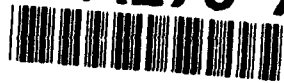


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Recycling at Naval Shore Installations: One Means of Curbing the "Garbage Glut"

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ABSTRACT

Phillips, Robert L., **Recycling at Naval Shore Installations: One Means of Curbing the "Garbage Glut"** --- Provides techniques and strategies to aid Federal recycling program managers. Highlights the major laws and regulations that stimulated recycling within the Department of Defense, discusses several benefits of recycling, and addresses start-up and operating costs associated with a recycling program. Briefly examines the Navy's current recycling efforts at shore activities. Contends that the real breakthrough in effective solid waste management will only come when intense recycling is combined with reducing waste at the source, expanding the use recycled materials, and investing in better research and development.

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**RECYCLING AT NAVAL SHORE INSTALLATIONS:
ONE MEANS OF CURBING THE "GARBAGE GLUT"**

INTRODUCTION

Growing volumes of trash, coupled with a shortage of environmentally safe disposal sites, plague cities worldwide. While the heated debate continues on finding the best method of curbing the "garbage glut," one approach - recycling - is considered by many as an immediate solution. Recycling offers everyone the opportunity to reduce disposal costs and ease the environmental stresses placed upon our fragile planet.

As part of their solution to the worldwide refuse problem, top Navy officials directed all shore facilities to cut solid waste disposal in half by 1995. Military installations were expected to establish recycling programs or expand existing ones in an effort to tackle this aggressive goal.¹

With this target established - which is far more ambitious than most state or city programs - base commanders are now faced with the problem of how to implement recycling effectively and make it an integral part of their overall solid waste management (SWM) plan. This is no small feat considering that Americans are often characterized as a "Throwaway Society".² Recycling - like learning and applying the metric system - has never been a high

priority of the American people.

Essayist Wendell Berry contends that misplaced values are at the root of our waste problems: "Our economy is such that we cannot afford to take care of things: Labor is expensive, time is expensive, money is expensive, but materials - the stuff of creation - are so cheap that we cannot afford to take care of them."³ Cynthia Pollock, from the Worldwatch Institute, points out that "waste disposal problems exist because most consumed goods are designed for a one night stand. They are purchased, consumed, and discarded with little regard for their remaining value."⁴

Recycling in the Navy (or anywhere for that matter) will only be successful if we develop creative training programs, insist upon top-down leadership and commitment, alter our buy, consume, and discard habits, and aggressively pursue the procurement of recycled goods. In addition, recycling must be supplemented with: intense efforts to reduce waste at the source, the development of more environmentally sensitive products, and expanded research and development.

We, the Navy, owe it to the taxpayers to reduce our solid waste disposal costs. We must be leaders in the solid waste disposal crisis. Recycling and overall waste management must become a way of life if we are to achieve success in curbing the "garbage glut."

PURPOSE

The primary purpose of this research paper is to offer some techniques that may benefit Navy and other Federal recycling

coordinators. Knowledge of "what works" can help program managers design recycling programs or fine-tune existing operations. Moreover, since I believe that recycling is but one means of correcting our trash problems, three broad SWM strategies will also be proposed that could be considered and implemented by the public and private sectors.

I will begin with an overview of recycling in the Department of Defense (DOD) and highlight some of the major laws and directives that have stimulated the program. Following this bit of history, I will address two important questions, "Why recycle?" and "Is it cost effective to recycle?," and provide a brief status report on the Navy's current recycling program. Finally, I will focus on some effective local recycling techniques and highlight three specific areas in SWM that merit national attention and direction.

RECYCLING IN DOD: PAST TO PRESENT

Some forms of recycling - the process by which recovered materials are transformed into new and useable products - within DOD, can be traced back to World War II. Military installations, in concert with the rest of society, saved tin cans, glass, and other products due to limited sources of raw materials. One-third of all paper, along with other strategic metals like copper and aluminum, were recycled during the war. Glass bottles and jars were reused up to 40 times in an effort to conserve natural

resources and eliminate fruitless processing requirements.⁵

As worldwide trade resumed after World War II, recycling declined. Most bases and communities moved toward collecting mixed garbage; the separation of materials was considered to be too labor intensive and thus too expensive when compared to the low cost of simply dumping trash into a landfill.⁶

The energy crisis of the 1970s gave some people an incentive to recycle. However, most recycling centers were unable to offer a steady supply of reliable secondary materials. As a result, most programs floundered in the 1974-1975 recession and subsequently collapsed when market prices hit rock-bottom.⁷

In 1975, recycling was formally introduced within DOD. A portion of the Military Authorization Act allowed installations to receive funds generated from the sale of recyclable materials. One year later, the Resource Conservation and Recovery Act (RCRA) established minimum standards for SWM. In addition, RCRA mandated that all federal facilities must not only adhere to Federal SWM laws and regulations, but state, interstate, and local ones as well. If legal codes and regulations conflicted between institutions, the federal facility was required - under RCRA - to adopt the more stringent requirements.⁸

The DOD recycling program got a boost in 1982 with the approval of Public Law 97-214, the Military Construction Codification Act. This law was significant; it authorized recycling proceeds to be distributed as follows:⁹

- * Expenses for recycling operations must be funded with proceeds.
- * After expenses, the remaining balance can be transferred to the base's morale, welfare, and recreation fund.
- * If the activity desires, it can use 50% of the remaining balance to fund energy conservation, pollution abatement, and occupational safety and health projects.
- * The maximum remaining balance at the end of any fiscal year can not exceed \$2 million. Excess amounts must be forwarded to the U.S. Treasury in the form of miscellaneous receipts.

In response to Public Law 97-214, Deputy Secretary of Defense Thayer issued a memorandum encouraging each DOD activity to establish a Qualified Recycling Program (QRP). Specifically, a QRP is an organized operation that develops and monitors efforts to recover scrap or waste for recycling or reuse.¹⁰ The program also includes managing the recyclable materials to enhance their marketability.¹¹ A QRP is normally established by an installation directive or regulation and must include as a minimum a designated managing activity and a means for fiscal and record accountability.¹²

On November 8, 1984, Congress amended RCRA in an effort to further regulate solid waste disposal units (landfills).

Specifically, RCRA provisions on solid waste:¹³

- * Required states to develop SWM management plans.
- * Prohibited open dumping.
- * Corrected the release of hazardous waste from landfills.
- * Increased the amount of ground water monitoring.
- * Prohibited disposing of hazardous waste in landfills.

Although this amendment has no direct link to recycling, its indirect effect is extremely important. The new restrictions mandated the closure of "out-of-date" landfills and forced the nation's managers of trash to build new and expensive solid waste disposal units and seek alternative methods of managing the "garbage glut." RCRA could be considered as the true recycling catalyst; its enactment forced the American public to take a hard look at the hidden resources available in materials that had been routinely discarded in the past. In fact, if we were to inventory our past discards we would probably find "metals more valuable than the richest ores, paper derived from millions of hectares of forests, and plastics incorporating highly refined petrochemicals."¹⁴

Finally, a last bit of significant recycling history can be found in Executive Order 12780. This order, signed on October 31, 1991, required all federal installations to have a resource, recovery, and recycling program.¹⁵ Moreover, it established "preference programs" for the procurement of products that contained recycled materials.¹⁶

It's interesting to note that recycling in DOD was formally introduced some 17 years ago. Unfortunately, the requirement to recycle has just recently been adopted. Let's now explore the reasons to, and benefits of, recycling.

WHY RECYCLE?

Executive order 12780 makes recycling in DOD mandatory. Therefore, the option - not to recycle - isn't available to us.

SWM legislation at both the federal and state levels is growing at a rapid pace. During 1988, approximately 2,000 bills were introduced into federal and state legislatures dealing with various aspects of SWM.¹⁷ Today, 41 U.S. states have laws, goals, or other guidelines requiring 25% to 50% recycling targets over the next 5 to 10 years.¹⁸ "Nine states have bottle bills and 33 states have regulations requiring the purchase of recycled goods."¹⁹

Setting aside the mandatory requirements, recycling provides a way to live harmoniously with our environment. It is an especially attractive strategy because of its potential to conserve resources and energy, reduce disposal requirements, and conserve limited landfill space.

Conserve Resources And Energy

Recycling items such as metal, paper, glass, and plastic reduces energy requirements, lessens the demand for raw materials, and curbs the environmental stresses placed upon this planet. For example, producing aluminum from discarded soda cans instead of bauxite reduces energy use and air pollution by 95%. Moreover, reprocessing paper from recyclable materials instead of virgin timber cuts energy requirements by three quarters and reduces the destruction of valuable forests.²⁰

By reducing the demand for energy - 90% of which is supplied by fossil fuels - recycling lessens greenhouse gas emissions and scales back pollutants that contribute to acid rain. Many prominent scientists argue that greenhouse gas emissions are the major cause of global warming. In addition, pollutant byproducts from the burning of fossil fuels are already linked to the destruction of millions of acres of forests and the production of thousands of "lifeless lakes."²¹

Reduce Disposal Requirements: Save Landfill Space

Over the last 20 years, most industrial nations have come to realize that the "new scale and character of waste" are overtaking our existing landfills.²² The U.S. generates more solid waste than any other country in the world and this trend shows few signs of subsiding.²³

The Environmental Protection Agency estimates the annual cost of solid waste disposal to be in excess of \$30 billion, a figure growing 17% a year and predicted to top-out at \$75 billion by the year 2000.²⁴ U.S. residents throw away, on average, 3.5 pounds per person of garbage each day.²⁵ From 1986 to 1988, the total amount of solid waste generated each year increased from 158 million tons to 180 million tons.²⁶ If we continue with our typical discard habits, it is projected that our annual mountain of garbage will reach 200 million tons by the end of the century.²⁷

While waste production increases, waste disposal options decrease. Nationwide, the number of landfills has dropped from an estimated 17,000 in 1975 to 4000 today.²⁸ One particular study indicated that all but four states are running out of suitable locations to dump their trash.²⁹

Locating areas for new landfills has become difficult due to strict environmental regulations and intense public opposition. As landfills close, costs for solid waste disposal are rising dramatically. Some areas in the Northeast are charging more than \$100 per ton in tipping fees - the cost of unloading garbage at landfills or incinerators.³⁰ It's hard to believe that only a few years ago it cost less than \$10 per ton to dispose of trash in most landfills!³¹

The increased cost in tipping fees is closely linked to the capital investment required to construct a new "state-of-the art" landfill. Moreover, enormous costs are required not only to operate an environmentally approved facility, but also to close and monitor (up to 30 years) the landfill after it has served its useful purpose.

State approval alone requires countless studies and tests. Once approved - a process that could take years - the landfill must be constructed with some or all of the following safeguards:³²

- * Double plastic liner to contain the trash
- * Leachate collection system
- * Methane burn-off facility
- * Groundwater monitoring wells

Environmentally approved disposal units aren't cheap! For example, construction of a small landfill may require investing approximately \$500,000 for the initial testing and studies, \$1-2 million for the design, and \$10-15 million for the actual construction. To further complicate matters, federal and state laws require post-closure plans prior to the start of construction. In a nutshell, environmental regulatory officials want to know how you intend to prevent environmental contamination during and after landfill operations.

You may wonder why all the red tape and restrictions? The reason is that when landfills leak, they release "an often-toxic soup of

rainwater and decomposing waste called 'leachate'."³³ Leachate can contain a wide range of hazardous substances - including heavy metals and organic chemicals - which find their way into the groundwater table, lakes, streams, rivers, and oceans. Since water is a perfect transport vehicle and observes no jurisdictional boundaries, it has the ability to carry pollutants to any corner of the globe.

The severity of the problem is demonstrated by the fact that more than one-fifth of the hazardous waste sites on the U.S. superfund cleanup list are municipal landfills. The situation is further complicated because the decay of garbage produces methane gas, which is both a contributor to global warming and a severe fire hazard.³⁴

In addition to complying with strict federal and state environmental restrictions, another major hurdle in getting a landfill approved is gaining public support. The public's perception of "the old trash dumps" and homeowners' objections to having a landfill sited near their property have fueled the fire in the solid waste disposal crisis.³⁵ Public opposition to siting these facilities has created a number of humorous garbage acronyms:³⁶

NIMBY - NOT IN MY BACK YARD
NIMEY - NOT IN MY ELECTION YEAR
NIMTO - NOT IN MY TERM OF OFFICE
NOPE - NOT ON PLANET EARTH

In fact, when the state of Georgia proposed a ban on the sale of disposable diapers, this brought out a new cry and acronym from parents of young children: NUMKAPT (NOT UNTIL MY KIDS ARE POTTY TRAINED). To the delight of these parents, the disposable diaper ban was dropped from Georgia's recycling law.³⁷

Despite their success, NUMKAPTs in all parts of the country shouldn't celebrate too quickly. "Procter and Gamble's \$1.6 billion-a-year diaper business could be legislated away at the stroke of a pen. The 16 billion diapers Americans dispose of annually amounts to over 1% of municipal solid waste."³⁸

Although Georgia, New York, and Washington State defeated their proposed disposable diaper bans, Nebraska recently got one through: similar bills are surfacing in California and Oregon.

The reality is that all the garbage has to go somewhere. With a solid waste stream consisting mainly of paper, glass, plastics, metals, textiles, wood, food wastes, and yard wastes, the potential to recycle and thus avoid enormous disposal costs is endless. The opportunity to collect proceeds from recycled goods makes this SWM strategy that much more attractive.

IS IT COST EFFECTIVE TO RECYCLE?

In most areas of the U.S., the total program costs for recycling wastes is now no greater than collecting and disposing of trash in a landfill.³⁹ However, every individual program is different

and the true cost of recycling can only be determined by conducting an economic analysis.

The first step in performing an economic analysis is to estimate the types and quantities of materials available and eligible for recycling. Next, a complete market survey should be conducted to determine the current and projected future prices of the recyclable materials, as well as any hidden costs - pickup charges and special preparation costs (baling, tying, etc.) - that may be required by the materials buyer. Projected revenue can be determined by multiplying the estimated quantities of each recyclable material by the expected price identified in the market survey.⁴⁰

The types and quantities of materials available for recycling will in large part determine the start-up and projected annual operating costs. Typical costs include:⁴¹

Start-Up Costs

- * Storage buildings
- * Planning and design
- * Installation of utilities
- * Internal collection systems (bins and hampers)
- * External collection systems (vehicles and dumpsters)

Operating Costs

- * Overhead (space rental, maintenance, and utilities)
- * Staff (manager, equipment operators, and labor)
- * Equipment (fuel, maintenance, supplies)
- * Education (advertising and printing)

It should be noted that when considering start-up and operating costs, it is imperative that the influence of environmental, hygienic, aesthetic, and safety requirements be considered when determining storage locations and frequency of pick-up.⁴²

The final step in the economic analysis is to calculate those SWM costs that are reduced or eliminated when recycling is implemented. These costs - tipping, hauling, and permit fees - are incurred when a landfill is used to dispose of garbage.⁴³

Recycling of a material becomes economically feasible when the added costs - start-up and operating - are less than avoided costs plus revenue. The decision may seem obvious when added costs are less than avoided costs and revenue. However, economic considerations should not be the entire driving force behind the decision to implement recycling. Careful consideration should be given to intangible benefits like aesthetics, employee morale, and pollution abatement.⁴⁴

THE NAVY'S RECYCLING PROGRAM: OFF TO A GOOD START!

The Navy's program appears to be part of a growing national trend toward recycling. You could say that "recycling is in vogue!"⁴⁵ The Navy reports that 95% of all their shore installations worldwide have some form of recycling.⁴⁶ Likewise, U.S. citizen participation is growing by leaps and bounds; curbside collection programs alone have increased from 600 in 1989 to 4000 today.⁴⁷

According to their solid waste annual report, the Navy recycled 8.3% of the 4.5 million tons of solid waste it generated in fiscal year 1990. This rate was somewhat below the overall national average of 13% and considerably lower than the 40% rate achieved by such countries as Japan and Germany.

Although below the national average, the Navy still leads all other military services in its recycling efforts.⁴⁸ Twelve million dollars were netted in recycling revenues in 1990, of which the majority came from metals. This is not surprising since most Navy and Marine Corps industrial installations have had a tradition of collecting scrap metals for sale through Defense Reutilization and Marketing Offices.

Despite the Navy's recycling success within DOD - which is attributed to innovative outreach projects and participation in agency and national award programs - much progress is still needed if they are to achieve their 50% solid waste reduction goal by 1995. With the exception of rubber, wood, and metals, less than 1% of all other materials were recycled. Of the 4.5 million tons of waste generated, 90% was placed in a landfill and 1.7% was incinerated. The total cost to the taxpayer in 1990 for collection and disposal was approximately \$100 million.⁴⁹

MAKING RECYCLING WORK FOR YOU

Recycling is a closed-loop process consisting of the following major steps:

- * Dispose of products
- * Collect and separate recyclables
- * Market and sell recyclables
- * Convert recyclables to raw materials
- * Manufacture like or new products from the raw materials
- * Market and sell new products
- * Repeat process

It is important to remember that problems in any one of these steps could have a severe impact on the overall program. For example, intense recycling collection efforts may create unmanageable stockpiles unless there is a potential buyer to remove these materials. Likewise, buying products made only from virgin materials instead of recycled goods would cause the entire program to flounder.

This section of the paper will make the assumption that adequate external markets exist for recyclables. Therefore, the focus will be on providing techniques that will assist shore installations in setting up and operating a recycling program.

Education

Employee education and public awareness are considered by many as one of the most important components of a recycling program.⁵⁰ A successful operation requires support and participation from the employees who generate and provide the materials and the staff

who manage the recycling business.⁵¹

Education lets employees know what to do and how to do it. If employees are misinformed or not motivated to change their waste disposal habits, the materials will find their way to a trash can, and there will be nothing to recycle. Moreover, if the material is contaminated or incorrectly placed in the recycling bin, it will be difficult to market or will require additional manpower to properly sort it. For example, jars and other glass products coated with food or industrial substances may not be accepted by the material buyers. Likewise, the market value of paper could be seriously reduced if employees throw paper clips, carbons, and other trash into the collection boxes.⁵²

No matter what creatively designed advertising campaigns are used to promote public awareness and encourage participation, make sure all employees are fully informed. It only takes one or two employees not knowing or abusing the recycling rules to seriously contaminate your material and undermine the entire program.

Leadership and Process Improvements

A well run recovery center can support its own key staff and still generate revenue for the shore activity. However, to be successful, any recycling business needs the attention of the base commander and an aggressive and innovative full-time recycling coordinator. Moreover, a process-focused approach is

the only way to truly achieve continuous, measurable improvement in your program.⁵³

According to a study performed by Glen Belnay and Michael Greenberg, it appears top officials, not citizens or individual employees, are responsible for determining the success of individual recycling programs. Belnay and Greenberg concluded that aggressive recycling is more likely to be found where leaders perceive that recycling is in the best interest of the community rather than if the employees are affluent or well-educated.⁵⁴ Simply put, if the base commander doesn't support and actively promote the recycling program, it will most likely fail.

Keeping track of the recycling program and its progress is a must for the program manager. Monitoring and accurate record keeping will help track goals and determine those strategies and techniques that produce the best results and provide the biggest revenue payoffs.⁵⁵

Reporting the results and savings from the program is a good incentive for participants and keeps the base commander and department heads informed of the operations. Moreover, the feedback obtained from monitoring is a key factor in structuring the on-going education programs.⁵⁶

Every program can benefit from an in-depth analysis of the composition of commodities and revenues produced by each element. This data can help program managers find the best combination of high-volume material such as newspapers and office paper and high-revenue materials such as aluminum and scrap metals.⁵⁷

Finally, a systematic method should be used to identify and correct the root causes of problems that may be encountered. The Air Force - a strong proponent of Total Quality Management - recommends a process-focused approach as one means of implementing continuous improvements in your operation.

The basic steps include:⁵⁸

- * Defining the complete process and determining the main problem areas.
- * Analyzing the problems and identifying the root causes of each one.
- * Identifying and evaluating possible changes to the process.
- * Implementing the changes and measuring the process.
- * Formalizing the changes within the organization.
- * Repeating the steps for continuous improvement.

This six step approach should serve as a useful tool for fine-tuning collection operations, determining the proper balance of advertising and education, and identifying the right mix of recyclable goods.

There's More Out There Than Cans, Paper, and Glass

Generally, recycling programs will begin based on one or two profitable commodities. However, as organizational and

operational details are smoothed out, recycling coordinators should look for new materials to add to the collection system. Food products, textiles, machine toner cartridges, construction waste, used motor oil, and yard trimmings are only but a few of the potential sources of extra revenue for your program.⁵⁹

Food Products: Unclog Those Drains.

When a public works officer thinks of fat, grease, and bones from the dining facility, visions of plumbing nightmares come to mind. However, these food waste products are actually collected by tallow and rendering companies. At the rendering facility, the contents are separated, dewatered, checked for toxicity, and then eventually sold to producers of animal feed supplements and soap.⁶⁰

Textiles: Don't Throw Away Those Old Rags!

There are numerous domestic and international markets for textiles - fabric scraps, old clothes, blankets, and rags. Textile waste can be reprocessed into new fabric, yarn, industrial felt, carpeting, and mats; some cloth scrap can be marketed through craft associations.⁶¹

Machine Toner Cartridges: Save On Office Supplies.

Machine toner cartridges from laser printers and photocopiers are now being refilled by numerous service companies. Recyclers will take the old cartridge and provide a refilled one for about 1/2

the cost of purchasing a new cartridge from the manufacturer. This service not only provides considerable savings on office supplies, but eliminates the requirement to dispose of the toner cartridge as hazardous waste.⁶²

Construction Waste: It Can Be Recycled Or Salvaged.

Construction and demolition waste can account for 50% of the solid waste stream in some areas. Class I debris - concrete, bricks, rebar, etc - can be reprocessed and used for aggregate in road construction. On the other hand, class II - wood, plaster board, etc. can be reused by various salvage contractors.⁶³

Used Motor Oil: Don't Put Your Command In Jeopardy!

It is illegal to put used motor oils in trash dumpsters, drains, storm sewers, or the ground. The same holds true for antifreeze and other automotive and equipment fluids. It is imperative that all installations recycle their used motor oils or have it removed by a licensed hazardous materials contractor. There are very strict Federal and State laws on hazardous waste management and noncompliance could subject employees to stiff fines and penalties.⁶⁴

Yard Trimmings: Composting Is The Answer.

Composting - a natural biological decomposition process - is ideally suited for managing and using organic materials such as yard trimmings (leaves, brush, weeds, and grass clippings) and

food scraps. At present, the Navy is composting 14-15% of the some 900,000 tons of organic waste they generate.

There are 3 approaches to composting. First, you can compost on-site if space is available. Second, you can work with a local landscaping contractor, and third you can transfer the materials to a commercial or municipal composting facility.⁶⁵

The major advantages of composting programs are that they keep bulky materials out of the waste stream and eliminate the need to pay wasteful tipping fees. In addition, your grounds maintenance department will be provided with an excellent soil conditioner, which can substitute for purchased peat moss and topsoil. Compost adds valuable nutrients and helps the soil retain moisture.⁶⁶

Be Smart About What You Buy

In the fall of 1991, the White House issued a directive requiring federal agencies to give preference to recycled materials when purchasing products. However, unless the White House mandates specific goals for recycled materials in products, recycling programs are likely to be "discredited" and may eventually fail.⁶⁷

According to Jack Friedline, former Deputy Public Works Director in Phoenix, Arizona, consumer preference and buying habits are

key components of a recycling program.⁶⁸ Sound and environmentally-conscious buying habits produce a healthy stream of recyclable goods and ensure a solid market for products made from secondary materials.

Recycling managers are normally consumed with determining collection and processing systems, identifying materials, and finding markets for recyclables. However, according to Friedline, the success or failure of the program depends largely not on the people planning it, but rather on the people supplying the recyclables. The products purchased and subsequently placed in the recycling bins will ultimately determine the amount of revenues that will be received.⁶⁹

It is imperative that buyers or consumers - responsible for creating the recycling material stream - be aware of how the choices they make affect the recycling program economically. Whether it is goods obtained in the commissary or base exchange, or products procured through the installations purchasing and contracting department, we need to be asking some smart questions about the goods we purchase. For starters, we might ask:⁷⁰

- * How much packaging is used?
- * How easy is it to sort the material?
- * How much recycled material is in the product?
- * Will I be able to sell the recyclable based on current markets?
- * How much revenue will this material produce?
- * What is the potential to reuse this product?

The reason for these questions is to pressure manufacturers to be environmentally sensitive about the products they produce. Today, manufacturers have no direct incentive to design products for effective waste management. Why? The cost of collecting and disposing of most garbage is assumed by the state or federal government. As a result, this cost, along with other local, state, and federal services, is just passed on to the taxpayer in an undifferentiated amount.⁷¹

Advice from Experienced Recycling Managers

Studies and surveys are excellent informational tools. However, soliciting advice from experienced recycling managers is probably the single best source for acquiring unique strategies and techniques that will benefit your recycling program. The following represents some additional lessons-learned from front line program managers.⁷²

- * Make the program simple and convenient.
- * Recycling must be a normal part of operating procedures.
- * Don't rush. It takes time to educate the employees.
- * Avoid multiple handling of material.
- * Have enough collection containers and sufficient room to store materials. Markets are volatile and you will eventually need additional space to expand your operations.
- * Separate as much at the source as possible to eliminate double handling of the material.

EFFECTIVE SOLID WASTE MANAGEMENT REQUIRES MORE THAN RECYCLING

Researchers estimate that as much as 80% to 90% of today's U.S. solid waste stream could be recovered through aggressive

recycling. A 1987 pilot project with 100 volunteer families achieved 84% at a time when only a dozen communities in the nation were recycling 25% or more.⁷³

Unfortunately, for all its promises, recycling alone will not prevent us from "drowning in our own garbage."⁷⁴ Despite the enormous energy and enthusiasm within the Navy and others collecting and marketing recyclable products, recycling rates greater than 20% are rarely achieved. The recommendations provided in this paper to program managers may boost the Navy's overall recycling rate to 20-25%, but that only gets us half-way to our 50% reduction goal. Therefore, we must seek additional SWM strategies to ensure our success.

In my opinion, the real breakthrough in managing the "garbage glut" will only come when intense recycling is combined with reducing waste at the source. Moreover, we, as a nation, must entice more markets to absorb recycled materials and invest in better research and development.

Source Reduction

Real progress can be made by waste reduction.⁷⁵ Unfortunately, Americans tend to focus on managing rather than reducing waste.

Waste prevention requires a careful analysis of buying practices and production processes. The use of permanent shipping

containers or plastic pallets eliminates the requirement for cardboard boxes and wooden skids. Meticulous inventory and quality control reduces the need to dispose of materials that have reached their useful life. Electronic mail prevents the creation of interoffice memos and a switch to double-sided copying substantially reduces the use of paper. Finally, just consider the source reduction that could be achieved if every cafeteria in the U.S. used china plates instead of paper and plastic products.⁷⁶

Products

Manufacturers need to be convinced or forced to produce more environmentally sensitive products.⁷⁷ "Waste volumes will not be reduced significantly until products, packages, and materials are designed for durability, reuse, and recycling."⁷⁸ Moreover, promoting standardized containers and mandating a National Bottle Bill would help cut energy costs.⁷⁹

People should also have the option to choose items that are less harmful to the environment. Consumers need more information about the products they purchase, along with incentives to help them make the right choices, so that "the conscience need not do battle with the pocketbook."⁸⁰

Finally, recycling materials should get the same tax and subsidy treatment that is provided for raw materials.⁸¹ Many of today's

tax codes and pricing practices discriminate against recycling.⁸² Government subsidies on the use of virgin resources have hurt the market for recyclable materials.⁸³ Tax credits have favored extraction and processing of raw materials like timber, sand, and bauxite.⁸⁴ Moreover, tax breaks on shipping costs and capital investments have encouraged industry to use raw rather than recycled materials.⁸⁵

New Technology

Recycling provides a new frontier for new and innovative processes. Potential investors in recycling equipment and research should be enticed with tax incentives and low interest loans.

Industry needs to undertake a major redesign effort to cut excess packaging because 39% of the paper and paperboard ends up going directly into a landfill or incinerator.⁸⁶ Cost effective methods for removing contaminants and recycling more of the some 60 billion pounds of plastic resins produced annually should be top priority for research and development firms.⁸⁷

Finally, a process able to make useful products from the entire waste stream - without the need for costly separation - would go a long way toward correcting some of the difficulties inherent in recycling and SWM.⁸⁸ For example, an experimental recycling process in Philadelphia has the ability to take the entire waste

stream (with the exception of ferrous metals) and produce two original commodities - fiber and granulate.⁸⁹ The fiber is being used by the agricultural industry and by chipboard manufacturers and the granulate is being tested as a landfill cover and as a road and building aggregate.⁹⁰ Likewise, Oregon is turning waste wood into chips for the production of hardboard.⁹¹ With intense research and development, the day may come when plants, like these, rid the world of landfills and incinerators.

FINAL WORDS

Time will tell if we are able to get our waste disposal habits under control. Some skeptics think that Americans will never truly embrace recycling or implement other effective methods of SWM. They contend that this problem, like the public debt, lack of health care, and the risk of nuclear holocaust, will ultimately be passed along unresolved to the next generation.⁹² Others argue that industry and private citizens should be charged based upon the number of bags or volume of refuse they generate.⁹³ This, they decree, is the only fair way to distribute the cost and bring the solid waste crisis to the attention of the public.

Recycling and other forms of SWM - like source reduction - are effective tools to curb the "garbage glut." However, no matter what strategy or technique is employed to promote our waste management objectives, we should always be motivated by the fact

that how we treat the environment may well determine how we coexist together on this planet. "We did not weave the web of life; we are merely a strand in it. Whatever we do to the web, we do to ourselves..."⁹⁴

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