

ELEMENTAL KEYS TO SUSTAINABLE WASTE PREVENTION

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Summary

Whatever its form, we will always have waste. Management is essential. Minimization is key. In the past, everyone handled waste in much the same way. It was either dumped or buried in the ground, or discharged to the nearest waters. As waste increased, accumulated and became more hazardous, it began to impinge on humans and wildlife

alike. Not much thought was given to content because it was assumed that the solution to pollution was dilution. When industrial activity expanded and the effects of dumping became obvious, the more advanced countries introduced controlling legislation, and better methods of disposal for both domestic and industrial wastes were devised. Regulatory agencies were formed and enforcement began. However, waste treatment became a socioeconomic issue. Implementation and compliance ranged from none to varying degrees of treatment. How big you were, where you were located and who you knew, were determining factors. Entire industries moved from more highly regulated locations to places where environmental laws were lax or non-existent. For many, these evasions were only temporary, because society was becoming more educated, concerned and demanding.

In countries where free enterprise was allowed, the development of equipment and treatment methods became vendor-driven. There was a need and therefore a market. Research could be compensated. Environmental consultancies sprang up and waste treatment was considered the answer.

However, as landfills overflowed and waste streams increased, it became obvious that treatment alone would not be enough. It was time to take a fresh look at what was being contributed to waste streams because regulators were getting involved and treatment was becoming more expensive. Other methods had to be explored.

In the field of quality management there is a term called “root cause.” Find the cause of a problem, so a solution may be addressed. For waste management this has a broader application. It is called waste minimization or source reduction. The best way to reduce waste is to try not to produce it. This method is also known as pollution prevention or P2 and features six broad techniques. Today, P2 is being included in the environmental programs of many companies around the world. It is also a requirement of the environmental management system contained in international standard ISO 14001. The standard is attempting to put companies worldwide on the same footing, by requiring the implementation of equal, environmental management systems.

However, it is not industry alone that is causing hazardous and toxic waste problems. Domestic discharges are still unregulated and in many places, collectively, far outweigh industrial contributions. In unsewered and remote areas, wastes of any kind are entering the ground and waterways unmonitored. Educating producers and consumers is another key to minimizing such sources. Everyone is the product of education, background and experience. A persons views, way of life and actions all reflect this phenomena. These are the building blocks. When some of these ingrained, basic beliefs are questioned, the first reaction of any individual is the natural impulse to defend what is felt to be true. The simplest response is to just reject the veracity of such information or changes and then dismiss them. Each new concept introduced to persons in all walks of life must meet that challenge. The keys to meeting that challenge are reason, rational, and education. The difference between what is known today versus what was thought to be true about the environment and practices 10 or 20 years ago, did not just evolve. Dedicated individuals, groups and education programs changed it. Without these constant reminders, environmental progress will not keep pace with advances in technology. An equation, which includes economic, social, technical and environmental

components, will invariably produce the right answer.

In the industrial world, products are always in various stages of creation. Methods for eliminating, minimizing, treating and disposal of the wastes created must also keep evolving. Wastes have to be controlled. They can be minimized.

1. Evolution of Waste

1.1 History

Some things in this world are inevitable. They are death, taxes, and waste. It seems the more we develop, the more waste we produce. There are many reasons why that is so. Some are very logical and others just plain frivolous. The problem probably started when man discovered how to use metals. Prior to that, most waste was biological and easy to return to the soil. In fact, early man may not have known that waste was good for the soil and being biodegradable it turned into fertilizer. Later, when it was discovered that organic wastes helped plants grow, it became common practice to collect and disperse it in selected plant growing areas. Each generation followed in the footsteps of the previous, as farming grew and became the predominant industry. Thus, there was an ecological balance, which was very easy to maintain. A prime example is China, where there are farms that have been in operation for more than 5000 years.

One of the first man-made solid wastes was metal, it was used primarily to make armaments and tools, but it was not a big problem. The concentration of metal wastes in any one place was not more than natural forces and oxidation could handle. However, precedents were being set. As more metals were discovered and their utility found, the more they were used for different purposes. Knowledge grew and in addition to armaments and household items, even clothing dyes were infused with metals such as copper, lead and mercury. But, there was no historical experience, so no thought was given to whether these metal-bearing items could effect the health of the user, or what should be the proper method of disposal. One such case was the widespread use of pewter. Its ability to resist rust and durability made it a mainstay for cooking and eating utensils by the military, and many others. However, pewter contains an enormous amount of lead, which causes brain deterioration and other bodily malfunctions. Surprisingly, only in recent history has the truth about lead been discovered and its use in water pipes, paints and other materials minimized or discontinued.

The real problems began to appear after the industrial revolution started. Wastes were no longer produced in nominal amounts here and there; they were being produced by the ton, by industry and consumers alike. Wastes generated during production and even the products themselves, following their useful life, were discarded into the most convenient lake, river, dump or landfill. After all, wasn't the solution to pollution dilution? The thought was "just bury it, or let it rot, rust or dilute, it will eventually go away." This continued for hundreds of years. During this time technological advances were being made in leaps and bounds, with little or no thought given to the impact the wastes produced would ultimately have on the environment. What is a strange dichotomy is the fact that many of the civilizations that did not participate in the industrial revolution and remained more primitive technologically, also remained more

closely related to nature. While the more advanced groups exploited nature for their own gain, these so-called primitives still communicated with and respected their surroundings. Who then, was and is the more civilized?

As wars continued through the centuries, technical and economic advancements were always the top priorities. It was not until the Second World War had passed, that many governments were forced to address the environmental problems they had caused. The victors as well the losers had looked the other way during their efforts to win. But the devastation made ecological restoration absolutely mandatory, if civilization was to be restored. Environmental agencies had to be formed, studies conducted and regulations set. In most democratic countries, the war effort could no longer be used as an excuse to ignore the environment. Wastes had to be managed.

On a worldwide scale the waste management problem was enormous. It differed from continent to continent, country to country and region to region. A number of non-democratic governments chose to ignore the problem in favor of controlling the population for their own political gains. This indifference still exists today in many places. It is based on numerous factors. Different approaches were adopted in response to various factors including waste quantity, content, capabilities and attitude of the government, product maker's cooperation, and the willingness of the end-user to reduce the problem.

Several countries with sufficient economic resources decided to take action following the damage inflicted during the Second World War. They took the opportunity to apply new techniques and introduce modern equipment for more efficient treatment of wastes. This, in fact, put countries that had been war-torn, ahead of many that had not been so scarred. In spite of their prosperity, numerous countries untouched by war continued to use outdated methods of waste management.

Next on the scene were the advances in chemistry which were producing a myriad of new compounds and synthetic materials such as DDT and PCBs. These advances were highly acclaimed and also touted to be a relief for the conservation of our natural resources. Again, a lack of historical data on the long-term effects of these chemical compounds and how to deal with them gave rise to many complications.

Only after the consequences of improper use and disposal became obvious did many concerned groups and governments decide it was time to take action. Even where restrictions and controls had been put on limiting the production and sale of certain chemicals, little thought was given to the fact that wastes were still being created during the processes. In places where the issues were addressed, some companies who were not ready to change, and tried to avoid the costs involved with waste treatment, with excuses and delaying tactics. Others simply moved to places where there were no controls or regulations with which to comply or, where enforcement was lax or less stringent. It was a time when most of the general public was not aware of what was going on. None of the evasive actions being taken by companies or the fact that they were polluters was publicized. It did not make the news, until many of the sites that had been vacated and left polluted, started to cause grievous health complications for the new users. Following the departure of those companies, some of the polluted properties

were developed for home sites. The unfortunate people who purchased these homes were unwary victims. Contaminates left by the companies had poisoned the soil and water supplies. It took 20 years for those places that had invited and welcomed these same polluters to relocate within their borders with no restrictions on waste emissions, to experience the same consequences and realize the folly of their actions. A thirst for immediate economic gain had overshadowed their ability to think about the future. To complicate matters even further, many former industrial sites still harbor hazardous and toxic wastes that remain buried, put there, years ago, by processes and industries that no longer exist. These undiscovered wastes will continue to pollute the ground, air, lakes and streams as well as the seas for years to come.

2. Sources

There is a tendency to think that industry and business are the only creators of the waste problem. That is only partially correct. While industry does create most of the wastes, it is the wants and needs of people that drives industry to produce goods and services to fulfill these desires. Fashion, style and opulence have been great creators of waste for thousands of years.

Whether it be the dyes used for high fashion fabrics, or the brilliance of a chrome ornament on a vehicle, they are all contributors. Using the earth's natural resources to create materials to satisfy these types of wants without thought of environmental consequences is not only irresponsible, it is shameless.

Why must chrome be used, when bright nickel shines so well? Why do some newspapers now need brilliant colors, using heavy metal inks, when soy or water-based inks will do? The question that comes up in dealing with preventing pollution is: What must be sacrificed? The word "sacrifice" is something that users and consumers, especially the affluent, do not want to hear. "Why should I sacrifice having anything, if I can afford to pay?" This is called "conspicuous consumption." To fight it, is useless. Attempting to minimize and control it, is a more sensible approach.

Industries fully realize that products are "vendor driven." If there is a potential market, then there is an economic reason to pursue and explore the potential. Wastes however, do not as a rule present the same potential for profit. They must be examined separately. Some wastes may have a value as feedstock for another process. Some may be recycled, but some will always remain and must be disposed of at an extra cost.

Also, it is not always the larger companies or producers who have the greatest waste problems. In fact, it is usually many small companies who are struggling just to keep their head above water. These companies feel that if they can get ahead a little, then they will be in a better position to address the environmental issues.

In most cases, such attitudes never lead to the promotion of environmental consciousness until the issues are forced upon them. When that happens, their costs are usually much, much greater due to fines and strict regulatory controls.

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Biographical Sketch

Joseph E. Paluzzi is a professional engineer in quality engineering. He is currently an environmental engineer and project manager with the Massachusetts Office of Technical Assistance. Previously, he was with Camp Dresser & McKee Consulting Engineers, where he worked on industrial wastes, water and sewage treatment, and pilot plant installations. He has also worked for General Dynamics as a facilities engineer in shipbuilding, and with Stone & Webster Engineering Corporation as a lead quality assurance engineer, involved in auditing and evaluating all areas of management, design, engineering, purchasing, construction and subcontracting. He has degrees in environmental engineering and industrial technology from Northeastern University, and is an active member of the American Society for Quality. He is the originator and national chairman of the American Society for Quality (ASQ), Energy and Environmental Quality Division Pollution Prevention and Waste Minimization Committee. He is the founder and chairman of the ASQ, Boston Section, Environmental Quality Committee and initiated Environmental Management Systems Roundtable. He has made numerous presentations to professional groups locally and nationally regarding pollution prevention, and contributes articles to professional publications.