AVAILABILITY OF ACTIVE SUBSTANCES IN PAPER AND BOARD MANUFACTURING

BIOCIDES FOR EUROPE

Cepi RENEWABLE RECYCLED RESPONSIBLE EUROPEAN PAPER

Process conditions favor microbial growth due to the nutrient-rich environment of starch, fresh water, pulp and a warm and moist production environment

Microbial growth interferes with production efficiency by causing paper breaks, malodour, and microbial contamination. It causes slime and biofilm formation. Impacting raw material integrity and disrupting processes.

Availability of a broad range of biocides in the paper and board manufacturing process is crucial to mitigate these issues. However, the availability of active substances for PT 12 biocides is currently under increasing pressure.

Already now, the number of PT 12 actives is critical

40 actives approved or under review reduce to just 20 individual molecules

Out of these 40 actives on the Art. 95 list (Regulation (EU) 528/2012):

1. Five result in active bromine generated from alternative precursors,
2. Two result in active chlorine generated from alternative precursors,
3. Six result in chlorine dioxide generated from alternative precursors,
4. Four result in monochloramine generated from alternative precursors,
5. Two are formaldehyde releasers, and
6. Seven of these are quaternary ammonium compounds with essentially the same use pattern and limitations.

This, leaves us with another 14 independent molecules.

Combined this effectively results in 20 molecules.

These 20 molecules belong to 4 groups that cannot replace each other

7 oxidisers react rapidly and are quickly consumed; while they are highly effective overall, they must be used up before reaching equipment or raw materials, and they perform poorly against biofilms.

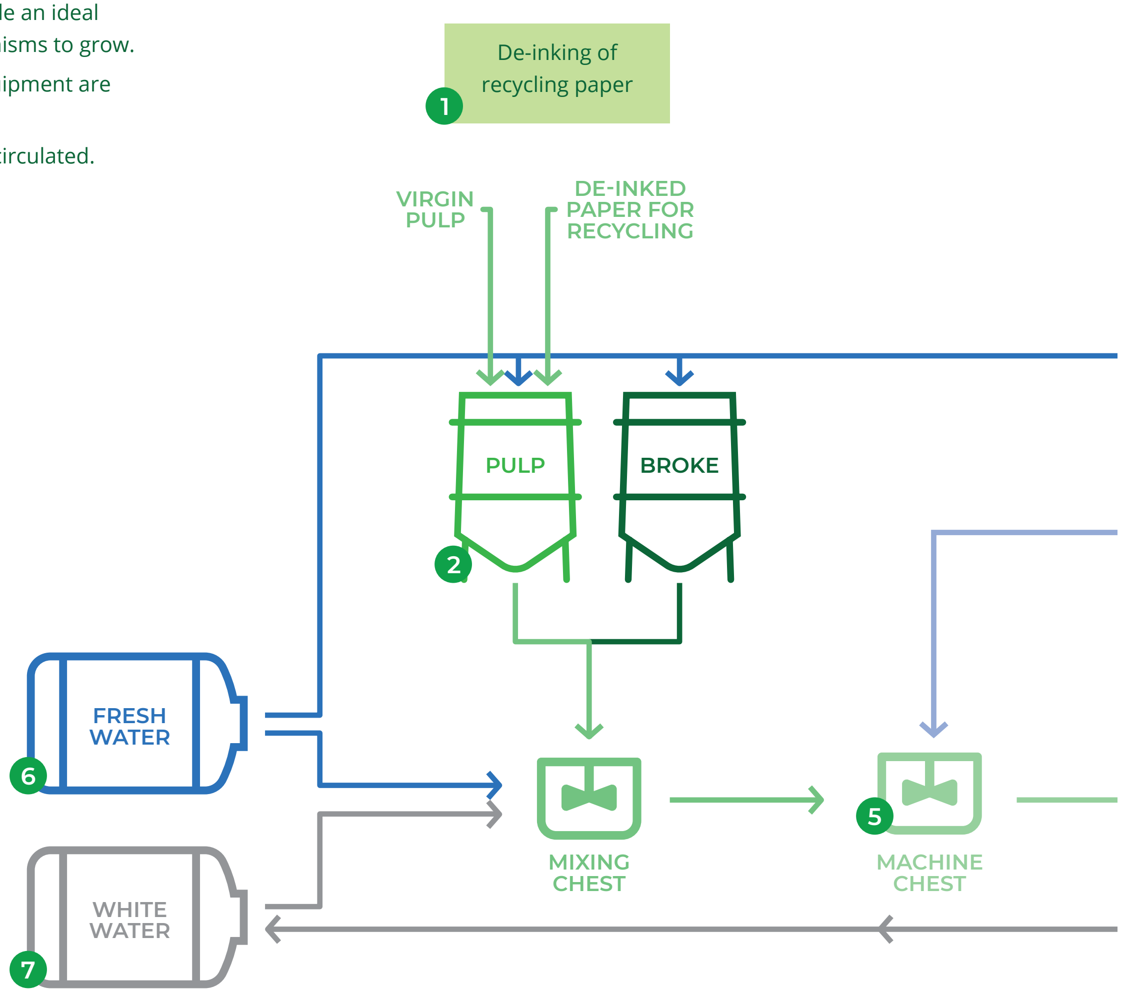
2 organic cationic classes of molecules—QUATS and THPS—are rarely used, as they tend to deactivate most raw materials, which are typically anionic.

10 organic, non-charged molecules are generally compatible with raw materials and equipment; while many act slowly and offer long-term preservation, a few are fast-acting, though most have efficacy gaps and are therefore used in well-balanced combinations.

Formaldehyde releasers, compatible with existing chemistries and equipment, but rarely used due to their classification as CMR substances and limited fungicidal effectiveness.

Paper production and biocides addition points

- Upon arrival, some of the raw materials might be highly contaminated, and they will undergo storage and transportation in a wet state.
- Biobased additives (e.g. starch) and warm conditions (40 – 60°C) provide an ideal environment for microorganisms to grow.
- Raw materials and most equipment are susceptible to oxidisers.
- > 99% of water continously circulated.

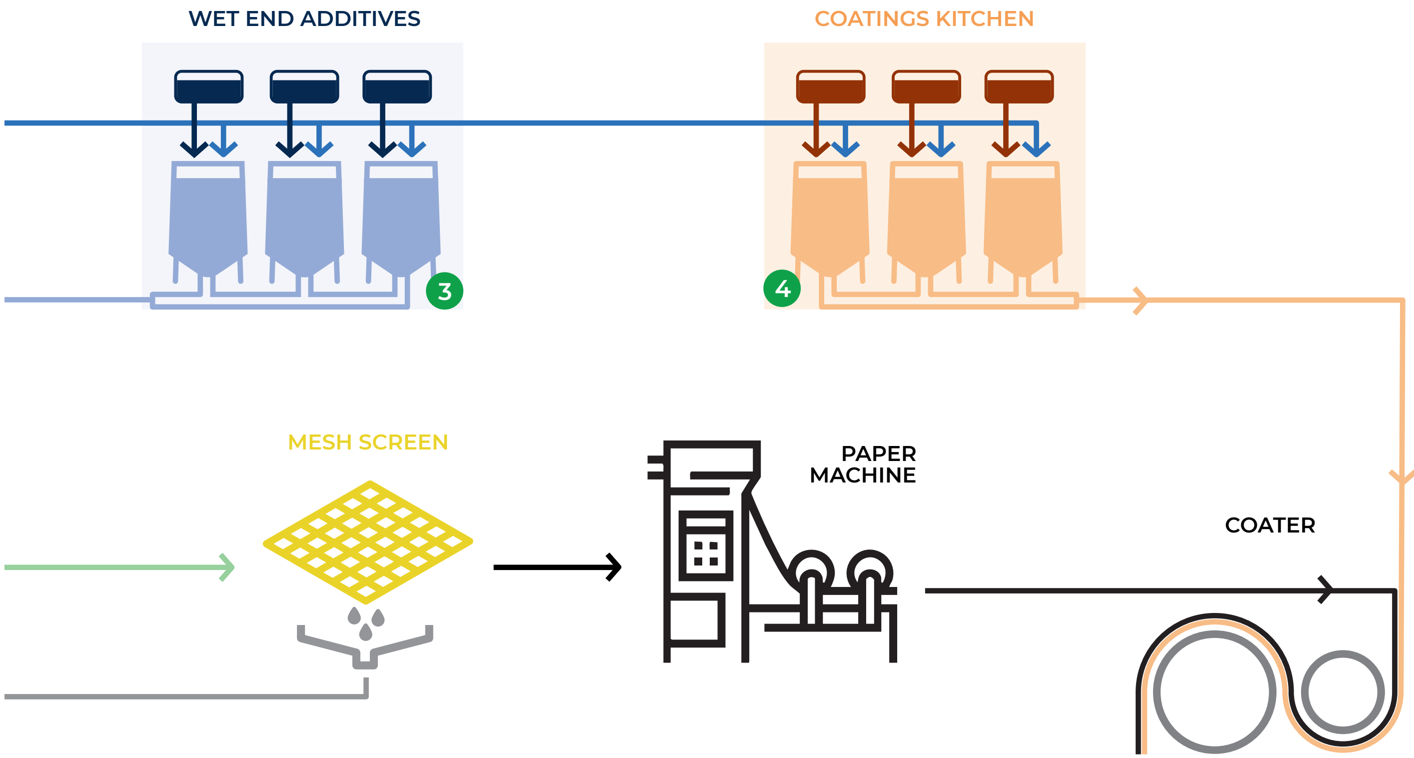


Biocide features at the individual addition points

- High initial concentration of microorganisms plus ideal growth conditions.
- Planctonic microorganisms and biofilms need to be controlled.
- Quick control plus long term protection.

Legend:

1. Oxidisers + glutaraldehyde
2. Oxidisers
3. Organic non-charged only
4. Organic non-charged only
5. Fast organic non-charged
6. Oxidisers + organic non-charged
7. Mild oxidisers + organic non-charged



Active substances and their uses

	Oxidisers	Organic cationic or formaldehyde	Organic non-charged
Additives and coatings		limited use for formaldehhyde releasers	bronopol, CMIT/MIT, glutaraldehyde, BIT, MIT, DBNPA
De-inking	chloramines	limited use for QUATS	glutaraldehyde
Fresh water	Cl_2, Br_2, ClO_2, chloramines, peracetic acid	limited use for QUATS	bronopol, CMIT/MIT, DBNPA
White water	chloramines (Cl_2, Br_2, ClO_2), peracetic acid		bronopol, CMIT/MIT, DBNPA, glutaraldehyde
Pulp and broke	Cl_2, Br_2, ClO_2, chloramines, peracetic acid		bronopol, CMIT/MIT, glutaraldehyde

Conclusion

Currently, none of the PT 12 actives (as of March 2025) are replaceable. They have unique activity profiles against micro-organisms and different compatibilities towards raw materials and production equipment.

The combination of these features makes every active unique.

A larger diversity of actives with even identical technical and biological features is needed to account for adaptation of microorganisms which could challenge effective microbial management, resulting in increased energy and water consumption, deterioration of product quality, and a higher risk of spoilage downstream.

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