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C R O S S P U R E® - THE FUTURE OF KIESELGUHR-FREE BEER FILTRATION

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EXECUTIVE SUMMARY

Crosspure® (Figure 1, 2) is a synthetic polymer that can be used for optimal filtration and stabilisation in general. It is intended to use as a regenerable replacement of Kieselguhr and is capable to remove tannoids, flavanoids and other haze forming polyphenols from i.e. beer.

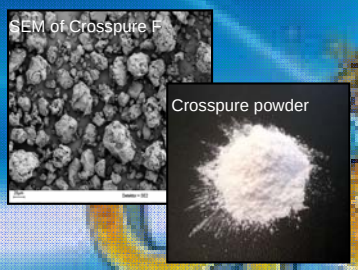

Figure 1 (left): Morphology of Crosspure F (SEM)
Figure 2 (right): Standard Crosspure powder

In contrast to powder-free filtration technology, which implicates a fundamental CAPEX, Crosspure can be used in existing, slightly modified kieselguhr filter lines. Furthermore it is eco-friendly and cost effective as transports and stock can significantly be reduced.

INTRODUCTION

Kieselguhr is a natural filtration aid used during the beer filtration process for decades. The main driver for brewers moving away from kieselguhrs is health, safety and environmental constraints.
Disposal costs for spent kieselguhr is an increasing part of total filtration costs and so brewers are commonly interested in finding more economic methods to replace it.

The current worldwide kieselguhr consumption in the brewing industry is more than 180,000 tons per annum. As a non-renewable raw material it has limited sources and so will not encourage environmental sustainability.

Crosspure is a product that can be used for optimum filtration and stabilisation of beverages in general. It is intended to be used as a regenerable replacement of Kieselguhr to remove solids from beer.

TECHNICAL DESCRIPTION

Crosspure is manufactured by a patented compounding process of a mixture of Polystyrene and PVPP. Crosspure is available in two grades (see table 1).

Parameter	Crosspure® F	Crosspure® XF	Unit
Wet density	0,47	0,57	g/cm³
Swelling volume	< 3.5	< 3.5	l/kg
Permeability	> 170	> 100	mDarcy
	70 -120	30 - 60	l/h x 1600 cm²
Catechin adsorption	> 20	> 20	%

Table 1: Application properties of Crosspure

FILTRATION TRIALS

• Pilot filter scale

The pilot candle filter was installed in by-pass to a standard kieselguhr - PVPP filter combination. Crosspure pre-coat was approx. 2,000 g/m² and dosages varied between 120 g/hl. The commercial kieselguhr filter line was run with 1,200 g/m² and a dosage of 120 g/hl. PVPP addition rate was 20 g/hl.

• Production filter scale

Main description
Number of screens: 40
Filtration surface: 45 m²
Filtration rate: 230 hl/h
The used filter is a modified PVPP filter.

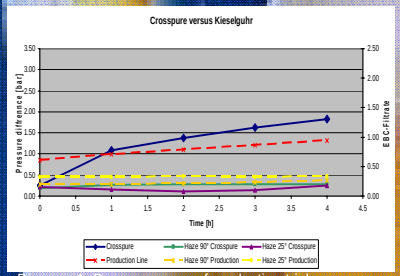

Diagram 1: Pressure curve of production trial

The analytical results of the comparison of Crosspure vs. kieselguhr + PVPP are shown in table 2.

Analytical parameters	Crosspure	Kieselguhr + PVPP
Alc. [%V]	0.60	0.62
Alc. [%G]	0.46	0.47
Extract [Plato]	9.48	9.53
d20/20	1.0335	1.0335
pH value [pH]	4.49	4.48
Colour [EBC]	10.0	10.0
Tannoids [mg/l]	< 1.0	17
Sens. proteins [mg/l]	12.2	10.8
T. polyphenols [mg/l]	77.0	144.0
Forcing test, 60C [WD]	18	11
Bitter units [EBC]	38.9	36.5
Foam stand [NIBEMs]	133	110

Table 2: Analytical results Crosspure vs. normal filtration

REGENERATION PROCEDURE

The most important part of regeneration is degradation of yeast cells through different chemical cleaning steps. A hot caustic soda treatment after first water rinsing helps to remove around 90% of the biomass of the filter cake. The remaining organic load can cause tremendous problems during coming filtrations and so has to be totally removed.

Figure 3: Regeneration step 7

Regeneration cycle:
1. Rinsing with hot water
2. NaOH-cleaning (2%, 85°C)
3. Rinsing with water
4. Enzymatic treatment (40-50°C, pH 4-5)
5. Deactivation of enzymes
6. Rinsing with surfactant & NaOH, followed by hot/cold water and pH adjustment
7. Transfer filter cake to dosing unit

All conducted filtration trials confirmed high mechanical and chemical stability of this new filter aid and losses of below 2.0 per cent.

OPERATING COSTS

Based on existing filtration costs it could be shown that Crosspure use results in a cost benefit for the brewers. Depending upon the used stabilisers cost advantage varies between 2-60 %. Table 6 shows a cost comparison of a 1.5 million hectolitre brewery.

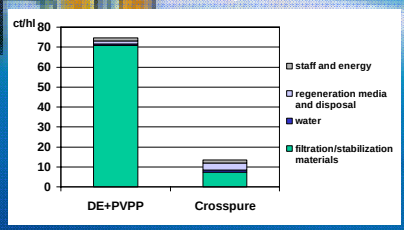

Table 6: Operating costs of KG/PVPP (single grade) vs. Crosspure

APPROVAL SITUATION

Crosspure is approved for use in Europe, Russia, Philippines, Vietnam, U.S.A. and Mexico. It is further expected to be applied in China, Thailand, Brazil and South Africa in the first half of year 2008.

SUMMARY

The benefits of BASF's new beverage filtration aid in comparison with existing conventional products are:

- ✓ Reduced inventory
- ✓ No disposal of filter aid
- ✓ Consistent product quality
- ✓ No uptake of metals
- ✓ Non abrasive filter aid
- ✓ Filtration & stabilisation in one filter line

ACKNOWLEDGEMENT

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