

HOW TO PAY FOR GREEN SOLID WASTE SYSTEMS IN TOUGH FINANCIAL TIMES

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ABSTRACT

The objective of this paper is to provide practical examples of how municipalities are approaching and funding sustainable materials management programs. These programs are sometimes referred to as "green solid waste programs" and include use of alternative fuels, improving collection efficiency, automating collection, and smart ways of managing, maintaining, and funding existing assets. Funding alternatives and the integration of "green solid waste programs" into long range municipal planning efforts also are discussed.

FUEL CONVERSION

Two current significant trends in solid waste management are the transition by waste haulers and municipalities of their collection fleets from diesel to compressed natural gas (CNG) or liquefied natural gas (LNG) fuels and expanding investment in natural gas fueling stations. Waste collection manufacturers report that within the last three years, more than half of their new vehicle sales include those designed to burn natural gas.

The reasons for the conversion from conventional fossil fuels to natural gas include a variety of economic, environmental, and political considerations. Foremost among these is that natural gas produced in the United States appears to be the lowest cost alternative fuel source. Traditionally, the price of a barrel of oil has been about six times that of a thousand cubic feet of natural gas. With the widespread use of fracking technology to recover significant quantities of natural gas, this ratio has jumped to as high as 12:1. Depending on geographic location and proximity to gas lines, the average price of natural gas today can cost \$1.50 to \$2.00 less per diesel gallon equivalent (DGE). Projections from government, corporate, and non-profit prognosticators suggest that natural gas will continue to be plentiful and relatively cheap compared to diesel fuel.

Typical refuse truck fuel use averages between 8,500 to 10,000 gallons per year at an average fuel efficiency of 2.5 to 3 gallons per mile. Thus, the growing differential between natural gas and diesel fuel, municipal or hauler operated trucks can shave as much as 30 to 50 percent on fuel costs and enable solid waste agencies to pay for the cost of the new equipment within three to four years. What was once prompted by environmentalism

due to the promulgation by United States Environmental Protection Agency (USEPA) of new restrictive federal heavy-vehicle emission regulations has now been largely driven by the promise of significant long-term fuel savings.

With an estimated industry wide fleet of more than 175,000 vehicles, including traditional packer trucks, front-end loaders, automated side loaders, recycling trucks, and roll-off trucks, the long-term replacement of the waste collection fleet is now underway. Several of the major waste hauling firms in the United States have already made capital replacement plans to replace their existing diesel-fuel refuse collection vehicles with natural gas vehicles as they are scheduled for replacement. A few municipalities as well are entering the arena as "early adopters" on this wave to natural gas.

COLLECTION EFFICIENCY

Since equipment costs, labor and fuel are significant operating expenses for waste collection operations, reducing the number of routes, labor hours and mileage through route optimization is a critical and straight forward approach to increasing efficiency and reducing costs. However, route optimization is not simple. Waste routing software is typically complex to implement and has a high rate of failed implementations, i.e., the software was too complicated to be adopted into daily operations. Waste routing is extremely complex. Waste routing requires multiple types of routing software algorithms:

- High density for residential curbside collection,
- Point to point routing for commercial collection or residential bulky items collection, or
- Paired routing for roll off box collection and delivery.

There is not one application on the market that handles all types of waste routing effectively. Multiple applications would need to be implemented to service all types of waste collection routing.

To assess whether your operation is a good candidate for implementing waste route optimization software, the following questions should be answered.

- Do the crews have assigned route boundaries?
- Do the crews have maps to use?
- Was the last re-route more than 5 years ago?
- Do you know how many stops and containers included in each individual route?
- Are the current routes developed based on all of the factors of time, weight, number of dump trips, and the number of stops?
- Do you know how long each route should take?

If the answer is “no” to any of these questions, it is highly likely that the operation is not efficient and would benefit from route optimization. Given the cost of operating a truck each year, exceeding \$200,000, it does not require a significant improvement in efficiency to reach an return on investment in only a few months.

These projects are highly complex. For residential waste collection, you will have thousands of customers that must be plotted on the map. You will have varying productivity rates amongst different types of vehicles, in different types of streets and neighborhoods, and with different types of customers. There are maneuver restrictions on certain roads and time constraints around schools or heavy traffic areas. The complexity can seem insurmountable, but the route optimization software applications reduce complexity and make it easy to make routes, change routes, and generate maps and report outputs. However, they are very complex to configure and set-up. They are even more problematic to maintain and keep the data up to date. Many operations will assign the logical candidate to learn and use the software: the Route Supervisor that manually created routes in the past. This is oftentimes a common point of failure. The supervisor does not have the technical background or experience in implementing a complex software application. Another common mistake is using the GIS staffer that has limited time and limited knowledge of waste operations.

Yet another common pitfall is the expectation that the routing software will do everything that the salesman says that it does. For example, the travel paths generated by high density routing applications are typically not as efficient as what can be manually generated by a highly experienced routing expert. The benefit of the software is not in making perfect routes, but in providing the ability to quickly generate many routes with accurate completion times and other parameters.

Although there are not any studies quantifying the failure rate for waste routing software implementations, from our observations, more than half of the residential curbside waste routing projects end up in the customer not continuing to use the

waste routing software on an on-going basis. The project provides an initial set of routes that are implemented and then the software is hardly used again. It is for this reason that many municipalities hire a consultant that is highly experienced with the various routing applications to develop the routes for them.

COLLECTION AUTOMATION

Automated side-loader trucks were first implemented in the City of Phoenix in the 1970s with the aim of ending the back-breaking nature of residential solid waste collection, and to minimize worker injuries. Since then, thousands of public agencies and private haulers have moved from the once, traditional read-loader method of waste collection to one that also provides the customer with a variety of choices in standardized, rollout carts. The carts have enabled communities throughout the country to significantly reduce worker compensation claims, minimize insurance expenses, while at the same time offering opportunities to workers who are not selected for their work assignment based solely on physical skills.

There are roughly about 120,000 solid waste vehicles on the road in the United States with about 40 percent of all new waste collection vehicles purchased in 2012 (the most recent statistics available) were automated. There is a real sense in the solid waste industry today that automated trucks are significantly increasing their share of the new sales in recent years. This trend is rapidly increasing as many agencies and private haulers attempt to minimize their increasing insurance costs and more effectively control their cost of labor, while at the same time provide increased customer service levels and opportunities for an aging work force.

Solid waste collection workers are highly exposed to health and environmental safety risks due to exposure to heavy workloads, volatile compounds, and potentially hazardous or even infectious materials, resulting in musculoskeletal, dermal, respiratory, and gastrointestinal problems. A fully-automated collection program enhances worker safety and comfort, minimizes manual lifting and exposure to possible hazards in the waste such as sharp objects. Fully-automated collection eliminates heavy lifting, walking between setouts and frequent steps on and off the truck. The mechanical arms on modern, fully-automated trucks are typically operated by the driver using a joystick control. Rather than slogging through rain and high temperature environments, operators of automated refuse collection systems spend their shifts in climate-controlled comfort. The reduced physical requirement increases the diversity and longevity of the workforce that is able to collect waste. Automated collection has proven to significantly reduce collection worker injuries resulting in reduced workers compensation costs, decreasing disability claims, decreasing the number and cost of light-duty assignments, and reducing salary fringe benefit costs.

TRANSITION TO ONCE-A-WEEK RESIDENTIAL COLLECTION

Tradition, public health, odor, and pest management concerns have usually resulted in two solid waste collections per week, especially in the warm weather south. Studies by a number of national solid waste associations have demonstrated that the second collection day is usually underutilized in terms of setouts on the curb and in weights per stop. In Florida, data collected by SCS from automated collection programs with cart system similar to those employed by the City suggests that on the average the second collection day participation is 85% of those placed on the curb on the first collection day, resulting in approximately 76% of the total weight set out on those first days.

The advent of automated collection combined with expanding recycling programs nationwide has provided the opportunity for jurisdictions to begin considering converting from the historic twice weekly collection to once weekly service. The larger containers have proved to provide adequate refuse storage volumes. Combined with recycling and green waste curbside collection programs, national surveys indicate the larger size 90+-gallon carts are adequate for the average home of four (4) people. Each container will hold the equivalent of three (3) normal trash cans. Therefore, residents now have adequate capacity for solid waste collection to occur once per week.

As automated collection continues to expand, it is quickly becoming the collection method of choice across the country. In Florida, SCS conducted a statewide survey of solid waste collection in 2014. The results showed a marked transition from manual to automated collection as well as once-a-week collection frequency in some of the largest 35 municipalities. This survey reported that nearly 60 percent of the top 35 cities in Florida, at the time of the survey, utilized automated collection, of which 67 percent were municipally operated programs. Of the 35 cities surveyed, nearly one-third reported once weekly residential collection. Roughly, 53 percent of Florida's residents receive automated collection service and nearly four million of residents in Florida currently receive once-a-week collection service.

EQUIPMENT MAINTENANCE

With the ever increasing costs of vehicles and equipment for solid waste management, many communities are evaluating their budgets and how they approach their overall vehicle and equipment replacement programs. Historically, local governments have reduced fleet sizes and deferred replacements during economic downturns or times of budget shortfalls to provide a balance against the need to increase user fees or rates to meet operating expenses. While one can argue that the decision to reduce fleet replacement spending is a valuable corrective action, it could result in increasing fleet expenses for these agencies if they tip the balance of fleet replacement spending too far.

All vehicles and equipment used in public works eventually wear out and become more expensive to maintain and operate. That is, unplanned maintenance and repairs due to component failures tend to rise with increasing age of the vehicles or equipment. These unpredictable incidents result in such events as increasing shop time, delays in securing major parts for repair, as well as delays in getting the vehicle or equipment back into operation.

Capital costs tend to decline over time, while operating and maintenance costs increase. The combination of these two basic curve functions results in a "U-Shaped" cost curve, oftentimes called "total costs". The economic theory of vehicle and equipment replacement predicts that vehicles and equipment should ideally be replaced during the flat portion of the curve, that is, at the time annual operating costs begin to outweigh capital costs. Deferring replacement purchases in order to accommodate short-term budget shortfalls can result in future increased replacement costs and oftentimes unmanageable fleet replacement backlogs.

Commonly, public sector organizations attempt to purchase solid waste vehicles and equipment using cash generated from their annual operating income. In essence, this is somewhat akin to an individual paying for a personal vehicle in cash from his or her annual salary – a somewhat daunting task for most people. Similarly, many agencies have historically used cash as the primary means of funding their replacement program. Since it involves no interest or debt financing costs, cash purchases are viewed by many finance and solid waste managers as a financially prudent method for funding fleet replacement. Unfortunately, the use of cash to primarily fund vehicle and equipment replacements results in volatile funding requirements with high annual peaks and valleys. For example, in order for many agencies to replace a "big ticket" vehicle or piece of equipment, it might be necessary to freeze a significant portion of other fleet replacements and cut other operational programs (i.e., training, safety, and professional development, etc.) within the agency's overall budget authority. In my opinion, this almost always results in a deferral of some replacement purchases. Typically, where agencies use cash as the primary means to fund vehicle and equipment purchases, one often finds older fleets, higher maintenance costs, and backlogs in purchases.

There are a number of alternative vehicle/equipment purchasing programs which are being used by solid waste agencies to preserve cash:

- **Guaranteed Buy-Back Programs** -These buy-back programs are an alternative to an outright cash purchase of fleet equipment. That is, the agency has the right to sell, lease, trade or otherwise dispose of the vehicle. However, in the bid for equipment, the bidder guarantees that he will repurchase the machine from the agency at the end of a specified hourly or annual

term from the date of delivery. Typically, many agencies use these provisions to keep maintenance costs to a minimum and to enable them to procure new equipment at a frequent rate.

- **Sinking Fund** - In order to fund fleet replacements, many solid waste agencies have used a sinking or revolving fund to spread the costs of funding new vehicles or equipment over a longer period of time. Essentially, this type of financing approach requires that an agency make periodic payments into a fleet replacement fund thereby ensuring that there will adequate funds available for the replacement vehicle or unit when it comes due for replacement. For example, if the initial purchase price for a vehicle is \$120,000 and the replacement cycle is determined to be six years, then \$20,000 is budgeted every year to pay for the replacement of the vehicle. In comparison to the cash method, a sinking fund helps even out the annual volatility of the agency's replacement funding needs. Critical to its success is the ability of the agency to properly account for the inflationary increases in purchase prices for the replacement vehicles or equipment, interest earning on the funds placed in reserve, and salvage values of the vehicles or equipment, if any. In essence, a basic advantage to this approach is that it enables the agency to predict its annual funding needs over a long planning horizon. Notwithstanding, a major disadvantage of the sinking fund method of funding, however, is that it oftentimes is prohibitively expensive to establish for most agencies if there already a large backlog of fleet replacement needs. That is, a large amount of cash must be deposited initially to create the working capital necessary to start replacing vehicles or equipment. Further, there is always the temptation on the part of municipal officials to raid such funds during lean budget years undermining a well-designed fleet replacement program in a single year.
- **Debt Financing** - In comparison to cash or sinking fund financing programs, debt financing typically allows solid waste agencies an option to spread out the costs of fleet replacement. Rather than trying to accumulate cash reserves in a sinking fund, an agency can borrow funds from financial institutions, either as lines of credit, fixed-term, bank loans or bonds, repaying the outstanding principal and interest on a periodic basis once the vehicles or equipment are placed in service. Similar to the sinking fund method of financing fleet replacement, debt financing enables the agency to eliminate the peaks and valleys in replacement funding requirements. Also, in some respects the predictable natures of the annual expenditures have tended to make replacement funding less subject to controversial budget decision making.

Historically, many solid waste agencies have shied away from debt financing to fund their fleet replacements. Oftentimes, much of this is due to local or managerial preferences to avoid high interest charges for vehicles and equipment that have a short lifespan. In other cases, state or local laws prohibit the use of debt financing without voter approval.

- **Leasing** - Leasing or lease-purchase options are other commonly used methods by solid waste agencies for financing fleet replacements. Usually, these financing programs are offered directly from the manufacturer or third-party distributor. In comparison to the other financing methods discussed in the paragraphs above, leasing enables the agency to pay a fee ("installment purchases") for a vehicle or equipment and then essentially 'walk away' from it after a specified period. New municipal lease programs now being offered on the market allows agencies to have new trucks every two years with full factory warranties on the vehicle chassis and body. A variant of leasing is a lease-purchase where an agency can own the equipment. Overall, there is no hard and fast rule in lease financing since the terms may differ from manufacturer to manufacturer. In most cases, their obligation terminates if the department fails to appropriate funds to make the renewal year's lease payments. Because of this provision, neither the lease nor the lease payments are considered debt. Payments can be structured monthly, quarterly, semi-annually, or annually based on the cash flow of the agency. What makes municipal leasing financially desirable is its treatment of interest under Section 103 of the Federal Internal Revenue Code. The interest earnings under a properly structured and documented lease are exempt from federal income tax under the same tax laws that enable a municipal bond to carry a tax-exempt rate. Because the lessor does not pay federal tax on the interest earned, the tax-exempt lease oftentimes carries a much lower interest rate than other kinds of leases and installment loans thus significantly lowering the cost of financing for the borrower. This enables the agency to replace vehicles or equipment more frequently without having to acquire significant cash reserves before purchases the replacements.

In summary, each of the financing methods described above has its own particular advantages and disadvantages, which can be influenced by local municipal circumstances. Clearly, there is no single best approach to financing fleet replacement costs. With the financial challenges facing local governments today in providing cost-effective and timely solid waste management services, evaluation of these various approaches should be made focusing on ways to minimize costs and providing value-added services to the public.

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