Brewtan® F

>>> Beer stabilisation at end-filtration
Application data-sheet

>>> INTRODUCTION

Worldwide flavour and colloidal stability are important quality benchmarks for brewers and consumers. Beer should be an agreeable drink of pleasing flavour, attractive colour and clarity, containing sufficient gas to carry aroma and foam even after transport to the other side of the world or after storage for months in supermarkets.

Brewtan® F is a 100% natural gallotannin specially designed to provide a combined increase of colloidal and flavour stability. When used just before end-filtration, it reacts primarily with the acid SH-group containing proteins by adsorption and precipitation. The formed Brewtan® F - protein complexes are removed by filtration.

Reacts instantly with haze sensitive proteins by adsorption and precipitation
Doesn't interact with foam active proteins

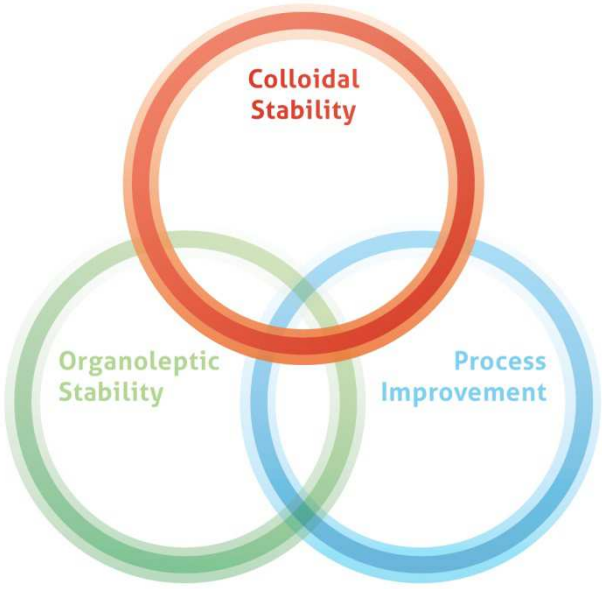

Figure 1.: Properties of Brewtan® F

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>>> APPLICATION AT END-FILTRATION

>> Practical implementation

Required equipment

Stainless steel equipment is recommended as dissolved iron from ordinary steel equipment forms a dark blue complex with gallotannins.
The use of Brewtan® F just before end-filtration requires specific equipment; Brewtan® F is dosed proportional in the beer stream just before a buffer tank. The body feed pump must be adapted for coarse filter-aids.

Preparation, dosing & sequence of addition

Typical dosage levels of Brewtan® F before end-filtration range between 0,5 – 1,5 g/hl. The quantity of Brewtan® F used is expressed relative to the amount of final 100% malt 12°P beer. The amount of added adjuncts, gravity of the beer, yeast count, and O_2-levels has to be taken into account.

Clear solutions are obtained by slowly adding Brewtan® F to soft water at room temperature while stirring to prevent lumps. We recommend a concentration of 10% that afterwards is further diluted to 1 – 5% at cellar temperature. The water used must be O_2 free and covered with CO_2-gas to avoid O_2 injection in the beer.

Reaction times

The reaction of Brewtan® F with unstable acid proteins only takes a few seconds at temperatures between –1,5°C and + 20°C, however the formation of stable flocks takes a few minutes. The optimum temperature for immediate stabilisation is –1,5°C to – 0,5°C.

Filtration setup

Brewtan® F reacts with beer proteins to form small flocks. By co-precipitation, bigger flocks are formed and the level of protein removal improves.

Kieselguhr filtration is a mix of surface and deep filtration, unlike perlite filtration, which is a mix of deep and adsorption filtration. Due to the different filtration behavior, as well as the lower density of perlite, lower bodyfeed dosages can be reached when using Brewtan® F in combination with perlite as bodyfeed.

Set up:

1st precoat:	700 g/m² of a coarse kieselguhr or perlite (e.g. 1,5 Darcies)
2nd precoat:	500 g/m² of a filter aid mixture similar to bodyfeed (e.g. mixture of filter aids between 1,5 and 6 Darcies)
Body feed:	75 to 150 g/hl of a coarse filter aid (composition similar as second precoat) in proportion to the yeast load and Brewtan® F dosage.

Typically a Brewtan® F filtration is started at 120 g/hl of bodyfeed. In case the Brewtan® F dosage is higher than 1,2 g/hl, the starting dosing of filter aid is increased to 100 g/hl for every 1 g/hl of Brewtan® F.

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Impact of raw materials

- Malt
  Malt with a protein content of 9-12% is good brewery malt, lower than 9% gives foam problems, more than 12% gives very unstable beers. Malt with high nitrogen content gives a lower brewhouse yield, will result in more soluble proteins and thus also more haze formation in the final beer. Brewtan® F can help to correct fluctuations in malt quality by eliminating these excessive amounts of proteins.

- Hops
  Unoxidized, high α-content hops give the best stable beers. Very easy tools which help to improve the overall stability are hopextracts and pellets. Vacuum packed pellets under N_2, even pre-isomerized, are stable for a few years at temperatures below 15°C; polyphenolfree hopextract is stable for over 10 years and greatly enhances the colloidal stability.

>> Compatibility with other stabilisers

Brewtan® F can be used in combination with other stabilizers like PVPP, provided some precautions are taken.

>> Residues in final beer

Brewtan® F addition	Polyphenol residue (as gallic acid)
0 g/hl	0,50 ppm
2 g/hl	0,40 ppm
4 g/hl	0,40 ppm
6 g/hl	0,39 ppm

Table 1.: Residues of Brewtan® F in final beer

To determine the impact on the polyphenol residue of Brewtan® F four similar brews were made using the same raw materials and brewing method.

The polyphenol residue of this untreated beer is 0,50 ppm. When the polyphenol residue is determined in the Brewtan® F treated beers (2, 4 and 6 g/hl) the polyphenol residues found are lower than the residues found in the untreated beer, even when dosages higher than the recommended dosage are applied.

>>> IMPACT OF BREWTAN® F USE

>> Impact on colloidal stability

To study the impact of Brewtan® F on colloidal stability some comparison trials with Silica Xerogel have been performed. Two different beers, one with a low yeast count and one with a high yeast count prior to filtration, have been used in this comparison study.

The colloidal stability has been evaluated according to MEBAK.

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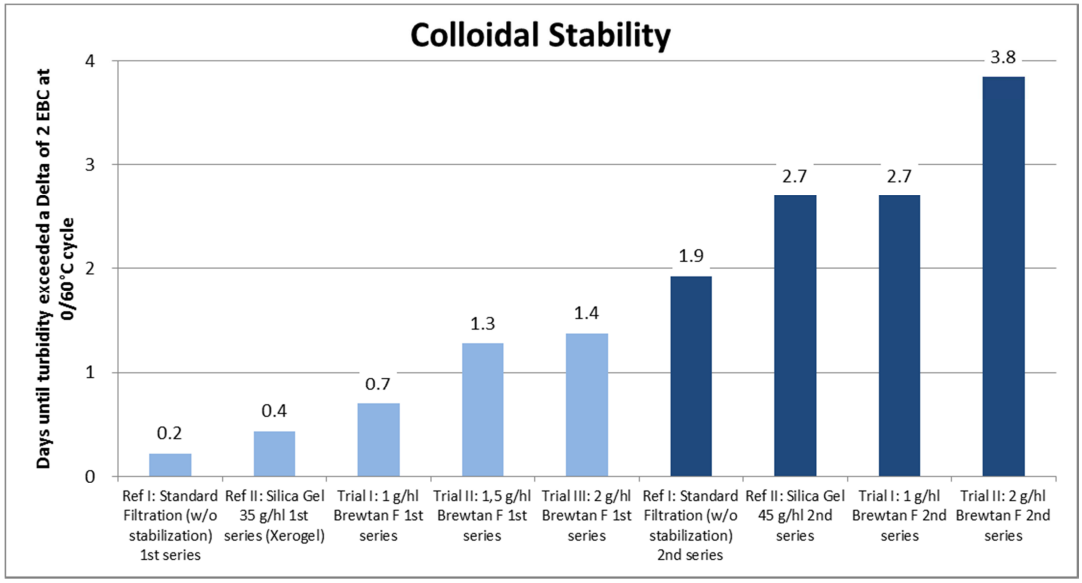

Figure 2.: Comparison of a Xerogel stabilisation with a Brewtan® F stabilisation

From the above figure, one can conclude that 1 g/hl Brewtan® F has a similar stabilisation behaviour as 45 g/hl of Silica Xerogel and that this behaviour is more or less independent from the yeast count in the beer prior to filtration. Besides the economic benefits achieved by replacing Xerogel by Brewtan® F, one will also notice a decrease in waste disposal from the filter and an easier manual handling (1).

>> Impact on organoleptic stability

Impact on taste stability

The chemistry of beer aging is a very complicated subject for which decades of study has been conducted throughout the world in order to try to gain a better understanding of the topic. One of the factors affecting the beer stability is the metal content as this is a catalyst for aging reactions, like the Fenton-oxidation reaction.

During filtration, both the beer itself and the filter aid used are a source of metal ions. A study conducted by Stephan Hanke from the Bitburger Braugruppe has clearly shown that Brewtan® F not only reduces the metal content in the beer, but also prevent additional metal pick up from the diatomic earth (1).

		unfiltered beer	diatomic earth	potential load with a dosage of 100 g/hl	Untreated filtered beer	Recovery Yield [%]	filtered beer 2 g/hl Brewtan F	Recovery Yield [%]
Aluminum	ppm	0.005	215	0.215	0.158	71	0.090	40
Vanadium	ppm	< 0.001	21.5	0.0215	0.018	77	0.007	28
Iron	ppm	0.031	76.	0.076	0.051	26	0.034	4
Nickel	ppm	0.002	0.225	0.000225	0.002	0	0.002	0
Copper	ppm	0.047	0.375	0.000375	0.047	0	0.045	0
Arsenic	ppm	0.002	2,.50	0.00245	0.004	82	0.004	82

Table 2.: Brewtan® F reduces the metal content in the filtered beer (1)

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The same comparative trial against Silica Xerogel (Figure 3.) clearly indicates that the addition of Brewtan® F reduces the iron content with approximately 50% compared to beer stabilised with Silica Xerogel [1].

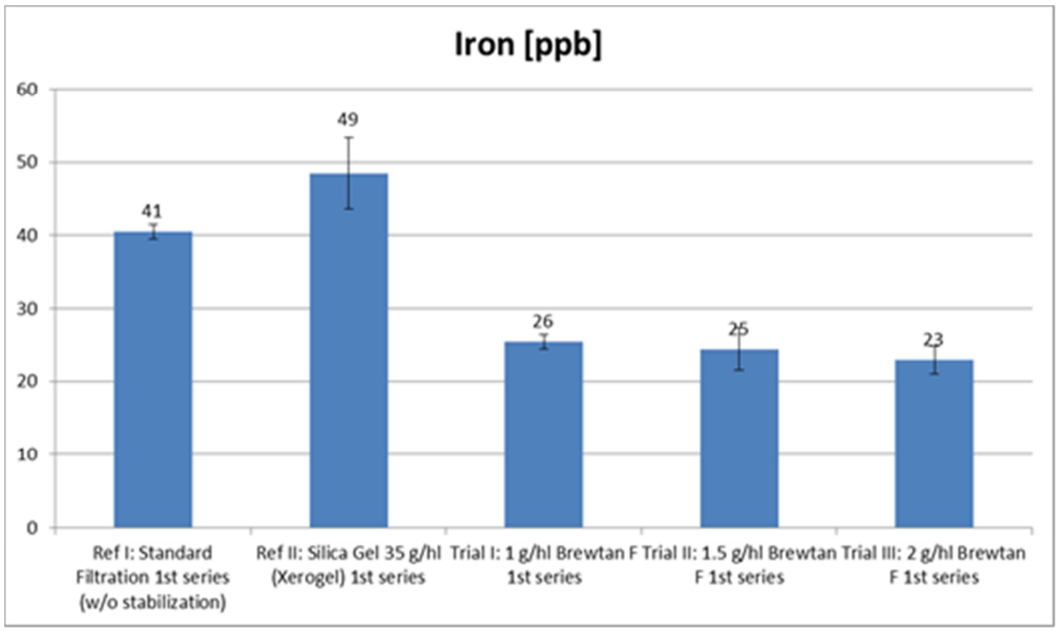

Figure 3.: Reduction of the iron content by Brewtan® F

Impact on foam

Four trial brews were split in two just before end-filtration; one half was the control the other half was treated with Brewtan® F.

Thus foam half-life of the untreated control and beer stabilised with 2 g/hl Brewtan® F during end filtration could be compared.

Use of Brewtan® F during end-filtration has no negative influence on foam. In some cases the foam is even better with Brewtan® F due to absorption of fatty substances on the Brewtan® flocks.

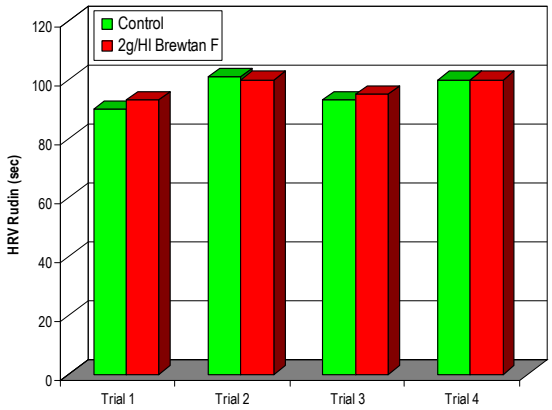

Figure 4.: Impact of Brewtan® F on foam

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>>> BIBLIOGRAPHY AND REFERENCES

(1) **Use of tannins for beer stabilization during end-filtration**
S. Hanke, G. Stettner, World Brewing Congress 2012

>>> OVERVIEW

Figure 5. shows the different ways of incorporating gallotannins into the brewing process. This allows brewers to choose the most appropriate product for their requirements; it is also possible to combine two or more of these methods to give a combination of process and stability benefits.

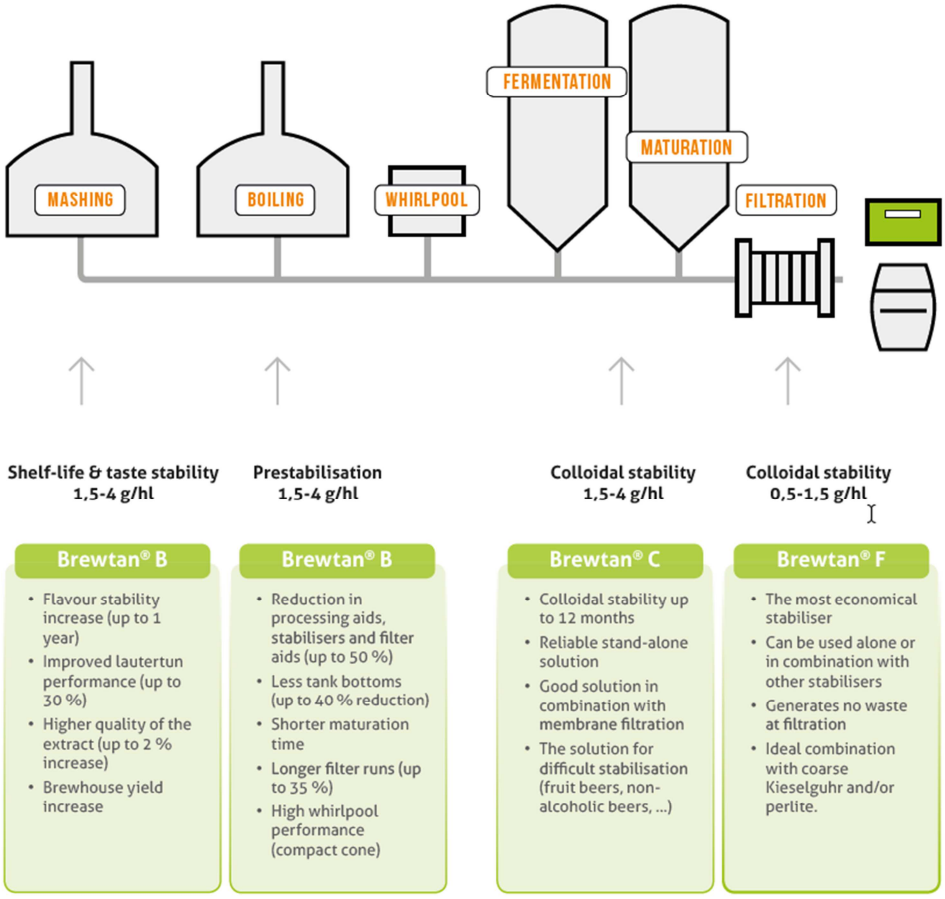

Figure 5.: Brewtan®, your natural beer stabiliser

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