St. Lawrence TECHNOLOGIES

INDUSTRIAL WASTEWATER

SELECTION AND INTRODUCTION OF CLOSED-CIRCUIT TECHNOLOGIES IN A THERMOMECANICAL PULP AND NEWSPRINT MILL

ABSTRACT

Regulatory requirements, international market pressures and the reduced summer flows of the Rivière-du-Loup, have led F.F. Soucy Inc. to consider the concept of zero effluent discharge. A two-pronged approach was adopted combining measures to cut fresh water consumption and promote water recycling. F.F. Soucy has, thus, succeeded in reducing its water consumption from 34 m^3 to 21 m^3 per ton of paper. The project also assessed the possibility of combining biological and physical-chemical treatments to implement closed cycle technologies at the mill. However, further studies of the impact of closed loop technologies on the quality of paper and on mill operation must be undertaken.

MAIN FEATURES

- **Technology**
  - Reduced water leakages from vacuum pumps and other areas.
  - Recycling of white water to paper machine N° 1.
  - Improved management of white water from paper machine N° 2.
- **Environment**
  - Fresh water consumption was reduced from 34 to 21 m^3/t.
  - Higher process water temperatures were achieved.
  - Energy needs were reduced.
- **Cost**
  - Improvement in the stability of papermaking machine operations.
  - Reduction in annual energy costs by $150 000.
  - Reduction of costs of secondary treatment.
  - Closed-circuit operations using advanced and proven technologies has not proved to be economically feasible.

Saint-Laurent Vision 2000

Environment Canada — Québec Region

Environnement Canada — Région du Québec

SOUCY

PROJECT OBJECTIVES

1- To examine the feasibility of introducing closed-circuit technology to the TMP newspaper mill of F.F. Soucy in Rivière-du-Loup.

2- To test at the pilot scale several of the most promising closed-circuit technologies.

3- To analyse the technical and economical benefits of the project.

4- To validate the results by a computer simulation of the process.

PHASES

Phase 1: Preliminary studies to identify appropriate closed-circuit technologies.

Phase 2: Pilot tests to assess the most promising technologies identified in Phase 1.

Phase 3: Detailed development and computer simulation of the closed-circuit process and estimation of capital and operating costs.

BACKGROUND

The Rivière-du-Loup supplies the mill with the water necessary for its operations. Due to the low summer flow of the river, the mill must occasionally limit its water intake for a few days to be able to operate its papermaking machines. Moreover, plants must install treatment technologies capable of both removing toxicity and distinguish themselves with exemplary environmental record in a very competitive market. The proactive approach adopted by F.F. Soucy is also preventive in nature. In order to meet the most stringent forthcoming standards aimed at maintaining the integrity of receiving environment, the company has chosen to adopt a zero effluent discharge orientation. The technology which will be selected by F.F. Soucy must take into consideration the effects on product quality and on operating costs.

TECHNOLOGY

The technologies listed below and identified with an asterix were implemented during this project. Tertiary physical and chemical treatment was evaluated by pilot units in view of a 100% water reuse. Computer simulations confirmed the soundness of the chosen technologies.

1- **Modifications to the seals of the vacuum pump:** This technique allows fresh water additions to be controlled by water temperature regulation.

2- **Examination of watertight seals and cleaning hoses:** This required the installation of flowmeters and manual control valves and to convert the fresh water network to recycled water.

3- **Paper production using peroxide-bleached pulp:** Fresh water is replaced by white water.

4- **Improved methods for white water management:** The rich white water from the papermaking machines will be diverted and reused in pulp dilution.

COST-BENEFITS OF FLOW-REDUCTION TECHNOLOGIES

Project	Effluent reduction m³/t	Installation cost $
Wood chip washing	0.7	759 800
Screening	0	489 800
Water segregation*	0.2	360 000
Vacuum pumps water for paper machines showers	N/A	78 000
Watertight seal water for vacuum pumps*	2.8	120 000
Paper machine N° 1: Recycled water system*	3.0	641 300
Paper Machine N° 2: Reused water system	5.8	517 800
Watertight seals, fittings, hoses*	5.5	211 000
Albany filter washwater	0.5	9 400
Paper bleached pulp using peroxyde*	0.9	0
Improved management of white water (Paper machine N° 2)*	0.3	127 500
Make-up water of TMP at Paper Machine N° 2*	0.3	184 000
Total	**20**	**3 498 600**

** Installed technologies. Real water consumption reductions following implementation reached 13m³/t out of a possible 20 m³/t.*

RESULTS

Environment

Installation of the selected technologies allowed F.F. Soucy to reduce its discharges from a present level of 34 to 21 m^3/t. Other projects will reduce discharge flows to 15 m^3/t. The introduction of closed-circuit technologies is not contingent on such drastic reductions, however. Should the mill decide to increase its production capacity, the modifications required to treat these additional effluents will be minimal.

Economics

Reduced water consumption and the recirculation of white water will reduce the volumes to be treated as well as the capital and operating costs of the secondary treatment system. The higher and more constant temperature of the process water will lead to a more stable operation of papermaking machines. Energy savings have resulted into a yearly savings of $150 000.

POTENTIAL AND LIMITATIONS

At this stage, it is still too costly to operate the mill in a completely closed system using technologies such as membrane systems, the Bio-lime process, crystallization, evaporation or wet oxydation. Innovative technologies need to be further developed. Since reduced water consumption increases the dissolved solids concentration, it will be necessary to study the impact of dissolved solids on paper quality. Nonetheless, this project achieved close to 80% of the anticipated benefits attainable by such preventive action.

INFORMATION

This data sheet is based on the results of a technology demonstration project conducted jointly by the F.F. Soucy Inc. and Beak Consultants Ltd. The project received financial and technical assistance from the Technology Development and Demonstration Program of Environment Canada.

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