MIXED PRODUCTS AS AN ALTERNATIVE

Kieselguhr-free precoat filtration

Since decades, precoat filtration has been the most frequently applied method of beer filtration worldwide. By a good and reliable clarifying effect and a high hourly output it provides the user with a gentle and careful filtration technique. Not least, these results can be traced back to the use of kieselguhr. But because of kieselguhr being criticised out of different reasons over the last years, more and more alternatives are introduced onto the market now.

Kieselguhr (diatomaceous earth) has outstanding filtration properties due to its very special structure. It forms a compact filter cake which is resistant towards pressure surges and thus assures stable filtration.

Kieselguhr dust contains crystalline constituents which are respirable and are irritant to the lung (affecting the alveoli) and thus may lead to diseases of the respiratory system. Based on a study by the IARC (International Agency on Research of Cancer; a workgroup of the WHO-World Human Organisation), kieselguhr was classified as hazardous to health in 1997 and its use has always been criticised since then.

Disposal of kieselguhr

By changes in the German Regulation on Fertilisers (see Federal Law Gazette I page 2482, last revision of 5th December 2012), the use of kieselguhr is questioned anew. After the brewery and fruit juice associations objected, this “new” regulation on fertilisers was reviewed once again.

The first prohibition to apply kieselguhr on crop areas was withdrawn and the special require-
ments were added (see chart 1). In how far these requirements can be observed without increased expenditure has yet to be clarified.

**Alternative technologies**

The possibility exists to replace kieselguhr by new, or also by older technologies, as well as by their combinations. Hereby, especially crossflow filters, separators and sheet filters are employed.

The only way to avoid costly investments in new plants and equipment, is to use alternative filter aids. At the current level of development, perlite, cellulose and synthetic materials as single components do not provide the required properties to be able to replace kieselguhr in technical, economical and qualitative respect.

**Filter aid mixed products**

By the combination of different filter aids also their specific advantages and qualities can be ideally combined and harmonised which enables to match a filter aid from different components to fulfill the high requirements of beer filtration in the future. For this purpose, the Erbslöh Geisenheim AG has developed two filter aid mixed products which are specially applied during beer filtration for the first (product 1) and for the second (product 2) precoating.

**Solution approach**

The advantage of filter cellulose is that by targeted milling and fibrillation of selected fibres its structure can be modified in a way that it forms a voluminous and strongly branched spacial texture. Into this structure perlite of different fineness is embedded, which determines density and compactness of the filter cake formed.

After all, it is the principle of filter sheet production which is applied. Product filtration is designed accordingly: A first precoat of the filter cake with the new mixed product VarioFluxx® PreCoat 1 forms a well structurised and stable “filter layer” which reliably retains haze particles and microorganisms. The second precoating with VarioFluxx® PreCoat 2 forms a fine clarification layer for a, in a targeted way, increased haze reduction. The continuous dosage is without exception conducted with special perlite, the fineness of which matches beer-specific requirements.

The aim is the formation of a well structurised filter cake in the first and second precoating to obtain an optimal filtration effect. Both precoatings determine the clarification degree and assure a reliable and reproducible filtration. The continuous addition merely keeps the filter cake above the precoating layers open by the perlite particles forming a drainage structure between the haze particles.

**Filtrate quality**

The filtration results show a comparable clarification effect to kieselguhr and often even an improved head retention of the filtrated beers. The filtration course is stable and provides

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**Chart 1: Restrictions/conditions for the application of kieselguhr in accordance with the German Regulation on Fertilisers**

<table>
<thead>
<tr>
<th>Requirements/conditions</th>
<th>Interpretation</th>
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<tr>
<td>– Particles of crystalline silicic acid with diameter &lt; 50 µm ≤ 0.1 %</td>
<td>The cristobalite concentrations of the individual kieselguhr types can vary significantly. This minimum content cannot be reliably kept by computation.</td>
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<tr>
<td>– Kieselguhr portion in filtration residue ≤ 75 %</td>
<td>In the individual case, product losses must be accepted by this regulation, respectively, alternatives must be found.</td>
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<td>– Sieve passage: ≤ 0.10 mm max. 0.2 % ≤ 0.05 mm max. 0.1 % ≤ 0.01 mm max. 0.005 %</td>
<td>With the classical kieselguhr mixture, in filtration these parameters are hard to keep.</td>
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reproducible and reliable results. The microbiological retention rates are also absolutely comparable. With regard to heavy metal load, the new mixed products are advantageous due to the fact that the cellulose fibres used in the mixture are very strongly extracted in the production process and are highly pure.

Economy
The economic efficiency of the filtration with the new mixed products strongly depends on the total throughput of the filter. The costs for precoating are increased whereas the costs for the continuously added filter aids during the process are reduced. So principally, an individual break-even point for the saving of costs can be determined for every filter.

Conclusion
Precoat filtration with the filter aid mixed products newly developed by the Erbslöh Geisenheim AG, is a genuine alternative to kieselguhr and meets the requirements of the changed Regulation on Fertilisers. In technical respect, the new mixed products can be applied on the existing filter plants without problems and without increased costs. Filtrate quality in respect of head retention and load of beer-soluble elements, as for instance heavy metals, is positively affected. Enhanced economy is obtained by an increased total filter throughput.

Fig. 3: Course of precoat filtration with the new mixed products
VarioFluxx® PreCoat 1+2

Fig. 4: Course of turbidity of precoat filtration with the new mixed products
VarioFluxx® PreCoat 1+2

Fig. 5: Economic efficiency