

7.3 Retention Rates

Retention Rates are used to estimate how long vehicles remain in use. In EMFAC2000, these estimates are based on comparisons of DMV data covering consecutive calendar years. By observing the population of a specific model year of vehicles through time, a curve can be derived expressing what percentage of all vehicles sold remain in the fleet after a specified amount of time has elapsed. Because this approach looks at a specific model year over different calendar years, net migration effects, the influx of vehicles first sold outside of California that subsequently register in California, and those California vehicles which leave the state, are reflected implicitly.

Retention Rates are used in EMFAC2000 for both forecasting to future calendar years and back-casting for those years where registration information is unavailable. The figures below contrast the retention rates used by MVEI7G and EMFAC2000. EMFAC2000 assumes a higher retention rate, a longer useful life, for passenger cars compared to MVEI7G. Within EMFAC2000, trucks are assumed to last longer than cars, and diesel-fueled vehicles tend to last longer than their gasoline-powered equivalents.

Figure 7.1-1 Comparison of Passenger Car Retention Rates

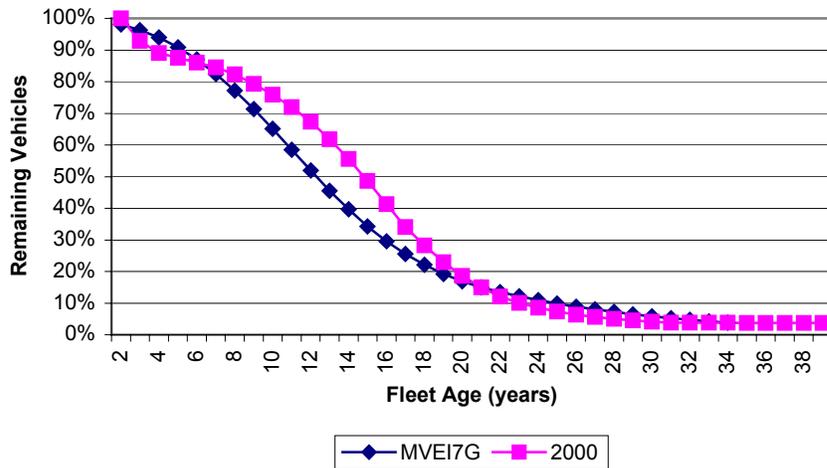
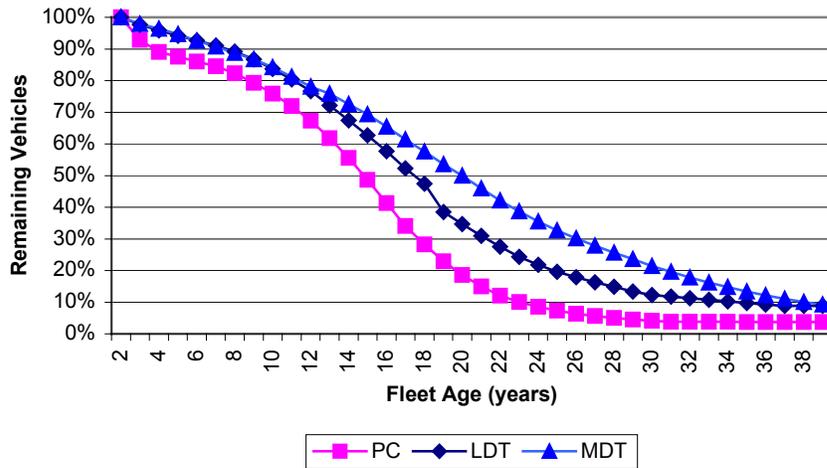


Figure 7.1-2 Retention Rates Used in EMFAC2000



7.4 Forecasting / Back Casting

Registration information for the years 1997 through 1999 were obtained from the Department of Motor Vehicles and incorporated into EMFAC2000. All other calendar year estimates produced by the model are either back cast from 1997 or forecast from 2000. As stated above, retention rates are used for this purpose.

As an example of back casting, assume that there are 1,000,000 1990 model year passenger cars registered in year 2000. Lets further assume that the retention rate for ten year old passenger cars is 80 percent. In back casting to 1990, the population of new vehicles would be calculated as $1,000,000 \times 100 / 80$, the year one retention rate divided by the year ten retention rate, which equals 1,250,000.

Forecasting is handled in a similar manner within EMFAC2000. Aging the fleet is accomplished by moving each model year's population down the retention rate curve and estimates of new vehicles sales are established by a growth factor which is set to match information provided by regional agencies.

Lets assume the year 2000 passenger car fleet numbers 10,000,000, the growth rate is two percent per year and the annual attrition rate, the number of passenger cars that fall out of the fleet each year is 10,000 according to the retention rate curve. In forecasting to year 2001, the model first ages the fleet by one year ($10,000,000 - 10,000 = 9,990,000$). Given that the fleet growth rate is two percent, the overall fleet in 2001 should be 10,200,000. Therefore, new vehicle sales for 2001 must be 210,000 passenger cars ($10,200,000 - 9,990,000$). EMFAC2000 is capable of back casts to 1970 and forecasts to 2040.

7.5 Vehicle Miles Traveled (VMT) and Speed

EMFAC2000 utilizes county specific estimates of vehicle miles of travel provided by transportation planning agencies. These estimates of current and future VMT are used for passenger cars, light trucks and medium-duty vehicles. For all other vehicle classes, EMFAC2000 calculates the class specific VMT as the product of the age-specific vehicle population and mileage accrual. Although this method of establishing VMT differs significantly from that of MVEI7G, the resulting estimates were within five percent of MVEI7G, statewide, and within ten percent of each county or air basin estimate for those counties or basins covered by a transportation planning agency.

For heavy-heavy duty trucks, over 33,000 pounds GVW, the fleet is also adjusted for the presence of out-of-state trucks, which are estimated to contribute approximately twenty five percent of the overall VMT for this class of vehicles according to the 1992 Truck Inventory and Use Survey (TIUS) conducted every five years by the U.S. Bureau of Census. An additive adjustment is also made to account for Mexican plated cars and trucks operating in California, which impact both San Diego and Imperial Counties.

In calculating VMT, EMFAC2000 assumes that all of a vehicle's mileage is accrued within the county of registration. Although a "cross county" VMT matrix is coded into EMFAC2000 for the purpose of allocating a portion of a vehicle's overall travel to other counties, this feature of the model is not currently invoked. Staff intends to randomly equip vehicles with global positioning systems (GPS) in order to populate the cross county matrix.

Those same planning agencies that provide estimates of VMT, also provide information needed to disaggregate the total VMT by speed. EMFAC2000 accepts VMT data in five mile per hour bins, from 5 to 65 miles per hour, in order to adjust the basic emission rates. For those areas which are not covered by a transportation planning agency, EMFAC2000 retains those speed distribution estimates from MVEI7G. Estimation of the travel habits of heavy-duty vehicles are outside of the capability of transportation planning agencies, EMFAC2000 uses instrumented truck data in order to estimate the speed distributions of these vehicles.