



**LEES CROSS FLOW FILTRATION
"TLS"**

VLS
Technologies



PRINCIPLES OF FILTRATION

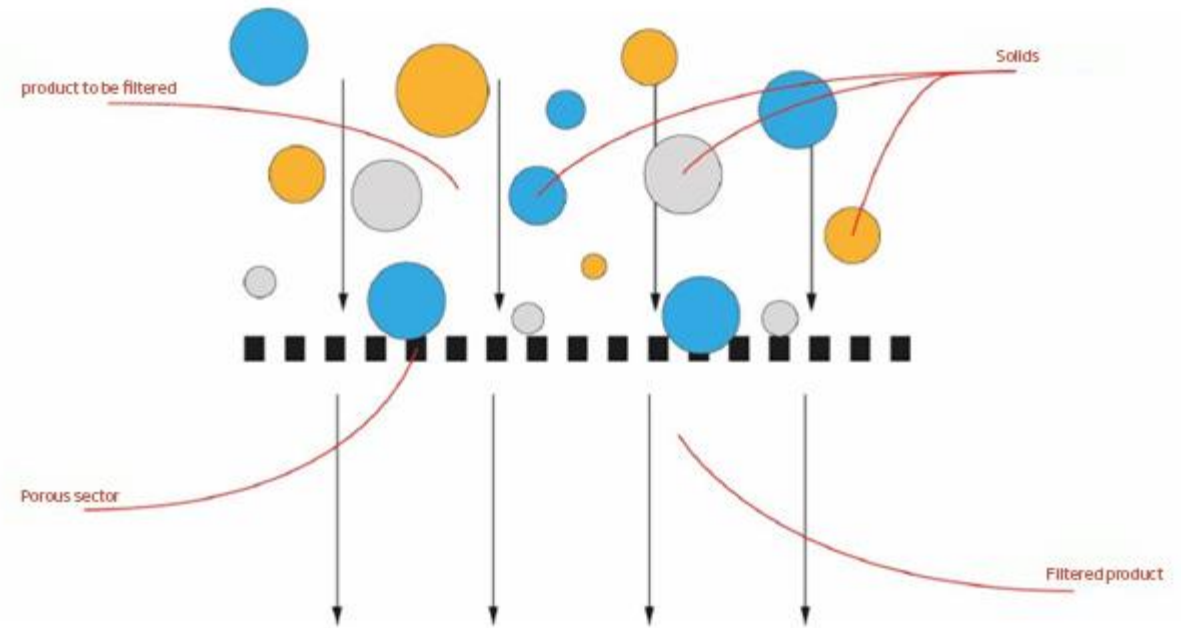
Traditional filtration vs cross flow filtration

TRADITIONAL FILTRATION

In the traditional filtration the product to be filtered meets the porous sector (filtering media) at right angles. The porous sector retains the solids and let the clean product go through.

Filterability is assured by the use of filtering aids such as perlite, diatomaceous earth or others.

The duration of the filtering cycle depends on the capability of the filter to accumulate solids and aids (D.E. filters and press filters) or to keep the precoat (rotary drum vacuum filters).

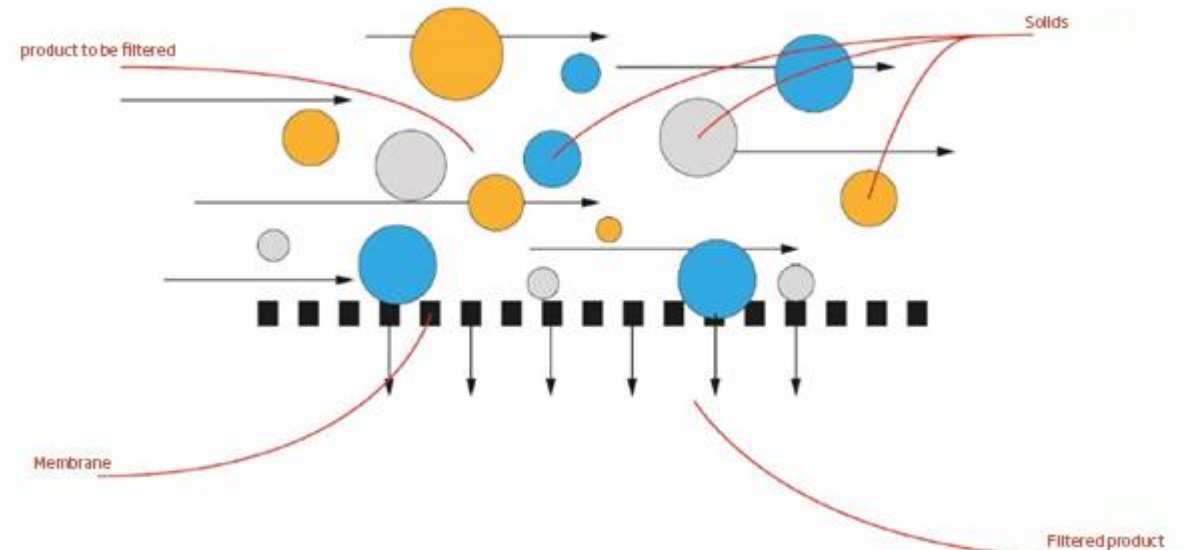


CROSS FLOW FILTRATION

In the cross flow filtration the product to be filtered flows parallel to the porous membrane (filtering media) at such a speed which carries the solids in suspension.

The filtrate permeates through the membrane thanks to the delta of pressure between the two sides of the membrane.

The filtering cycle depends on the capability of the membrane to self regenerate both during filtration, rinses and cleanings with chemicals.





CLASSIFICATION OF MEMBRANES

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Tubular membranes, internal diameter > 10 mm.

Capillary membranes, internal diameter up to 1,5 mm.

«Flat sheet» membranes

Spiral wounded membranes, composed of flat sheet membranes wrapped in on themselves.

TUBULAR MEMBRANES

TUBULAR MEMBRANES



CERAMIC MEMBRANES

TUBULAR MEMBRANES



TUBULAR MEMBRANES IN STAINLESS STEEL

TUBULAR MEMBRANES



CAPILLARY MEMBRANES



CAPILLARY MEMBRANES



TLS

The new system for lees filtration

CHARACTERISTICS OF THE PROCESS

The TLS cross flow filters allow the filtration of lees and must with high content in solids (included filtering aids).

The quality of the filtrate is way better if compared to traditional filtration (in ex.: rotary drum vacuum filters) to the point that the filtrate can be immediately used without needing any further treatment.

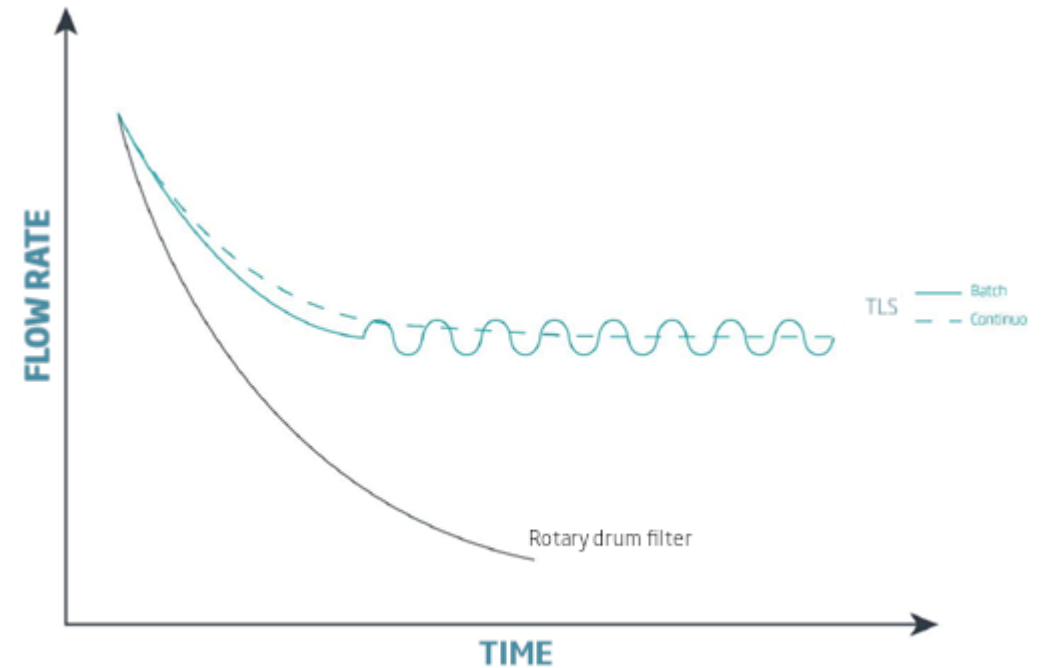
The presence of an operator is minimal.

CHARACTERISTICS OF THE PROCESS

The TLS filters reach a high average performance thanks to a stable balance between hourly flow rate and stops for cleanings.

The graphs aside shows a comparison between the traditional filtration (with rotary drum vacuum filter) and the cross flow filtration with a TLS filter.

According to the type of product it is possible to choose how and when to perform the concentrate discharge (in continuous or batch).





SECTORS

Advantages of the TLS



SECTORS

The TLS filter has been designed to work with liquids with high contents in solids, with percentages that range between 5% and 35% and with concentrate on the outlet between 60% and 85%.

The main products for which the TLS has proven to be profitable are:

- lees from continuous flotation;
- lees from discontinuos flotation;
- lees from static sedimentation;
- lees post fermentation;
- fermented lees post clarification;
- wines and musts with high contents in solids;
- wine.

The machine can also filter hard products with the presence of high concentrations of filtering aids such as bentonite, gelatine and charcoal.

ADVANTAGES

No need for filtering aids such as diatomaceous earth or perlite.

Compared to the tradition filtration you will have the following advantages:

- Reduction of costs connected to filtration;
- No costs for disposal of filtering aids;
- Better quality of the filtrate (guaranteed < 1 NTU) and no oxygen pick up;
- Better performances in filtration.

THE MEMBRANE, THE HEART OF THE SYSTEM

STRUCTURE

- Material: tubular, sintered AISI316L Stainless Steel.
- Porosity: 0,2 microns.
- Filtering surface: 16m² .
- Diameter of the tubes: various (from 6 to 16 mm).

The porosity and the diameter of the tubes come from a choice of the manufacturer and determine, together with the inner logics of the automation, the efficiency of the system.



THE MEMBRANE, THE HEART OF THE SYSTEM

ADVANTAGES:

- High reliability.
- High mechanical resilience.
- No fear of thermal shocks.
- High resilience to high temperatures (possibility of steam sterilization).
- Possibility of use with solutions with high alcoholic degree.
- No gaskets or O-Rings. The tubes are welded on the support flange.
- High resilience to chemical agents (acids, alkalines, oxidants).
- Food degree.



STRUCTURE

Components



MAIN COMPONENTS OF THE TLS

CENTRAL UNIT assembled on its own frame with adjustable feet:

Feed group composed of:

- n° 1 mono type feed pump;
- n° 01 Stainless Steel prefilter with motorization for self cleaning;
- in/out product lines;
- retentate discharge line.

CIP unit for cleaning composed of

- n° 01 Stainless Steel service tank equipped with level sensors;
- n° 01 prefilter for water;
- n° 01 pneumatic system for dosing of detergents (acid, alkaline, oxidant);
- n° 01 centrifugal pump for washing.

Control panel in Stainless Steel completed with PLC with touch screen (Siemens 9") for automatic management and control of all the phases (filling, filtration, discharging and cleaning) without the need for an operator.

Instrumentation of control composed of automatic valves, pressure transducers, digital flow meter, temperature probes.

MAIN COMPONENTS OF THE TLS

FILTRATION LOOP composed of:

- n° 01 centrifugal recirculation pump;
- n° 02 Aisi 316L Stainless Steel membranes, 16 m² each of filtering surface for a total of 32 m²;
- n° 01 multi-tubular heat exchanger for retentate temperature control.

The additional module makes it so the system is MODULAR and susceptible to expansion at a later time.

Solutions for liquid processing

MAIN COMPONENTS OF THE TLS

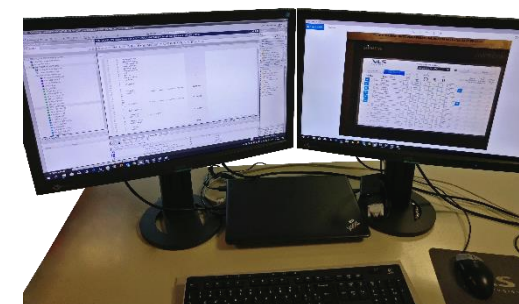
ACCESSORIES not included in the standard configuration of the machine:



Remote control

It allows to visualize and control all the parameters via smartphone, tablet, laptop.

Remote Assistance



The standard configuration includes the module for remote assistance from VLS's headquarter.

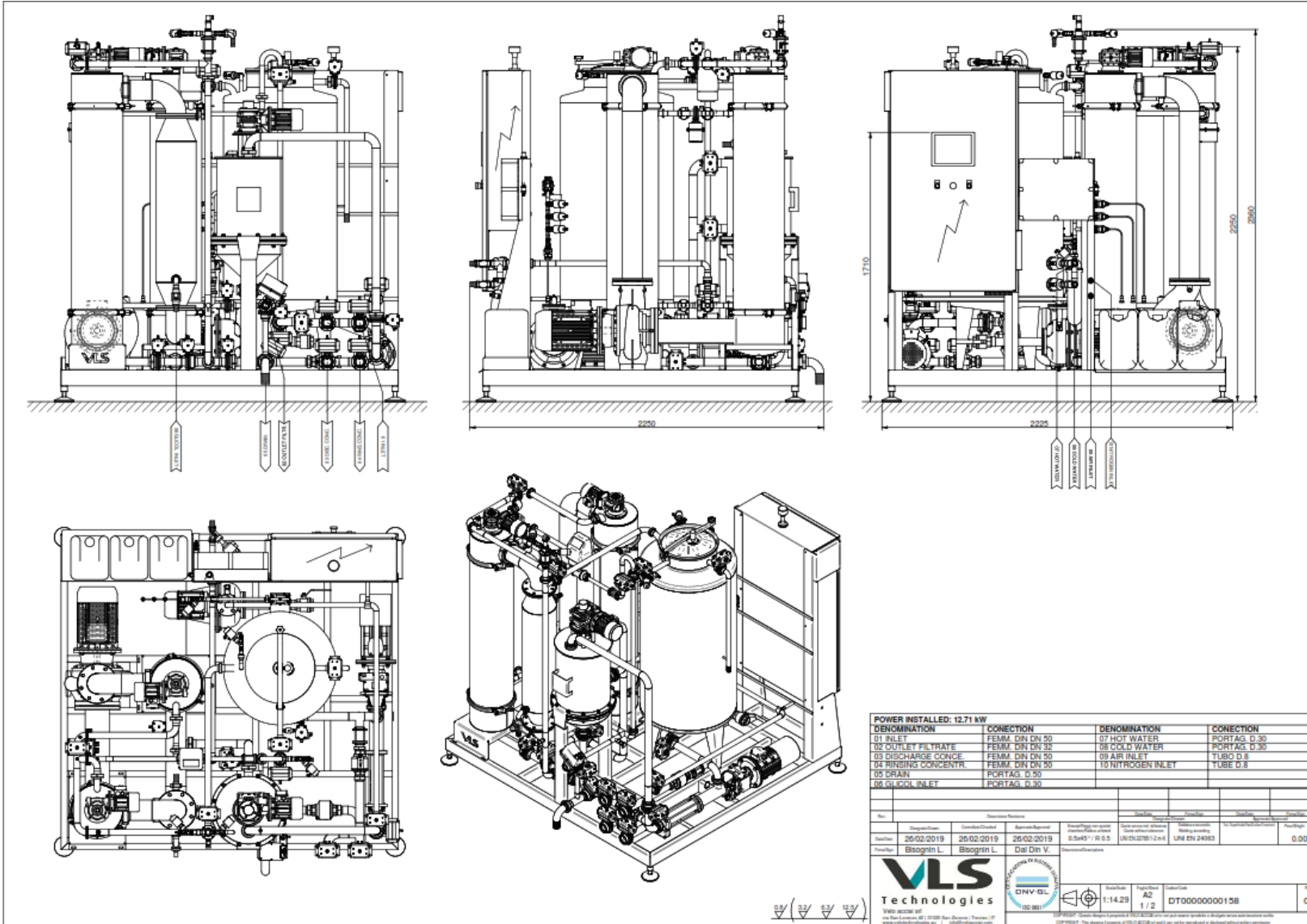
MAIN COMPONENTS OF THE TLS

ACCESSORIES not included in the standard configuration of the machine:

Diffusion pulse system: placed on the head of each membrane, it allows to have longer filtering batches and reduce the number of washing cycles. It is recommended when processing products which can form fibers.

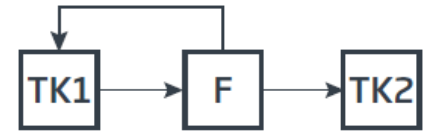
Kit for single bank exclusion: it consists of a set of manual valves which allows the single bank to be excluded from the process while filtering with the remaining ones. It can be useful in ex. when filtering small batches.

Kit for expansion (1 for each bank): it allows to add additional banks / filtration loops at a later time.



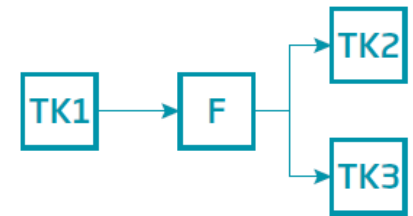
WORKING TYPES:

1) Recirculation on feed tank:



F: Lees stop
TK1: Feed tank
TK2: Filtrate tank

2) Direct passage:



F: Lees stop
TK1: Feed tank
TK2: Filtrate tank
TK3: Retentate tank



PERFORMANCES

Products characteristics and performances

PRODUCTS CHARACTERISTICS AND PERFORMANCE

Generally speaking, the **flow rate**, the **recovery** and the **volume of filtrate** for each **filtration cycle** can be considered to be in an INVERSE RELATIONSHIP with the **content in solids** of the lees and the **viscosity of the permeate**.

Lees which are more concentrated (with higher contents in solids such as lees from discontinuous flotation) shall be filtered at a lower flow rate, with shorter batches and less recovery.

In case of fermented lees, the high content in solids is balanced by a lower viscosity. So, for the same content in solids, fermented lees can be filtered at a higher flow rate while the duration of the batch and the recovery will be similar.

PRODUCTS CHARACTERISTICS AND PERFORMANCE

PERFORMANCE

| LEES FROM STATIC SEDIMENTATION AT ROOM TEMPERATURE | Solids [% v/v] | Average Q.ty for membrane [hl/h] | Production for membrane [hl/ 24] | Recovery [%] |
|---|----------------|----------------------------------|----------------------------------|--------------|
| Lees WITHOUT addition of aids and enzymes | 10 - 15 % | 2,6 - 4,4 | 52 - 88 | 80 - 85 |
| Lees WITH addition of bentonite, gelatine and enzymes | | 3,2 - 5,3 | 64 - 106 | 80 - 85 |

| LEES FROM STATIC COLD SEDIMENTATION | Solids [% v/v] | Average Q.ty for membrane [hl/h] | Production for membrane [hl/ 24h] | Recovery [%] |
|---|----------------|----------------------------------|-----------------------------------|--------------|
| Lees WITHOUT addition of aids and enzymes | 15 - 20 % | 2,1 - 4,9 | 42 - 98 | 65 - 70 |
| Lees WITH addition of bentonite, gelatine and enzymes | | 2,6 - 5,3 | 64 - 106 | 65 - 70 |

PRODUCTS CHARACTERISTICS AND PERFORMANCE

PERFORMANCE

| FLOTATED LEES | Solids [% v/v] | Average Q.ty for membrane [hl/h] | Production for membrane [hl/ 24] | Recovery [%] |
|--|-----------------------|---|---|---------------------|
| DISCONTINUOUS FLOTATION can have bentonite, gelatine ed enzymes. | 20 - 28% | 2,6 - 4,4 | 52 - 88 | 65 - 75 |
| CONTINUOUS FLOTATION can have bentonite, gelatine ed enzymes. | 10 - 15% | 3,5 - 5,3 | 70 - 106 | 75 - 80 |
| RED WINE FLOTATED LEES | Solids [% v/v] | Average Q.ty for membrane [hl/h] | Production for membrane [hl/ 24] | Recovery [%] |
| Fermented lees with yeasts, marc and grapeseed from red wine vinification. | > 30 % | 4,4 - 6,2 | 88 - 124 | 55 - 65 |
| WHITE WINE FERMENTED LEES | Solids [% v/v] | Average Q.ty for membrane [hl/h] | Production for membrane [hl/ 24] | Recovery [%] |
| Fermented lees from sedimentation with yeasts and claryfing agents. | 10 - 15 % | 3,9 - 5,3 | 78 - 106 | 75 - 80 |
| LEES FROM CLARIFICATION | Solids [% v/v] | Average Q.ty for membrane [hl/h] | Production for membrane [hl/ 24] | Recovery [%] |
| Lees from clarification with bentonite, carbon, protein claryfing agents. | 10 - 15 % | 4,4 - 6,2 | 88 - 124 | 75 - 80 |

TECHNICAL CARATTERISTICS AND SERVICES

| TECHNICAL NOMINAL DATA | U.M. | TLS 32 A | TLS 64 A | TLS 96 A | TLS 128 A |
|--|---------------------------------|----------|----------|-----------|-----------|
| Produzioni / Flow rate | | | | | |
| Flotated lees | hl/h | 6-10 | 12-20 | 18-30 | 24-40 |
| Decanted lees (bentonite, gelatin, carbon) | hl/h | 5-10 | 10-20 | 15-30 | 20-40 |
| Cross flow retentate | hl/h | 5-8 | 10-16 | 15-24 | 20-32 |
| Wine | hl/h | 10-20 | 20-40 | 30-60 | 40-80 |
| Must, juices | hl/h | 8-16 | 16-32 | 24-48 | 32-48 |
| Technical Data | | | | | |
| Filtering surface | m ² | 32 | 64 | 96 | 128 |
| Modules | nr. | 2 | 4 | 6 | 8 |
| Membrane material | AISI 316L | | | | |
| Fittings | 1" BSP - DIN11851 DN50 - 1,5"TC | | | | |
| Consumption | | | | | |
| Installed power | Kw | 15,41 | 26,77 | 41,08 | 52,44 |
| Cold water (rinse) | Lt. | 350 | 570 | 790 | 1010 |
| Hot water (rinse) | Lt. | 350 | 570 | 790 | 1010 |
| <i>Complete washing (wine)</i> | Lt. | 1750 | 2850 | 3950 | 5050 |
| <i>Complete washing (lees)</i> | Lt. | 2100 | 3240 | 4740 | 6060 |
| Alcaline detergent | Lt. | 3,5-5,25 | 5,7-8,5 | 7,9-11,85 | 10-15 |
| Acid detergent | Lt. | 2,5-3,5 | 4,2-5,7 | 6-7,9 | 7,5-10 |
| Oxidant | Lt. | 0,7-1,4 | 1,2-2,3 | 1,6-3,2 | 2-4 |
| Dimensions | | | | | |
| A - Length | mm. | 2350 | 3450 | 4550 | 5650 |
| B - Width | mm. | 2300 | | | |
| C - Height | mm. | 2280 | | | |

RESULTS



EXAMPLES OF PRODUCTS PROCESSED WITH TLS

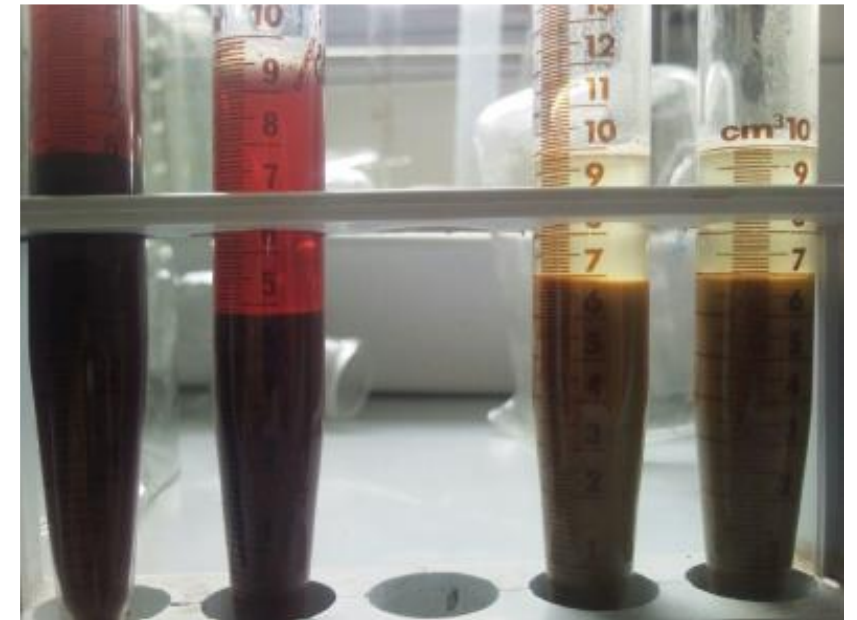


1. Rotary Drum Vacuum Filter
2. Bottled wine
3. TLS

CONCENTRATE

Quantity of solids and liquids in the concentrate.

Visual analysis with centrifuge.



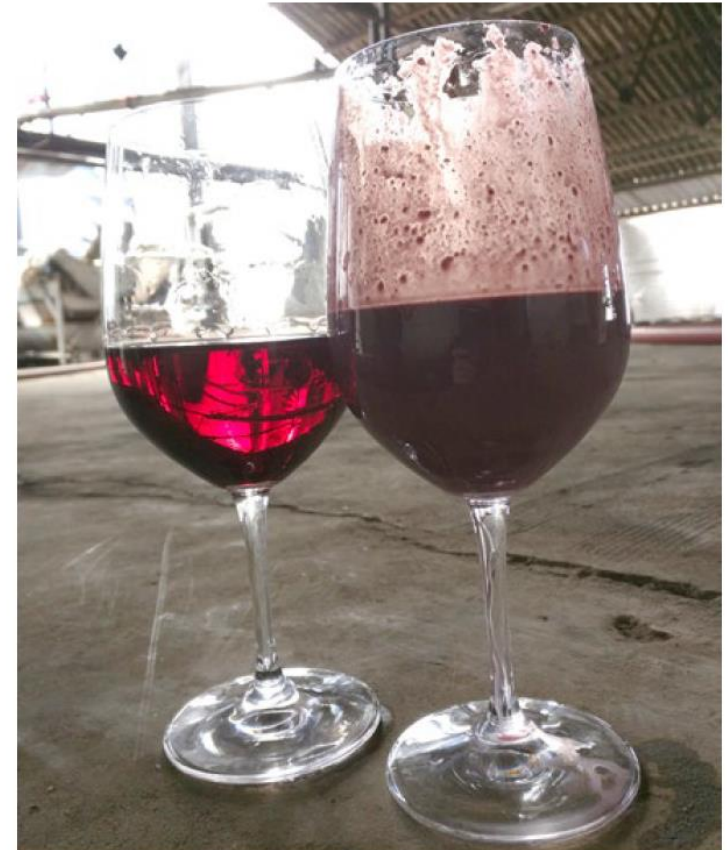
White wine lees:

Inlet product: 25% solids
Batch: 100 HI
Average flow rate: 3,2 HI/h
Length of the batch: 20h
Concentrate: 70% solids
Filtrate: 64HI
Recovery: 64%



Red wine lees with clarifying agents and retentate from cross flow:

Inlet product: 10,5% solids
Batch: 74 HI
Average flow rate: 2,7 HI/h
Batch time: 24h
Concentrate: 78%
Filtrate: 64HI
Recovery: 87%



ANALYTIC RESULTS

RESULTS

| PARAMETERS/CABERNET | | LEES | TLS | ROTARY DRUM VACUUM FILTER |
|--|----------|-------|-------|------------------------------|
| Alcohol | % v/v | 12,44 | 12,5 | 12,3 |
| Total SO2 | ppm | 82 | 70 | 54 |
| Anthocyanins | ppm | 713 | 685 | 640 |
| Total Polyphenols (T.P.I.) | ppm | 1516 | 1450 | 1410 |
| O.D. 420 nm | 10 mm cv | 0,269 | 0,256 | 0,255 |
| O.D. 520 nm | 10 mm cv | 0,398 | 0,39 | 0,36 |
| O.D. 620 nm | 10 mm cv | 0,099 | 0,09 | 0,085 |
| Intensity of the colour O.D. 420+520 +620 | 10 mm cv | 0,766 | 0,73 | 0,7 |
| Tone O.D. 420/520 | 10 mm cv | 0,68 | 0,65 | 0,7 |
| Dissolved Oxigen | ppm | 0 | 0,53 | 5,2 |
| Suspended solids | % v/v | 30 | 0 | n.d. |
| Turbidity | NTU | n.d. | 0,2 | 40-60 |



Product processed: «**AGED decanted lees**» of white wine containing clarifying aids (PVPP, bentonite).
 % of inlet solids content: 50,6%

| Filtrate q.ty | Time | Average flow rate | Washings | Average of TMP | P1% |
|---------------|------|-------------------|----------|----------------|-----|
| 155 HI | 36 h | 4,3 HI/h | 2x5min | 0,22 bar | 32 |

| Alcohol content | %VOL | Total acidity | Volatile acidity | pH | Int | Ton | PFT |
|--------------------|-------|---------------|------------------|------|-----|-----|-----|
| 11,35 (mL alc % g) | 11,75 | 5,21 | 0,3 | 3,35 | | | 396 |



Product processed: «**RECENT decanted lees**» of white wine containing clarifying aids (PVPP, bentonite, carbon).

% of inlet solids content: 35,4 %

| Filtrate q.ty | Time | Average flow rate | Washings | Average of TMP | P1% |
|---------------|------|-------------------|----------|----------------|---------|
| 54 Hl | 9 h | 6 Hl/h | 0 | 0,6 - 0,9 bar | 35 - 70 |

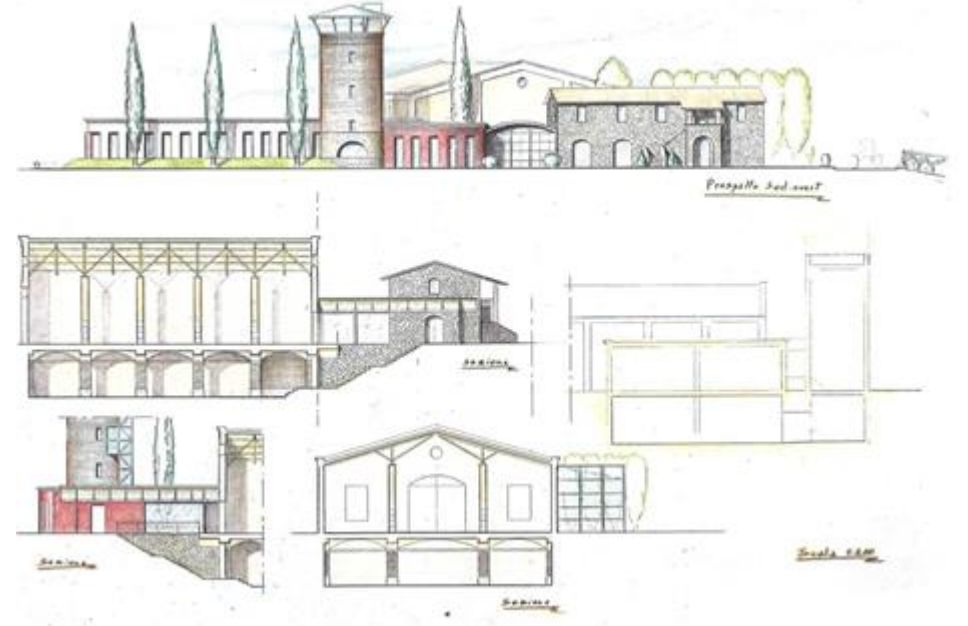
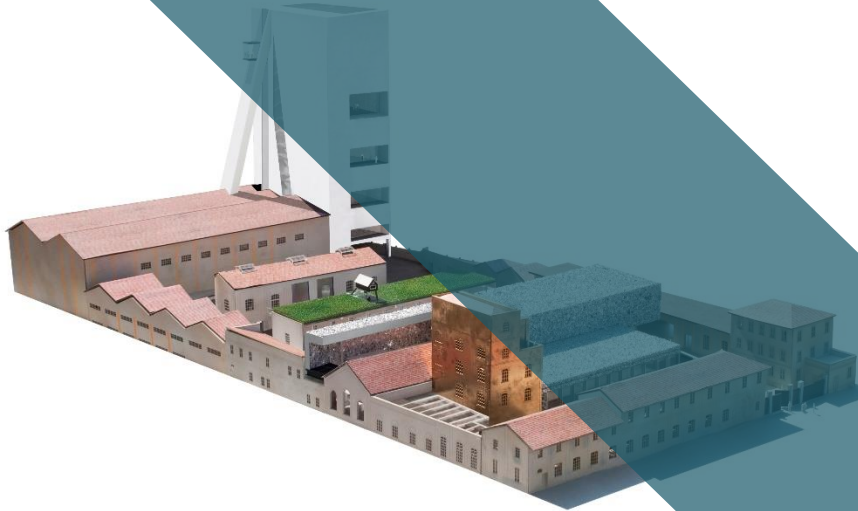
| Alcohol content | %VOL | Total acidity | Volatile acidity | pH | Int | Ton | PFT |
|--------------------|-------|---------------|------------------|------|-----|-----|-----|
| 11,66 (mL alc % g) | 11,70 | 5,32 | 0,25 | 3,25 | | | 270 |



Product processed: «**AGED decanted lees**»
of red wine containing clarifying aids
(bentonite).
% of inlet solids content: 47,9 %

| Filtrate q.ty | Time | Average flow rate | Washings | Average of TMP | P1% |
|---------------|------|-------------------|----------|----------------|-----|
| 77 HI | 11 h | 7 HI/h | 0 | 0,24 bar | 32 |

| Alcohol content | %VOL | Total Acidity | Volatile acidity | pH | Int | Ton | PFT |
|--------------------|-------|---------------|------------------|------|-------|------|------|
| 12,80 (mL alc % g) | 13,01 | 5,1 | 0,51 | 3,61 | 19,07 | 0,59 | 2860 |



REFERENCES

Cross flow filters with SS membranes



REFERENCES



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COLLI ASOLANI - ITA
(TLS 2 A)



BODEGA EL MILAGRO S.A. - CHI (TLS 6 A)



LIVIO FELLUGA SRL - ITA (TLS 4 A)



BOTH A KELDER - SA (TLS 6 A)



ROMBAUER VINEYARDS - USA (TLS 2 I)



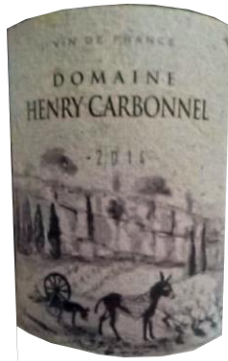
CITRA VINI S.C. - ITA (TLS 2 A)

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DOMAINE LA
PROVENQUIÈRE

DOMAINE DE LA PROVENQUIÈRE - FRA (TUN 3/1 A)




DOMAINE CARBONNEL - FRA (TUN 3/1 A)



Belgian
Owl


BELGIAN SINGLE MALT
WHISKY

THE OWL DISTILLERY - B (TLS 2 A)



RACK & RIDDLE

RACK AND RIDDLE - USA (TUN 6/2 A)



Bonollo
La Grappa, da sempre.

DISTILLERIA BONOLLO SPA - ITA (TLS 6 A - EXP)



JASON
STEPHENS
WINERY

JASON STEPHENS WINERY - USA (TUN 3/1 A)



BLUE PYRENEES
estate

BLUE PYRENEES - AU (TUN 3/1 A)



THANKS FOR YOUR ATTENTION!

VLS
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