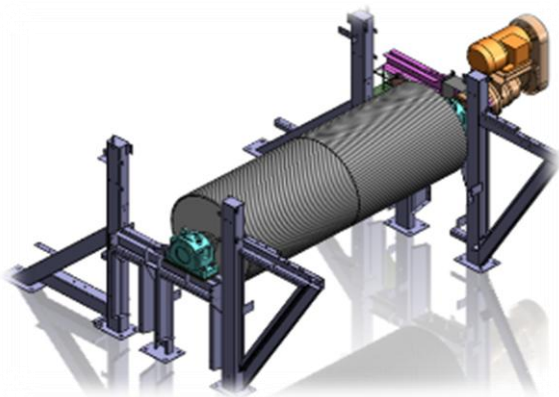
3.2.1. Tail pulley



Supported by two tensioning and water - tight swivel- bearing blocks

- Diameter of pulley: 630 mm
- Material of pulley body: SS304L
- Material of shaft: SS304L
- Drip proof disc to protect the bearing blocks
- Lining: Rubber SBR - 65 shore
- Thickness
 - Shells: 10 mm
 - Flanges: 5 mm

3.2.2. Head pulley



Supported by two water-tight swivel - bearing blocks

- Diameter of pulley: 630 mm
- Material of pulley body: SS304L
- Material of shaft: SS304L



- Drip proof disc to protect the bearing blocks
- Lining: Rubber SBR - 65 shore with a chevron design for belt driving
- Thickness
 - Shells: 10 mm
 - Flanges: 5 mm

Special features

- **One single through steel shaft :**
 - Provides stiffness of the assembly
 - Eliminates torsion on the external surface
- **External surface, side flanges & shaft covered with hot vulcanized rubber:**
 - Perfect adherence of the rubber and durable protection against corrosion
 - Allows final machining to have pulleys in a perfect horizontal position
- **Drip-proof discs mounted on shafts**
 - Protection of bearings from corrosion

3.3. FILTER DRIVE

The filter drive includes the following components:

3.3.2. Electric motor

- Absorbed power: 0,29 kW
- Installed power: 0,37 kW
- Type: Cast-iron body – TEFC – IM1001 (B3)
– 4 poles - IP 55 – CI F/B - IE4
3 x 400V (HASLER' standard)
F/B (HASLER' standard)
- Voltage:
- Insulation:
- Brand:
 - IEC standard: WEG or ABB, SIEMENS
 - NEMA standard: WEG or TECO WESTINGHOUSE
- Painting: Refer to Part "4. Painting Specifications"
- Belt speed: From 0,17 m/min to 2,04 m/min

3.3.3. Planetary gear box

It is fixed on the shaft of the filter head pulley. The gear box is locked in rotation by means of torque handle. The torque is controlled by the dynamometric handle acting on a limit switch in order to protect the gear box and the filter against overload.

Gear unit is design for 50 000 hours / 0,29 kW

- Constant output torque: 2328 Nm
- Safety factor: 1,3 x Power installed
- Brand: BREVINI, (or equivalent.)
- Painting: Refer to Part "4. Painting Specifications"

NOTE

If other choices are requested, an option will be offer and price adjusted.



3.4.

RUBBER BELT



On its upper surface, the belt presents transversal grooves which allow the liquid to flow towards oblong holes drilled in their axis (one oblong hole per groove).

- Number of belt per filter:	1
- Material:	EPDM
- Width (Useful):	500 mm
- Top cover thickness:	10 mm
- Bottom cover thickness:	4 mm
- Overall thickness:	18,5 mm
- Material of the carcass:	Polyester
- Drilling zone:	without carcass
- Number of plies:	4
- Weight of the rubber belt:	171 kg

Special features

- **The belt is delivered endless; it is fully machined in HASLER Group factory, controlled and ready to run.**
 - The belt is installed on our dedicated machine and run to remove mechanical stress.
 - Carcass is located via our dedicated machine, so that holes are drilled in the centre of the belt, not overlapping with the carcass. Holes are perfectly aligned.
- **Drilling and grooving are made according to customer's process requirements.**
 - Width and depth of slopes as well as step of grooves and belt thickness are optimized according to customer's requirements. Dimensions of holes also follow that rule.
 - Oblong holes are preferred to round holes in order to avoid fragility in the centre of the belt.
- **Not suitable for washing with nitric acid**



3.4.1. Grooving

Manufactured in our plants with a slope towards the oblong holes.

- Pitch: 14 mm
- Width: 7 mm
- Depth: 7 mm
- Drilling oblong holes: 6 x 10 mm

3.4.2. Belt curbs

- The curbs are made of Natural Rubber and cold bonded on the belt sides to form a containing wall.
- Type: Undulating section with and high flexibility obtained from casting. The design was patented by HASLER Group/Filtres Philippe. It's "accordion" shape provides a good support of the filter cloth, a good tightness at the bottom as well as high flexibility when passing over the pulleys.
- Height of rubber curb bonded to the belt: 70 mm

3.4.3. Belt support on upper side (active part)

The rubber belt support device ensures any contact between the rubber belt and the frame support and protects the rubber belt against wear. The support table is constituted by set of steel sections. The top of these steel sections is covered by HMWPE sliding strips and a set of endless wear belts driven by the rubber belt, slide on. An automatic take-up device allows to compensate the stretch and maintain each belt under tension.

- Steel frame sections: 304L
- Sliding strips: HMWPE
- Endless wear belts: Polyester reinforced rubber with PE sliding side
- Dimensions of belts (W x T): 30 mm x 5 mm
- Support distribution : 2 x 2 sections (on each side of the vacuum box)

Special features

- **Belt supporting system provides optimum flatness, hence maximizing cake washing efficiency and recovery of filtrates.**
- **Best solution to reduce belt wear and low cost of spare parts (wear belts and sliding rules).**
- **Doesn't require blowers and air boxes (air support table) nor important amount of water (water support table).**



3.4.4. Belt support on return side

By rollers supported by water-tight ball bearing blocks.

- Material of roller: 304L
- Diameter of roller: 219 mm

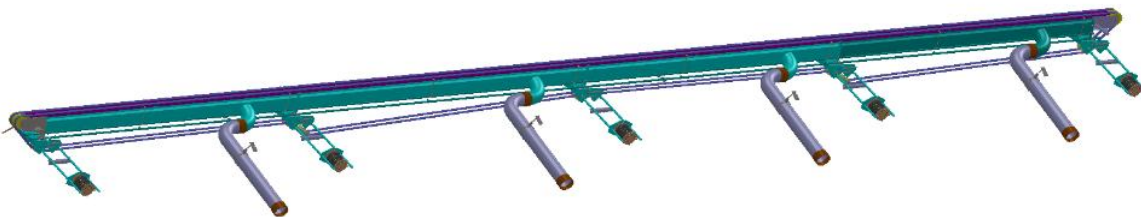
3.4.5. Belt tracking

- Roller made of HMWPE fitted on shaft.
- Diameter of roller: 100 mm
- Shaft: 316L

3.4.6. Rubber belt washing

- 2 wash headers fitted with spray nozzles
- Construction:
 - Wash pipes: 304L
 - Spray nozzles: PVDF
- Wash collection trough
 - Material: 304L
 - Outlet pipe connection: DN50, flexible hose to cloth trough

3.5. VACUUM BOX



- Number: 1
- Type: Omega section with special articulated support mechanism
- Body is constituted of several pieces, flange-jointed.
- Construction:
 - Body of the box: 304L
 - Supporting parts: 304L
 - Sliding strips, made of UHMWPE, and supporting :
- Endless wear belts, made of rubber, with polyester down sliding side
 - Number: 2
 - Wear belts supporting rollers: UHMWPE



- Size of wear belts
 - Width: 38 mm
 - Thickness: 10 mm
- Filtrate / gas nozzles
 - Number: 4
 - Connection: DN65
- Connection from vacuum box nozzles to the external frame side made by means of :
 - Elbows to allow the rotating during vacuum box tilting operation.
 - Material of pipe connection: 304L
 - Connection with the others: EPDM sleeve
- Maintenance:

The tilting system for the vacuum box allows the access for inspection, cleaning and parts replacement. Powered raising and lowering mechanism consist of an articulated frame pneumatically driven. It is operated by a pneumatic bellow after unclamping.

During operation the vacuum box is clamped in the normal working position.
- If required by process, vacuum box is equipped with movable internal baffles for separating the filtrate ports. The number of baffles is equal to the number of sections minus one.

3.6. FILTER CLOTH

- Type: Monofilament or/and multifilament
- Material: Polyester or polypropylene

Endless joining of the cloth is made by means of ultrasonic welding process. The welded cloth is installed with the help of a fitting up constituted by a winding with a tension-ratchet, fitted on of the filter feed end frame.

3.6.1. Cloth rollers, supported by water-tight ball bearing blocks, consisting of:

- One cloth positioning roller with caps at the ends to bend the cloth on each side.
- Diameter of roller: 60,3 mm
 - Material of roller : 304L
- One set of exit rollers.
- Diameter of roller: 60,3 mm
 - Material of roller : 304L
- One set of cloth rollers on return circuit.
- Diameter of roller: 60,3 mm
 - Material of roller : 304L
- **Not suitable for washing with nitric acid**



3.6.2. Cloth tensioning



Obtained by a framework supporting a cloth roller pneumatically driven.
Regulation and operating of this system by means of adjustment of the air pressure in the pneumatic bellow.

- Number: 1
- Framework: 304L

Special features

- **Fully automatized system, high accuracy and reliable adjustment.**
- **No counterweights required.**

3.6.3. Take-up device

Obtained by means of a roller fitted on set of rails at the feed end of the filter and moving vertically.
Take up length is approximately 800 mm.

3.6.4. Cloth tracking



The system is made of 2 main pinches which put a pressure or not on the cloth and control its tracking.
The control of the pressure is made thanks to 2 sensors on both sides of the cloth.

- Number of pinches: 2
- Type of pinche: Made by 2 rollers (1 static and 1 movable)
- Material of rollers: 1 x Stainless steel and 1 x Polyurethane



Special features

- Long operational life, no bearing wear as bearing blocks are not used as pivot.
- Pneumatically driven, very soft action on the cloth.

3.6.5. Filter cloth washing

- 3 wash headers fitted with spray nozzles
- Construction:
 - Wash pipes: 304L
 - Spray nozzles: PVDF
- Wash collection trough
 - Material: 304L
 - Outlet pipe connection: Flat welding flange, norm according to CARESTER's requirement.

3.7. CAKE DISCHARGE

- Discharge roller 168,3 mm
- Diameter of roller: 168,3 mm
- Construction:
 - Cake discharge hopper 304L
 - Scraper Polyurethane

3.8. FLUIDS DISTRIBUTION

3.8.1. Compressed air circuit

1 cabinet for control of the cloth tracking, cloth tensioning and vacuum box tilting.

- Marina IP 55
- Compressed air connection on cabinet: 1/4 " threaded hole or 1/2 " NPT
- Air pressure regulator: Brand NORGREN
- Valves: Polypropylene
- Distribution pipes inside the filter
 - Material of pipes: Polyethylene
 - Material of fittings: Polypropylene



3.8.2. Belt and cloth washing

- A manifold piping with outlets and valves
 - Manifold connection: Flat welding flange, norm according to customer requirement.
 - Manifold: 304L
 - Valves: Membrane type, body made of cast iron, EPDM membrane.
 - Hoses: High quality rubber hoses
- Outlets distribution:
 - Cloth and belt washing: 5
 - Wear belts lubrication: 2

3.8.3. Vacuum piping

3.8.3.1. Filtrate internal pipes for connection from vacuum box to the filter side

- Diameter: DN65
- Quantity: 4
- Material: 304L
- Connection: Pipes with EPDM sleeve, smooth pipe

3.8.3.2. Vacuum manifold between above pipes and filtrate receivers

It is divided in tight zones by an obturator between two flanges.

- Number of section: 3
- Diameter: DN65
- Inlet connection: 4 x DN65
- Outlet connection: 3 x DN65
- Material: 304L

Pipes with EPDM sleeve for connection.

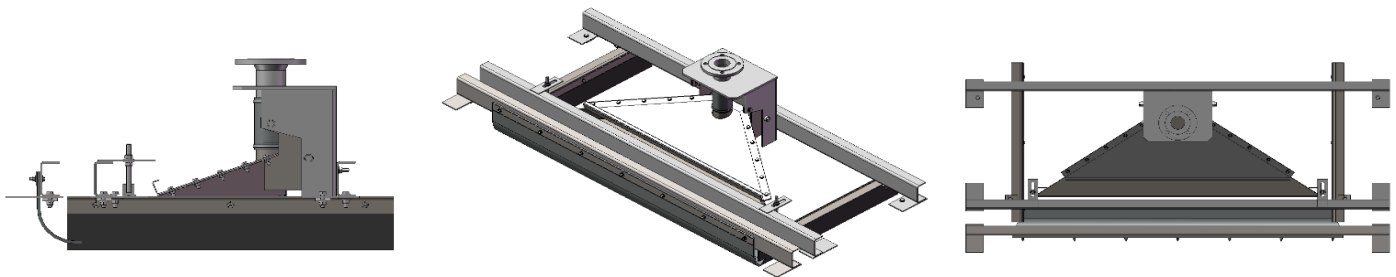
3.9. PROCESS EQUIPMENT

3.9.1. Slurry entrance dam and apron

- Apron: Rubber
- Support: 304L
- Number: 1



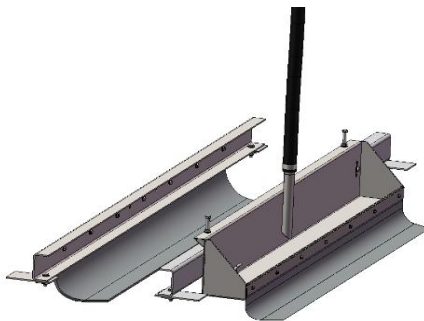
3.9.2. Slurry distributor



Fish tail feeder especially designed to spread PrNd/Nd slurry filtration slurry product on the filter width.

- Material: 304L
- Number/Connection: 1 x 25 mm
- Lateral protections of the feeding area by rubber aprons.

3.9.3. Cake wash distributor



The distributor is adjustable and locked in position on the frame by brackets. It can be moved on the frame when unscrewing the locking system.

- Material: 304L
- Connection: 3 x 20 mm
- Number: 3

3.9.4. Pendular dam (separation dam)

- Type: Pendular
- Apron: Rubber
- Support: 304L
- Number: 4



3.10. STANDARDS FOR CONNECTION

- With CARESTER: According to CARESTER's requirement.
- Internal: EPDM sleeve on smooth

3.11. SITE CONDITIONS

As per request or to be defined later.

- Geographic zone:
- Altitude:
- Temperature: +5 to +40°C
- Humidity: 60%

NOTE: The complete filtration unit (filter with associated equipment) has to be installed in a non - freezing zone with a minimum ambient temperature of 5°C (41°F).

3.12. ANCHOR BOLTS

Anchoring elements for the filters (anchor rods, dowels, etc.) will be supplied by HASLER Group.



3.12. ELECTRICAL CONTROLS AND SECURITIES

3.12.1. List of sensors included into the filter

- Emergency stop rope (left/right)	NB : 2 – HS01/HS02	Code 1-5
- Cloth misalignment (left/right)	NB : 2 – ZS03/ZS04	Code 1
- Cloth tension (min./max.)	NB : 2 – ZSL01/ZSH02	Code 2
- Belt drive unit overtorque	NB : 1 – WSH01	Code 1
- Belt misalignment (left/right)	NB : 2 – ZS05/ZS06	Code 1
- Ultrasonic cake measure thickness	NB : 1 – LIT01	Code 7
- Slurry level control	NB : 1 – LSH01	Code 7
- Cloth run-off	NB : 1 – SSL01	Code 2
- Pressure transmitter		
• Compressed air circuit	NB : 1 – PIT01	Code 3
• Water circuit	NB : 1 – PIT02	Code 3
- Electromagnetic Flowmeter		
• Vacuum box lubrication	NB : 1 – FIT01	Code 4
• Type:	Electromagnetic flowmeter	
• Cloth&Belt washing	NB : 1 – FIT02	Code 4
• Type:	Electromagnetic flowmeter	

Signal codification

Code 1 – 1 SPST (NC if not acted)

Code 2 – inductive sensor 2 wires (NC if not acted)

Code 3 – 4-20mA HART signal

Code 4 – 4-20mA HART signal

Code 5 – include one second SPST to be separately and directly wired in the belt drive motor main contactor coil control circuit.

Code 7 – 4-20mA HART signal

All our transmitters used the 4-20mA HART signal.

The here above controls will be wired on one junction box fitted on the belt filter frame. This box will include one terminal block, one grounding copper bar and cable gland fittings.

Cables and terminals labelling will be in accordance with the electrical scheme identifications numbers.

LIMIT OF SUPPLY

Security and functioning of the equipment controlled by the customer's PLC/DCS according to the logic diagrams supplied by HASLER Group. Software programming works by the customer.

All the control and instrumentation cables, conduits and gland fittings not installed in the HASLER Group's workshop will be supplied and installed on site by the customer.

Wiring up to the junction box. After the junction boxes, this is a supply from CARESTER.



3.12.2. Standard list of suppliers

MATERIAL	TYPE	BRAND	REMARKS
Emergency stop trip wire switch	XY2-CE1A270TK XY2-CE2A270TK	Schneider Electric Télémécanique	
Electromechanical limit switch	ZCK-J1TK ZCK-E61TK	Schneider Electric Télémécanique	
Inductive sensor	IB0016	IFM Electronic	20 ... 250 Vca/cc
Pressure switch	B4	Ashcroft Dresser	Wetted parts st. steel 316
Variable area flowmeter	865	Gemü	With reed switch sensor Type 1251/1256
Junction box enclosure (JB)	Série KS	Rittal	GRP IP66 (IEC 529) Nema 4x
Terminal blocks (JB)		ENTRELEC or WEIDMÜLLER	
Cable gland fittings	Polyamide	Capri or Lutze	JB and sensors
Control and instrumentation cables	1,5 mm ² (AWG16)	HELUKABEL	300/500V DIN/VDE - SEV 600V-90° UL / CSA
Cake thickness transmitter	Ultrasonic sensor type FMU40	Endress Hauser	Signal 4-20mA HART

4. PAINTING SPECIFICATIONS

According to Hasler Group and sub- suppliers standard.

NOTE: In case of modification of the process or the colour, HASLER Group will have to be notified no later than 1 month after the order (can be subject for extra prices).



5. BATTERY LIMITS AND EXCLUSION

5.1. BATTERY LIMITS

The equipment includes everything necessary inside the battery limits for a normal operation of the filter. The battery limits shown on the general assembly drawing are:

- Flange of the slurry distributor
- Flanges of the wash distributors
- Rubber sleeves of the filtrate pipes
- Flange of the cake discharge hopper
- Flange of the filtrate manifold
- Flange of the water manifold
- Flange of the vacuum pump
- Flange of the filtrate pumps
- flange of the Filtrate receivers
- flange of the tanks
- Air inlet at the entrance of the pneumatic cabinet
- Terminals of the accessories electrical box

5.2. EXCLUSION

- Civil work
- Support steelwork
- Operating platform
- Electrical and wiring
- MCC or electrical cabinet
- Inspection by independant authorities
- Unload, warehousing and handling on site
- Painting on site

5.3. MODIFICATIONS

The technical specifications described in this agreement cannot be modified without HASLER Group consent.

6. EC DECLARATION OF INTEGRATION & SAFETY PERSONNEL PROTECTION

HASLER Group will deliver an EC declaration of integration and not a certificate.

That means that the equipment described above is destined to be integrated or assembled in a general arrangement or to be added to other equipment in integral running with each other.

In consequence, the start-up of this equipment is forbidden as long as the general arrangement in which, it will be integrated or all of integral equipment in which, it must be assembled, are not in compliance with the provisions of directive 98/37/CEE or in compliance with the National provisions for transposition of this directive in the country of start-up.

According to EC standard, safety personnel protections have to be installed all around the filter. HASLER GROUP will provide safety guards all around the filter.



COMPLEMENTARY EQUIPMENTS & SERVICES FOR "PHILIPPE" VACUUM BELT FILTER

CLIENT	CARESTER
JOB REF	CAREMAG
QUOTATION N°	726789_2B5-01rev4
PRODUCT	PrNd/Nd slurry filtration
SELECTED FILTER	VACUUM BELT FILTER 2 m ²
WIDTH	500 mm
TYPE	2B5 - SERIE 2
DATE	31/01/2025

TABLE OF CONTENT

COMPLEMENTARY EQUIPMENTS AND SERVICES

Appendix "Fume Hood"
Appendix "Drip Pan"
Appendix "Filtrate receiver"
Appendix "Cyclone"
Appendix "Vacuum Pump"
Appendix "Filtrate Pump"
Appendix "Splash protection system"
Appendix "Steam Box"
Appendix "Local Control Panel"
Appendix "Erection on site"
Appendix "Commissioning on site"
Appendix "Site Acceptance Test"



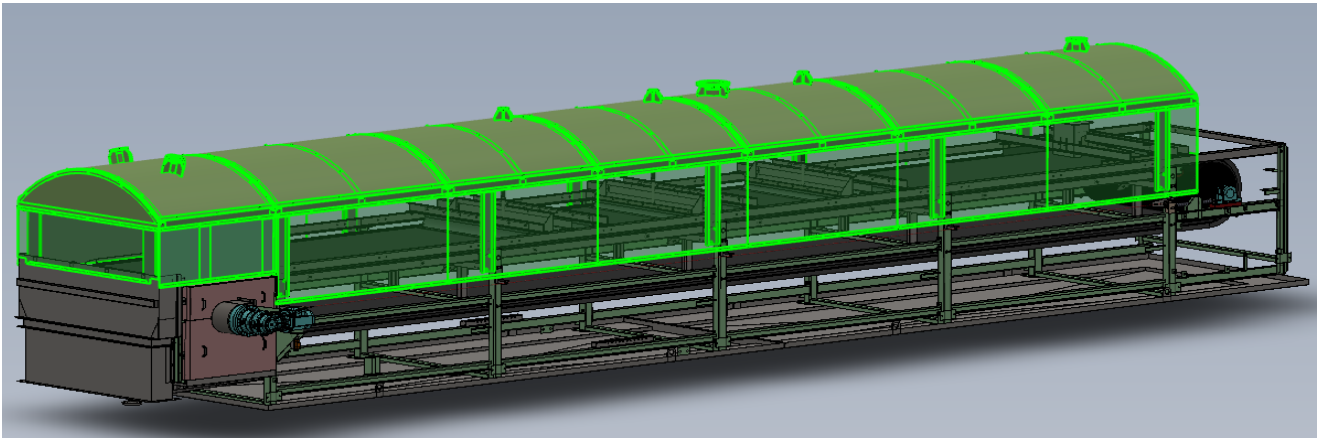
Appendix "FUME HOOD"

FUME HOOD

It covers the whole or part of the filter active area. The housing structure is made of steel section number and supported by the filter frame. The top is made of polypropylene plate.

On each side, there is a full openings for easy access to wash through and dams. This openings are blinded by translucent PVC sheets.

- | | | |
|------------------------------------|------------------------|-------|
| - Frame material: | 304L | |
| - Total length: | 7130 mm | |
| - Exhaust flowrate to be foreseen: | 1300 m ³ /h | (TBC) |
| - Outlets | 2 x 200 mm | |
| - Exhaust fan and piping: | Excluded | |



Appendix "DRIP PAN"

It collects drips below the filter. It is made of PPH.

- | | |
|--------------------|---------------------------------------|
| - Material: | PPH |
| - Location: | Below the filter |
| - Outlet number: | 1 (TBC) |
| - Outlet diameter: | To be defined in engineering |
| - Total length: | Under the entire length of the filter |



Appendix "FILTRATE RECEIVER"

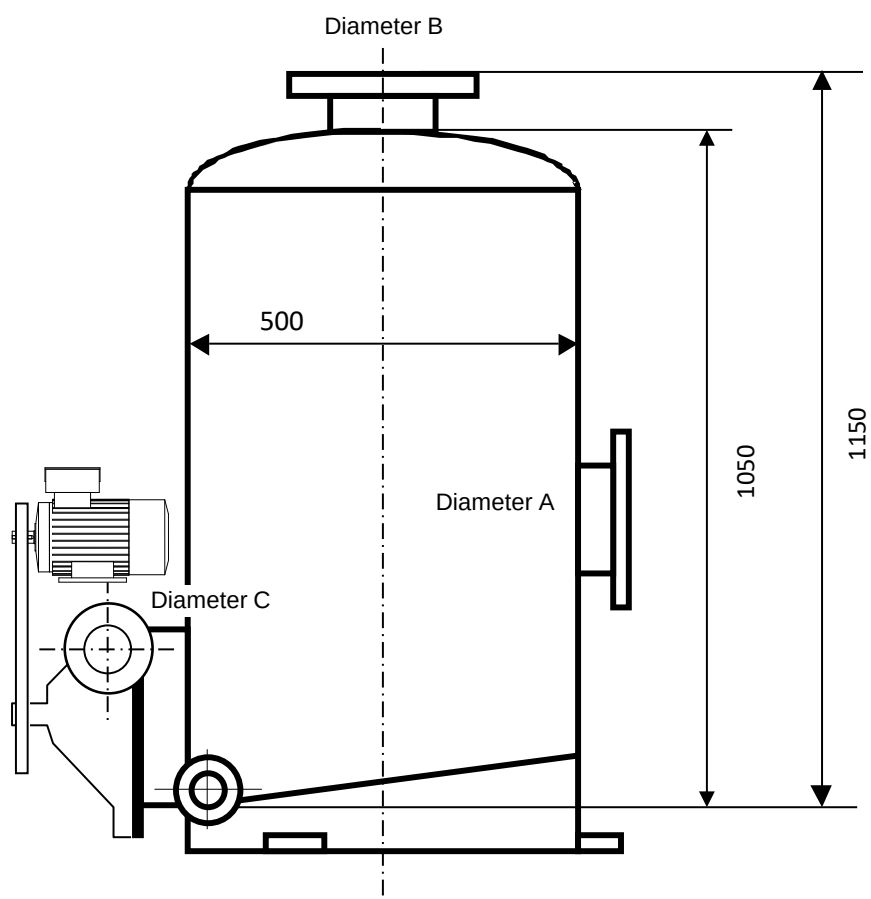
- Material: 304L
- Diameter: 500 mm (TBC)

Equipment

- Supporting legs: Excluded
- Connection "A": 65 mm
- Connection "B": 65 mm
- Connection "C": 32 mm

Other connections

- Level probe: DN50 (2") - Nbre: 2
- Pressure indicator transmitter: DN50 (2") - Nbre: 1



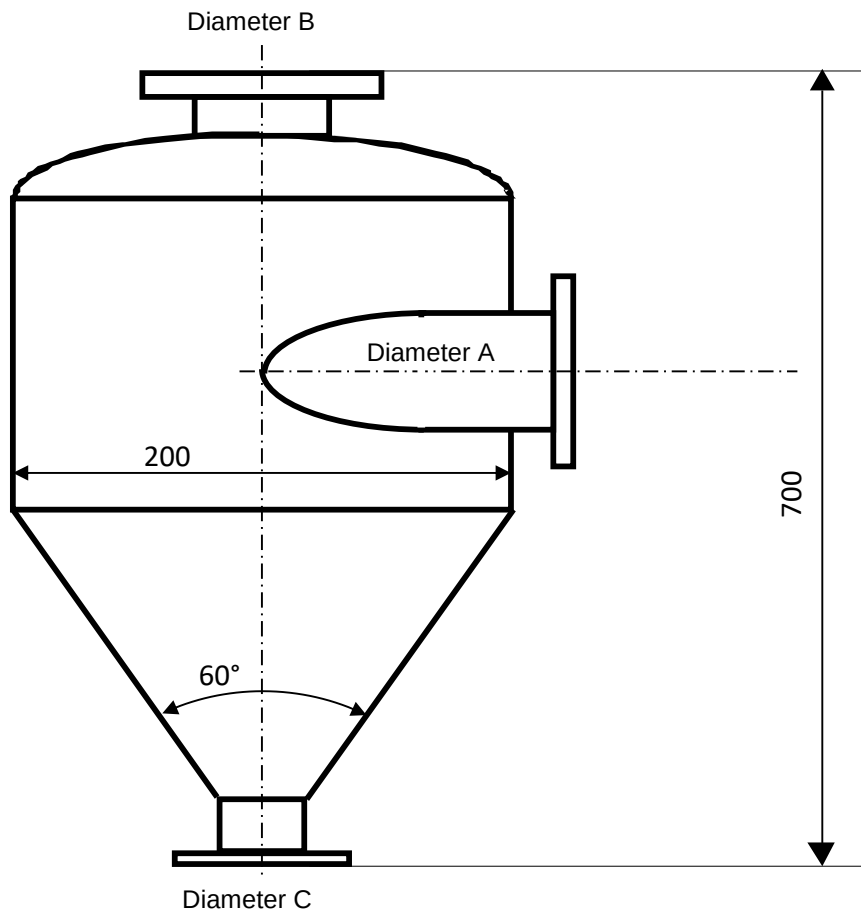


Appendix "CYCLONE"

- Material: 304L
- Diameter: 200 mm (TBC)

Equipment

- Supporting legs: Excluded
- Connection "A": 65 mm
- Connection "B": 65 mm
- Connection "C": 40 mm





Appendix "VACUUM PUMP"

- | | |
|---------------------|--------------------------|
| - Type: | Liquid ring |
| - Quantity: | 1 per filter |
| - Material: | Carbon steel & cast-iron |
| - Delta Pressure: | -613 mbar rel |
| - Nominal pressure: | 400 mbar abs |

Sizing basis

- | | |
|----------------------------|-------|
| - Gaz temperature: | 40 °C |
| - Liquid ring temperature: | 30 °C |

Characteristics

- | | |
|-----------------------------|-----------------------------|
| - Capacity: | 200 m ³ /h (TBC) |
| - Rotary speed: | 1015 RPM |
| - Absorbed power: | 4,8 kW |
| - Installed power: | 5,5 kW |
| - Voltage | 400 V |
| - Frequency | 50 Hz |
| - Liquid ring requirements: | Complete recirculation |
| - Noise level: | 80 dB(A) at one meter |

NOTE: Noise measured in open field around pump and with exhaust air flange connected to an exhaust pipe (out of supply) without any reverberation/addition of the pipe or air sound exhaust.

Injection water must be not corrosive, free solids, not hard water at a normal temperature. If not, the water must be treated.

Accessories

- Inlet seal water piping with instrumentation & valves as per P&ID
- Discharge separator in carbon steel
- Transmission per V-Belt
- Vacuum breaker in stainless steel
- Base plate in SS316L
- Electrical motor 5,5 kW - IE4
- Exhaust silencer excluded
- Water piping in carbon steel
- Plate Heat Exchanger
- Temperature Indicator + their thermowell
- Recirculating pump with closed coupled motor

- Painting: according to supplier's standards



Appendix "FILTRATE PUMP 1"

- Type: Centrifugal - Krogh Type Pump
- Quantity 1
- Capacity 3 m³/h (TBC)
- H.M.T.: 30 m (Maximum)
- N.P.S.H. (required): To be confirmed
- Material: 316L or equivalent
- Shaft sealing: Standardized Simple Mechanical Seal
- Absorbed power: 1,98 kW (*)
- Installed power: 2,2 kW (maximum)
- Weight (with motor): to be given by supplier

Accessories :

- Base for pump and motor
- Standard electrical motor 2,2kW - 380/400V - 50Hz - 4P - IE4
- Coupling and guard
- Painting: according to supplier's standards

(*): to be confirmed depending on the final layout of the unit

Appendix "FILTRATE PUMP 2 & 3"

- Type: Centrifugal - Krogh Type Pump
- Quantity 2
- Capacity 2 m³/h (TBC)
- H.M.T.: 30 m (Maximum)
- N.P.S.H. (required): To be confirmed
- Material: 316L or equivalent
- Shaft sealing: Standardized Simple Mechanical Seal
- Absorbed power: 1,98 kW (*)
- Installed power: 2,2 kW (maximum)
- Weight (with motor): to be given by supplier

Accessories :

- Base for pump and motor
- Standard electrical motor 2,2kW - 380/400V - 50Hz - 4P - IE4
- Coupling and guard
- Painting: according to supplier's standards

(*): to be confirmed depending on the final layout of the unit



Appendix "SPLASH PROTECTION SYSTEM"

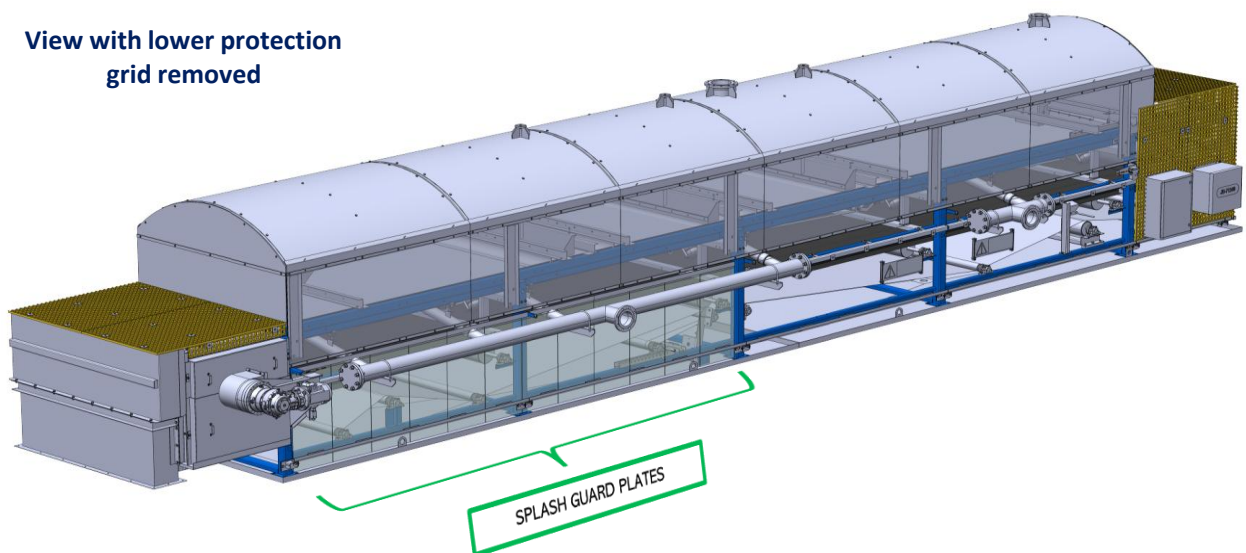
For the belt filter to operate at optimum efficiency, the cloth and belt must be washed before each new filtration cycle. A hooded washing system at the end of the filter performs this task.

However, when the belt and cloth are returned, they will drip down the length of the filter (generating water splashes). We therefore propose the following system to ensure a clean and healthy working environment.

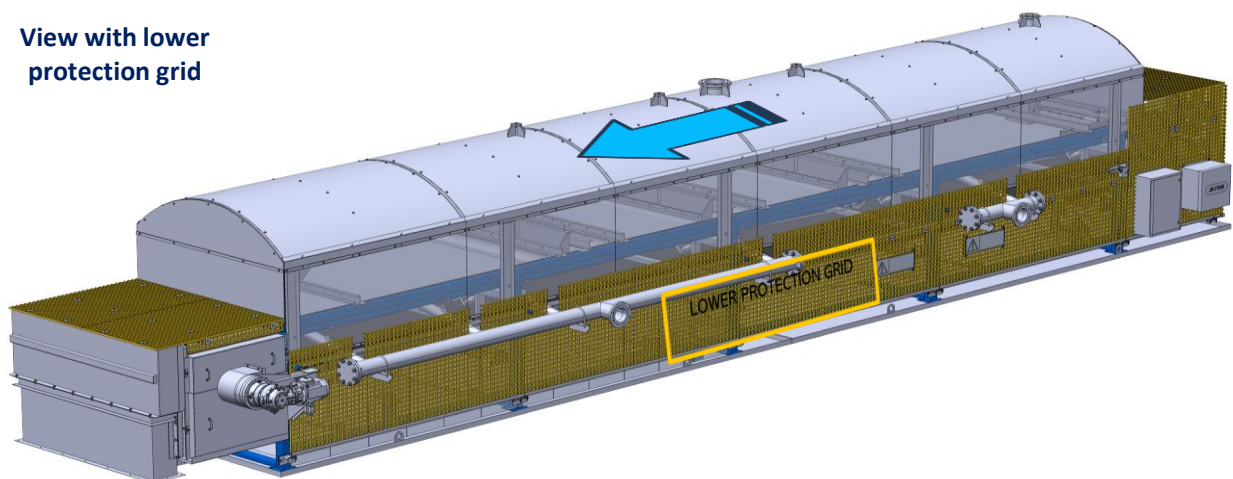
Splash protection system includes :

- Plates made from eco-designed materials (which will be fixed to the lower protection grid)
- All the fasteners required

View with lower protection grid removed



View with lower protection grid



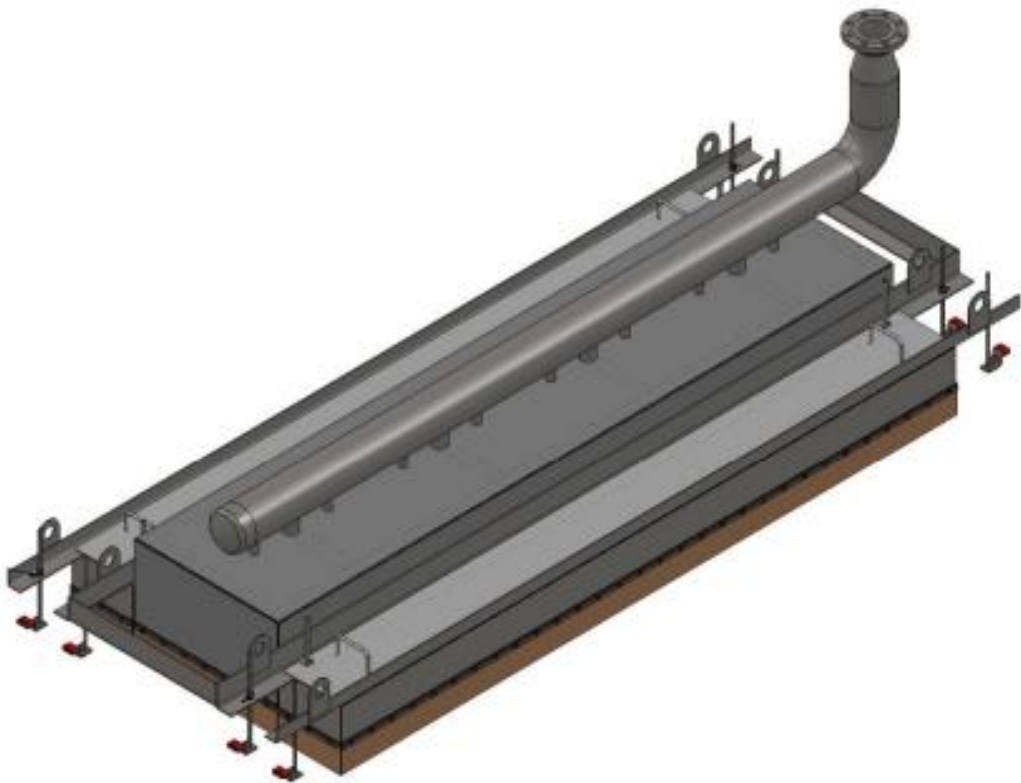


Appendix "STEAM BOX"

OPTION

The Steam Hood is used on the drying zone of the Vacuum Belt Filter. Its main goal is to reduce the cake moisture by using steam which is diffused all over the steam hood surface on the cake.

You already have installed this kind of steam hood on your filter with good result, and now you would like to install a second steam hood after the first one in order to reduce more again the cake moisture.





Appendix "LOCAL CONTROL PANEL"

II - LOCAL CONTROL PANEL

The Local Control Panel is used to start, stop the belt filter, and adjust the belt filter speed, locally close the filtration unit.

It will be polyester enclosure IP66 Nema 4X, manufacturer RITTAL or similar, size 600 mm high, 400 mm wide, 200 mm deep (wall mounting) and will be installed on site by customer close to the belt filter.

The area classification is non-hazardous.

The Local Control Panel includes:

- 1 panel 600 mm high x 400 mm wide x 200 mm deep with front door equipped with handle and lock and key.

Components located on the front door:

- 1 "Emergency stop" push button.
- 1 belt filter motor "START" push button.
- 1 belt filter motor "STOP" push button.
- 1 belt filter motor "FASTER" push button.
- 1 belt filter motor "SLOWER" push button.
- 1 "BELT FILTER SPEED" numeric indicator.

Components located inside the control panel:

- 1 "CLOTH CHANGE" key operated handswitch selector.
- 1 Horn for belt filter "ALARM START-UP" located on the top of the control panel.
- 1 Terminal block set allowing the control panel internal components wiring connections of the hereabove signals and the external wiring connections between the Local Control Panel and the Customer's PLC/DCS inputs/outputs.
- Analog input signal for numeric indicator: 4-20 mA from Customer's PLC/DCS or Variable Frequency Drive.
- Voltage supply for numeric indicator: 230 Vac-/50HZ or 24 Vdc supplied by the Customer.
- Internal wiring will be laid with PVC wiring ducts.
- Wiring and parts labelling will be in accordance with electrical scheme identification numbers.
- Each end of wire will be provided with vinyl sleeve type marker for numbering identification.



NOTE:

The use of “CLOTH CHANGE” key operated handswitch selector is allowed only in maintenance mode and local mode, and at fixed minimum belt filter speed, and reserved only for authorized personnel.

The Local control panel will be completely assembled, wired, adjusted, and tested at HASLER Group’s factory.

III - VACUUM BELT FILTER JUNCTION BOX

The Vacuum Belt Filter Junction box is used to wire all instruments located on the belt filter.

It will be Polyester enclosure IP66 Nema 4X manufacturer RITTAL or similar, size 530 mm high, 430 mm wide, 200 mm deep and will be installed on the belt filter.

The area classification is non-hazardous.

The Vacuum Belt Filter Junction box includes:

- 1 cabinet 530 mm high x 430 mm wide x 200 mm deep with front door equipped with lock and key.
- 1 terminal block set allowing the internal components wiring connections with the external wiring connections between the belt filter instruments.
- 1 set of polyamide cable glands fitting.
- Internal wiring will be laid with PVC wiring ducts.
- Wiring and parts labelling will be in accordance with electrical scheme identification numbers.
- Each end of wire will be provided with vinyl sleeve type marker for numbering identification.

The Vacuum Belt Filter Junction box will be completely assembled, wired, adjusted, and tested at HASLER Group’s factory.



IV - INSTRUMENTATION CABLES, CONDUITS AND TAGS

- All the instrumentation cables and conduits between the Junction box located on the belt filter and the instruments located on the belt filter will be supplied by HASLER Group.
- All the instrumentation cables labelling supplied by HASLER Group will be in accordance with electrical scheme identification numbers.
- Fitting and wiring of these instrument cables will be done by the Customer under HASLER Group's supervision.

V - TECHNICAL DOCUMENTATION

The Technical Documentation in English includes:

- The Electrical scheme.
- The Local Control Panel equipment with part list.
- The Vacuum Belt Filter Junction box equipment with part list.
- The Instrument list.
- The Instrument data sheets.
- The Functional analysis.
- The logic diagrams.
- The technical documentation of instruments and electrical components.

VI - LIMIT OF SUPPLY

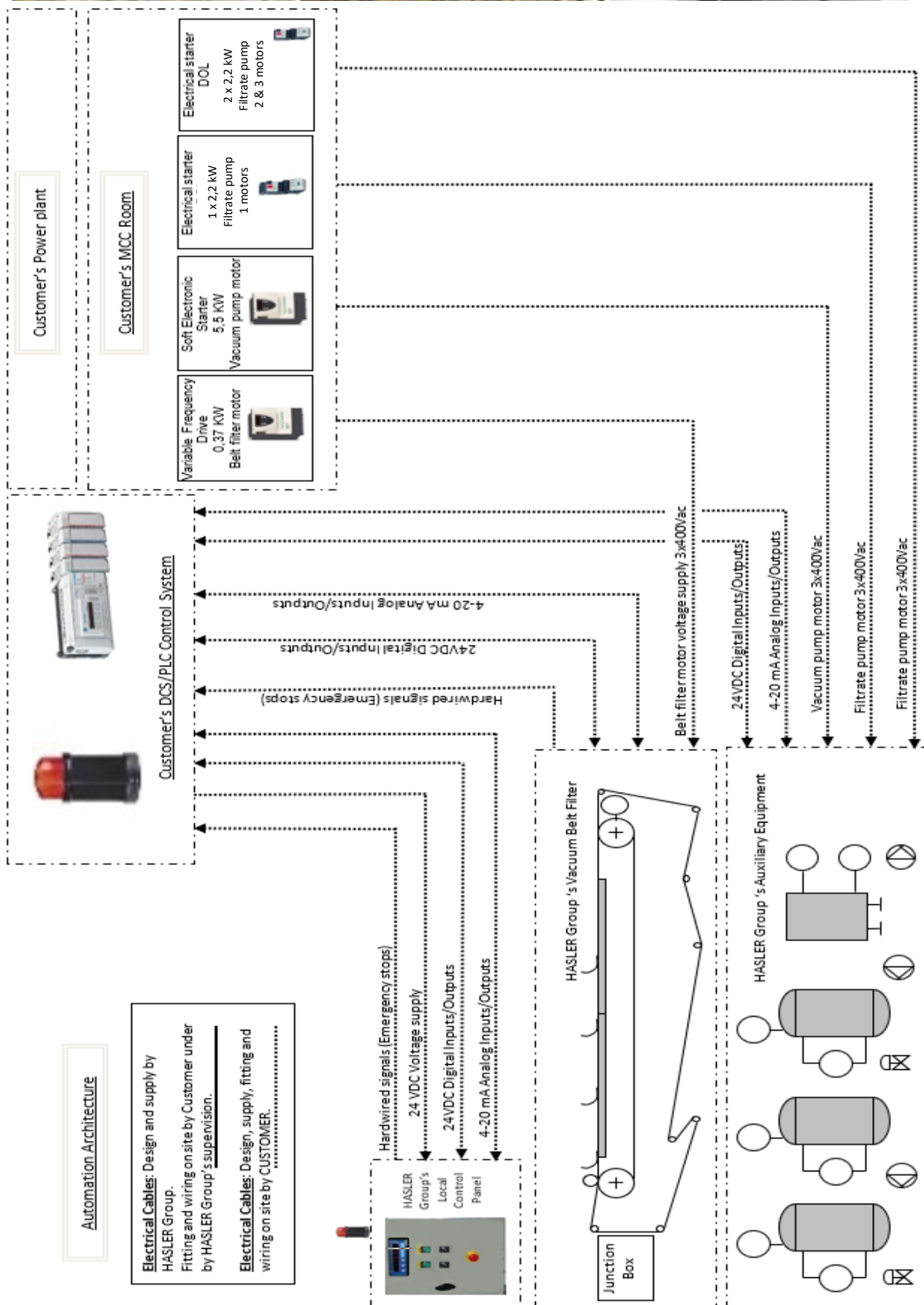
- Not included in our offer:

- The safety and logic sequences of the filtration unit are controlled by the Customer's PLC/DCS according to the logic diagrams and the functional analysis supplied by HASLER Group.
- The software programming works will be done by the Customer.
- All control cables, instrumentation cables, network cables and conduits between the Junction box located on the belt filter and the local control panel, the motors, the field instruments (not located on the belt filter), the Customer's PLC/DCS and MCC will be supplied and installed on site by the Customer.
- Cable glands fitting (or conduit fitting) for the Customer's cables will be supplied and installed on site by the Customer.
- Wiring up to the junction box. After the junction boxes, this is a supply from CARESTER.



VII - LIST OF ELECTRICAL SUPPLIER

LOCAL CONTROL PANEL			
DESIGNATION	TYPE	MANUFACTURER	REMARKS
Enclosure	Type AX	Rittal	Polyester IP66 NEMA 4X
Pushbuttons, hand switches, signalling pilot lights	Type XB4-XB5...	Schneider Electric	IP66
Horn	Type T100	AET	IP66
Terminal blocks		ABB - Entrelec	
Cables glands	Polyamide		Iso Metric
Internal control wiring	Isolated wires and ferrules		Execution according to EN 60204
JUNCTION BOX			
DESIGNATION	TYPE	MANUFACTURER	REMARKS
Enclosure	Type PLM	Schneider Electric	Polyester IP66 NEMA 4X
Terminal blocks		ABB - Entrelec	
Cables glands	Polyamide		Iso Metric
Internal control wiring	Isolated wires and ferrules		Execution according to EN 60204
INSTRUMENTATION CABLES FOR VACUUM BELT FILTER			
DESIGNATION	TYPE	MANUFACTURER	REMARKS
Instrumentation cables	Control cable JZ-500 black (digital signal) Shielded cable JZ-500-C black (analog signal)	Helukabel Lappkabel	PVC flexible control and Cu-screened cable, 300/500V Temperature range: -5 to +80°C





Appendix "ERECTION ON SITE"

ERECTION ON SITE

According to HASLER Group's enclosed daily contractual fees.

Depending of the means, manpower supplied by the client and the site conditions. The here after estimations should be discussed.

For erection, customer will provide all specified equipments for lifting, handling, power.

	HASLER Group manpower	Customer manpower per filter
Erection	One supervisor	See planning

Estimated duration: 3 weeks - to be confirmed during KOM

Special tools for erection supplied by HASLER Group

- Special tools and accessories (which are specific to HASLER Group) for cold bonding of the curbs. These equipments are imported temporary by HASLER Group.

- Specific supports according HASLER Group drawing

NOTE: Transportation cost for these equipments will be charged to Customer.

Tools for erection to be provided by customer

- Means of lifting, cranes, pulley block.... Heavy piece = 2000 kg.
- One (1) theodolite.
- One (1) welding generator (TIG).
- Standard tools and safety accessories necessary for each filter.
- Two (2) Wooden floor length 10 meters for each filter.
- Two (2) Textil slings length 2 meters, 2 tons.
- Two (2) Textil slings length 1 meters, 2 tons.
- Two (2) Textil slings length 2 meters, 4 tons.
- Two (2) Textil slings length 4 meters, 6 tons.
- Three (3) Textil slings length 6 meters, 6 tons.
- Four (4) shackles 10 tons.
- Two (2) Pulley blocks 1 ton.
- One (1) lifting beam 10 ton according the HASLER Group specifications.
- Two (2) ladders 3 meters.
- One (1) jacks 6 tons.
- Two (2) winch cables 5 tons.
- Two (2) pneumatic machine bolts
- One (1) dynamometrical spanner machine bolts

Utilities for filter erection

- Compressed air: 7 bar.
- Electricity: 240 V with electrical junction box.
- Power electricity with inverter at disposal 3 weeks after the beginning of filter erection.
- Storage for small equipments as screws, nuts..... near each filter.
- Lifting.



Appendix "COMMISSIONING ON SITE"

Estimated duration: 2 weeks

During the period provided for commissioning, our engineer with customer technicians will do:

- Mechanical start-up.
- Check all components.
- Adjust technical parameters.
- Feed filter with slurry.
- Optimize technical parameters.

Training of customer technicians:

- Theory of vacuum filtration, explanation and questions-and-answers.
- Description of the installation
 - General description of the main components.
 - Filter.
 - Receivers, vacuum pump, filtrate pumps...
- Details of filter
 - Description of the main components and their function.
 - Theoretical.
 - Practice on site including demonstration.
- Start-up – Commissioning of the filter
 - Without product
 - With product
- Comments and verification of people knowledge



Appendix "SITE ACCEPTANCE TEST (SAT)"

- Audit with the customer on customer's site / SAT (2 days) :

This procedure describes the check points that will be performed for the following equipment :

MECHANICAL TEST OF BELT FILTERS

- Checking the belt movement
- Checking the belt supporting device
- Checking the cloth course (Cloth not installed)
- Checking the driving unit
- Checking the pneumatic working
- Checking the electrical connections
- Table flatness / Alignment of vacuum box and table
- Square of the filter / Leveling
- Other controls

TEST PROCEDURE FOR LOCAL CONTROL PANELS AND JUNCTION BOXES

- Local control panel
- Junction boxes located on filter

INSTRUMENTATION TEST

NB : Before the equipment leaves our assembly site in Le Mêle-sur-Sarthe, a customer visit will be scheduled. The purpose of this visit is to carry out a visual inspection, in the presence of the customer and the person in charge of this subject at HASLER, and to ensure that all components meet the initial requirements.



Appendix "Water Content quality - Vacuum Wear Belt and Table Wear Belt lubrication"

Water Content quality - Vacuum Wear Belt	Range
Floating particles (mg/l)	<200
Temperature (°C)	<45
Conductivity (µS/cm)	1 - 1000
pH	8,5 > > 6,5
Water hardness in °dH	5 - 15
Carbonate hardness in °dH	<15
Chloride (Cl-) (mg/l)	<250
Sulphate (SO ₄ 2-) (mg/l)	<350
Free carbonic acid (mg/l)	0
Nitrate (NO ₃ -) (mg/l)	<50
Potassium permanganate usage (mg/l)	25
Ammonium NH ₄ ⁺ (mg/l)	<5
Organics - Hydrocarbures	Forbidden
Demineralized water	Forbidden
Vacuum box wear belt lubrication water flow in l/hr for 2B5 Filters	80
Pressure for Vacuum box and Table lubrication (bar)	1 (<4 mandatory)



Appendix "Water Content quality - Cloth and Belt washing water"

Water Content quality - Cloth and Belt washing water	Range
Floating particles (mg/l)	<200
Temperature (°C)	<45
Conductivity (µS/cm)	1 - 1000
pH	8,5 > > 6,5
Water hardness in °dH	5 - 15
Carbonate hardness in °dH	<15
Chloride (Cl-) (mg/l)	<250
Sulphate (SO4 2-) (mg/l)	<350
Free carbonic acid (mg/l)	0
Nitrate (NO3-) (mg/l)	<50
Potassium permanganate usage (mg/l)	25
Ammonium NH4+ (mg/l)	<5
Organics - Hydrocarbures	Forbidden
Demineralized water	Forbidden
Belt and Cloth washing water flow in m3/hr for 2B5 Filters	2,98
Pressure for Cloth and Belt washing water (bar)	> 3