

Abstract

Viscose speciality fibres are likely to be a future filter aid for precoat filtration as they give high process flexibility, are bio-based and fully biodegradable, bear no health risks and are therefore easy to handle and to dispose and – the most important criterion – they help obtaining an optimum product quality without altering the taste.

To prove this, in the last years, since precoat filtration is still the most widespread way of beer filtration, a lot of alternative filter aids have been analysed but none was able to be successful. All the applied filter aids have in common, that they cannot deliver the same technological flexibility with the same sensory quality over the whole process. So in the development of new strategies all new approaches are driven by these quality, flexibility and sustainability aspects to succeed in the market. That forces an increasing engagement in finding the best processes with the best alternative media for kieselguhr. Working on this topic means that limitations and disadvantages have to be considered in the solution as well.

Actually this presentation reports the development of this new alternative filter aid and its results. Therefore, the steps of the last years' work with the core work on the modification of viscose fibres will be presented, ending with the approval of the filtration in a pilot plant at a Bavarian brewery. With this success also evaluation of the chances and limitations of this alternative precoat process can be done.

In detail the shown research results will include the analysis of the sedimentation behaviour, cake building processes, porosity development, cake flow-through, process of precoat, technological values, turbidity, evaluation of the retention rate and the importance and dependence of compressible cake behaviour that lead to the approved filtration proclaimed. The research results indicate that a replacement of kieselguhr by functional viscose fibres as filter auxiliary for precoat filtration of beer is possible without losing filtering performance, even more with an increased filter flux, and that with a turbidity in order with the typical specific limits and beer qualities. Due to the successful adaptation of the viscose speciality fibres to the process equipment for kieselguhr precoat filtration the breweries as users of the filtration technology will be able to continue using their existing equipment without major investments in technology.

Target of the work

Development of an alternative filter aid which is capable for flexible adjustment to the filterability of beer

Requirements for the Solution

Technological requirements

- Bright filtrate with minimum turbidity
- Improvement in the physical stability of the beer
- High microbiological safety for the filled product

Process-related requirements

- High filter service life
- Low operating costs
- Easy operation

Controllable flexibility

- Beer is a natural beverage made from renewable raw materials.
- Fluctuations in the quality of the raw materials and product from year to year are natural and unavoidable.
- The brewing process has to compensate these fluctuations.
- They should not be allowed to influence the capacity.

Materials & Methods

Test equipment:

Lab filtration unit
Glass filter chamber with 55mm diameter
Viscose fibres
Reference beer (specialty reference recipe ©)

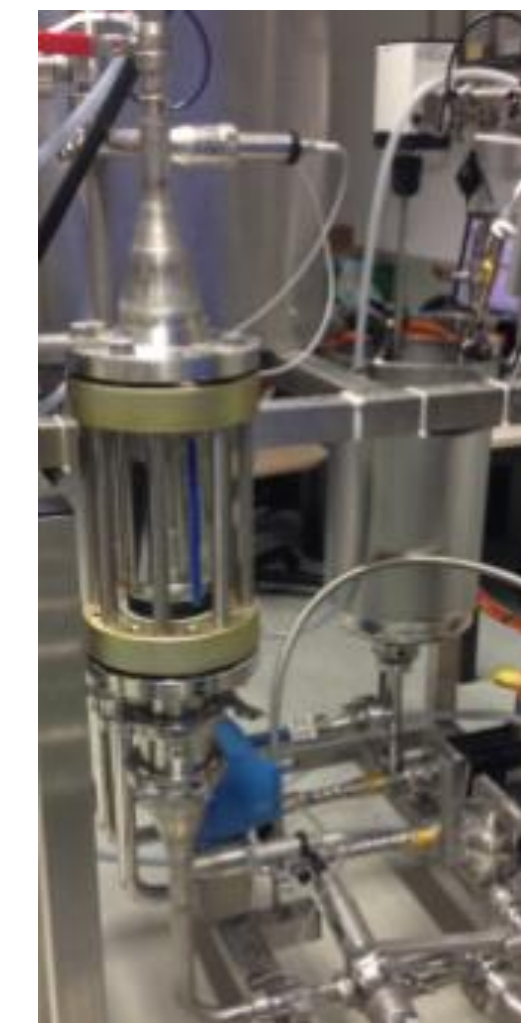


Fig. 1:
Lab filtration unit

Viscose speciality fibres are regenerate fibres:

- They are no natural cellulose.
- It is a man-made fibre on the base of cellulose.

Tailor made fibres allow specific influence:

- Diameter, length, cross-sectional form, shape
- Functional groups
- Adsorption additive functions

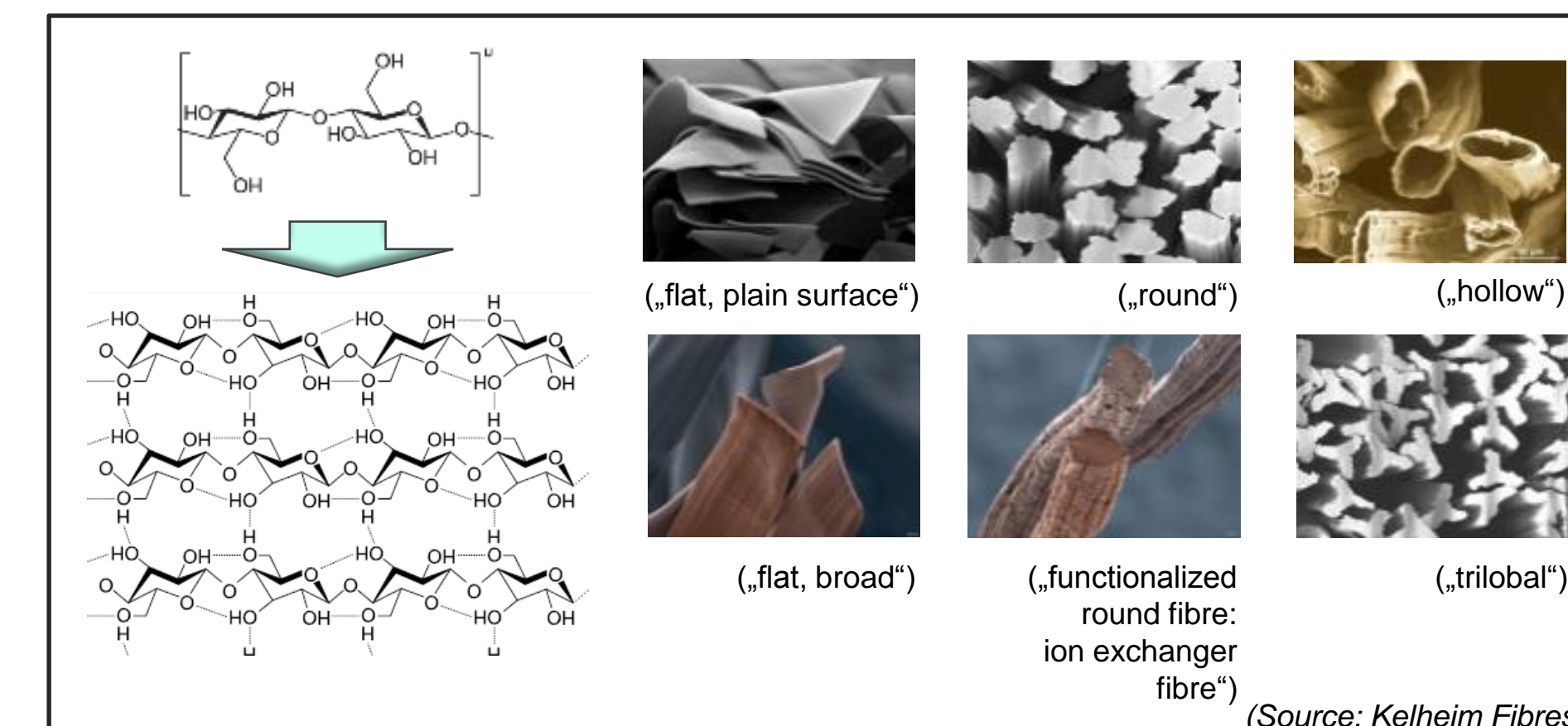


Fig. 2:
Variety of tailor made viscose fibres

Selected Results of the Viscose Fibre Development

The presented results start with the analysis of permeability and use the compressibility of alternative filter aids to achieve the necessary cut-off:

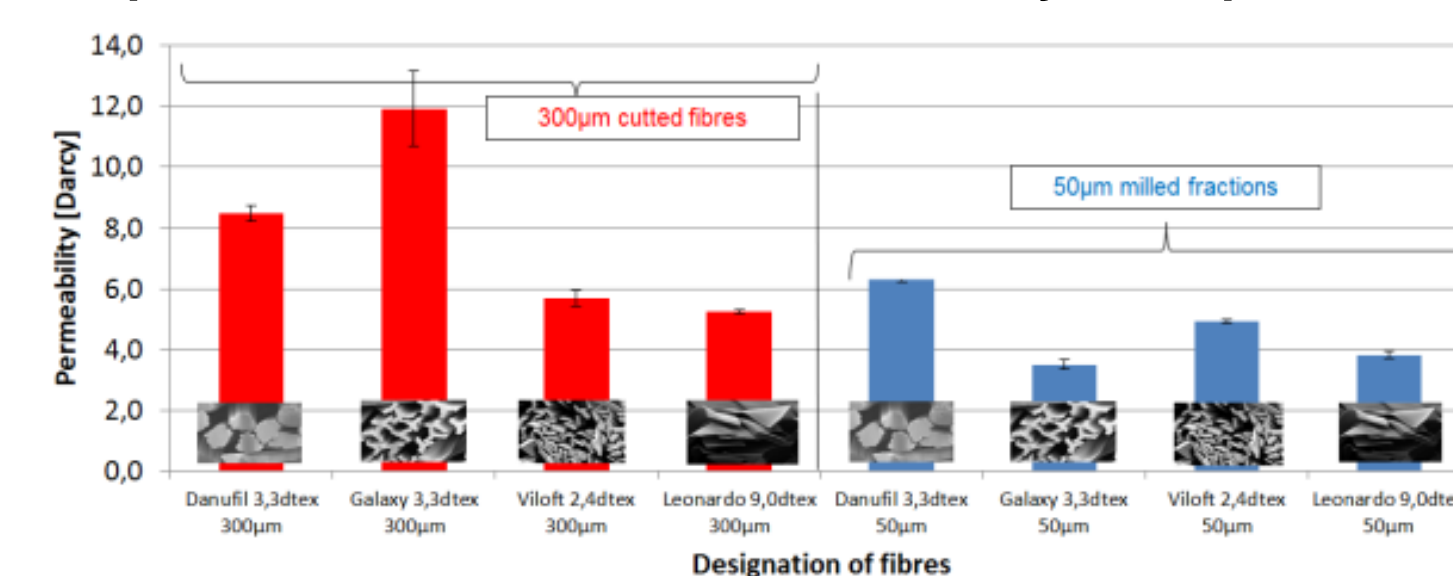


Fig. 3: Permeability of different fibre shapes and lengths

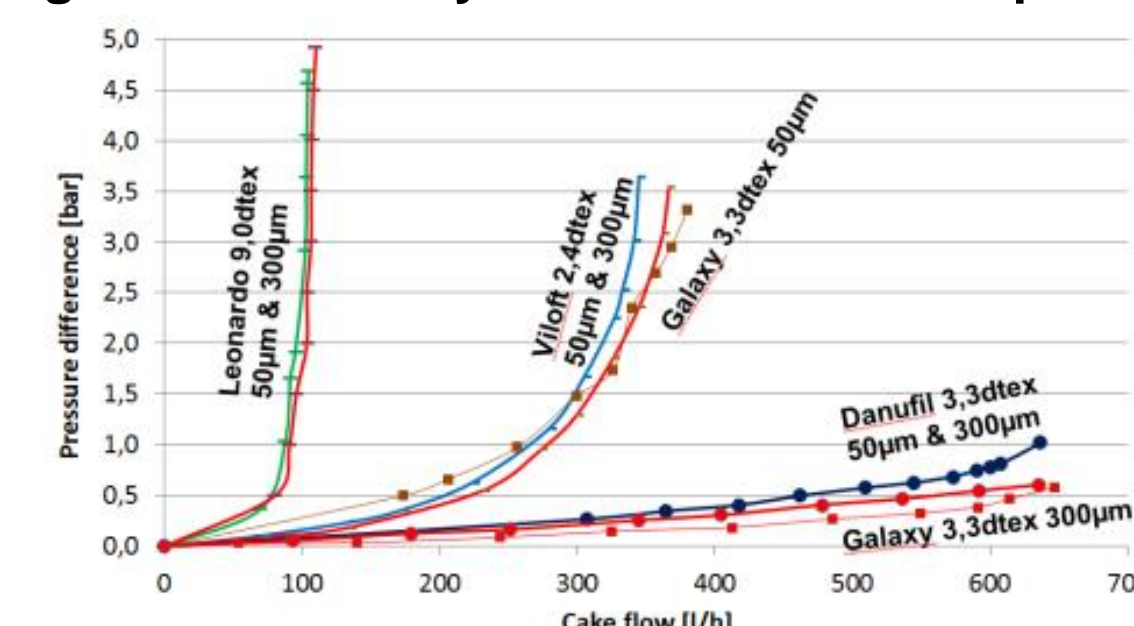


Fig. 5: Resulting pressure differences according to cake flow

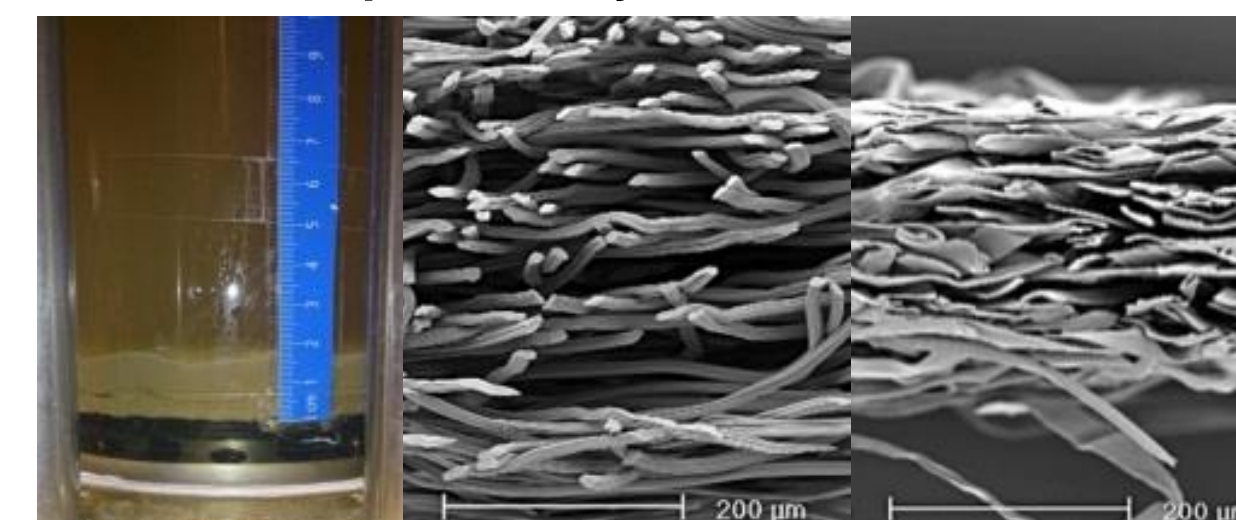


Fig. 4: Precoat and compressed cake of two exemplary flat fibers

- Compressible fiber behaviour is fact.
- The compressibility must be part of filtration strategy and results in different pressure loss over the cakes in dependence to diameter, length, cross-sectional form and shape.
- Therefore assorted exemplary fibres deliver the results on the right to the benchmark for comparison to diatomite earth:

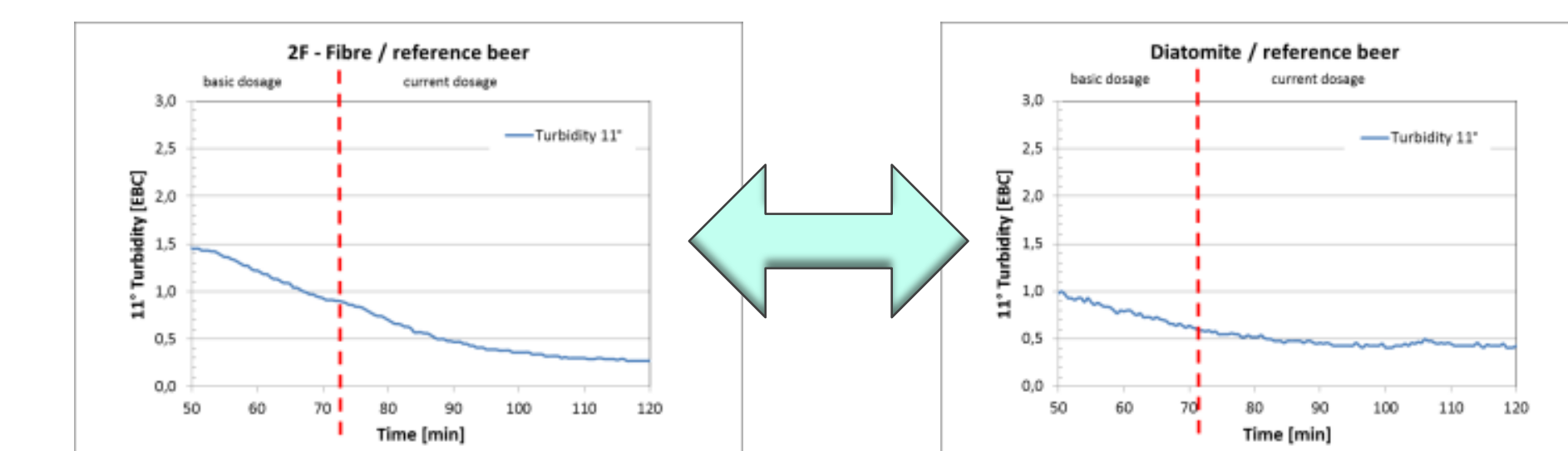


Fig. 6: Turbidity curves for the comparison of a reference beer filtration with viscose fibres (Danufil 2F, left) and diatomite (right) (run lengths are normalised)

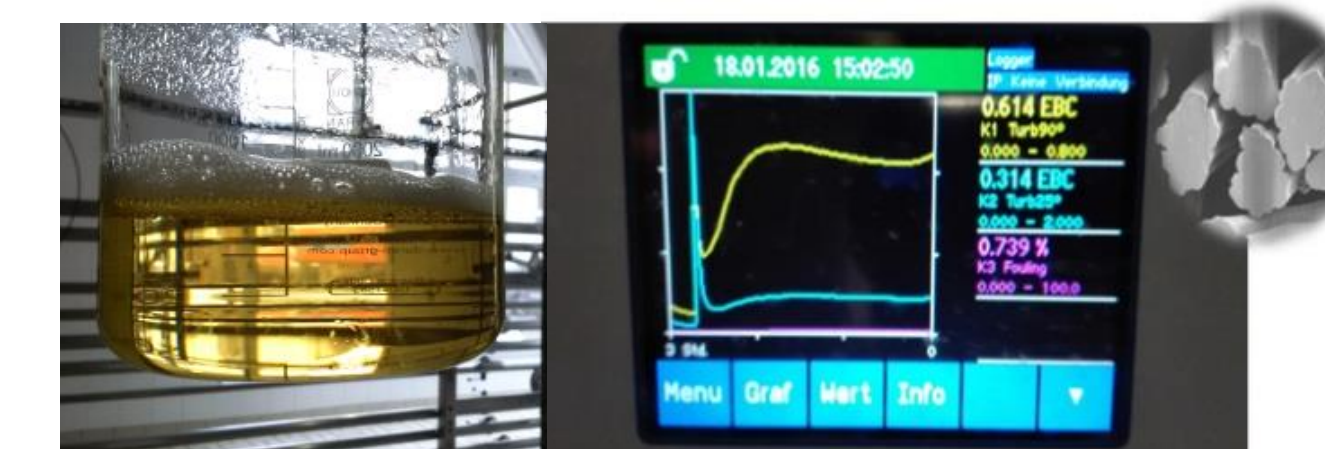


Fig. 7: Concluding exemplary filtration at the pilot plant in the brewery (25° EBC (blue) - 90° EBC (yellow))

- Comparable retention rates / cut-offs are achieved.
- Functional viscose fibres have the potential to be the alternative filter aid for diatomite earth in the beer filtration.

Conclusion

Viscose speciality fibres are likely to be a future filter aid for precoat filtration as they give high process flexibility, are bio-based and fully biodegradable, bear no health risks and are therefore easy to handle and to dispose and – the most important criterion – they help obtaining an optimum product quality without altering the taste.

References

- Zacharias, J.: New approach in beer clarification with the focus on precoat filtration. MBAA International Convention, Austin, Texas, USA, 2013.
- Photos of Fibres: Kelheim Fibres 2013.
- TUB und Krones AG: © Recipe of Reference "Pseudobeer" (not published), 2014.
- Zacharias, J.; Schneid, R.: Viscose fibres as alternative filter aid - chance, limitation and possible coexistence with membrane filtration, EBC, Porto, Portugal, 2015.
- Scholz, R.; Zacharias, J.: Bierfiltration mit Viskosefasern, 13. Symposium Textile Filter, Chemnitz, Germany, 2016.

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