



Tecnologias limpas na produção de celulose e papel

Cleaner Technologies



- **Debarking in the forest site**
- **Anthraquinone pulping**
- **ECF & TCF bleaching**
- **Xylanase and enzyme bleaching**
- **Oxygen delignification**
- **Acid stage prior to pulp bleaching**
- **Washing presses**

- **Horizontal chipper**
- **Recycling of partially cooked knots**
- **Wire-free pulp baling**
- **Closure of water systems**
- **Caustic soda/ chlorine manufacture with membrane cells**
- **Burning of odorous gases or hydrogen in the lime kiln**
- **Effluent and solid residue free ClO₂ generation (based on chlorate and hydrochloric acid)**
- **Biomass burning as source of energy (biomass fuel)**
- **Use of natural gas as fuel replacing coal or fuel oil**

- **Low odor or odorless boilers**
- **Black liquor oxidation**
- **Cascade type evaporators replacement**
- **Fluidized bed boilers**
- **Flash dryers for lime mud drying**
- **Bark dryers**
- **Tall oil recovery**
- **Automation on measurement of kappa number and chemical addition in bleaching**
- **Intelligent controllers for valves**
- **Development of catalysts for combustion, delignification, bleaching, etc.**
- **Flotation cells for whitewater and fiber recovery**

- **Sludge presses**
- **Condensate stripping / distillation**
- **Burning of combustible vent gases**
- **Dry debarking**
- **Odorless recovery boilers**