



INTERNATIONAL MOTOR VEHICLE PROGRAM

FY '97 IMVP WORKING PAPERS

PRELIMINARY REPORT

**INTERNATIONAL MOTOR VEHICLE PROGRAM:
ENVIRONMENTAL PRACTICE SURVEY RESULTS**

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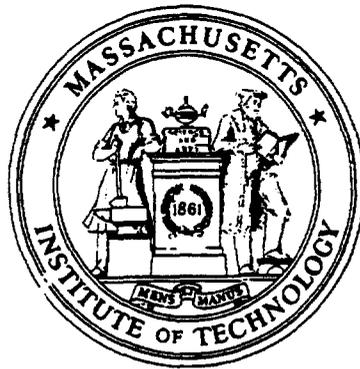
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**Preliminary Report: International Motor Vehicle Program
Environmental Practice Survey Results**



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Introduction

The following report outlines some of the initial findings from the preliminary data. Please note that this report is based on data collected so far. Additional surveys and continued analysis will lead to more thorough analysis in the future.

Our analysis of the survey is organized in the following manner: General Environment Management, Air Emissions, Paintshop Management, Utility Management, Solid Waste, and Water Pollution. At the end of the document you will find a summary of the major variables, as they average across North American and Japanese plants, along with the performance of your own company. The data on individual company and plant performance is being held strictly confidential.

General Environmental Management

This section outlines major comparisons in the area of general environmental management. Throughout the analysis, it is apparent that differences in management approaches are due to a mix of internal organization and culture, as well as external regulatory and institutional pressures. Externally, American plants are responding to a history of strict and complex environmental regulations and growing community pressures. Internally, Japanese management practices reflect a greater reliance on corporate level resources combined with an interest in continual improvement in manufacturing processes.

There is considerable variation in how plants are staffing environmental affairs and the activities performed by these staffs. Both North American and Japanese plants relied heavily on staff above the plants level for obtaining and disseminating regulatory information. As can be seen in Table 1, Japanese plants reported many more environmental staff than American plants. This practice has also carried over to a number of Japanese transplant facilities. There are a number of possible explanations for the larger number of environmental staff in Japan. The first two explanations are related to the process of defining environmental responsibilities. In Japan, 2/5 of the environmental staff were also reported to be responsible for health and safety, while in North America these functions are often handled separately from one another. Second, for those plants closer to Tokyo, EH&S staff that work at the corporate level may also be considered plant level, depending on the frequency and nature of interaction with the plant. Third, and perhaps most important, environmental activities that are normally public-sector in the North America, such as waste water treatment and incineration, are the responsibility of plant EH&S personnel in Japan, increasing the required size of the environmental staff. In fact, Japanese plants are required to have certified plant staff to manage these activities at each of their facilities.

Table 1: Environmental Management

	Japan	North America
Average Number of Environmental Staff	19	2
% Env. Staff Also Responsible for Health and Safety	40	0
% Time Environmental Manager Spends on the Plant Floor	60	20

Plants in both North America and Japan report active environmental management programs, though the exact nature of these programs varies between the two countries. Environmental managers in North America report spending an average of 20% of their time on the plant floor while managers in Japan report on average 60%. Again, this may be the result of differences in question interpretation, where Japanese respondents may have interpreted "on the floor" as "at the plant." Another likely explanation is that the larger number of environmental managers in Japanese plants allows them to be more actively involved in plant process. In fact, many environmental staff in Japanese plants have other responsibilities, such as maintenance. This may be encouraged further because they are less burdened by the strict environmental regulations facing their counterparts in North American plants.

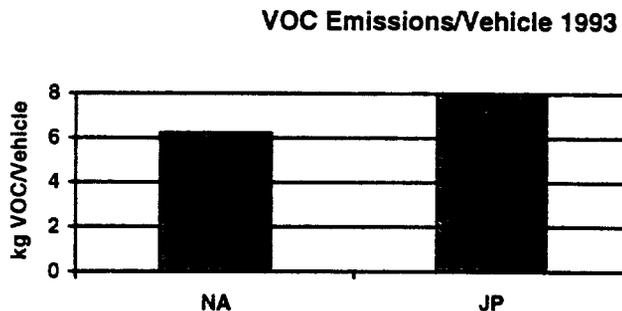
Both internal and external audits were conducted at almost all plants in North America and Japan. Internal audits were reported to occur more frequently in North American plants (on average at least every 3 months and often every month as compared to less than one every six months for Japan). The high frequency of internal audits in North America is most likely due to commonly performed "walk around" audits that serve to ensure proper chemical handling and disposal. On the other hand, Japanese plants reported a greater rate of external auditing (once a year in Japan compared to on average once every 2 years for the North American plants), a difference that could be due to variations in regulatory requirements. It is interesting to note that environmental audits which were until recently, a foreign concept to many Japanese plants, have disseminated rapidly throughout Japanese industry. The Japanese interest and commitment to complying with ISO 14001 is one of the key forces leading to the expansion of environmental auditing in Japan.

On average, external audits in Japan were performed by corporate staff, while in North America audits were performed by outside consultants. The use of external consultants may indicate a greater need for external validation in North America, where pressures from local communities and environmental groups are keenly felt. This difference in external pressures is further evidenced by the observation that Japanese plants reported a greater reliance on staff above the plant level for communication with community and other groups external to the firm. While this could be due to a greater interest in control over external information in Japan, it is likely also reflects the strong local community pressures in North America, to which plants must directly respond.

Air Emissions

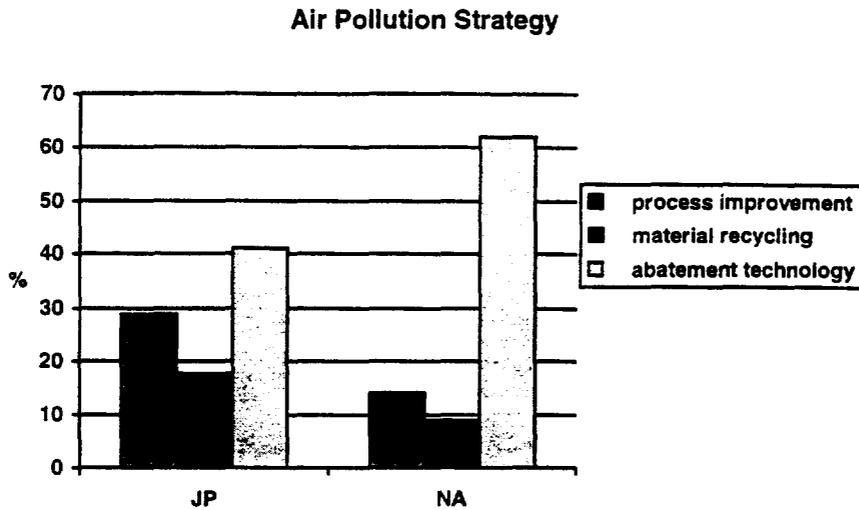
The primary measure of air emissions is VOC emissions. Our analysis suggests that the Japanese plants emit a third more VOCs than their North American counterparts (Figure 1). Because of the lower percentage of Japanese plants in the sample, the differences may be even greater than those found to date. The lower emissions levels in the US are due to tighter regulatory standards in North America. Regulations for odor in Japan, however, do require the use of control technology (primarily incinerators), causing some of the lower emitting Japanese plants to have emissions at levels below several of the higher emitting plants in North America.

Figure 1: VOC Emissions/Vehicle 1993



The data also suggest that plants in Japan and the North America are, at this time, taking different approaches to air pollutant reduction. As can be seen in Figure 2, North Japanese plants reported a higher contribution of abatement equipment to air pollutant reduction in 1994 than did North American plants. From discussions in Japan, it is clear that Japanese plants are relying more heavily on abatement equipment than in the past. The Japanese plants may be reaching the present limits of reductions through process change, and are now turning to abatement equipment to meet new regulatory demands. American plants continue to rely on abatement equipment as a strategy to meet ever tightening standards. However, a growing emphasis on pollution prevention in American industry, supported by government program such as EPA's 33/50, are starting to promote voluntary pollution prevention and source reduction efforts.

Figure 2: Air Pollution Strategy



Despite these efforts in the United States, a preliminary look at use of solvents and cleaners (Figure 3 and 4) suggests that in 1993 plants in Japan, on average, were using smaller volumes of solvents and cleaners with slightly better success at reducing (or at least not increasing) these potential pollutants.

At this time, we do not have much data on toxic air emissions, which has been a key priority in the 1990 U.S. Clean Air Amendments.

Figure 3: Solvent and Cleaners 1993

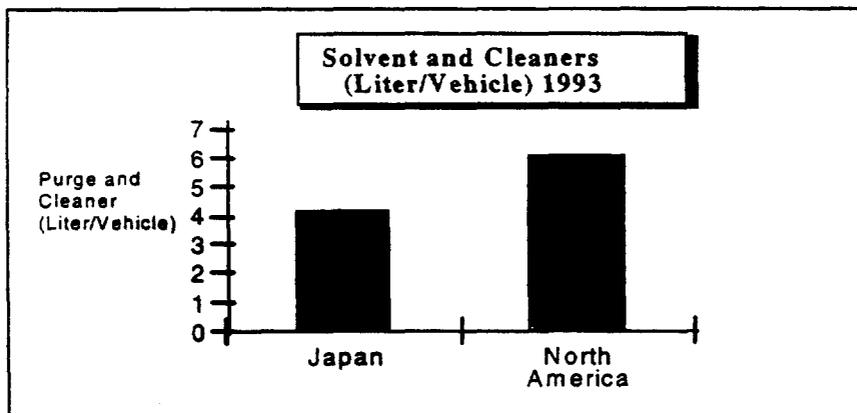
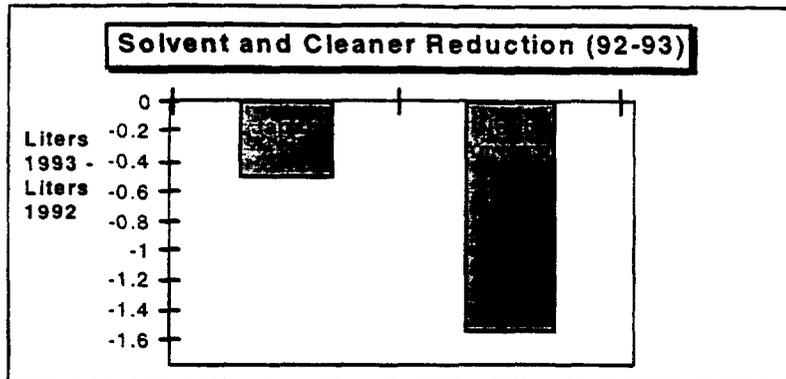


Figure 4: Solvent and Cleaner Reduction



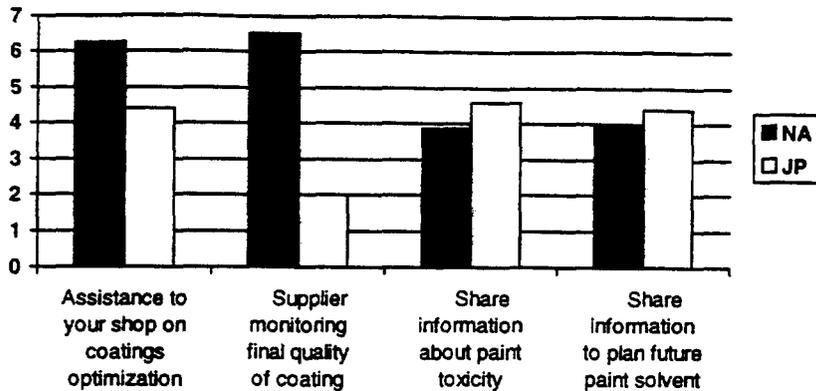
Paint Shop Environmental Management

For both the North American and Japanese plants, responsibility for coordinating day-to-day paint area production issues largely resides with the paint shop manager and responsibility for coordinating technical production issues is shared between the paint shop manager/coordinator and engineering manager. There were differences however, in the realm of influence of these latter technical managers. In Japan, the technical manager was reported to have more influence on strategic issues such as paint formulation choices and obtaining permits. In North American plants, technical managers had a greater influence on operational issues such as shop maintenance and operation of equipment. One explanation for this difference is that in Japanese plants influence on operational issues may be shared more widely than in North American plants.

Japanese plants report that there are few full time suppliers working in the paint shop (average of 1.0), while in North American plants the average number of full time representatives of suppliers at the plant is 5.5. One reason for this difference is the close physical proximity of Japanese suppliers to their customers, allowing them to provide essentially "on-site" representation. This difference also reflects a growing trend in the United States for suppliers to have a greater role in paint shop management. In the United States, it was consistently reported that suppliers have a greater amount of interaction on a number of major paint shop decisions such as assisting plants in process improvement. Japanese plants, however, reported a greater level of interaction with paint suppliers regarding future paint formulation. In North America more long term formulation decisions are made at the corporate level, partially explaining this lower level of interaction.

Another indicator of the growing role of suppliers in North American plants is the small number of plants that report the use of financial incentives to encourage suppliers to identify ways to reduce process costs.

Figure 5: Plant/Paint Supplier Interaction



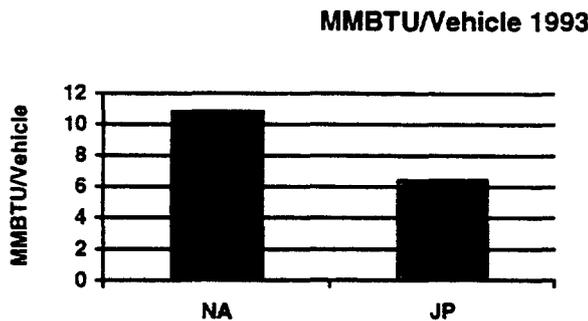
Utility Management

Differences in energy use in North American and Japanese plants were significant. Average energy use per vehicle was significantly lower for Japanese plants (6.41 MMBTU/vehicle) than for their North American counterparts (10.82 MMBTU/vehicle). As can be seen in Table 2 and Figure 6, energy use and conservation efforts were likely influenced by energy costs, which were reported to be more than three times higher in Japan. Many management variables reflected the increased focus on energy conservation. In Japan, for example, budgeting of energy is done at the level of the department, increasing department incentives for conducting conservation efforts. In North America, most budgeting is still done at the plant level. The number of energy meters used in critical areas was also reported to be greater in Japanese plants, indicating a greater interest in monitoring energy use.

Table 2: Utility Use and Costs

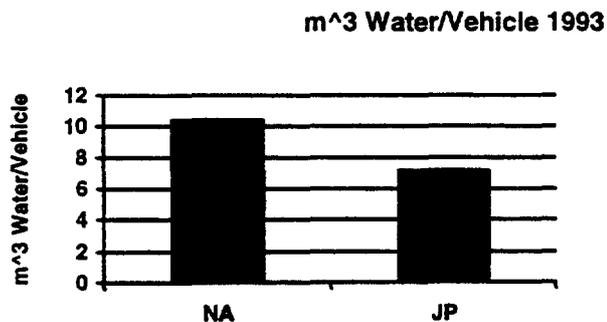
	Average Japan	Average North American
MMBTU/Vehicle 1993	6.41	10.82
\$/MMBTU	17.58	5.08
Energy Cost (\$/Vehicle)	108.2	63.09
Number of Energy Meters	3	2.2
Water M3/Vehicle 1993	7.15	10.39
\$/M3 Water	0.95	0.35
Water Cost (\$/Vehicle)	5.09	2.74
Number of Water Meters	5	1.95

Figure 6: Energy Use Per Vehicle



Water use follows a similar path to that of energy. North American plants report higher water use than their Japanese counterparts, while Japanese plants pay approximately twice that of North American plants for water per vehicle. Within both Japan and North America, water use is associated with the age of plant (older plants use more water). The stronger use of water meters in Japanese plants, however, may indicate a greater interest in water use monitoring and conservation. Since water use is to a great extent built into the capital equipment of a plant (i.e. heating and cooling towers, paint booths), it may be that plants with relatively newer equipment will have similar water use levels regardless of their location.

Figure 7: Water Use per Vehicle

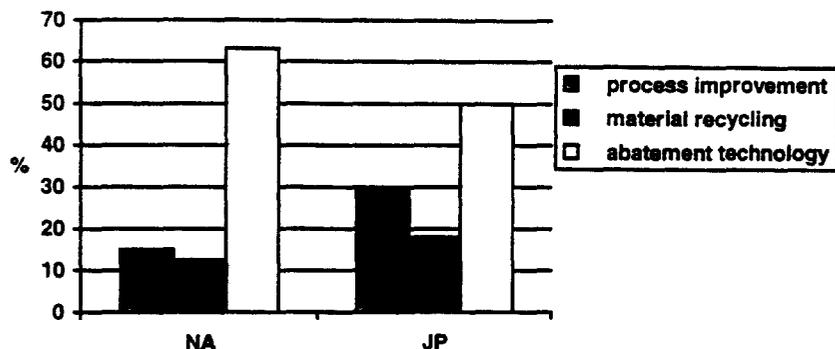


Water Pollution

Plants in both North America and Japan rely heavily on abatement equipment to reduce water pollution. As suggested above, Japanese plants all operate waste water treatment systems on their facilities and devote considerable attention to reducing and preventing water pollution. Many facilities are working to reduce organic materials, nitrogen and phosphates, substances which cause eutrophication. Japanese plants are responding to strict local water standards. Despite their heavy reliance on waste water

treatment systems, Japanese plants report a greater reliance on process improvement for reducing water pollution than their American counterparts. (We have data on sludge, but it will be provided in a future report.)

Figure 8: Water Pollution Strategy



Solid Waste

As seen in Figure 9, plants in both countries are reporting that recycling is a central component of their waste reduction strategy. A notable difference, however, is that Japanese plants report that they look towards process improvement to greater extent than plants in North American. One reason for this is that in Japan, landfilling costs are large and resources are more expensive. Therefore, many opportunities for recycling have already been explored. In contrast, in North America the popularity of recycling has emerged over the past five years, resulting in a contribution of this strategy to solid waste reduction.

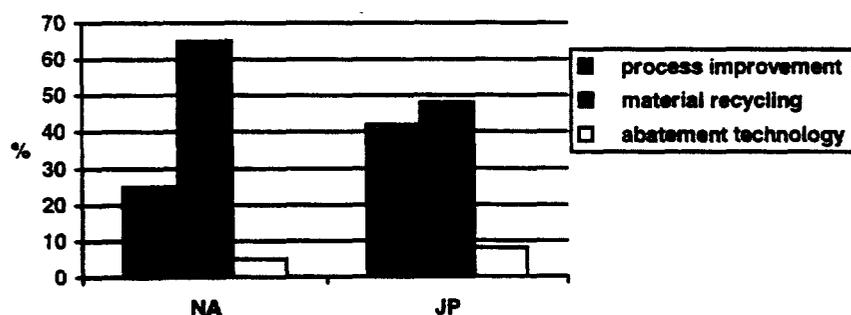
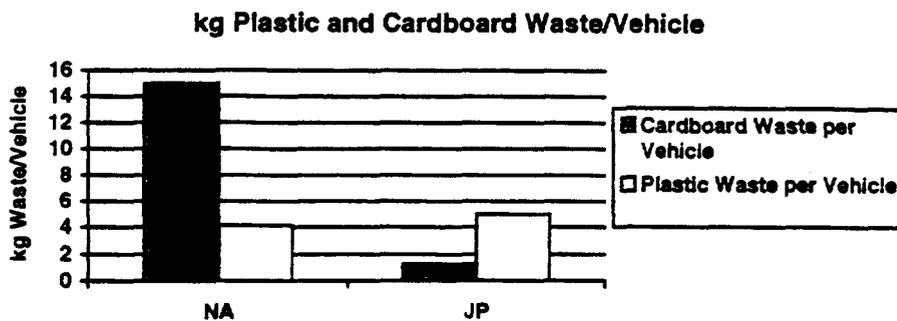


Figure 9: Solid Waste Reduction Strategy

Significant differences were reported between North American and Japanese plants for solid waste (waste includes lanfilled, incinerated, and recycled waste materials). The data indicates that Japanese plants, on average, generate about 20% more plastic waste. One explanation for this difference is that Japanese plants reported plastic that was recycled internal to the plant while Americans did not. This would make a

significant difference because many of the Japanese plants have injection molding processes at their assembly plants. In addition, Japanese plants report a greater percent of their plastic waste going to incineration with energy recovery, an economically superior alternative to landfilling that is often not available in the United States because of strong community opposition to incineration siting. This may give plants in North America a greater incentive to reduce plastic waste. On the other hand, the reliance on incinerators may give some Japanese plants the incentive to keep plastic waste streams higher to optimize incinerator performance, depending on the way in which the incinerator is financed and operated.

Figure 10: Cardboard and Plastic



As can be seen in the Figure 10, Japanese plants had far less cardboard waste than did North American plants. This difference can be primarily explained by a difference in packaging strategy in the two countries. As seen in Figure 11, Japanese plants reported a far greater utilization of indefinitely reusable containers than plants in North America. Greater use of returnable containers in Japan may be the result of a relatively geographically close supplier network that makes container return more feasible economically and, in many cases, financially beneficial.

Figure 11: Container Disposal

