

Mill process engineering,
the implications of change,
advantages /disadvantages

55th Appita Annual Conference

Hobart Tasmania

Forum on water and fibre recovery

1 May 2001

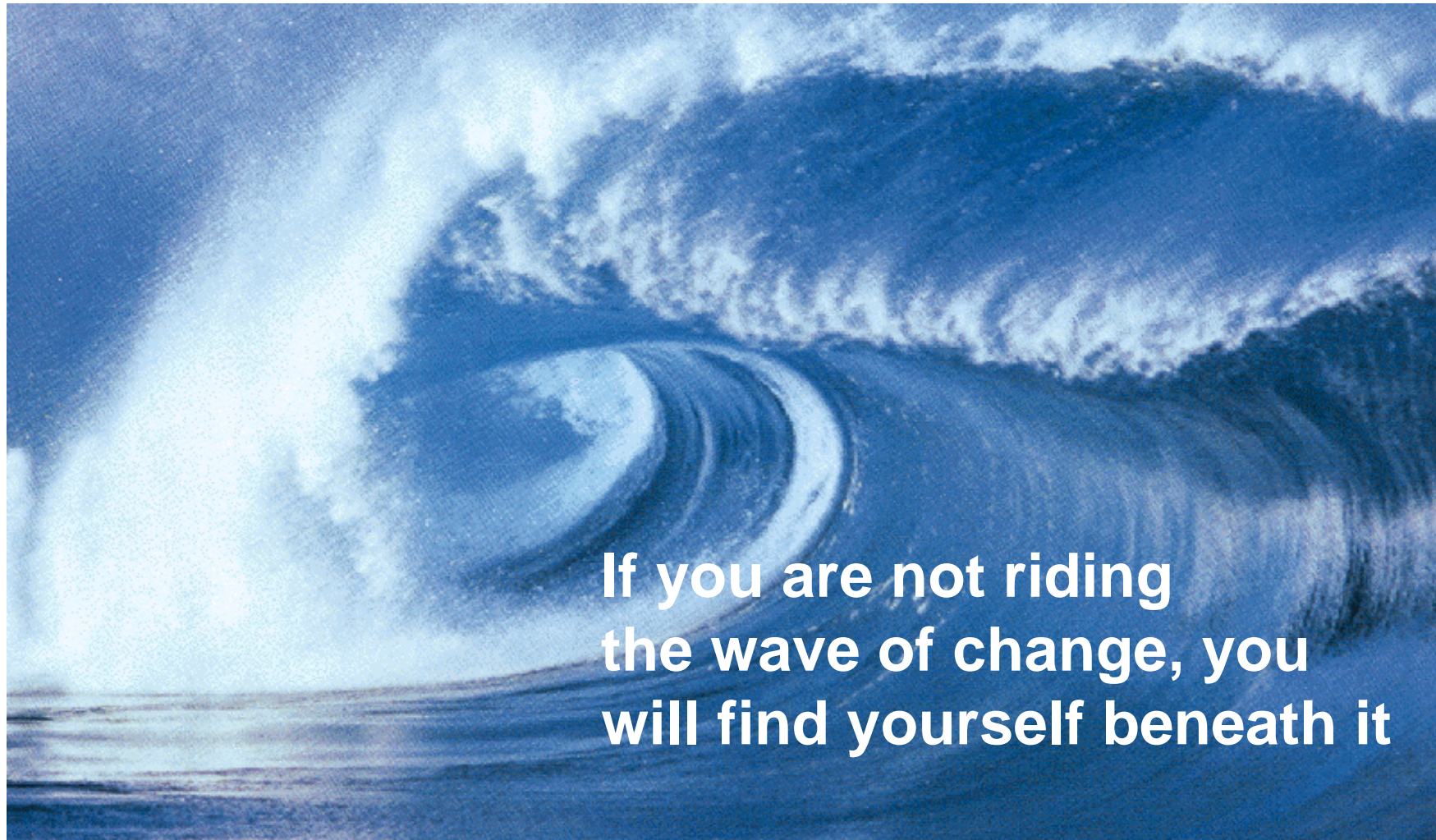
Roberto Miotti



Outline

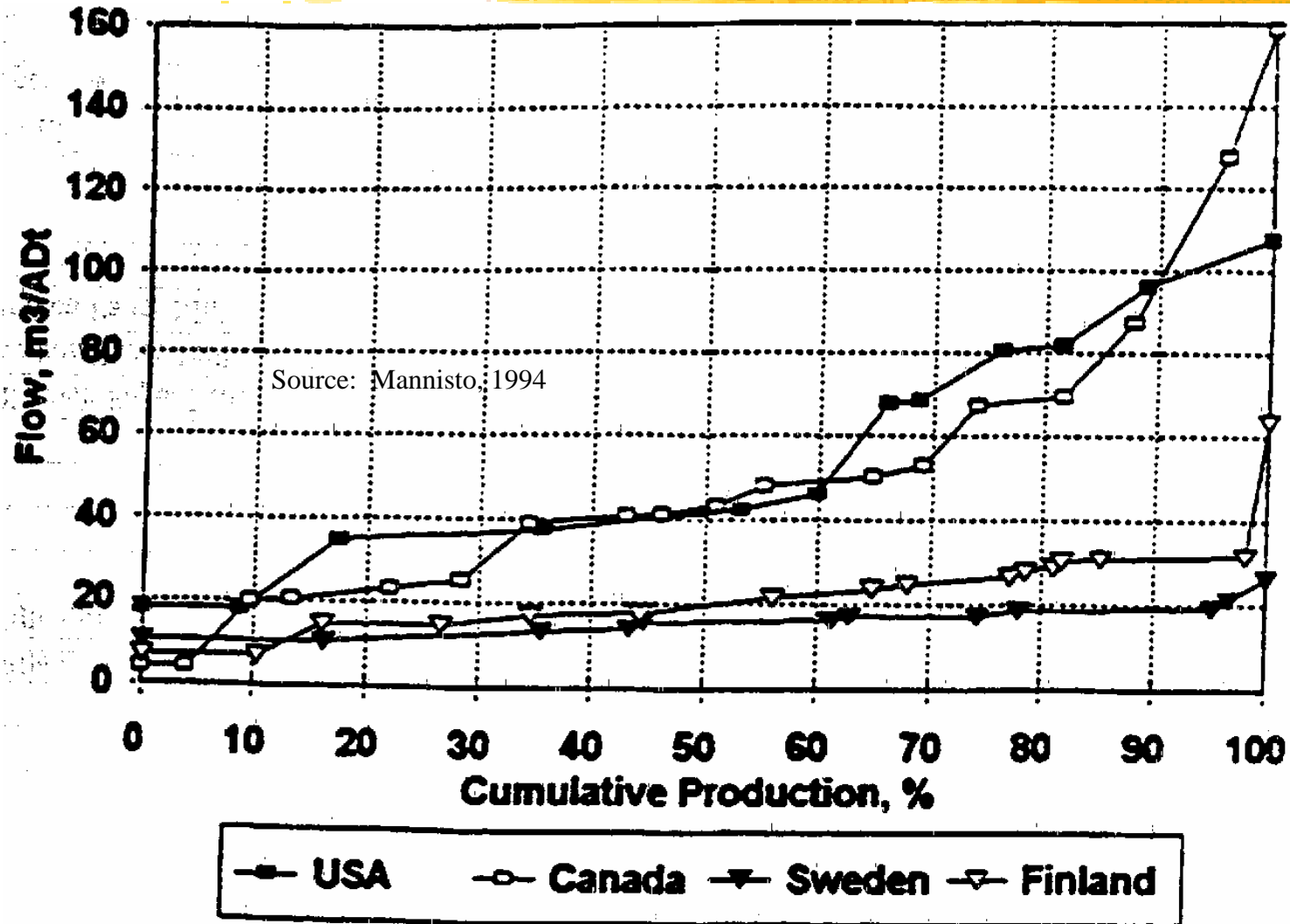
- ⌘ High DOC and its drivers/ advantages
- ⌘ Water use reduction
 - ☑ General principles
 - ☑ Equipment
 - ☑ Disadvantages
- ⌘ A look at the future and conclusions

The wave of change



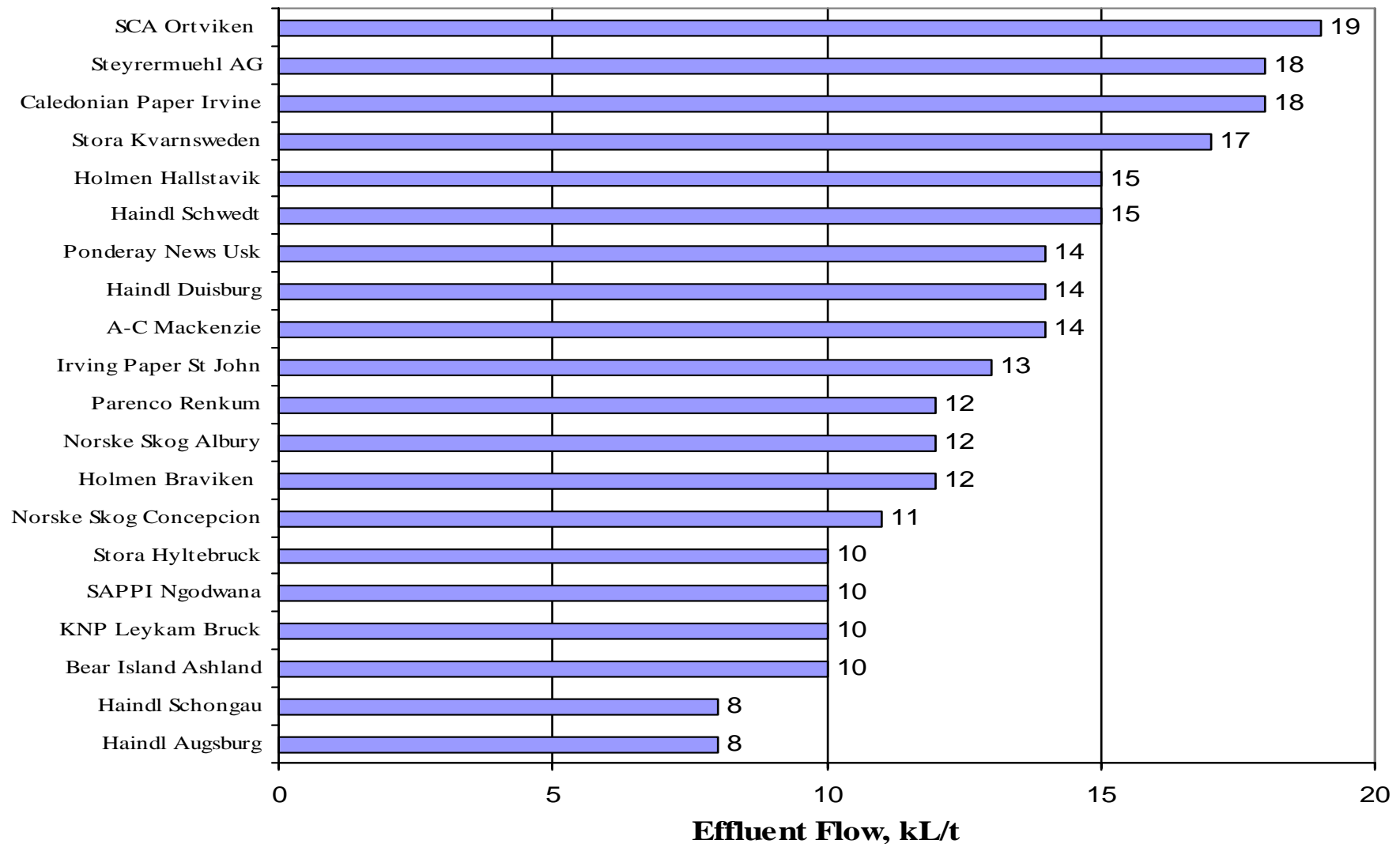
**If you are not riding
the wave of change, you
will find yourself beneath it**

DOC of mechanical pulp mills





Mechanical pulp mills with effluent flow < 20 kL/t



DOC of mechanical pulp mills

A thick, horizontal yellow brushstroke underline that spans the width of the slide, positioned directly below the title.

- ⌘ Worldwide trend towards higher DOC
- ⌘ European mills are at the forefront
- ⌘ Haindl Papier has state-of-the-art mills
- ⌘ Norske Skog Albury has an ongoing reduction program and off-river disposal of wastewater

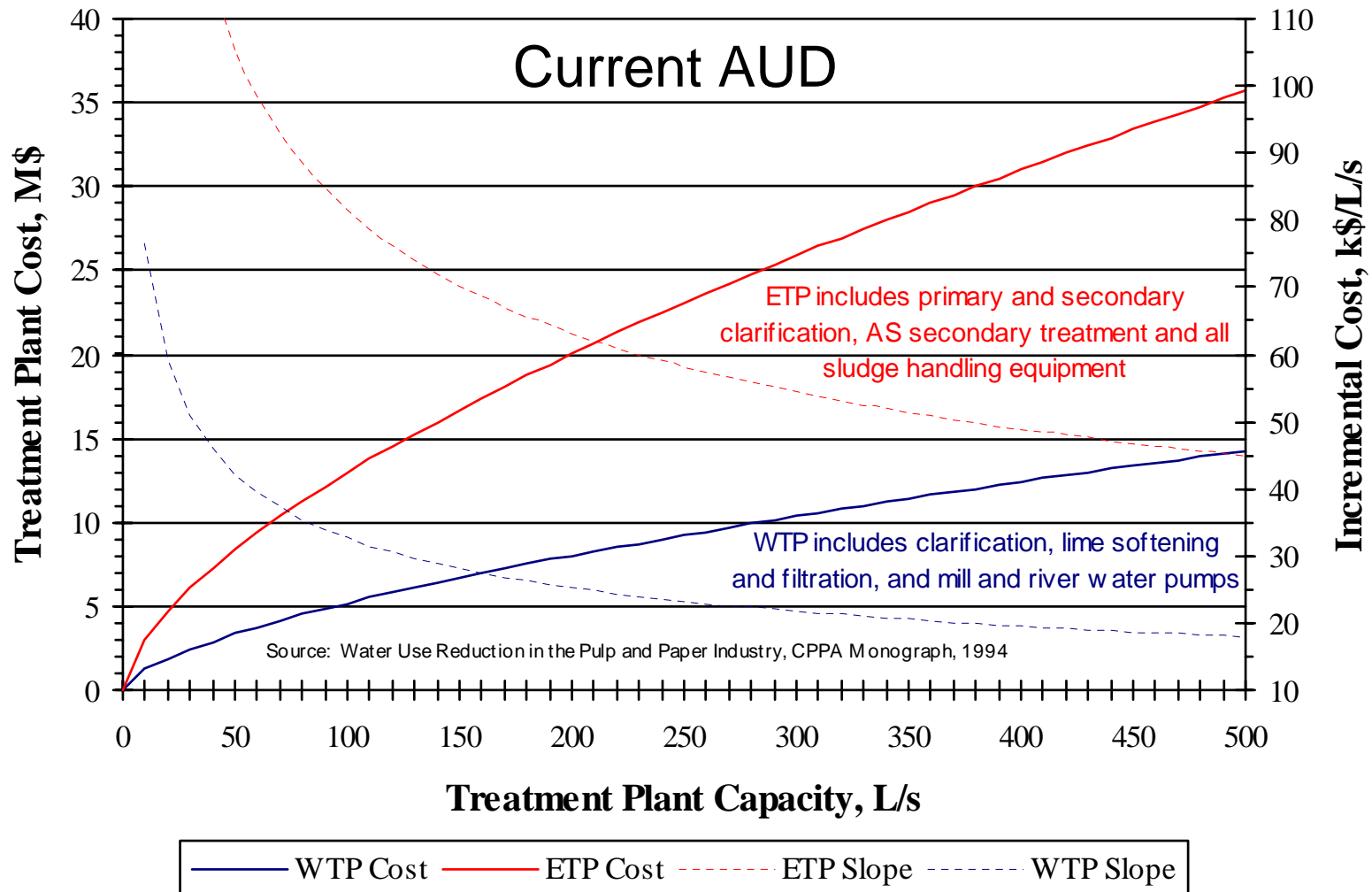


Drivers for high DOC New installations

- ⌘ Lower investment costs for water supply/
treatment and effluent treatment
- ⌘ Choice of location not dictated primarily by
abundant water supply



Water and effluent treatment plant costs





Drivers for high DOC Existing installations

- ⌘ Expansion while remaining within EPA limits for water and effluent
 - ☑ Proposed doubling of capacity at ANM Albury in 1995
- ⌘ Lower SS to/ higher HRT in ETP
- ⌘ Decommissioning or reallocation of redundant ETP equipment due to < flowrate



Drivers for high DOC All installations

- ⌘ Water conservation has ecological merit
- ⌘ Operating cost savings (site specific)
 - ☑ Water treatment \$50-300/ML
 - ☑ Effluent treatment \$500-1,000/ML
 - ☑ Pumping \$10-20/ML
 - ☑ Fibre \$300-400/t
 - ☑ Chemicals \$300-1,500/t
 - ☑ Heat energy to bring cold fresh water to system temperature

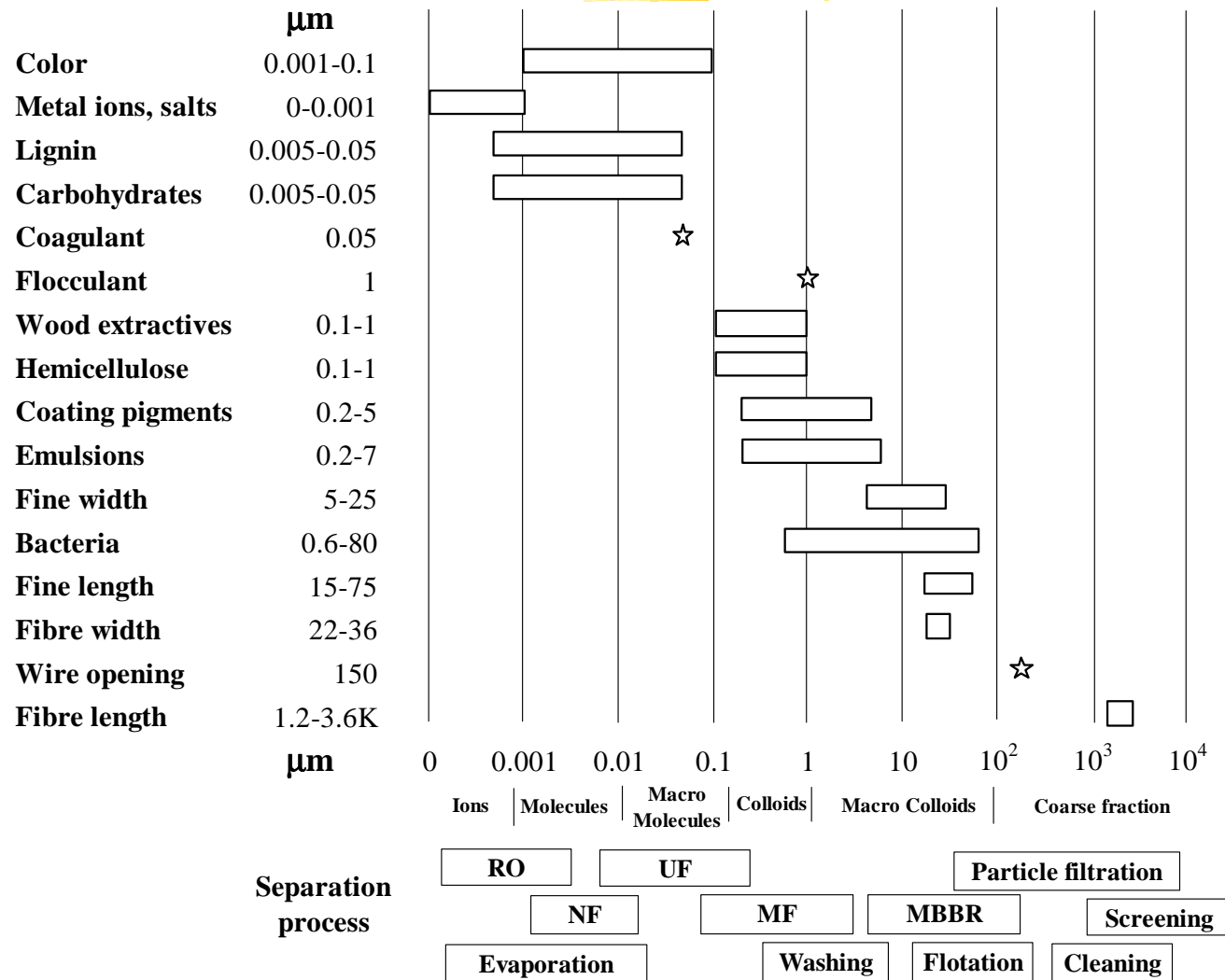
Drivers for high DOC All installations

A thick, horizontal yellow brushstroke with a textured, painterly appearance, extending across the width of the slide below the title.

- ⌘ May be dictated by local conditions
 - ☑ LWRS at Norske Skog Albury
 - ☑ Shallow lake at Millar Western Meadow Lake
- ⌘ Economies of emerging technologies (e.g. evaporation, RO, NF) are contingent on reduction in water use



Particle sizes and separation technologies





General principles of water use reduction

⌘ Minimise fresh water use

⌘ Reuse clean (cooling) water

- ☑ If additional heat load is minimal, route directly back to the mill feed water clearwell
- ☑ Otherwise, cool in a cooling tower prior to reuse

General principles of water use reduction

A thick, horizontal yellow brushstroke underline that spans across the width of the slide, positioned below the title.

- ⌘ Replace fresh water with suitable whitewater
- ⌘ Recycle whitewater countercurrently
 - ☒ From cleaner to dirtier (flushing)
 - ☒ As close to the source as possible
 - ☒ Use lowest quality available but adequate
- ⌘ Treat whitewater before reuse (e.g. filtration, flotation) as required



General principles of water use reduction

- ⌘ Sewer whitewater from the pulp mill instead of the paper mill
- ⌘ Sewer whitewater of highest clarity
- ⌘ Carry out M&E balances of existing and future systems



Equipment for water use reduction

⌘ MVR and ME evaporators

☑ Fresh water is contaminated water purified by natural evaporation

⌘ Thermophilic aerobic MBBR

☑ Promising but need more work at higher temperatures

⌘ RO/ NF/ UF/ MF (membranes)



Equipment for water use reduction

- ⌘ Microfilters (Algas), sand filters, strainers, DAF clarifiers and centrifuges
- ⌘ Indirect contact condensers
- ⌘ Mechanical seals
- ⌘ Cooling towers
- ⌘ Effluent ponds
- ⌘ Contaminated condensate strippers



Disadvantages of water use reduction

⌘ Fines buildup

⌘ TDCS buildup (especially extractives)

⊡ Lower:

⊗ Surface tension forces in forming and pressing/
bonding/ strength properties/ brightness/ PM
speed/ FPR/ drainage

⊡ Higher:

⊗ Kraft fibre use/ cationic demand (retention aid
use)/ conductivity/ porosity

Disadvantages of water use reduction

A thick, horizontal yellow brushstroke underline that spans across the width of the slide, positioned below the title.

- ⌘ Slime and deposits/ foaming/ corrosivity
- ⌘ Higher:
 - ☑ Conductivity/ temperature (including effluent)/ risk of depositions/scaling/ risk of corrosion/ runnability and quality problems
- ⌘ Process stability may suffer

Disadvantages of water use reduction

⌘ Need for:

- ☑ Larger filtrate/ whitewater storage capacities in both pulp mill and paper machine
- ☑ More efficient washing equipment
 - ☒ Separate pulp mill and paper mill water circuits (water locks)
- ☑ Specific water-saving equipment

⌘ The higher the DOC the worse the effects



A look at the future and conclusions

- ⌘ More and more mills will implement water reduction/ management strategies and move towards high DOC
- ⌘ The chosen technical solutions will be site specific and depend on a balance between economic benefits and costs
- ⌘ Process stability will increase in importance as a KPI