

Houston Fire Department Data-Driven Fleet Replacement

USE OF DATA CASE STUDY

The Opportunity

In 2017, the Houston Fire Department's fleet was in a critical state. Its aging vehicles were no longer dependable due to a lack of adherence to the adopted replacement cycle. Funding from the city of Houston was required, but how much and for how long were big questions. Challenged by Chief Sam Pena, the staff developed a data-driven analysis that led to a public-private partnership to replace vehicles earlier in their life cycles and in a cost-effective manner.

The Action

Using data from the city's Fleet Management Division, the staff developed a model that considers the cost of operation, depreciated value, and capital replacement cost to determine the total cost of ownership. Through the analysis, the staff demonstrated that the dollar cost to the city versus the ability to sustain service delivery was exceeded much earlier in the whole lifespan of the vehicles. As a result, the analysis supported a change that allowed the department to recover more of the current market value for used vehicles, the revenue from which could then be used to fund the replacement program.

DEPARTMENT INFO

HOUSTON FIRE DEPARTMENT

POPULATION SERVED: 2.31 MILLION

TOTAL UNIFORMED PERSONNEL: 3,648

TOTAL CIVILIAN PERSONNEL: 96

FIRE STATIONS: 93

ISO CLASS: I

GOVERNANCE: STRONG MAYOR

HIGHEST LEVEL OF EMS SERVICE PROVIDED: ALS
TRANSPORT

ANNUAL BUDGET: \$535.5 MILLION

The Outcome

The department started with its administrative and light-duty vehicles, which require less preparation, fewer warning lights and communications equipment, and other equipment to test the concept. Then, working with a national car rental firm, the department could replace its 105-vehicle light-duty fleet by selling the older vehicles on the used-vehicle market. The return on the sales exceeded the cost of the replacement vehicles by an estimated \$100,000.

Introduction

When presented with the all-too-typical challenge of maintaining an aging fleet of vehicles with limited capital dollars, the Houston Fire Department staff used available data combined with financial analysis to create a process that takes a new approach to this thorny issue.

By 2017, the team was faced with a vehicle replacement schedule that, based on manufacturer recommendations, did not reflect the ever-increasing wear and tear caused by the escalating call load. In addition, an analysis revealed that 69% of the light and medium duty fleet was over ten years old, with an average age of 10.8 years. It would take 19 years to cycle out the entire fleet at the historical acquisition rates. As a result, Chief Sam Pena challenged his staff to use data to examine the core reasons the situation had occurred, develop alternatives, and convince the financial management folks that it was worth a try. Assistant Chief Ruy Lozano led the project and presented an overview of its status during the Center for Public Safety Excellence's 2022 Excellence Conference.

The department was experiencing extended out-of-service times for repairs, delayed preventative maintenance, and breakdowns while responding to incidents, operating on the scene, or transporting patients to the hospital. Characterized as a "predictable surprise," the staff viewed this as but one outcome of the shift in the American fire service to an all-hazards response deployment. Suppression units are responding in support of the EMS program, the fastest-growing segment of "business" for many departments. The resulting up-tempo in responses can increase vehicle maintenance costs, shorten the vehicle's overall service life and potentially impact the reliability of the services provided to the community.

The Opportunity

Traditionally, fleet replacement is a budget-driven process that frequently needs to recognize the condition of these valuable assets. Therefore, a typical municipal replacement schedule tracks data points such as a vehicle's age, road miles, engine/pump hours, maintenance expenses, or a combination of these data points to determine when the vehicle is slated for replacement. Compounding the challenge is that, unlike the consumer automotive industry, fire apparatus manufacturers are not required to have replacement components available for at least ten years. Instead, manufacturers will provide the parts, but as the vehicle ages, parts are built to order, which results in extended out-of-service time for the apparatus and premium pricing.

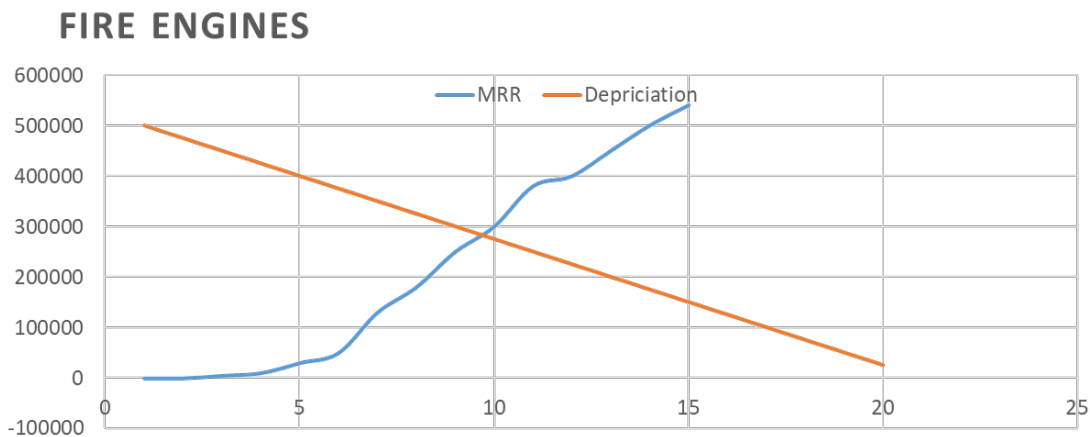
"Too often, we look at the capital investment separately from the operating investment. Put the two together, and you get the total cost of ownership." **AC Ruy Lozano, HFD**

Once a vehicle operates beyond this threshold, it typically incurs higher maintenance costs that exceed the value of retaining the vehicle. Assistant Chief Lozano and his team found the current schedule inadequately anticipated

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when a vehicle should be replaced. The projections for the new vehicle costs did not effectively track the rate or amount of the manufacturer's annual price increases. As a result, like other departments, Houston frequently kept the apparatus in service beyond the point where the operating costs exceeded the vehicle depreciation value. And like these other fire departments, Houston was forced to delay some replacements because the available budget dollars did not meet the actual need.



A vision change developed by the staff flipped the equation and let the data drive the budget, adding operation, capital, and depreciation costs and exploring lease options and the impact on what the department came to refer to as the total cost of ownership (TCOO) for the fleet. In addition, this analysis could establish guidelines by apparatus type before units go into service and after they have been in service to evaluate when they should be replaced.

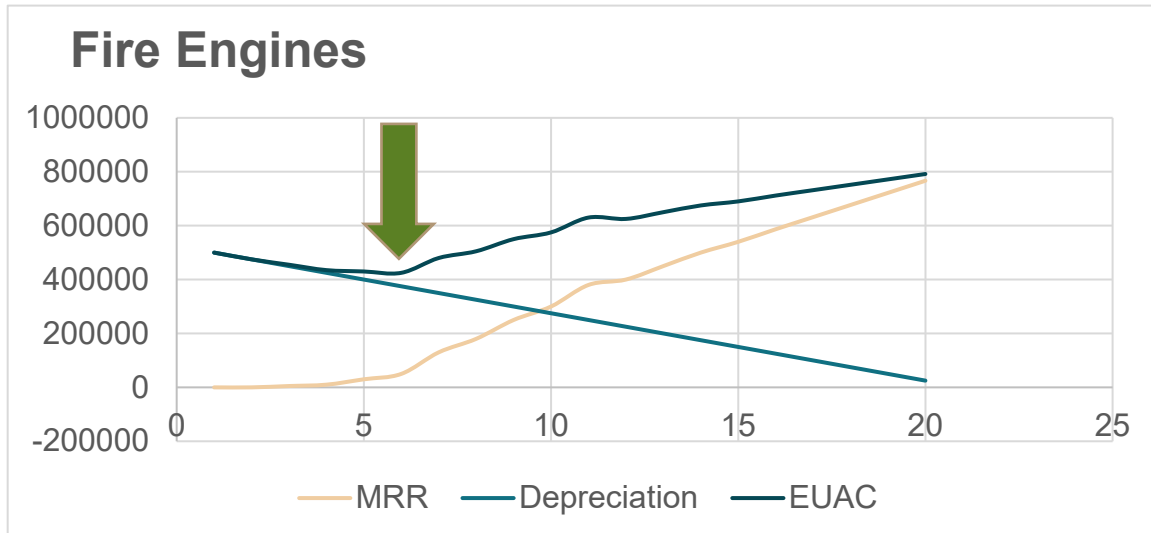
The Action

Vehicle maintenance records should start when a vehicle is placed into service. As such, records can document vehicle operational costs, providing the metrics to assist in crafting replacement policies. The Houston staff worked closely with the Fleet Management staff and its records management system, known internally as M5, to model alternative cost structures to secure replacement fleet vehicles. At the same time, vendors were asked to provide private-sector best practices. The staff modeled alternative approaches to vehicle acquisition compared to historical data. Evaluating both capital and operating costs resulted in developing an accurate total cost of ownership to decide on the best choice for the future.

One of the analysis models considered was the Equivalent Uniform Annualized Cost (EUAC) methodology, which is used for a variety of purposes, including capital budgeting. But it is often used to analyze two or more possible projects with different lifespans, where costs are the most relevant variable. By replacing the vehicle at EUAC's lowest point (see the arrow below), one

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can take advantage of the resale value and reduce future maintenance costs while avoiding the nonarticulated cost of out-of-service time and poor public perception of service reliability and low department morale.



Initially, the staff had informal discussions with a national car leasing firm to assess the viability of the used-vehicle market, which could be a vital component of developing a program. The short answer: it is viable. Since most local governments purchase vehicles at a discount from the consumer market, by selling the vehicle in the used-vehicle market after a year of use, the department can take advantage of the gap between the lower purchase price and the higher resale value to fund the overall program.

The next step was to gain the approval and participation of the city finance department, which was initially skeptical that the program could work. Several meetings took place to understand the concerns, develop answers and meet the most pressing concerns.

The Outcome

The department began to explore new purchase strategies in 2017. In 2018 the staff considered focusing on the annual replacement of the light-duty fleet to leverage the economies of size with the secondary used-car market. The department implemented the revised replacement process in 2021, with the outcome realized in 2022. Due to the solid used-car demand and the premium prices paid by consumers, the return on the sales exceeded expenses by an estimated \$100,000 for the program's first year. They can now replace aged vehicles with newer models to increase fuel efficiency and reduce maintenance expenses. They estimate that the program will be able to reduce their maintenance costs by 85% for a total savings of \$417,889 on maintenance alone.

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Fiscal Year	FY2021 (3 months)	FY2022	
LSB Cost	\$(133,911.99)	\$(654,040.00)	
Sale of 84 of 105 LSB cars	\$119,468.00		
Equity 49 cars replacement		\$563,500.00	
Equity for extended lease 56 cars (.65 per dollar*)		\$410,809.75	
Revenue		\$974,309.75	
Net Cost	\$(14,443.99)	\$320,269.75	\$305,825.76

*Note: Vendor paid HFD \$0.65 on each dollar of equity while extending the lease term an additional 12 months, with the same payments. This allows the department to immediately capture a portion of the equity while maintaining enough equity to provide a margin of safety in the unlikely scenario that the resale market significantly deteriorates in the coming months.

The next step is to move to larger, specialty vehicles such as engines, ladders, and ambulances. Again, a private company specializing in fire apparatus will be needed as a partner.

Tips for Replication

- Start small; keep it simple.
- Expenditures for maintenance and repair, as well as the resale value are significant considerations and should not be ignored.
- A comprehensive maintenance and repair cost-tracking system must be in place.
- The resale value for the apparatus must be considered as revenue to be reinvested into the replacement apparatus.
- Altogether, consideration of apparatus purchase, maintenance and repair, and resale value results in a total cost of ownership decision-making model.
- Use data and add graphics to better communicate the program and its benefits to those not operating in the fire department's arena.
- Gain the support of the financial managers and be prepared to adjust the program to address identified concerns.
- Enter into an open-ended lease with no early termination, mileage, or abnormal wear and tear penalties.

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