Measures to Control Soil and Groundwater Contamination

We are actively implementing measures targeting early-stage completion of remediation of soil and groundwater contamination generated by Murata's past business activities.

Measures to Control Soil and Groundwater Contamination

Elimination of Trichloroethylene and the Like

In the first half of the 1980s, the Environment Agency (currently the Ministry of the Environment) first identified chlorinated organic solvents, such as trichloroethylene, as potentially carcinogenic. Recognizing the importance of this issue, Murata began taking steps toward eliminating the use of chlorinated organic solvents such as trichloroethylene. By the time groundwater permeation was prohibited according to the terms of the 1989 Water Pollution Prevention Law, 17 of Murata's 22 production plants and subsidiaries had ceased using trichloroethylene. Furthermore, by 1995, four of the remaining five plants had eliminated the use of chlorinated organic solvents, with the remaining plant continuing use of such solvents because of the product preferences of a particular large customer. By March 1998, however, use of such solvents—which include trichloroethylene, tetrachloroethylene, dichloromethane, 1,1,1-trichloroethane, and carbon tetrachloride—had been eliminated throughout the company. We can boast that, among all companies using chlorinated organic solvents, our achievement was exceptionally rapid.

In 1991, in parallel with this countermeasure, Murata introduced up-to-date technology that enabled the Company to undertake a factual survey of soil and groundwater contamination in all plants.

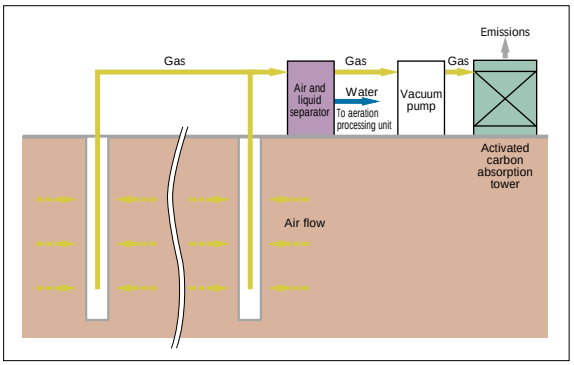
As a result of this effort, it was concluded that 14 of the Company's 36 plants and subsidiaries had to institute remediation measures to remove contamination by chlorinated organic solvents.

Implementing Early-stage Remediation Countermeasures

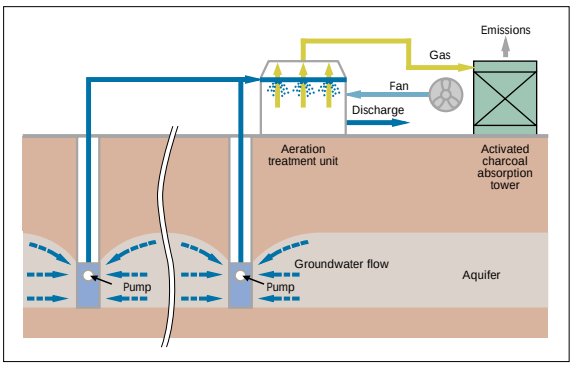
As part of our cleanup operation, we drilled wells wherever it was deemed necessary at polluted sites and along the borders of plants and subsidiaries. We have also prevented the spread of contamination beyond the sites by actively cleaning polluted soil and groundwater by means of strong vacuum extraction and the activated carbon absorption process* and by the water pumping, aeration, and activated carbon absorption process.**

Regarding our prior use of chlorinated organic solvents, we sought to document the results of our survey and countermeasures. Thus, since 1991, we have undertaken detailed soil and groundwater pollution surveys and have instituted a voluntary response. The survey and cleanup measures adopted by Murata are implemented with the most advanced technologies available. Furthermore, we reported our progress to the government and ceased submission of government reports in 1998.

* Strong vacuum extraction and activated carbon absorption process
A well drilled for remediation of a contaminated area is decompressed with the installation of a vacuum pump. Any chlorinated organic solvents in the soil are extracted by means of gasification. The recovered gas is processed by means of absorption with activated charcoal.



** Water pumping, aeration and activated carbon absorption process
Groundwater is pumped up with a pump installed in a well used for remediation of a contaminated area. The recovered water is aerated and the chlorinated organic solvent is isolated by means of gasification. The treated water is discharged into the sewerage or a river when the contaminant has been reduced to less than the environmental standard. The gasified chlorinated organic solvent is processed by means of absorption with activated charcoal.



Preventing the Migration of Pollution beyond Plant Sites

Table 1 shows the progress of the cleanup during fiscal 2003. Two plants (Toyama Murata Manufacturing Co., Ltd. and Kanazu Murata Manufacturing Co., Ltd.) have completed their cleanup operations, while 12 plants are continuing to conduct cleanup operations. As the table indicates, the year-on-year trend is toward lower pollution in general, and cleanup efforts are progressing. Each plant is remediated by concentrating the local pollutants in wells drilled along the border of the site. As a result, we believe that this approach currently prevents any pollution from migrating beyond the plant sites.

Moreover, two plants—the Takefu Plant of Fukui Murata Manufacturing Co., Ltd. and Wakura Murata Manufacturing Co., Ltd.—have largely satisfied the environmental standard.

Table 1. State of Groundwater Remediation (mg/L)

Substance (Environment Standard Value) / Plants and Subsidiaries	Trichloroethylene (0.03 max.) FY2002	Trichloroethylene (0.03 max.) FY2003	Cis-1,2-dichloroethylene (0.04 max.) FY2002	Cis-1,2-dichloroethylene (0.04 max.) FY2003	Remarks
Murata Manufacturing Co., Ltd., Head Office, Nagaoka Plant	0.267	0.047	0.006	N.D.	
Fukui Murata Manufacturing Co., Ltd., Takefu Plant	0.014	0.013			
Fukui Murata Manufacturing Co., Ltd., Shirayama Plant	0.869	0.373	0.284	0.230	
Fukui Murata Manufacturing Co., Ltd., Miyazaki Plant	1.385	1.375	0.289	0.273	
Asuwa Electronics Industries, Ltd.	0.376	0.098	4.105	1.139	
Iwami Murata Manufacturing Co., Ltd.	0.181	0.194	1.616	1.108	
Wakura Murata Manufacturing Co., Ltd.	N.D.	N.D.			
Himi Murata Manufacturing Co., Ltd.	N.D.	N.D.	N.D.	N.D.	
Kanazu Murata Manufacturing Co., Ltd.	N.D.	N.D.			Cleanup completed
Kanazu Murata Manufacturing Co., Ltd., Natsume Plant	0.114	0.117	0.095	0.123	
Hakui Murata Manufacturing Co., Ltd.	0.044	0.027	0.157	0.111	
Hakui Murata Manufacturing Co., Ltd., Togi Plant	0.171	0.178	0.147	0.251	
Toyoma Murata Manufacturing Co., Ltd.	N.D.	N.D.			Cleanup completed
Murata Electronics North America	Trichloroethylene		Cis-1,2-dichloroethylene		
State College Operation	0.014	0.017	0.014	0.030	

1) Data are average values from April 2002 to March 2003 and from April 2003 to March 2004.
2) Data show the average values for downstream groundwater in all wells drilled along the border of a site.
3) We established the apprehended area in order to prevent migration of pollutants beyond the site, and are undertaking remediation efforts.
4) "Not detectable" means the measured quantity is below the lower limit of detection.
5) The diagonal line indicates that the site is deemed free from contamination.
6) The standard value at the Murata Electronics North America State College Operation will be determined by the most recent risk assessment.

Thorough Prevention of Groundwater and Soil Contamination

Beginning in 1995, Murata established a voluntary standard for preventing ground permeation. As a result, we are taking steps to avoid ground permeation by any and all chemical substances. To ensure compliance with our voluntary standard for ground permeation prevention, we are implementing the measures stated at right. These measures have been concluded everywhere during fiscal 2002, except in some parts of some plants. See page 28

- Tanks containing chemical substances shall be double-walled and installed above ground, fluid control banks shall be installed, and leakage control coatings shall be applied.
- All forms of conveyance for chemicals, drainage from production processes and wastewater treatment equipment shall be doublewalled and installed above ground.

Allocating Reserves to Cover All Remediation (Decontamination) Costs

Completion of all remediation (decontamination) measures entails very high countermeasure costs. For business accounting purposes, Murata has completed a trial calculation of the full cost of remediation measures to ensure all contamination has been removed. As a result, we have appropriated a reserve as a credit (Table 2).

Table 2. Cost of Soil and Groundwater Remediation (Millions of yen)

Total for FY1991–FY2003		Estimate for FY2004 and later*		Total	
Nonconsolidated	Consolidated	Nonconsolidated	Consolidated	Nonconsolidated	Consolidated
963	6,741	691	4,709	1,653	11,450

* Note: Amount allocated as a reserve credit is the result of a trial calculation of the full cost of remediation measures, up to completion of the contamination cleanup.

Our Efforts to Promote Remediation

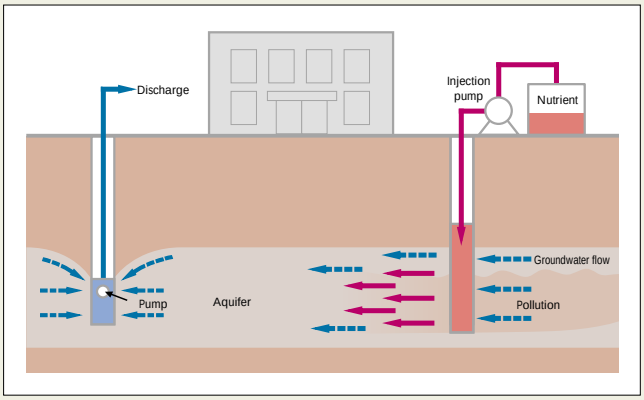
In an effort to complete their remediation efforts at the earliest possible date, our plants and subsidiaries with relatively high pollution densities have introduced new technologies in addition to their existing remediation measures. They are also aggressively implementing new remediation measures.

We plan to promote remediation at five sites in fiscal 2004. For each site, we employ one of three remediation different methods—the Anaerobic Bio Method, the On-Site Iron Powder Method, and the On-Site Oxidation and Decomposition Method—depending on density of the contamination and the location of the source of contamination (Table 3).

Table 3. Remediation Methods and Sites Planned for Implementation in Fiscal 2004

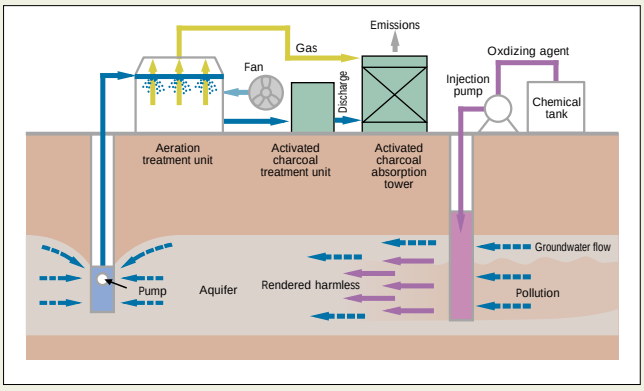
Plant	Method
Fukui Murata Manufacturing Co., Ltd., Shirayama Plant	Anaerobic Bio Method
Asuwa Electronics Industries, Ltd.	On-Site Iron Powder Method
Iwami Murata Manufacturing Co., Ltd.	Anaerobic Bio Method
	On-Site Oxidation and Decomposition Method
Hakui Murata Manufacturing Co., Ltd.	Anaerobic Bio Method
Hakui Murata Manufacturing Co., Ltd., Togi Plant	Anaerobic Bio Method

The distinctive features of each method are illustrated as follows.



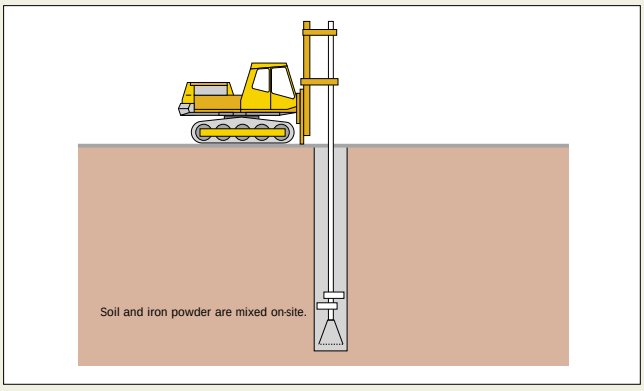
Anaerobic Bio Method

This method decomposes chlorine-based organic solvents by injecting nutrients into groundwater in order to cultivate microbes present in the soil under anaerobic conditions. This is a very safe method because it used anaerobic microbes that already exist in the soil.



On-Site Oxidation and Decomposition Method

This method entails the direct injection of the oxidizing agent (potassium permanganate) into groundwater, which directly oxidizes, decomposes and renders harmless various chlorinated organic solvents such as trichloroethylene and cis-1,2-dichloroethylene. In order to prevent any unreacted oxidizing agent from flowing to the downstream area, a pumping well and activated charcoal removal system are installed downstream from the injection point of the oxidizing agent.



On-Site Iron Powder Method

Soil and iron powder are mixed on-site. The reducing power of metallic iron deoxidizes, decomposes, and renders harmless chlorinated organic solvents such as trichloroethylene and cis-1,2-dichloroethylene.