



Innovative beer filtration with a single pre-coat free of kieselguhr

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Introduction

The objective of this new method is to optimise filtration with the application of a sole pre-coat for beer filtration. This technology is a real innovation, if we consider that beer has always been filtered with two pre-coats all containing diatomite.

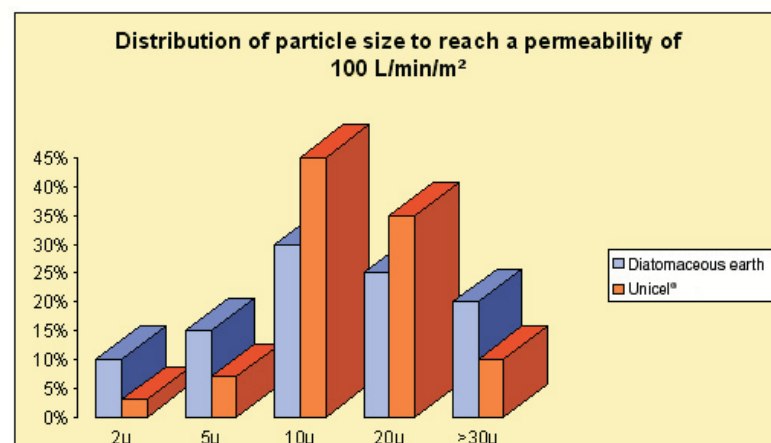
The first pre-coat is traditionally used as a support for the whole filter cake, the second pre-coat is used as a filter aid and is further completed by continuous dosing, to trap particles above approx. 0,2 μ .

Proteins and polyphenols are usually absorbed using silica gel and PVPP.

A single pre-coat therefore, has to ensure on the one hand support for the whole coat, without being abrasive towards candles, plates or sheets, to enable on the other hand a good turbidity and microbiology, with an optimal filterability in terms of hectoliter per cycle in order to reach both qualitative and economical improvement.

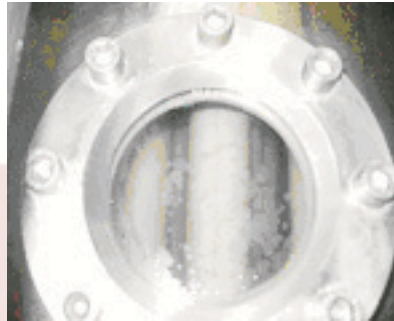
How can a single pre-coat insure the role of two traditional pre-coats?

A filter aid is selected according by permeability (liter/minute/m²) or darcy with a large distribution of particle size. The reduction of the small particles allows for a faster forming of deposit on the septum and decrease of turbidity when running a closed circuit with water.

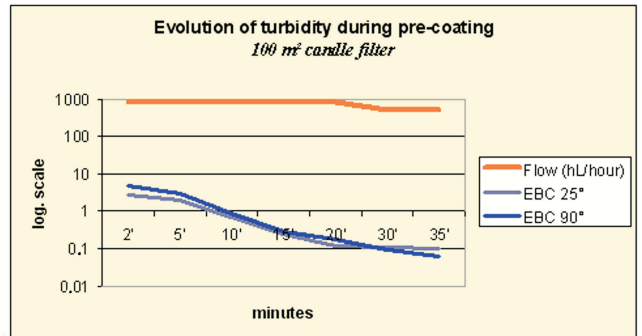


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Single pre-coat after 20 minutes of closed circuit.



Different beers to be filtered

The characteristics of the beers coming from the maturation tank or unitank are variable, consequently it has been divided into two groups whatever the type of fermentation (high gravity or lager type). Three major parameters have been identified to select the right single pre-coat:

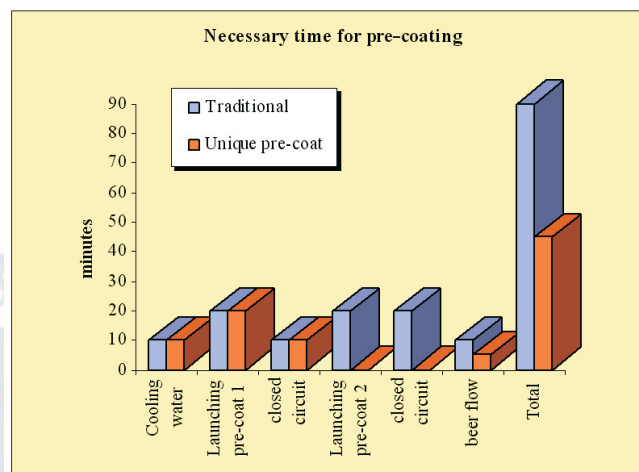
- ↳ Beer is centrifuged or not: the yeast is a colmating element for the filter, can come in high concentration at the beginning of filtration, at the same time it also aids filtration;
- ↳ Turbidity (EBC) of the beer before filtration: this parameter fluctuates according to the amount of yeast, also to the maturation time and temperature determined by the brewmaster;
- ↳ Filter aid in body feed: it is recommended that the permeability of the pre-coat can reach approximately the same as the bodyfeed.

	<i>Unicel® Centri</i>	<i>Unicel®</i>
Permeability	80 L/min/m ²	100 L/min/m ²
Centrifugation	Yes	No
Turbidity of beer before filtration (EBC 90°)	< 30	> 30
Continuous dosing (Darcy)	Mix of fine – medium fine 0,06 – 0,2	Mix of medium fine – white 0,2 – 1

We actually consider the turbidity of the beer before filtration as more determining than the centrifugation to select the unique pre-coat permeability.

Comparative analysis of the construction of a pre-coat

The progress in the pre-coat building: this parameter is very positive, allowing a saving time of 45 minutes for every new filtration. When the filter is considered as the bottleneck of the brewery compared with the bottling line, when the request of beer is higher (seasonality, increasing market...), this time saving allows to increase the productivity by approximately 5%.



Impact on cost saving: the productivity when the brewery needs to filter more, the cleaning time saved, decreased the labour cost and extra hours at the end of the week; indeed, one week of filtration brings 6 to 8 hours extra time, or one labour shift.

Necessary quantities and impact on residuals

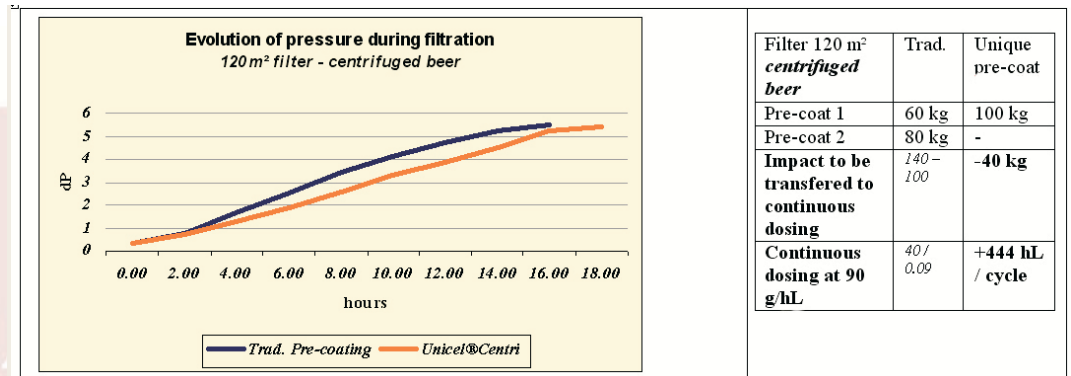
The use of a single pre-coat is usually used between 800 to 1000 grams per square meter, while the traditional pre-coating requires 1200 grams for centrifuged beers, up to 1500 grams per square meter for the non centrifuged one. Based on a 100 m² horizontal plates filter, such innovation allows the following improvements:

<i>Centrifuged beer on horizontal plates</i>	Traditional with 2 pre-coats	Alternative with 1 unique pre-coat Unicel® Centri
		
Quantities for 1 filtration	120 kg	80 kg
Number of filtration / year	300	300
Necessary quantities required for 1 year	36,000 kg	24,000 kg
Impact of direct consumption		-12,000 kg
Residual (1 kg grows to 3,5 L)	126,000 kg	84,000 kg
Quantitative impact of residual		-42,000 kg

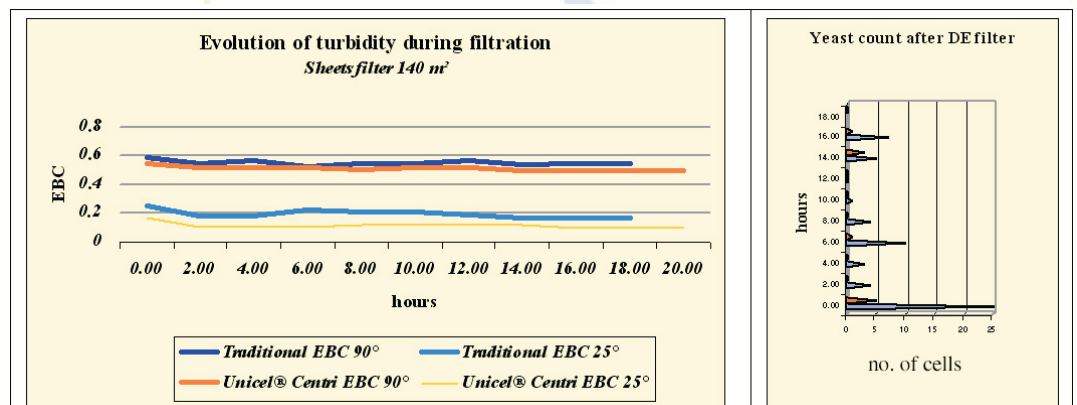
The economical impact has to be calculated according to the regional cost where the brewery is located.

Follow up of a filtration run

The evolution of the pressure is globally identical, and this parameter is very important when the filtration gets stopped because of the volume capacity. Indeed the decrease of quantity in the pre-coating allows to enlarge the filter capacity during body feed from one to two hours, so 5 to 10%.



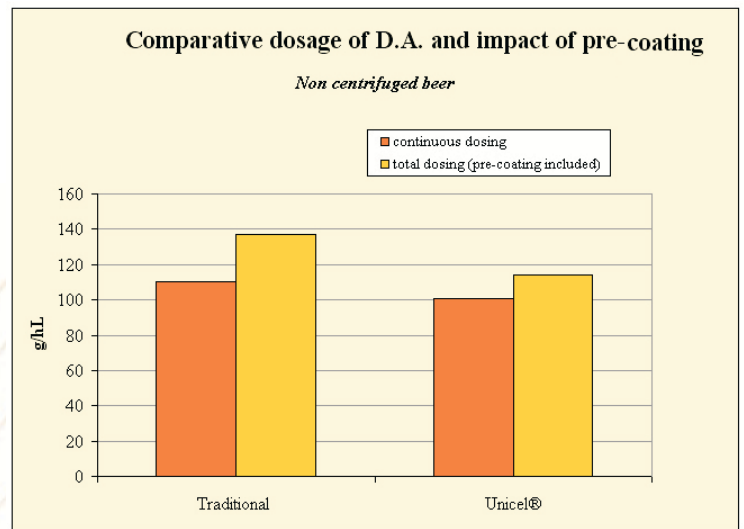
From a quality point of view, it is possible to confirm that the filtration can be improved in terms of turbidity and microbiology. The net consisting of the fibres improve the retention of small particles which have direct impact on the turbidity, and the yeast count particularly when filtration starts and the cake is not yet thick; such a net of fibres enables a perfectly homogeneous deposit on the filter septum. This positive effect can be followed during the entire cycle of filtration thanks to the adsorptive power brought by the electrokinetic charge of the cellulose fiber.



The cellulose fibre better protects the candles, plates or sheets from the abrasivity of xerogel or D.E.; it also enables a quicker filter cleaning procedure.

From an environmental point of view, this unique pre-coating agent is cristobalite-free which decreases the risk of inhalation related health complications by people handling this material.

From a quantitative and economical point of view, it has been possible to determine the decrease of total consumption, mainly due to the lower amount of the pre-coating filter aid.



It is therefore possible to expect a decrease in the continuous dosing, with a total decrease of filter aids, pre-coat included.

Conclusion

We can consider that, 40 minutes after applying the single pre-coat onto the filter, beer filtration can start, thanks to all obtained qualitative parameters, which means a saving of more than 45 minutes for every new filtration run. The quality of filtration improves as does the function of the filter. The perfect homogeneity of the single pre-coat on candles, plates or the tight permeability of the sole pre-coat does not influence the length of a run; during industrial applications a lower pressure evolution was also noticed, surely caused by the pre-coat elasticity, giving better resistance. A significant decrease in body feed has been noted and also the impact on filtration, considering that a pre-coat is always an invariable, not dependent on the length of the filtration run, the less kieselguhr is put in the filter at this step, the lower the economic impact will be on the whole filter cycle. All these indications highlight the interest in using a single pre-coat, under consideration of the beer to be filtered.

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