

# ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

A tool for understanding environmental decisions related to the pulp and paper industry



## EFFECTS OF DECREASED WATER USE ON ODOR

### Microbial Growth in Process Waters

Oxygen dissolved in process water initially accelerates the growth of aerobic bacteria, which in turn consume dissolved oxygen. Closed systems typically contain low concentrations of dissolved oxygen of around 1 mg/l. Low oxygen contents favor the growth anaerobic bacteria, consisting primarily (90%) of the group *Bifidiobacterium subtilis*. Low oxygen conditions also favor the existence of sulfate-reducing bacteria. These bacteria are found in low concentrations in process water but can exist in large concentrations under slime deposits (Jung and Kutzner 1978). Table W18 shows microorganism concentrations between two paper mills; one operating at low effluent conditions (20 m<sup>3</sup>/mt) and one operation at effectively zero effluent conditions.

**Table W18. Microorganisms in Process Water in Paper Mills Using Waste Paper**  
(adapted from Geller and Götttsching 1982)

Description	Specific Effluent Volume, (m <sup>3</sup> /mt)		Unit
	0	20	
Colony count, aerobic	110	290	106 col/ml
Colony count, anaerobic	920	15	106 col/ml
Yeast and molds	90	230	104 col/ml
Bacterial spores, aerobic	10 <sup>-4</sup>	10 <sup>-4</sup>	titer (ml)
Bacterial spores, anaerobic	10 <sup>-3</sup>	10 <sup>-3</sup>	titer (ml)
Sulfate-reducing bacteria	10 <sup>-4</sup>	10 <sup>-4</sup>	titer (ml)
Coliforms	10 <sup>-5</sup>	10 <sup>-6</sup>	titer (ml)

### References

- Geller, A. and Götttsching, L. 1982. Closing water system completely in the Federal Republic of Germany. *Tappi Journal* 65(9): 97-101.
- Jung, W.K. and Kutzner, H.-J. 1978. Microbiologic problems associated with closed process water systems in the paper industry. *European Journal of Applied Microbiology and Biotechnology* 5(2): 215-224.