# St. Lawrence TECHNOLOGIES

## ABSTRACT

The die-cast metal-parts industrial sector produces effluents which come mainly from waters used in washing floors and machine such as molds and machine tools. These waters contain metallic residues and various kinds of industrial oils and greases, and are discharged into storm sewers, or into domestic wastewater sewers.

There is, now, no effective effluent-pretreatment technology for this industry, nor any way for companies working in this domain to find out about such technology. It is clear that research is needed into a method for managing effluents in this industry.

The principal goal of this project was to show, with the help of pilot units, the feasibility of managing the industrial effluents of the Moulage sous pression AMT Inc. plant at Saint-Cyprien. The results obtained have allowed determination of the necessary size of pretreatment equipment, and of the appreciable savings that can be realized by recycling such effluents.

# INDUSTRIAL WASTEWATER

# INTEGRATED MANAGEMENT OF EFFLUENTS FROM A DIE-CAST METAL-PARTS PLANT

## MAIN FEATURES

- **Technology**
  - Recovery of non-soluble oils and treatment by cyclone separation
  - Treatment of soluble oils by multi-stage file
  - Recovery of oily waters and treatment by flocculation and filtration
  - Recycling of detergent solutions by pocket filters
- **Environment**
  - Elimination of the discharge of effluent into storm sewers
  - A technology that can be used by all companies specialized in die casting metal parts
  - The possibility of reducing to zero the discharge of effluent into the sewer
- **Cost**
  - Savings, by recycling, in the purchase of products such as soluble and non-soluble oils, and detergent solutions
  - Savings in the cost of external recovery and elimination of oily residues
  - Annual total savings of the order of $90,000

Saint-Laurent Vision 2000

Environment Canada Protection Québec Region

Environnement Canada Protection Région du Québec

ROCHE

AMT

Federal Office of Regional Development (Québec)

Bureau fédéral de Développement régional (Québec)

## PROJECT OBJECTIVES

The initial objectives of the project were:

1. To demonstrate the feasibility of optimal management of industrial effluents from the Moulage sous pression AMT Inc. plant, so as to set up a closed-cycle, no-discharge operation.

2. To determine precisely the design and size criteria of treatment equipment.

3. To define the operating criteria for optimal running of installed equipment.

# BACKGROUND

More than a dozen companies in Quebec specialize in die-casting of metal parts.

This industrial sector generates effluents which come, mainly, from waters used in washing floors and machines, such as molds and machine tools. These waters contain metallic residues and various industrial oils and greases. They are discharged either into storm sewers, domestic waste water sewers or, at the limit, holding ditches.

The effluents from this sector are not subject to discharge standards in Quebec. The Ministère de l'Environnement et de la Faune (MEF) now recommends that such effluents not be discharged into storm sewers, so as to protect holding reservoirs. However, their discharge into waste-water sewers could affect the productivity of the treatment plants into which they flow. It is important, therefore, that these effluents be pretreated.

Setting up mechanisms of integrated management of various liquid and solid residues produced by this sector involves three different kinds of measures.

1. The control of residue production at source and preventative maintenance of equipment.

2. Pretreatment of waste water.

3. Recovery and optimal recycling of products contained in the waste water.

The goal, in setting up these measures, is reducing discharge to the sewer to zero.

There is now no effective pretreatment technology for this industry, nor any way for companies working in this domain to find out about such equipment. Clearly, to solve these problems, it is necessary to develop technology or management methods to handle these effluents.

# TECHNOLOGY

The proposed pretreatment technologies for the firm's wastewater have four distinct aspects:

**Recovery and treatment of non-soluble oils**

Non-soluble oils (cooling oil, glycol and gear oil) are first recovered and subject to cyclone treatment in a mobile filtration unit.

**Treatment of soluble oils**

Soluble lubricating and cooling oils are treated in a pilot unit equipped with a multi-level cyclone filter. Contaminated oils are taken directly from the

*Cyclone treatment in a mobile filtration unit.*

# RESULTS

cooling oil line of a die-casting machine.

### Recovery and Treatment of Oily Waters

Oily waters were treated by means of a pilot flocculation and filtration unit. The waste water was pumped into a flocculation basin. An operator manually added the flocculant. After a rapid mixing, following by a slow mixing, the flocculation separated water from oil. The water was then evacuated and filtered on a polypropylene filter.

### Recycling Detergent Solutions

Detergents were recovered and treated for recycling in a pocket-filter filtering unit equipped with a pressurized reservoir. This unit was connected directly to the discharge of the vibrating unit in which metal pieces are polished.

### Performances

The filtration unit for non-soluble oils, when using a new filter, allowed recovery of 94% to 99% of suspended matter. Performance decreased as the filter became used.

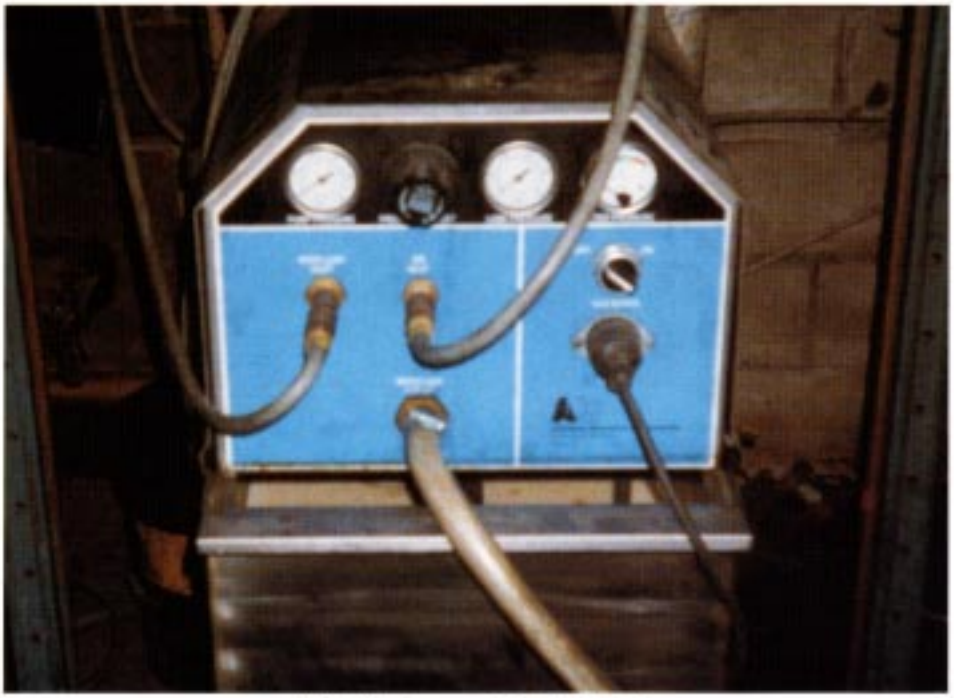
The effectiveness with which total suspended solids were recovered seems to be around 90%. However, this rate diminished with prolonged use of a degraded solution. Moreover, the composition of the oil/water mix tended to vary with time. The hydraulic capacity of the unit seems sufficient for treating the effluent of three die-casting molding machines.

The unit for treating oily water allowed removal of oils and greases as well as of suspended mater at rates acceptable for discharge of the resulting waste water into holding reservoirs, or its use within the plant as cooling fluid. Two 380-liter machines would be required.

The presence of oil in the detergent solution required a different material for the filters. The filters used allowed recalculation of the detergent solution equivalent to seven washing cycles, a promising result.

### Cost of the Technology

The capital cost of the proposed equipment is about $28,000. Estimated annual operating costs are around $50,000. These measures would permit total annual savings of $90,000. Managing detergents with the proposed technology would not, however, allow significant savings, given the operating costs involved.



*Pilot filtration unit for soluble oil.*

# POTENTIAL AND LIMITATIONS

**Potential**

The demonstration of the proposed recycling technologies showed that the management of a plant effluents could be included in an integrated management scheme. Moreover, recycling is desirable from an environmental point of view, and could lead to significant savings. Moreover, the effluent can be used within the plant, and thus permit the goal of zero discharge to be realized.

**Limitations**

Setting up such technologies involves certain risks, notably a drop in the quality of products or in productivity due to the use of recycled oils or detergents, which are likely to have properties different from those of the original materials.

# INFORMATION

This data sheet is based on results obtained in a technology development and demonstration project jointly carried out by Roche ltée and Moulage sous pression AMT Inc., with the technical and financial collaboration of Environment Canada and the Federal Office of Regional Development (Quebec).

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St. Lawrence TECHNOLOGIES

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