



DEPARTAMENTO DE MANEJO DE RECURSOS FORESTALES
FACULTAD DE CIENCIAS FORESTALES
UNIVERSIDAD DE CHILE

KEEPING THE RIVER CLEAN

PROBLEM 2

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This story deals with a pulp mill operating in a small town in Maine. The pulp mill makes mechanical and chemical pulp. Unfortunately, it also pollutes the river in which it spills its spent waters. This has created enough turmoil to change the management of the mill completely.

The previous owners felt that it would be too costly to reduce the pollution problem. They decided to sell. The mill has been bought back by the employees and local businesses, who now own the mill as a cooperative. The new owners have several objectives. One is to keep at least 300 people employed at the mill. Another is to generate at least \$ 40,000 of revenue per day. They estimate that this will be enough to pay the operating expenses and yield a return that will keep the mill competitive in the long run. Within these limits, everything possible should be done to minimize pollution.

A bright professional who has already provided good solutions to complex production problems is asked to suggest an operating strategy for the mill that will meet all these objectives simultaneously and in the best possible way. She feels that it could be done by linear programming. Towards this end, she has put together the following data:

Both chemical and mechanical pulp require the labor of one worker for about one day, or 1 workday (wd), per ton produced.

The chemical pulp sells at some \$ 200 per ton, the mechanical pulp at \$100

Pollution is measured by the biological oxygen demand (BOD). One ton of mechanical pulp produces 1 unit of BOD, 1 ton of chemical pulp produces 1.5 units.

The maximum capacity of the mill to make mechanical pulp is 300 tons per day; for chemical pulp it is 200 tons per day. The two manufacturing processes are independent; that is, the mechanical pulp line can not be used to make chemical pulp, and vice versa.

Given this, our professional has found that the management objectives and the technical and financial data could be put together into a linear program.