

January 18, 2013

MEMORANDUM

To: Andrew Hoekzema and Bill Gill, Capital Area Council of Governments (CAPCOG)
From: Chris Lindhjem, ENVIRON International Corporation
Subject: Industrial Equipment (Forklift) Category

Introduction

Industrial equipment emissions are dominated by forklifts, but also include a variety of aerial lifts, sweeper/scrubbers, refrigeration units, and various other types of equipment including vacuums, winches, conveyors, etc. ENVIRON contracted to receive sales data within each county in the Austin-Round Rock-San Marcos Metropolitan Statistical Area (Austin MSA) provided by Power Products Marketing (PPM), and PPM provided attrition rates to estimate in-use population. The counties in the study area were determined to be Bastrop, Caldwell, Hays, Travis, and Williamson.

PPM is a market research firm which provides detailed industry data and research services to the global power equipment market. PPM has been in business for over 10 years, though the founding partners have 15 and 30 years respectively in the engine-powered equipment industry.

PPM estimated the total in-service populations for the Austin MSA, by county, for the industrial segments and applications of Aerial Lifts, Forklifts, and Sweepers for calendar years 2006 and 2008. In addition to the population estimate, PPM provided annual usage estimates by application and a comprehensive written report outlining the methodology and estimating process. The primary data sources are historic sales of these equipment types to the counties of interest coupled with auction and other data to inform an estimate of the activity rates to estimate the attrition rates resulting in estimates of in-use equipment population. The attrition estimates and methodology are provided as an appendix in Excel format and is fully transparent to CAPCOG to review and suggested alternative estimates if appropriate. In fact, the activity estimates can be changed to affect the attrition and therefore the in-use population estimates.

ENVIRON used the population data from PPM for those equipment types to estimate the in-use population of other general categories of industrial equipment types. ENVIRON determined a proportional fraction of PPM to NONROAD population estimates for aerial lifts, forklifts, and sweepers to use for other industrial equipment categories.

ENVIRON compiled industrial equipment population and annual activity estimates in a format useful for TexN model inputs.

Population Estimates

Power Products Marketing (PPM) supplied population estimates specific to the CAPCOG counties based on sales and scrappage estimates are described in more detail in the Appendix A summary of the county level 2012 equipment populations and are shown in Table 1. It may seem odd to have equipment population provided to one decimal place, but the basis for the estimates relate to fractions of equipment left in service (for PPM estimates) and national population grown and fractionally allocated to the county. The NONROAD model allows the population estimate to be included and used as a decimal quantity in the emissions calculations, and, for purposes of explanation, decimal equipment counts can be understood to be individual equipment shared across county boundaries.

Table 1. Equipment population estimates comparison for 2012.

NONROAD Default							
Equipment/County	Bastrop	Caldwell	Hays	Travis	Williamson	5-County	
Aerial Lift	9.9	3.5	28.2	406.9	71.8	520.4	
Forklift	56.3	19.8	160.2	2308.2	407.6	2952.0	
Sweepers	5.6	2.0	15.9	229.1	40.5	293.0	
Total						3765.4	
PPM Estimates							
Equipment/County	Bastrop	Caldwell	Hays	Travis	Williamson	5-County	Relative to NONROAD
Aerial Lift	34.5	29.4	58.9	387.0	88.3	598.2	115%
Aerial Lift (with electric)	90.9	77.4	155.1	1018.5	232.3	1574.3	
Forklift	45.3	33.6	426.6	1511.2	286.5	2303.2	78%
Sweepers	20.3	14.4	23.5	127.3	177.8	363.3	124%
Total (no electric)						3264.7	87%

The default NONROAD model estimates were calculated using the NONROAD equipment population estimates for Texas, grown to 2012 using the NONROAD growth file and method. Similar default NONROAD estimates were calculated for 2006 and 2008 and used to backcast the 2012 equipment population estimates. The default NONROAD equipment populations were provided for 1996 (for 4-stroke and LPG forklifts), 2000 (for diesel equipment), and 1998 for all other equipment. To incorporate growth, the NONROAD model uses an activity indicator for industrial equipment that is provided for the years 1996, 1998, 2000, 2010, and 2015. For years in between these (2012, 2008, 2006), the NONROAD model interpolates. ENVIRON followed the NONROAD estimates and approach to provide estimates to use to project PPM industrial equipment estimates for 2012 to 2006 and 2008.

To determine default NONROAD equipment populations by county for 2012 as shown in Table 1, the Texas allocation file in NONROAD was used. The county divided by the state total of manufacturing employees was provided as a surrogate to determine equipment fractions for

each county. The NONROAD estimates match quite closely to the PPM estimates despite the significant differences in original data source and adjustments.

The PPM estimates included electric aerial lifts, so PPM provided a national breakdown of aerial lifts by power type to determine just those lifts producing air emissions. The figures in Table 2 were used to adjust the county level equipment population of aerial lifts.

Table 2. Proportion of aerial lifts by power (fuel) type and power bin.

Aerial Lifts	Percent of Population
Diesel	
11.1-16 hp	0.70%
16.1-25 hp	0.40%
25.1-40 hp	1.90%
40.1-50 hp	3.50%
50.1-75 hp	9.20%
75.1-100 hp	2.70%
Gasoline 4 stroke	
3.1-6 hp	0.80%
25.1-40 hp	2.90%
50.1-75 hp	6.80%
75.1-100 hp	2.00%
Liquid Petroleum Gas	
25.1-40 hp	0.40%
50.1-75 hp	4.00%
75.1-100 hp	2.70%
Electric	
3.1-6 hp	55.60%
6.1-11 hp	6.50%

Activity Estimates

ENVIRON (2012) collected and compiled survey data from several sources including the California Air Resources Board (ARB) and from industrial equipment gathered during the Texas review of construction equipment activity. The ARB and construction surveys did not explicitly identify the fuel type in all cases, but were conducted for the primary purpose of identifying diesel emissions from fleets, so were mostly likely diesel engines. In addition to the ENVIRON (2012) study, ERG (2005) gathered forklift activity estimates for LPG forklifts.

For forklifts, the survey data collecting in ENVIRON (2012) included 1739 forklifts of all fuel types (but primarily or exclusively diesel though not labeled in the original data source) averaging 811 hours per year with an additional 129 LPG forklifts in Texas (ERG, 2005) averaging 1270 hours per year. The combined average usage for forklifts is estimated at 843 hours.

Table 3 provides the average activity estimates from the combined study averages. In many cases, the fuel type for the equipment was unknown, so the average presented is for all fuel types.

Table 3. Activity estimates from survey data.

Equipment	Average Activity (hours/year) (+/- 90% CI)	Sample Size	NONROAD Model (hours/year)
Aerial Lifts	255 +/- 22	239	384 diesel 361 other
Forklifts	843 +/- 43	1868	1700 diesel 1800 other
Sweeper/Scrubbers	146 +/- 35	60	1220 diesel 516 other
Other General Industrial	1744 +/- 64	1253	878 diesel 713 other
Other Material Handling	1955 +/- 131	697	421 diesel 386 other
Terminal Tractors (Yard Tractors)	2558 +/- 50	4358	1257 diesel 827 other

Spatial Allocation

The EPA NONROAD model uses manufacturing employees to allocate national to state and state to county industrial equipment populations. For subcounty populations, however, it would be best to use a land use/land cover (LULC) indicator related to general business land ownership given the wide range of uses of this equipment.

Summary

In summary, the equipment population estimates for the study area were comparable with the NONROAD default population estimates with higher estimates for aerial lifts and sweepers and lower forklifts. In the appendix, PPM describes some unique activity and firms in the area that explain some of these unique features. Overall, for the three categories sampled in depth, the population estimates are slightly lower than the NONROAD default estimates. Therefore, the population for ‘Other General Industrial,’ ‘Other Material Handling,’ and ‘Terminal Tractors (Yard Tractors)’ equipment could also be estimated to be proportionally lower. Terminal tractors are a unique category most often associated with intermodal rail yards and marine ports (but occasionally found at truck depots and other industrial locations) and airports, and so the current NONROAD model may overestimate these equipment types for the study area.

The activity estimates from survey data were lower for aerial lifts, forklifts, and sweepers, but higher for the other equipment categories. CAPCOG may wish to consider using these average activity estimates in the TexN model.

References

ENVIRON 2012. "NONROAD Growth & Activity Update Draft Final Report." Prepared by: Chris Lindhjem, John Grant, and Lan Ma, ENVIRON International Corporation, August, 2012.

ERG 2005. "Data Collection, Sampling And Emissions Inventory Preparation Plan For Selected Commercial And Industrial Equipment: Phase II, Final Report." Prepared for: Texas Commission of Environmental Quality (TCEQ), Prepared by: Eastern Research Group, Inc., August 31, 2005.

APPENDIX A

Power Products Marketing (PPM) Equipment Population Estimates

Selected Commercial Population Volumes

A Project Report Presented By:



For:

Capital Area Council of Governments

Introduction

Power Products Marketing is a market research firm that provides detailed industry data and research services to the global power equipment market. Power Products Marketing has been in business for over 10 years though the founding partners have 15 and 30 years respectively in the engine powered equipment industry.

The purpose of this report is to document the methodology utilized to estimate in service populations for the five counties identified in the CAPCOG project.

Scope of Information

The objective of this proposal is to provide the scope, methodology, and project deliverables related to estimating in service populations for the five counties identified in the CAPCOG project.

Industrial Applications Scope

Aerial Lifts

Forklifts

Sweepers

Geographical Scope

Austin - Round Rock – San Marcos MSA

The first and most fundamental building block in estimating in service populations is an accurate accounting of retail unit sales. The U.S. market is truly a global market. There are product segments, such as ATVs and portable generators where there are literally hundreds of active suppliers. Power Products Marketing has identified and tracked over 240 active portable generator suppliers in the U.S., and over 280 active distributors of ATVs. In well established traditional markets such as compact tractors, market leaders (Kubota) source a significant percentage of their equipment from outside the U.S. borders. Even U.S. based market leaders such as Caterpillar use multiple manufacturing sites around the world to supply the U.S. market.

The only effective method to track these and other diverse and global segments is via retail sales tracking. Some research models attempt to estimate U.S. sales by simply assigning a general percentage for imports and exports (against production estimates) for each equipment

application. Using a simplified method such as this to track imports and estimated exports and somehow extrapolating sales by application is an ineffective and inaccurate method in the interconnected equipment markets of the 21st century. PPM over the past 10-years has developed a series of comprehensive databases focused on retail equipment sales, by model, including engine specifications in the United States. These sales databases form the basis of our research for this project. We believe, for the process of estimating the most accurate population figures, there is no greater indicator to what is being used in the off-road power equipment market than past retail sales.

Methodology

Retail Equipment Sales Tracking

Tracking retail equipment sales at a model level is first vital step in accurately estimating in-service population volumes. In years past, production could serve as a proxy, but as stated earlier in this proposal, the global nature of the US market, which brings manufactured equipment from hundreds if not thousands of manufacturing plants around the world make production tracking prohibitively complex. In the traditional market model, the progression a piece of equipment and the engine installed in the equipment progresses through several steps.



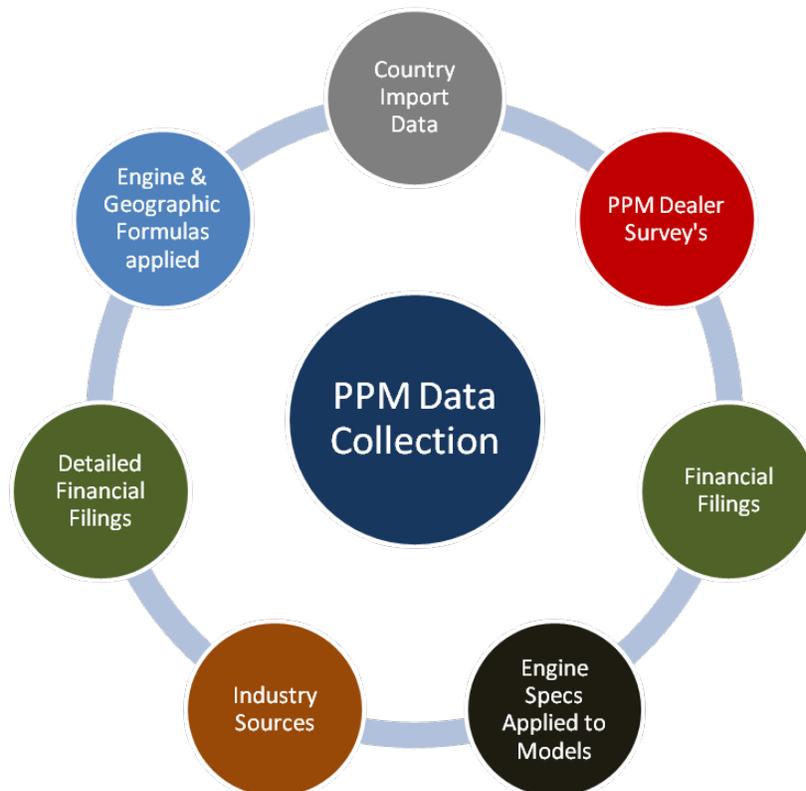
Tracking production activity at the OEM level may have worked 20 years ago, but there are several market segments where a new approach is needed.



In the sample models above, OEMs outside the U.S. ship products through intermediaries and/or use multiple manufacturing sites to ultimately supply U.S. dealers with equipment. In many cases, OEMs outside the US may not have detailed information related to retail sales. Without the ability to track production and ensuing exports from around the world, market research firms often

turn and rely on government statistics for U.S. sales tracking. Various industry reports reference summary level U.S. Department of Commerce data and/or HTS based data, which in our view do not accurately reflect true market activity.

The process utilized at Power Products Marketing to track equipment sales encompasses several steps.



Country Import Data

Imported equipment plays a key role in the U.S. engine powered equipment markets. Knowing the difficulty of tracking manufacturing activity around the world for the hundreds of engine power products, as well as the weakness of government statistics, PPM utilizes bill of lading data as a primary source for imported equipment.

Dealer Research

Bill of lading data provides in the most accurate detail the total number of machines entering the U.S. market. From this baseline, distributors and dealers need to be interviewed to determine model mix, inventories, and other factors relevant to the market. PPM conducts proprietary dealer surveys each year, calling several thousand retail points in the U.S. market.

Dealer surveys are also valuable for market share validation for domestic producers.

UCC Filings

Uniform Commercial Code filings are publically available documents showing equipment financed through banks and equipment finance firms. The filings show a wide variety of information, including the model purchased, the location of sale, and whether the unit was new or used. PPM examines UCC filings to assist with model mix determination, as well as to determine geographical sales distribution. The filings also provide a valuable benchmark for market share analysis at the application and model level. UCC Filings do not capture or reflect all sales made in any specific industry application or geographic location.

Power Products Marketing Sales Database

PPM structures its database by model and includes detailed specifications unique to each model sold in the United States. Engine specifications, including Tier status, 2 stroke versus 4-stroke, carbureted versus fuel injection, and others are included in each sales record.

Power Products Marketing Sales Database Quality Control

After completing our research we utilize several quality checks to further corroborate our U.S. sales estimates. Component suppliers have a clear view of domestic production schedules and associations such as AEM, MIC, NFPA, and the OPEI often publish summary information related to engine powered markets. PPM also has ongoing relationships with noted industry leaders that can point out areas where further research to refine sales estimates is needed. Finally, we actively work with our clients to improve our research products as our clients are in many cases the best sources for product improvement and specific model feedback.

Population Estimating

For estimating in service populations, our model utilizes several tools to estimate final equipment populations. Power Products Marketing has outlined the first tool we would utilize for population estimates, that being retail sales rather extensively. Retail sales is only the first step in the population estimation process. Median Life, Annual Activity, Load Factor, and Scrappage are tools used by the EPA, as well as the PPM model to arrive at a final population. PPM utilizes additional research tools as well to provide the most accurate in service population estimates.

Equipment Auctions

There is an abundant source for information related to median life, annual activity, and percent in use in the United States and that is auction transactions. The equipment auction business, once a local phenomenon, has become a national business. Large firms such as Ritchie Brothers, Rock & Dirt, and Iron Search document and record thousands of auction and sales transactions each year. Many of the transactions include such valuable information as Location, Brand, Model, Year of Manufacture, and total operating hours. By aggregating auction information, annual usage can be estimated by application, brand, model and region for a wide variety of engine powered equipment.

Geographic Allocation and UCC Filings

UCC filings are records of equipment financed, and can be analyzed to the county level. As noted earlier in this report, UCC filings are not effective for all types of equipment, but they provide a powerful tool in many applications where the incidence of financing is significant. At the most detailed level, UCC filings can also show the SIC code of the financing party.

STATE	COUNTY	SIC	SIC DESCRIPTION	BRAND	MODEL
PA	CLINTON	0191	GENERAL FARMS PRIMARILY CROP	NEW-HOLLAND	TC-48

Power Products Marketing utilized representative UCC filings to deliver population estimates by county for each application.

Capital Area Council of Governments Detailed Report

The baseline estimate for in service populations for the five counties included in the study was a recently completed national in service estimate by application and county. The basis for this project was a national estimate of in service populations. The national in service populations were allocated to individual counties utilizing four years of UCC filings, spread across seven calendar years, per application, per county.

For the CAPCOG project, an extended and more detailed analysis was performed. UCC filings for the included Industrial segments were examined for each year across a time period of 2000-2012. This filing trend, along with previous industry knowledge, was used to estimate sales within the five counties for the periods of 1990-1999 as well as pre 1990. As noted in previous sections of this report, UCC Filings do not capture or reflect all sales made in any specific industry application or geographic location. PPM utilizes national sales figures and internal proprietary market knowledge to make adjustments to UCC information during the process of estimating final sales.

This more detailed analysis allowed the CAPCOG historical sales data to be a more accurate reflection of the local market. The detailed analysis uncovered UCC filings that were deemed outliers, as well as the presence of a contract sweeping organization that most likely worked across several counties. At this level of detail, it was apparent there was an outlying and significant sale of Aerial Lifts in 2007 in Travis County. Additionally, there appears to be a large commercial contract sweeping provider in Williamson County. Power Products Marketing made adjustments to historical sales estimates to account for these occurrences.

The final adjusted sales record formed the basis from which in service populations for the five counties was estimated.