

Appendix M

Street Sweeping Vehicles

Street Sweeping Vehicle Provisions

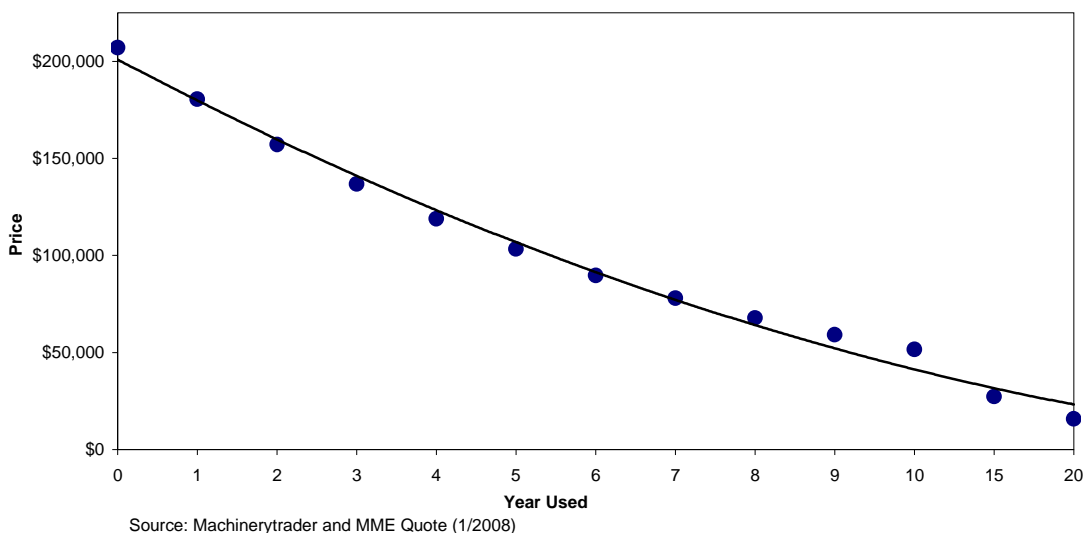
A. Vehicle & Industry Characteristics

Street Sweepers are designed to remove material from road surfaces by mechanical means, such as brooms, or by suction through a vacuum or regenerative air system. Street sweepers are semi custom vehicles in that a cab and chassis is mounted with the sweeping equipment, including hoppers, brooms, vacuums, engines and additional equipment. Sweepers are configured into either a single engine or dual engine configuration. In a dual engine configuration an auxiliary engine is bolted to the top of the vehicle or integrated into the machinery. The majority of street sweepers have twin steer capability for driver vision and maneuverability.

Sweepers can be categorized into two main types: mechanical and air sweepers. The mechanical sweepers are equipped with water tanks and sprayers that are used to loosen particles and reduce dust. The brooms gather debris into a main collection area from which it is vacuumed and pumped into a collection bin. A regenerative air street sweeper uses forced air to create a swirling knifing effect inside a contained sweeping head and then uses the negative pressure on the suction side to place the road debris inside a containment hopper. The debris laden air is then cleaned and reused to start the process anew.

The cost of replacement of these specialized vehicles range from \$150,000 to \$250,000 depending on configuration and fuel used. Sweepers depreciate at a slower rate than many other vehicle types so significant value remains in the used vehicle market as shown in the cost curve in Figure - 1. Body transfer is possible but rare, expensive, and typically done at the manufactures own facility.

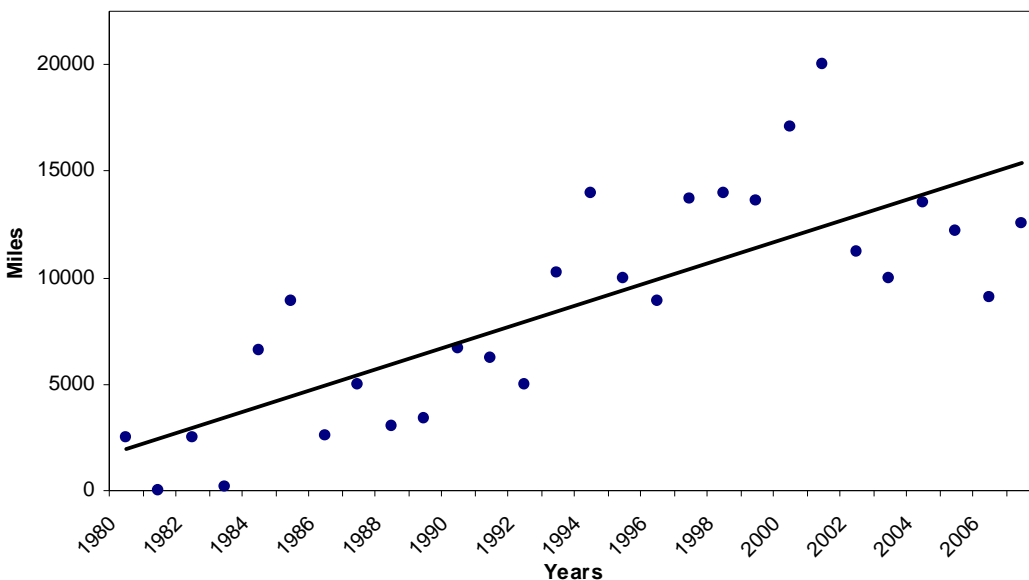
Figure - 1: Street Sweeper Cost Curve



Staff received information on the characteristics of sweeper companies via vehicle surveys and a detailed financial analysis by a forensic accountant provided from California Chapter of the North American Power Sweeping Association (NAPSA). Sweeper companies are typically small businesses with between 1 and 25 vehicles that operate within a relatively confined area of approximately 150 miles from the terminal. Average 2007 revenue for the reported companies was \$1.25 million in adjusted 2008 dollars. The industry estimated statewide population of street sweepers is 2500 vehicles with 60 percent owned by municipalities and 40 percent privately owned (NAPSA, 2008a). Based upon the returned fleet surveys approximately 75 percent of sweepers are dual engine and 25 percent are single engine. Pre-1998 dual engine sweepers represent about 37% of the statewide private fleet.

Many fleets divide their vehicles between mainline and backup use. Sweepers operate on average approximately 13,000 miles per year with mainline vehicles capable of operating in the 10,000 to 20,000 mile range and backups in the 1000 to 5000 mile range. Figure - 2 shows the average miles driven by age of vehicle. Vehicles with secondary engines operate the auxiliary engine on average 1130 hours per year however, this also varies greatly between mainline and backup operations.

Figure - 2: Average Miles Driven by Age of Vehicle



The reported average fleet age was 13.1 years with a standard deviation of 8.3 years. Such a high standard deviation indicates the large degree of variation in the relative age of the sweeper fleet. Moreover, the normal reported replacement cycle was inconsistent across fleet survey data. Several fleets indicated they operated vehicles 20 to 30 years or infinitely while many fleets, those that reported a numerical value, the average turnover rate was 8 years. Comparing the model year of the sweeper to the reported year purchase, the difference was 8.1 years, therefore, the average company buy an 8 years old vehicle. This analysis indicates how varied the business practices of sweeper companies are across California.

Additional fleet data was provided too late for staff to fully incorporate in the detailed staff analysis although a review of the data indicates similarity with the existing sample. The original data set is of sufficient size to represent the statewide privately owned sweeper population.

B. Existing Regulatory Framework & Industry Concerns

1. Sweeper Certification Standards

Many air districts require sweepers to meet stricter operating standards. The most common requirement is for sweepers to meet the pick-up requirements of South Coast Air Quality Management District (AQMD) Rule 1186. The pick-up requirements within the standard sets minimum requirements for particulate remediating - what size particles and how much dust can be kicked up during use. Sweepers that meet this standard are typically known as PM10 certified sweepers.

Another component of Rule 1186 requires certain public and private sweeper fleet operators to acquire alternative-fuel and otherwise less-polluting sweepers when undertaking work for government entities in the South Coast jurisdiction. This requirement is specific to South Coast although the San Joaquin Valley AQMD also has a similar regulation, Rule 8061. At significant expense, some private fleets have actively been upgrading their fleet in anticipation of, and to comply with, these regulations (South Coast, 2008).

2. PERP & Portable Engine ATCM Requirements

In 1997 ARB adopted a regulation establishing the Statewide Portable Equipment Registration Program (PERP). The regulation set registration requirements, fees, and reporting and record keeping guidelines for portable engines in the program. Auxiliary engines on street sweepers can be registered in PERP or permitted by local air districts (ARB, 2007a), although some air districts do not require permits.

Under the Portable Engine Airborne Toxic Control Measure (ATCM), the secondary engine must be replaced by January 1, 2010, if they do not meet U.S. EPA or ARB emission certification standard (at least a tier 1 engine). In many cases, it is infeasible to repower street sweepers with new engines; the only alternative would be to replace the vehicle, with a new vehicle having a new certified engine. In addition, the ATCM effectively does not provide for the purchase of used sweepers. (ARB, 2007b).

3. Industry Concerns Regarding Regulatory Standards

During meetings with staff representatives from the NAPSA outlined several concerns regarding existing regulatory standards and historical practices. NAPSA indicated that historically street sweepers were exempt from demonstrating compliance of smog and emission of pollutants standards in Department of Motor Vehicles (DMV) Registration Procedures 21.075. ARB is responsible for developing air pollution standards under section 21.000 of the DMV Registration Procedures and has the authority to create and

enforce regulations on street sweepers. The proposed regulation would not be enforced by DMV registration but the ARB's Enforcement Division (DMV, 2008).

Concern was also expressed regarding the feasibility and economic impact of the sweeping industry to comply with the proposed In-Use Heavy Duty Vehicle regulation and the existing portable engine regulations. NAPSA provided staff with a detail cost accounting analysis performed by a forensic certified public accountant on the effect current and proposed ARB regulations would have on the street sweeping industry. The analysis indicated most sweeper companies would not be able to continue operation past 2011 due to large negative cash flow balances, as high as 17 percent of annual revenue. Staff recreated the accounting model and adjusted the vehicle replacement assumptions to align with staff's current proposal for all of the companies. For most companies, the cash flow would always remain positive except in a few key year.

Staff analyzed a typical sweeper company with 22 older vehicles of which 7 were not being used. For the years 2010 through 2025, revenue would be approximately \$20 million and increased capital costs due to the regulation would be approximately \$680,000 in 2008 equivalent dollars or about 3 percent of gross revenues. However, absent the staff proposal the fleet would be required to replace about half of its street sweepers in 2009 and the costs without the proposed changes would be much higher.

The industry provided several letters from major vehicle manufactures that indicated that retrofitting auxiliary engines on dual engine sweepers would not be supported due to safety concerns. From the information supplied, it appears there is only a minor indication that the installation of a verified diesel emission control strategy (VDECS) on the main drive engine would not be feasible, especially on horizontal emission stacks. However, the proposed regulation already provides provisions for compliance delays until 2018 should the installation of a VDECS prove impossible due to safety or other concerns. The proposed regulation also provides provisions for vehicles used for emergency purposes.

Several sweeper companies indicated a specific model of sweeper that is no longer being manufactured is a workhorse of the industry and critical to maintaining day to day operations. Therefore it was critical to extend the compliance deadline for these older vehicles as long as possible.

NAPSA also indicates the essential remediation aspects sweepers contribute to a positive environmental benefit and should be taken into account. Staff believes this is not a justification to completely avoid cleaning up street sweepers given the close proximity these vehicles operate to the public and the ready availability of emission control technologies (NAPSA, 2008b).

Staff considered a proposal from the California Chapter of NAPSA as described in Section XVIII of the Technical Support Document. ARB staff considered the proposal from NAPSA and met with representatives to discuss their concerns. Although the proposal minimizes the costs to the street sweeper fleets, it would not achieve the

required reductions in toxic PM and NOx emission reductions to meet federal air quality attainment deadlines for the San Joaquin Valley and South Coast air basins. The proposal could also result in substantial loss in the anticipated health risk reduction since sweepers frequently operate in urban areas, especially residential neighborhoods.

C. Proposed Requirements for Street Sweepers

In coordination with changes to the portable engine requirements, staff is proposing to limit the operation of dual-engine sweepers with tier 0 secondary engines. Beginning on January 1, 2010 tier 0 dual-engine sweepers would be allowed to operate up to 250 hours per year until January 1, 2014. Starting January 1, 2014 the low use vehicle provision would apply for auxiliary engines operating 100 hours per year. Allowing some use of tier 0 engines would provide additional time for sweeper companies to use their older vehicles and permit greater flexibility for seasonal and backup use. Allowing these vehicles to operate uncontrolled engines over 250 hours would greatly increase public exposure to elevated emissions and would provide an unfair advantage to fleets who retired tier 0 engines to comply with the portable engine requirements.

Two-engine sweepers would be required to comply with the BACT PM schedule and install the highest level VDECS on the auxiliary engine of the sweeper when the propulsion engine is required to meet the PM BACT or when the vehicle is used to meet the requirements of BACT percentage limits or the Fleet average. This means when a vehicle's main engine is retrofit, repowered with a cleaner engine, or replaced the secondary engine must also be accordingly modified.

A fleet would have to follow the reporting procedure as outlined in the proposed regulation if they utilized the BACT percent limits or the Fleet Average compliance paths. Tier 0 dual-engine street sweepers would have to meet special labeling requirements. Within 30 days of the reporting date, fleet owners would have to permanently affix or paint an 'SW' identification label on each applicable vehicle. The identification label would have to be in clear view on left and right side. The letters would have to be black and at least three inches high on a five by eight inch white background.

To further reduce costs to private sweeper fleets and increase flexibility in complying with the regulation, staff is proposing to modify the Municipality and Utility Diesel-Fueled Vehicles regulation to increase the supply of existing newer used vehicles. The proposed modification would allow municipal sweepers with certified 2004 through 2006 model year engines to be sold within California and receive retirement credit towards the municipal regulation. Currently, municipalities may only receive retirement credit if such vehicles are sold outside the state and a vehicle sold instate cannot receive the credit. This change would increase the supply of cleaner used sweepers and allow private sweeper fleet operators to purchase to comply with the proposed regulation, thereby lowering their cost to clean up their vehicles (ARB, 2007c).

Staff is also proposing several amendments to the Portable Engine ATCM and PERP for dual engine street sweepers including clarifying definitions for street sweepers

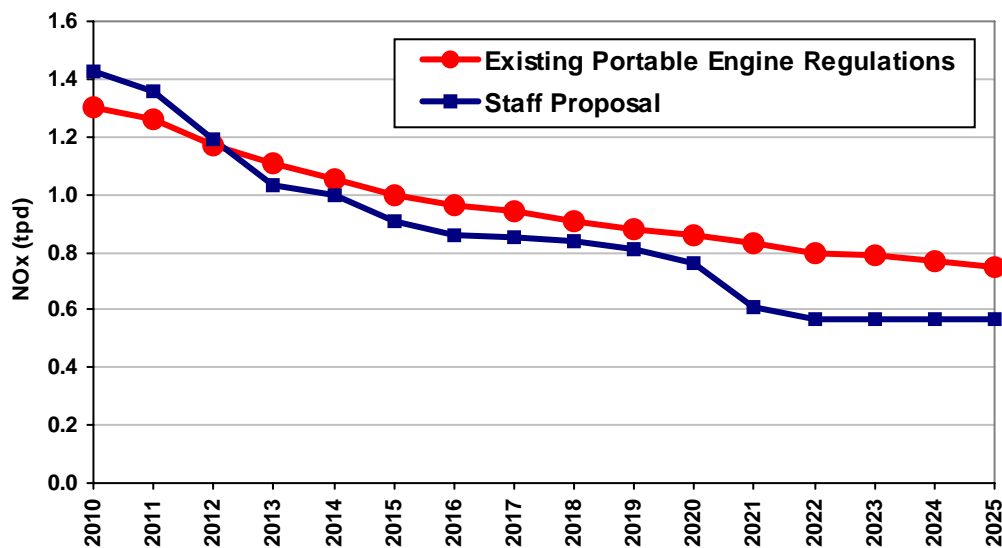
across the existing off-road and municipality and utility fleets regulations. Staff is also proposing to amend the ATCM to exclude the secondary engines on privately owned sweepers from the requirements of the ATCM and include the auxiliary engines within the scope of the proposed In-Use Heavy Duty Vehicle regulation.

The proposed amendments to the PERP would exempt secondary engines on dual-engine street sweepers from all of the emission requirements of the PERP, except the limits on opacity. The proposal would move fleets from PERP’s recordkeeping and reporting requirements into the proposed regulation’s applicable recordkeeping and reporting requirements. Secondary engines on sweepers already registered under the statewide PERP would remain subject to the inspection requirements and fees listed in the PERP regulation.

D. Methodology for Emissions Calculations

Staff modeled dual engine street sweeper NOx emissions expected with the existing portable engine regulations and the staff’s current proposal. Staff used the On-Road Fleet Cost Model in combination with the emissions inventory to determine the normal replacements without a regulation and to estimate emissions. The results are shown in Figure - 3. There would be a small increase in NOx emissions prior to 2012 but there would lower emissions starting in 2013.

Figure - 3: NOx Emissions with Staff Proposal



Utilizing the average miles and hours operated per year along with known emission factors, staff calculated a scalable factor to determine the emissions of single and dual engine vehicles. Under the baseline scenario, staff first estimated what the emissions would be from 2010 to 2025 using fleet survey data for 195 street sweepers and inventory data. The results were then scaled to represent the statewide fleet. ARB staff

estimates that there are about 1250 street sweepers in California that would be subject to the proposed regulation.

The secondary engine emissions in post-1998 dual engine vehicles were then modeled using the ratio of hours of use for the auxiliary engine to miles traveled from the survey data. The analysis assumed 1130 hours of operation per secondary engine for every 13,000 miles traveled, average engine horsepower of about 70 horsepower, the emission factor for in-use off-road vehicles in the 50 to 74 grams per brake horsepower-hour category, and a load factor of 60 percent. In cases where the presence of an auxiliary engine was not indicated staff assumed no secondary engine. Emissions data for single engine vehicles was determined from the ARB on-road emission inventory.

E. References

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