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DE Free Beer Filtration
Innovative Alternative to Improve Quality and Cost Efficiency on Traditional Equipment

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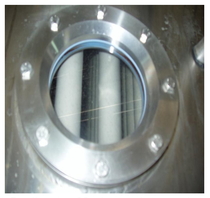
INTRODUCTION

The objective of this modern method is to optimize the beer filtration with the application of DE free single pre-coat and bodyfeed. Such auxiliaries, mainly composed with cellulose fibers on a perlite support, have been developed, tested and validated on frame, horizontal plate and candle filters, through industrial application: 3 breweries of 25,000hL, 350,000hL and 1,600,000hL have participated in setting up the trials.
The qualitative and efficient parameters of beer filtration have been followed : turbidity (ASBC 25 and 90°), microbiology (cell/ml), evolution of pressure (Δp/hour), continuous dosing (bodyfeed g/hL) and sludge volume, length of cycle and economical performance (cost/hL).
The unique pre-coat Fibroxcel®Uni according to the type of beer to be filtered (cells/ml and ASBC 90° of the green beer). and the bodyfeed - Spindacel® and Fibrosteril®, have been analysed in terms of granulometry (Malvern), permeability (Darcy, Lit/min./m²), soluble metals. Their dosage was adapted

DE FREE SINGLE PRE-COAT AND BODYFEED : FASTER, MORE EFFICIENT AND SAFER FOR THE BREWERY



Candles after 20 minutes of pre-coating.

Filtrox candle filter (80m²) with DE free single pre-coat of 770g/m².

The addition of a single pre-coat on Filtrox candle filter allowed to dose 60 kg for 80m² in ***SFBT***:
- the dosage was reduced by 40% compared with traditionnal pre-coating, down to 770g/m², allowing more sludge volume for the continuous dosing during filtration: 1 ½ hour more or at least more 600 hL of beer per cycle;
- the time to prepare the filter was reduced by 50% to 30 minutes (closed circuit after 30 min.: 0,2 ASBC 90 °– 0,11 ASBC 25°);
- the residuals from the filter have been reduced by 27 tons/year;
- the quality of filtration is similar to a traditionnal filtration from the first hecoliters filtered;
- the brewery prepares the single precoat in the stabilising vessel, so that the bodyfeed is immediately ready to be sent only 30 minutes after the end of the filter sterilisation.

68m² frame filter with DE free single pre-coat and bodyfeed.

Brasseurs de Gayant 68m² frame filter (100x100) has been pioneer in selecting DE-free filteraids, continuously optimising the application:
- while production increased by 30%, the selection of a single pre-coat allowed to save almost 1 hour in the filter preparation before starting filtration;
- the adsorption capacity of cellulose fibers permits a better turbidity, but also a better resistance to pressure, esssential for the lager and specialty beers filtration : ***Saaz***, ***Gold***, ***Goudale***, ***Saint Landelain***, ***Mithique***, ***Bière du Démon,*** etc.;
- the cost/hL was similar to a traditional application (2 pre-coats and kieselguhr) thanks to a reduction of pre-coat (down to 735g/m²) and bodyfeed from 95g/hL (DE) to 75g/hL;
- The cellulose fiber is less abrasive, allowing to expect more than 30 filtrations per sheet. The DE free has been validated closely with the operators, in order to filter in a safer ambient.

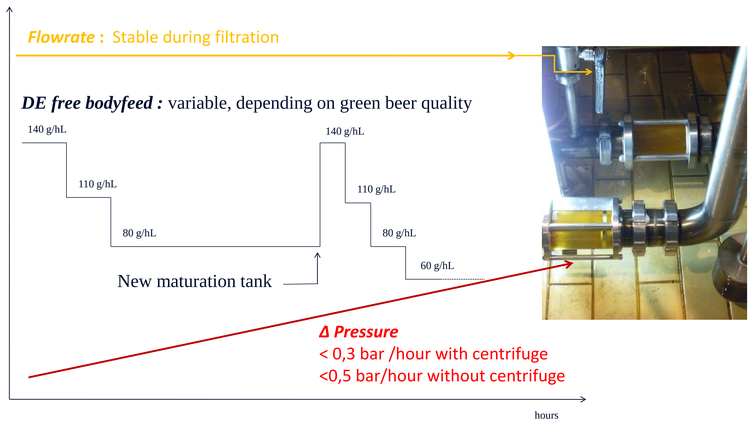
Horizontal plate filter (20m²) with DE free single pre-coat and bodyfeed in Birra Theresianer.

The maturation time in ***Birra Theresianer*** allows to filter with the finest granulometry of single DE free pre-coat and bodyfeed. The 20m² Padovan filter perfectly matches with the volumes and requirements of the brewery.

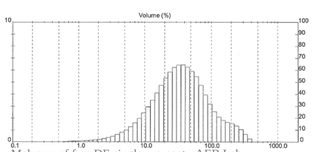
The brewery has been experimenting and systematically using free DE filteraids since 2008, have received many international rewards such as Chicago Beer World Championship (***Theresianer Premium Lager, Premium Pils, Vienna*** and ***Strong Ale***) and the Deutsche Landwirtschaft-Gesellschaft (DLG) in the recent years.

The essential parameter for the DE filtration is the capacity to keep an optimal brightness and resistance on pressure whatever the type of beer to be filtered.

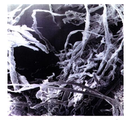
THEORICAL MANAGEMENT OF A FILTRATION RUN



PRODUCTION AND CONTROL OF DE FREE FILTERAIDS



Malvern of free DE single pre-coat - AEB Lab.



Electrocinetic power from cellulose fibers (left), the dilution in dosing vessel (right) remains 1/7 up to 1/10 with water, 5 minutes in solution before starting the transfer to the filter .

In order to produce qualitative and standardised lot of DE free filteraid, an automated production line has been built in Spain (AEB Iberica – Minalite), supported by laboratory equipments to validate the quality of raw materials and final product: distribution of granulometry (Malvern) allowing a reproductive permeability (Darcy or Lit/m²/min), pH, physical and chemical conformity.

AEB Production Unit

CONCLUSION

1. It has been technically demonstrated that a single pre-coat, composed of cellulose on perlite support at a medium range of 700 to 850g/m² could bring time, energy and cost savings while insuring a top quality beer from the first hL filtered.
2. The quality of filtration from DE free pre-coat and bodyfeed has been verified on lager beer as well as on specialty beers, with turbidity from 0,39 ASBC90° for lager (11°P) up to 0,80 ASBC90° for 18°P from top fermented yeast. The ASBC 25°, when measured, has always shown figures in line with the traditional method.
3. The ΔP evolution is usually slower than during traditional filtration, allowing a pressure reduction up to 30% thanks to a better resistance of the filter cake: the bodyfeed has been optimised to increase the filtration cycles and improve the cost/hL, always selecting the proper permeability of DE free auxiliary according to the beer to be filtered.
4. The production and the instruments of control permit a standardised quality of Fibroxcel®Uni, Fibrosteril ® and Spindacel ® .
5. A lot of breweries have been using this filtration alternative for all type of beer.

AEB Group partner :

PRACTICAL MANAGEMENT OF A FILTRATION RUN:SELECTING THE FITERAIDS ACCORDING TO THE CHARACTERISTICS OF THE UNFILTERED BEER

The pressure evolution has been improved thanks to a notable resistance of the DE free bodyfeed : the dosage was on average reduced by 20 to 30% with a similar Δp (P in - P out = 0,3bar/h max.). The filtration capacity per cycle can be therefore increased through a increase of available sludge volume (Lit.).
The quality of filtration is in line with the expectations of the Production Management, confirmed by average turbidity from 0,35 ASBC to 0,80 ASBC (Strong Ale, 18P). ASBC 25 remains also in line with the specifications.

	Birra Theresianer	Brasseurs de Gayant	SFBT
Unfiltered beer from maturation *(ASBC 90°)*	20 - 30	50 - 150	Centrifugation
Yeast count before filtration *(M.cell./ml)*	0,5 - 2	1,5 - 5	0,4-1
Composition of single pre-coat	**FIBROXCEL UNI**	**FIBROXCEL UNI**	**FIBROXCEL UNI**
Permeability	150 Lit/min/m²	150 Lit/min/m²	150 Lit/min/m²
Composition of bodyfeed	**FIBROSTERIL**	**SPINDACEL R & N**	**DE**
Permeability	60 Lit/min/m²	100 Lit/min/m²	80 Lit/min/m²

BRASSEURS DE GAYANT	°P	ASBC90°	BIRRA THERESIANER	°P	ASBC90°
Saaz	12,0	<0,55	***Premium Lager***	11,9	<0,50
Goldenberg	12,0	<0,40	***Premium Pils***	12,0	<0,45
Prima	12,0	<0,55	***Vienna***	13,5	<0,60
Bière du Démon	HG	<0,75	***Pale Ale***	14,0	<0,65
Goudale	HG	<0,70	***Bock***	15,0	<0,70
Divine	HG	<0,55	***Strong Ale***	18,0	<0,80
Celta	non alc.	<0,35	Winter malt W.Europe, 2013results		

SOLUBLE HEAVY METALS ANALYSIS

Analysis		FCC/EU requirements	Unique precoat	DE free filteraids[1]
Basis of analysis	***pH***	***For 100g/hL of beer***	***4***	***4***
Soluble aluminium EBC	mg/kg	< 100	**<80.0**	**68,4**
Soluble iron EBC	mg/kg	< 200	**<35.0**	**39,2**
Soluble calcium	mg/kg	< 2000	**<120**	**88,4**
Arsenic	mg/kg	≤10	**<1.0**	**0,36**
Cadmium	mg/kg	≤3	**<0.015**	**<0,04**
Copper	mg/kg	≤50	**<0.60**	**0,04**
Lead	mg/kg	≤10	**<0.20**	**0.16**
Magnesium	mg/kg		**<35.0**	**14,7**
Manganese	mg/kg	≤300	**<3.0**	**5,20**
Sodium	mg/kg	≤100000	**<300**	**396**
Vanadium	mg/kg	≤50	**<0.150**	**0,20**
Zinc	mg/kg	≤1000	**<0.60**	**0,24**

[1].Analysis VLB, Feb. 2014.

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