ENVIRONMENT

Technological Innovation

WASTEWATER

MOBILE UNIT FOR ECOLOGICAL WASHING AND MAINTENANCE OF HEAVY EQUIPMENT

ABSTRACT

The company Sani-Terre has developed a cost-effective and environmentally-sound technology for the washing and maintenance of heavy equipment directly at the site of operations (forestry, mining, etc.).

The Sani-Terre mobile unit, with its patented process, is distinguished by:

- Innovative hot water pressure wash for cleaning in winter and summer conditions.
- Patented tarpaulin system with inflated containment walls for recovering wastewater.
- Pumping system and wastewater treatment unit for separating and recovering oils, greases and other contaminants contained in washwater for later disposal.
- Reuse of treated water.

Entirely automated, the mobile unit helps reduce the environmental risks associated with petroleum hydrocarbons and heavy metals, as well as the risk of forest fires. Machinery also retains its economic value through preventive maintenance.

HIGHLIGHTS

Technology

- Mobile unit equipped with a bucket crane and a tarpaulin system for recovering washwater
- Hot water generating system coupled with a washwater pumping and treatment system

Environment

- Safely recovers washwater contaminated with hydrocarbons and heavy metals
- Significantly reduces water consumption by reusing treated water
- Reduces risk of forest fires
- Reduces greenhouse gas emissions (60 tonnes of CO_2 equivalent/unit/yr)

Cost

- Rapid and efficient hot water wash
- Allows for washing in winter as well as summer
- Facilitates insurance renewal
- Economic value of machinery retained through preventive maintenance
- Reduces need for costly repairs due to component overheating

Canada

SANI-TERRE
Earth and water pollution free, we're working on it!

FERIC

OBJECTIVES OF PROJECT / PHASES

The company Sani-Terre was established in 1998 to develop a mobile unit for washing forestry machinery directly at logging operations sites and for recovering the contaminated washwater usually spilled untreated onto the ground.

A group of 35 forestry machines in the Saguenay-Lac-Saint-Jean region were used in 2000 to evaluate the proposed technology. On-site testing of the first prototype demonstrated the viability of the concept, its application potential, and the interest of the forestry industry.

Sani-Terre perfected the treatment unit during the design phase of the second prototype. The company was also interested in reducing the mobile unit's fuel consumption and lowering associated greenhouse gas emissions. During winter 2002, the treatment unit washed 90 forestry machines in the Saguenay-Lac-Saint-Jean region. Tests showed that the quality of the filtrate now met standards for its reuse. Sani-Terre also performed winter washings in order to verify improvements made to the process and to determine developmental and commercialization strategies for the technology.

Sani-Terre is now planning to set up an experimental program north of Saguenay-Lac-Saint-Jean to evaluate the potential applicability of the technology in the railway, mining, and marine shipping industries and in the field of civil engineering.

BACKGROUND

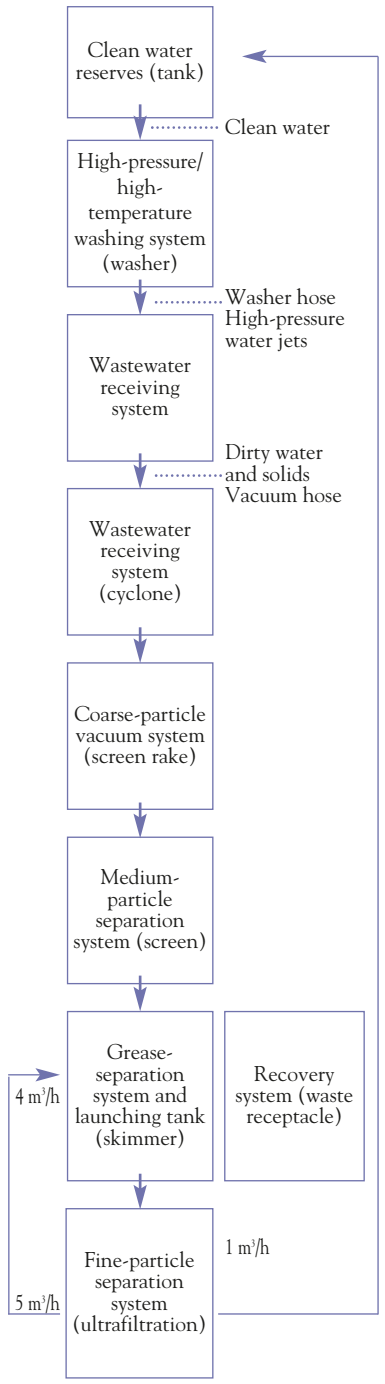
The machinery used in forestry cutting operations and forwarding wood must be washed regularly in order to remove accumulated oils and greases that end up causing components to overheat. Washing is also required by most insurance companies as a way to ensure that overheating is not the cause of equipment fires that can lead to forest fires.

Currently, machine operators wash their equipment on a sporadic basis. They generally use a fire pump or a portable pressure washer and draw their water, to which they sometimes add a degreaser, from a stream or lake. Residual oils and greases (4 to 8 L per wash) as well as hydrocarbon-contaminated washwater are simply evacuated onto the forest floor. This washing method calls for a large quantity of water and is very difficult to do in winter.

TECHNOLOGY

The technology developed by Sani-Terre consists of a mobile unit that is capable of reaching logging or other operations sites to wash machinery directly on site. It includes a receptacle made of heavy, resistant tarpaulin with inflated containment walls into which the heavy machinery is placed for cleaning using a high-pressure hot water treatment. The wastewater is recovered in the receptacle and diverted into a treatment system that separates the water and oil. The treated water is then pumped into a tank for reuse in the next wash. The unit is therefore an entirely independent, closed-circuit system. The recovered oils and contaminated wastes are then sent to a specialized company for secure disposal.

SCHEMATIC DIAGRAM OF THE PROCESS



CHARACTERISTICS OF THE SANI-TERRE PROCESS

Volume of water tank	Flow of washer	Water temperature	Pressure	Generator	Wash time[1]
2 m³	11 L/ min/washer	80°C	195 bar	250 kW	40-60 minutes

[1] Wash time varies depending on the season and type of machinery.

RESULTS

Studies conducted by the Forest Engineering Research Institute of Canada (FERIC) have demonstrated that Sani-Terre's filtration system is highly efficient. Analyses of water samples show that the filtration system keeps concentrations of petroleum hydrocarbons and heavy metals below allowable levels for discharge into municipal sewer systems.

In 2002, samples of dirty water and filtered water were drawn at each wash. The performance of the Sani-Terre process was evaluated based on overall removal yields for petroleum hydrocarbons $C_{10}C_{50}$, and heavy metals such as cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), and zinc (Zn). Samples were analysed by an accredited laboratory.

A total of 33 washes were observed: 4 in winter, 5 in spring and 24 in summer. The quality of the filtered water was found to be excellent. The quantity of petroleum hydrocarbons $C_{10}C_{50}$ remained below one part per million (ppm) with an average of 0.24 ppm, while the heavy metals remained below 0.26 ppm, except for zinc.

Zinc was the only metal that partially escaped from the filtration system and which did not meet the allowable standards (concentration above 5 ppm). The filtration system was therefore modified to take this into account. Subsequent analyses detected zinc at levels below the allowable limit, thereby confirming the effectiveness of Sani-Terre's mobile unit for treating washwater from heavy equipment cleaning.

REMOVAL YIELDS FOR HYDROCARBONS $C_{10}C_{50}$ AND HEAVY METALS

PARAMETER (ppm)	WINTER		SPRING		SUMMER		Allowable limit (ppm)	
	DW	FW	DW	FW	DW	FW	Combined sewer	Storm sewer
$C_{10}C_{50}$	1758	0.53	2181	0.18	670	0.16	30	15
Cd	0.01	0	0.06	0.04	0.03	0.02	2	0,1
Cr	0.51	0.01	0.13	0	0.06	0.01	2	0,1
Cu	2.25	0.01	0.84	0.03	1.57	0.04	5	1
Ni	0.18	0.03	0.12	0.03	0.08	0.06	10	1
Pb	0.49	0.05	0.25	0.04	1.45	0.25	5	1
Zn	n.d.	n.d.	n.d.	n.d.	4.3	0.07	5	1
Total metals	-	-	-	-	**7.49**	**0.45**	**10**	**n.d.**

DW: dirty water
FW: filtered water

POTENTIAL AND LIMITATIONS

Potential

In February 2002, there were an estimated 1800 forestry machines in Quebec and 7200 in all of Canada. The potential U.S. market is roughly 17 600 machines.

The technology's potential resides in:

- Possibility of all-season, on-site washing and maintenance services.
- Recovery and treatment of wastewater.
- Reduction of water consumption.
- Possibility of adapting the technology to other sectors such as mining, railways and marine transport.

Limitations

Use of this technology obviously represents additional costs for machine operators. The associated advantages such as reduced risk of breakage and fire, retention of the equipment's economic value through preventive maintenance and greater capacity for insuring the machinery are nonetheless not to be dismissed.

Awards

On May 22, 2003, Sani-Terre was honoured in the category of "Know-how in the area of sustainable development" at the *Gala des Phénix de l'Environnement du Québec*.

INFORMATION

This fact sheet is based on the results of studies conducted by the Forest Engineering Research Institute of Canada (FERIC) for Sani-Terre.
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