# RECYCLING TO BE GREEN

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**Abstract: Regardless of what people hear in the media, recycling does not offer the monetary rewards everyone is hoping. Many profess to tender programs to take all cardboard, paper, plastics, pallets or other industrial waste and compensate in exchange. Make sure research is completed at every stage.**

**The promise of gold by going green is a perception the media is portraying. Numerous licensed waste contractors want to "cherry pick" companies' waste. Through research and compromise, companies are able to get a one stop shop for all waste.**

**Achieving the numerous challenges rely heavily with the ultimate goals in the recycling program. The goals should be obvious and concise from the program conception. The company must be willing to make concessions of payment for some waste in order to have all taken by one recycling company.**

**There are several methods to implement that will get the end results desired. Many aspects of the program are required in the final decision. The ultimate goal is to not expose the company to legal obligations from the waste after it leaves the company's property. Ensure the contracts signed release the exposure to litigation in the future.**

**Similar to a 5S or lean program, management must be committed to the program. There are going to be expenditures that are not accurately recognized until the program is underway for months. Personnel inside the organization must monitor and sustain the system. Only once the program is entirely initiated will the company be able to capture variable cost.**

## I. INTRODUCTION

Working as a project engineer for a plastic manufacturer, cost saving initiatives are a constant part of the job description. Always striving to discover ways to reduce expenses across all lines of production and manufacturing is a daily practice. One area of concern was the large monthly expense of waste removal throughout the facility. The monthly expenses appeared excessive.

The manufacturing process allows recycling of all internally generated scrap plastic back into the finished product. The only waste should be that of packaging from raw material suppliers, cardboard, machine maintenance, depleted items and general waste from employees.

The first phase was to complete an analysis of the current methodology for waste disposal, including classification of waste and what can be separated for recycling. Three buckets were developed for the classifications. The first was known recyclables: cardboard, paper, and metal products. The second bucket would consist of internal waste that could be reused in other areas of the facility. The final bucket would be known as items that could not be recycled internally.

This required tracking all loads going to waste receivers. At the start of the program, the waste containers consisted of two forty yard roll-off units at the back of the plant and a forty yard compactor located at the loading docks. The outside units were first on the list to eliminate. Being located outside rendered them out of the constant ability to manage appropriately.

The investigation showed that wood pallets were the major item deposited in the outside containers. There were other abuses of containers by employees or others. Some days it appeared that people cleaned their garages and disposed of the waste in the easily accessed containers. The monthly expense for the use of the containers was averaging between eight and ten thousand dollars a month. Recovering the monthly expense of the outside containers within two months was the goal.

The second phase was to classify the remaining items that were being delivered to the compactor. The compactor was being exchanged every day for a cost of one hundred and thirty dollars. Again this was a hefty monthly expense of two thousand six hundred dollars per month.

Finally, monitor and control the systems to achieve long term success of the program. Before launching, detailed work instructions were required. Training of employees on the different types of waste and the locations and means to properly dispose of the waste was a key. Management needed to help drive the message daily to achieve overall expectations and success. Knowing that changing systems are always difficult, having management support was necessary.

## II. DISCUSSION

The first goal of eliminating the outside roll-off containers was essential to the project success. If this transition could occur in two months according plan and reduce the monthly expense by eight to ten thousand dollars monthly, the gain would be substantial for the project success going forward. Proposing that one hundred thousand dollars per year savings was a potential, everyone was on-board and pushing for more.

Contacting the suppliers of our wooden skids used to ship product to customers was first. Knowing that eighty percent of the items in outside containers were wooden skids, this was first on the list to remove. There were many items to consider; if the skids were no longer taken to the outside container, where were they to be stored. Tight on space throughout the facility, this was challenge. The solution was easily accomplished by requesting a dock in the warehouse to stage a trailer for used wooden skids. The next step was to find the company to take the skids.

The companies who supplied the new skids for shipping only wanted the skids they could incorporate back into their production. Trying to return the skids to the original shipper was not feasible as they did not want to have them returned because it was cheaper, actually less of a hassle for them to just use new skids when shipping to customers. Finally, after a week of discussions with recyclers and venders, a solution was found. Exploring who the supplier was to our vender was a turning point. They offered to take the skids at no cost. In exchange for not requesting monies for the skids, they offered to take all other skids that currently are being discarded in containers. They also provided the trailer for loading the skids and agreed to haul these for no cost. They were truly committed to the program. Sure a few lunches sealed the deal, but everyone must eat.

The skid removal program launched the following week, week two of overall project launch. The order was changed from two roll-off containers to just one the same day of skid removal from roll-off containers. This had an impact savings of two hundred and sixty dollars a day, six days into project launch; success was starting. This was too easy; it's known the fruit on the ground is easy, it's when the ladder is required to get the fruit at the top that is difficult.

Overall, wood waste accounts for about 17% of the total waste received at municipal solid waste landfills in the United States (EPA 1999). Wood pallet recovery for recycling is usually by chipping, for uses such as mulch or bedding material. This excludes wood combusted as fuel which was estimated at 1.3 million tons in 2007. Wood discards were 12.9 million tons in 2007 (EPA 2008). Of that total, only 8.5 million tons were used for packaging, sold as pallets or other packaging (EPA 2008).

Now it was time for the remaining items in roll-off containers to be sorted and classified. Investigating, it was discovered that contaminated plastic material was the next largest item going into containers. The contamination consisted of mixed types of materials from a lack of systems in other areas of the production process and just plain human mistakes. Department managers were called to a meeting and processes were implemented for tracking and eliminating this type of contamination. It started by requiring the shift supervisors to log all contamination by weight and put this against the daily scrap numbers. This had an immediate impact because the supervisors' incentives were based on scrap. Mistakes happen and when they did occur, the department manager also had to sign off on the contaminated material and file a corrective action plan to prevent future contamination from occurring.

The next item in containers was a different type of contaminated material, not from error, but because of dirt, oil or other contaminates on finished goods. Because of the lack of ability to process the plastic in these conditions, it was ruled to be "bad" scrap. A staging area was put in place to store and review all the "bad" scrap. Recyclers were contacted about the purchasing of the materials we could not process. Many looked at the materials and would take these at no cost but would not pay because of the cost to process the material in their facility. We agreed to send the "bad" scrap to the recycler and pay for shipping. This was done to get the items out of the waste stream and landfills. This system was in place the third week of project launch.

The fourth week of project launch, the second and final roll-off container was removed, thirty days ahead of schedule. Savings of eighty three hundred were realized the second month into project launch. Management was on-board for the long haul. As with most managers, they wanted more quickly. As explained in project launch, the next round of savings would be more difficult but obtainable.

What was going into the compactor that required it to be emptied daily was the next step in the project. Monitoring the material handlers, it was discovered that cardboard was the largest percentage of waste going into compactor. The option for removing cardboard from waste stream was explored. Purchase a compactor and man the unit or just have the cardboard hauled away were the choices for the cardboard. Because of the

amount of daily cardboard produced, this would require a full employee with benefits. This was cost that was to be avoided; adding manpower to support the program was not an option. Other means had to be explored to ensure the cardboard was removed and current manpower levels were maintained.

The vendor taking the wooden pallets was contacted about also receiving the cardboard. Seemed too easy, they agreed to take all cardboard in addition to the wooden skids on the same truck they were providing. Because the existing manufacturing process produces large boxes called gaylords, these were filled with non-usable cardboard and loaded on the trailer with the skids. The removal of the cardboard from the waste stream reduced the compactor exchange to two times per week, reducing the monthly expense for the compactor by nineteen hundred and sixty dollars.

Everyone was overwhelmed by the success of the project. Management was questioning why this was not done before and like most companies, when times are good focus is only on the large items. Because the waste removal expense had increased steadily over the years, it was not raising any flags. When the economy slowed and profits disappeared, companies start to really dig deep to recover. Also, having the time and personnel to devote to analyzing the systems contributes greatly. Before the economy slowed, everyone was concentrating on the customer, making sure they were satisfied at all cost. The customer is still the front runner, but because production demands had lessened, the time was available to explore what was deemed a fixed expense.
How far could this cost be reduced was the next goal.

Achieving only one compactor exchange per week was the next challenge. Again back to analyzing what were the next top five items in the waste stream. Shrink wrap is used throughout the production process to hold product together on skids. The shrink wrap is removed when the items are loaded onto a truck going to our customers. This was all being disposed of in the trash cans throughout the facility. Gaylords were set-up at different areas in the plant to capture this wrap along with any other plastic wrap. Liners are used on raw materials in gaylords to keep contaminates out and this also was being deposited in the waste stream.

Removing this item reduced the compactor exchanges to once per week. Hard to imagine that shrink wrap accounted for one entire compactor fill per week, but the end result achieved exactly that. The same recycler taking our “bad” scrap agreed to take the shrink wrap as well. They could actually make a little money on recycling this product; a win for both parties.

Continuing to investigate other items that seemed to have a minimal affect were explored. If shrink wrap had this affect, what else was overlooked as not important? Surely there were other items that seemed not worth the effort to separate. The struggle continued by investigating the trash cans of office personnel. Many were disposing of magazines and junk mail into the waste stream. Removing these to the recycle containers has not seemed to have a great impact on the overall system, but believing that over a year’s time this may eliminate the need for one additional compactor pull then again success was gained.

The future of the program is to study the environmental impacts of removing the waste haulers vehicles from the road because of fewer trips to the facility. This however must be offset by the increased truckloads of recycled material from the site. The overall reduction in carbon footprint from fossil fuels is only a small portion but important in the overall program success. Exploring deeper, what is the reduced energy use from the compactor? This can be measured and should be included in the final calculations of savings.

These studies however should not be padded but realistic calculations based on averages not projections or best case. Many cost savings initiatives are driven by the best cases, which in any organization turns out not to be the case; however, an average of slightly better than average is often the end result.

Numerous stories from small to large companies keep a daily reminder of the task at hand. Having heard stories of programs for cost savings that were implemented one year only to be removed two years later by the old program because the cost saving data was able to be manipulate to suit the current conditions was a concern. This program however did lend itself to these tangibles. There will be ways in the future to change the current program dynamics. As technology progresses in the recycling industries, the items currently given away may someday be worth getting a monetary reward for from the recycler. Competition will drive this change in the recycling industry, but new technologies are required before this can happen

## III. CONCLUSION

Four months into the project launch, the company has realized savings of over ten thousand dollars per month. Through monitoring and consistent training, the program has been a complete success. The monthly savings goes right to bottom line and not the landfill. The unknown cost for handling and keeping the program going never materialized. No labor was added to keep the program alive and ongoing.

The promise of selling the scrap and waste was never achieved, but the direct savings in waste handling greatly offset any profits many had hoped to achieve. Just knowing that the items that were going to a landfill no longer arrive gives everyone a sense of pride. Surely the company could use this for promoting its green vision. Big fliers, CNN, local paper, but we prefer to use it internally to motivate personnel to do better, both at work and home.

There may not be treasure in the trash but more than likely there are savings. The wiliness to compromise with recyclers and vendors goes a long way in reaching goals to be green.

The program still requires a daily commitment by all parties to ensure the focus is not lost. Driving the message daily seems tedious at times but only with constant reinforcement of the program will it succeed. This is true for any change in the production model. Many will find ways to disrupt or criticize about any change. The function of all from CEO's to janitors is to embrace the change. Finally, if the people will not change, change the people.

The chart on the following page shows the recyclables in the United States ( EPA 2008).

REFERENCES

1. *EPA, 1999.* Characterization of municipal solid waste in the United States: 1998 Update. Rep. EPA 530R.99.001 Washington, DC: Environmental Protection Agency, 159 p.

2. *EPA, 2008.* United States Environmental Protection Agency Office of Solid Waste (5306P) EPA530-R-08-010 November 2008 www.epa.gov

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## MATERIALS DISCARDED* IN THE MUNICIPAL WASTE STREAM, 1960 TO 2007 (In thousands of tons and percent of total discards)

**Thousands of Tons**

| Materials | 1960 | 1970 | 1980 | 1990 | 2000 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| Paper and Paperboard | 24,910 | 37,540 | 43,420 | 52,500 | 50,180 | 45,720 | 42,880 | 41,520 | 37,770 |
| Glass | 6,620 | 12,580 | 14,380 | 10,470 | 9,880 | 10,160 | 10,520 | 10,640 | 10,360 |
| Metals | | | | | | | | | |
| Ferrous | 10,250 | 12,210 | 12,250 | 10,410 | 9,430 | 9,830 | 9,960 | 10,240 | 10,360 |
| Aluminum | 340 | 790 | 1,420 | 1,800 | 2,340 | 2,570 | 2,640 | 2,710 | 2,620 |
| Other Nonferrous | 180 | 350 | 620 | 370 | 540 | 520 | 540 | 540 | 540 |
| *Total Metals* | *10,770* | *13,350* | *14,290* | *12,580* | *12,310* | *12,920* | *13,140* | *13,490* | *13,520* |
| Plastics | 390 | 2,900 | 6,810 | 16,760 | 24,060 | 27,760 | 27,480 | 27,760 | 28,640 |
| Rubber and Leather | 1,510 | 2,720 | 4,070 | 5,420 | 5,890 | 6,060 | 6,260 | 6,310 | 6,380 |
| Textiles | 1,710 | 1,980 | 2,370 | 5,150 | 8,120 | 9,200 | 9,530 | 9,990 | 10,020 |
| Wood | 3,030 | 3,720 | 7,010 | 12,080 | 11,870 | 12,600 | 12,770 | 12,790 | 12,890 |
| Other ** | 70 | 470 | 2,020 | 2,510 | 3,020 | 3,010 | 3,030 | 3,140 | 3,270 |
| ***Total Materials in Products*** | 49,010 | 75,260 | 94,370 | 117,470 | 125,330 | 127,430 | 125,610 | 125,640 | 122,850 |
| **Other Wastes** | | | | | | | | | |
| Food Scraps | 12,200 | 12,800 | 13,000 | 20,800 | 26,130 | 28,750 | 29,530 | 30,360 | 30,840 |
| Yard Trimmings | 20,000 | 23,200 | 27,500 | 30,800 | 14,760 | 11,960 | 12,210 | 12,300 | 11,730 |
| Miscellaneous Inorganic Wastes | 1,300 | 1,780 | 2,250 | 2,900 | 3,500 | 3,650 | 3,690 | 3,720 | 3,750 |
| ***Total Other Wastes*** | 33,500 | 37,780 | 42,750 | 54,500 | 44,390 | 44,360 | 45,430 | 46,380 | 46,320 |
| ***Total MSW Discarded -Weight*** | 82,510 | 113,040 | 137,120 | 171,970 | 169,720 | 171,790 | 171,040 | 172,020 | 169,170 |

**Percent of Total Discards**

| Materials | 1960 | 1970 | 1980 | 1990 | 2000 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| Paper and Paperboard | 30.2% | 33.2% | 31.7% | 30.5% | 29.6% | 26.6% | 25.1% | 24.1% | 22.3% |
| Glass | 8.0% | 11.1% | 10.5% | 6.1% | 5.8% | 5.9% | 6.2% | 6.2% | 6.1% |
| Metals | | | | | | | | | |
| Ferrous | 12.4% | 10.8% | 8.9% | 6.1% | 5.6% | 5.7% | 5.8% | 6.0% | 6.1% |
| Aluminum | 0.4% | 0.7% | 1.0% | 1.0% | 1.4% | 1.5% | 1.5% | 1.6% | 1.5% |
| Other Nonferrous | 0.2% | 0.3% | 0.5% | 0.2% | 0.3% | 0.3% | 0.3% | 0.3% | 0.3% |
| *Total Metals* | *13.1%* | *11.8%* | *10.4%* | *7.3%* | *7.3%* | *7.5%* | *7.7%* | *7.8%* | *8.0%* |
| Plastics | 0.5% | 2.6% | 5.0% | 9.7% | 14.2% | 16.2% | 16.1% | 16.1% | 16.9% |
| Rubber and Leather | 1.8% | 2.4% | 3.0% | 3.2% | 3.5% | 3.5% | 3.7% | 3.7% | 3.8% |
| Textiles | 2.1% | 1.8% | 1.7% | 3.0% | 4.8% | 5.4% | 5.6% | 5.8% | 5.9% |
| Wood | 3.7% | 3.3% | 5.1% | 7.0% | 7.0% | 7.3% | 7.5% | 7.4% | 7.6% |
| Other ** | 0.1% | 0.4% | 1.5% | 1.5% | 1.8% | 1.8% | 1.8% | 1.8% | 1.9% |
| ***Total Materials in Products*** | 59.4% | 66.6% | 68.8% | 68.3% | 73.8% | 74.2% | 73.4% | 73.0% | 72.6% |
| **Other Wastes** | | | | | | | | | |
| Food Scraps | 14.8% | 11.3% | 9.5% | 12.1% | 15.4% | 16.7% | 17.3% | 17.6% | 18.2% |
| Yard Trimmings | 24.2% | 20.5% | 20.1% | 17.9% | 8.7% | 7.0% | 7.1% | 7.2% | 6.9% |
| Miscellaneous Inorganic Wastes | 1.6% | 1.6% | 1.6% | 1.7% | 2.1% | 2.1% | 2.2% | 2.2% | 2.2% |
| ***Total Other Wastes*** | 40.6% | 33.4% | 31.2% | 31.7% | 26.2% | 25.8% | 26.6% | 27.0% | 27.4% |
| ***Total MSW Discarded -%*** | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

- Discards after materials and compost recovery. In this table, discards include combustion with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes.

- Includes electrolytes in batteries and fluff pulp, feces, and urine in disposable diapers. Details may not add to totals due to rounding. Source: Franklin Associates, A Division of ERG.