

Continuous Separation of Lignin from Organosolv Pulping Liquors

LigniSep

*Lignin separated
by filter press*

Fast Facts

1. Continuous lignin precipitation process
2. Simultaneous solvent recovery
3. Controlled agglomeration of lignin
4. Improved filterability of the produced lignin dispersion
5. Reduced water consumption

The difficulty with efficient lignin separation

Efficient separation processes are essential for the economic viability of lignocellulose biorefineries. In case of Organosolv-based pulping, this applies particularly to the recycling of the organic solvent and the accompanying lignin separation processes having a great impact on the energy consumption of the refinery. Known methods are the precipitation of lignin by dilution of the pulping liquor with water or another aqueous process stream or via direct evaporation

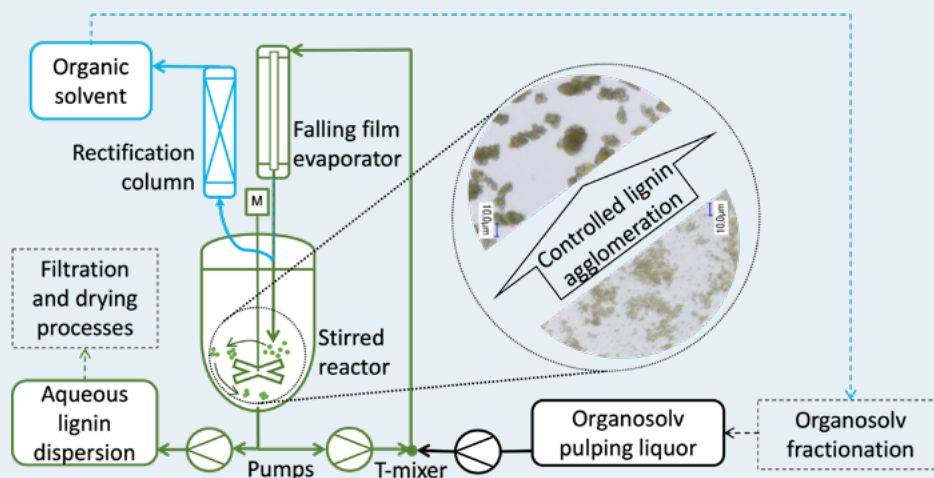
of the solvent. Whereas the first can lead to lignin dispersions with poor filtration properties due to small particle sizes and to a multiple increase in process streams of filtrate, the second may result in incrustations in the apparatus due to the precipitation of a soft and sticky lignin phase. These disadvantages of the state-of-the-art lignin separation processes result in increased operation and investment costs, lowering economic viability of the whole biorefinery.

Why LigniSep is your solution

The LigniSep process, jointly developed and patented by the Max Planck Institute for Dynamics of Complex Technical Systems and the Fraunhofer Center for Chemical-Biotechnological Processes CBP, uses the direct evaporation of an organic solvent from the pulping liquor applying a tailored combination of process parameters (temperature, pressure, and solvent concentration). With this setup, incrustations can be completely prevented allowing the continuous operation as well as a good filterability of the dispersions.

Collaboration

A joint development of the Max Planck Institute for Dynamics of Complex Technical Systems and the Fraunhofer Center for Chemical-Biotechnological Processes CBP.



The LigniSep process enables the continuous lignin precipitation from solvent-containing liquors (adapted from Schulze et al., *Ind. Eng. Chem. Res.* 2019, 58, 3797–3810)

References

LigniSep has been initially developed for an ethanol-based Organosolv liquor (with and without acidic catalysts). Further experience in the continuous production of hundreds of kilogram of lignin by LigniSep was gathered during the project LIBERATE (Grant agreement no 820735). The transferability to other solvents could be shown, e.g. to acetone-water solvent systems generated by FABIOLA™ process within the project UNRAVEL (Grant agreement no 792004).

Publication

Schulze, P.; Leschinsky, M.; Seidel-Morgenstern, A.; Lorenz, H. (2019) Continuous Separation of Lignin from Organosolv Pulping Liquors: Combined Lignin Particle Formation and Solvent Recovery, *Ind. Eng. Chem. Res.*, 58 (9), 3797–3810
<https://doi.org/10.1021/acs.iecr.8b04736>



Spectrum of services

- Adaption of the LigniSep process to your specific organic solvent
- Definition of a suitable process parameter set
- Optimization of obtained range of particle sizes
- Scale-up in dedicated LigniSep pilot plant (680 L)
- De-risking using mathematical process model considering mass and energy balances and phase transitions in the pilot plant

Patent

Method for precipitating lignin from Organosolv pulping liquors (“Verfahren zur Fällung von Lignin aus Organosolv-Kochlaugen”) EP file number: 15 79 0857.5



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