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Fleet Replacement Challenges = Opportunities ... A4
Brian Brown addresses fleet replacement challenges, explaining the process of evaluating an apparatus for replacement and offering guidelines based on a points system to help departments make these important decisions.

North American vs. European Apparatus .......... A10
Keith Purdy explores the varying evolutions of apparatus in Europe and North America, noting that understanding how designs were developed to meet solutions for different countries can provide useful insights for an apparatus design committee.

Refurbishing an Aging Fleet .......................... A14
With many departments opting to refurbish older apparatus as they keep an eye on their budget, Robert Corsi covers several factors to consider in the refurbishment process, including when to call it quits and look for new apparatus.

A PPC Guide to Acquiring Apparatus ............... A18
Joe Fratantaro offers a basic guide for how an apparatus purchase will affect a community’s ISO Public Protection Classification (PPC) rating.

Idle-Reduction Technology ............................ A20
Ed Ballam reports that after department officials determined that the carbon monoxide emitted from idling apparatus was a huge contributor to the elevated carbon monoxide levels found in the engineers and incident commanders, the Redmond, WA, Fire Department took steps to adopt idle-reduction technology.

ON THE COVER
The Maplewood, NJ, Fire Department responded to the scene of a four-story apartment complex fire that was still under construction. Heavy fire conditions forced crews to set up for exterior operations. Seven aerials, two ground monitors and numerous handlines helped contain the fire to the initial section of the complex. Firefighters performed interior attacks on the completed sections of the complex to help prevent any extension. Photo by Bill Tompkins
Fleet Replacement Challenges = OPPORTUNITIES

A fleet replacement program provides a vital framework for evaluating which units should be replaced and when.

A sound vehicle and maintenance replacement program is important to government agencies of all sizes. Be it a volunteer, combination or career department, reliable vehicles and equipment in appropriate working order are essential to providing public services to the communities served in a professional and timely manner.

Fire, EMS, wildland, aircraft rescue firefighting (ARFF) and hazmat apparatus and equipment that break down due to age or excessive use will ultimately lead to an interruption in service to the community and a strike against the agency’s dependability and reputation. While a sound preventative maintenance program is a key component of fleet management, here we’ll dig deeper, addressing how to best evaluate your fleet’s overall performance and the potential need for replacement. You must know your fleet and run it like a business. The more you put into your fleet, the more your “business” responds to cost savings as well as reduced downtime, operating cost and overtime. The
goal here is not only to identify what is working, but also to review your department’s current and past practices and make suitable recommendations for improvement going forward.

A complex process
The first step is to develop a viable and comprehensive replacement program or guideline. Without one, managers will be unable to properly assess apparatus and equipment replacement needs in a timely manner. If your agency already has a fleet replacement plan in place or is willing to adopt/create one, the plan needs to be validated. This is an area that has been neglected by many departments and cities for years. Support from upper management is vital to the implementation of the fleet replacement plan. Further, good working equipment contributes to positive employee morale.

In this endeavor, we face many challenges, including still-shrinking revenues, budget cuts in the fleet and support areas, increasing demand for service, increasing state mandates, NFPA 1911 (2012 edition) mandating more annual testing, as well as the age and possible readjustments of the fleet. Readjustments to the fleet throws in a nice twist as the unit(s) that were initially planned for replacement are now kept and reallocated in another division/bureau that “feels” they truly need it. These units now include increased maintenance costs, reduced resale value and increased downtime.

A planned approach
As we begin the process of developing guidelines for a fleet replacement program, we should first start with a simple question: At what age do you like to replace vehicles in your fleet? The fact that a vehicle has reached its replacement age or threshold doesn’t mean it automatically gets replaced. Some wear out faster than others, which may be a sign of the assignment, the intensity of use, and how the end-users take care of the vehicle. Some vehicles may need to be replaced sooner due to extreme wear and tear. As such, a comprehensive replacement program is instrumental in the budget-planning pro-
## Fire Engine Replacement Guidelines

<table>
<thead>
<tr>
<th>Factor</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>One point for every year of chronological age, based on in-service date.</td>
</tr>
<tr>
<td>Miles/Hours</td>
<td>One point for each 10,000 miles or 1,000 engine hours of use.</td>
</tr>
<tr>
<td>Type of Service</td>
<td>1, 3 or 5 points are assigned based on the type of service unit receives. For instance, fire pumps would be given a 5 because it is classified as severe duty service. In contrast, an administrative sedan would be given a 1.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Points are assigned as 1, 3 or 5 depending on the frequency that a vehicle is in the shop for repair. A 5 would be assigned to a vehicle in the shop two or more times per month on average, while a 1 would be assigned to vehicle in the shop an average of once every 3 months or less.</td>
</tr>
<tr>
<td>M&amp;R Costs</td>
<td>1 to 5 points are assigned based on total life M&amp;R costs (not including repair of accident damage). A 5 is assigned to a vehicle with life M&amp;R costs equal to or greater than the vehicle's original purchase price, while a 1 is given to a vehicle with life M&amp;R costs equal to 20 percent or less of its original purchase cost.</td>
</tr>
<tr>
<td>Condition</td>
<td>This category takes into consideration body condition, rust, interior condition, accident history, anticipated repairs, etc. A scale of 1 to 5 points is used with 5 being poor condition.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Point Ranges</th>
<th>Under 18 Points</th>
<th>18 to 22 points</th>
<th>23 to 27 points</th>
<th>28 points and above</th>
<th>Condition I</th>
<th>Condition II</th>
<th>Condition III</th>
<th>Condition IV</th>
<th>Excellent</th>
<th>Good</th>
<th>Qualifies for replacement</th>
<th>Needs immediate consideration</th>
</tr>
</thead>
</table>

Source: APWA Vehicle Replacement Guide

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to calculate the least costly life-cycle per class of vehicle.

2. The Best Practice Method involves surveying peer organizations with similar fleet and operating conditions.

Regardless of which method is used, life cycles must be developed with the goal to minimize overall fleet cost, maximize vehicle availability, and provide end-users with safe and reliable vehicles to perform their jobs.

Using either method, many agencies have developed a weighted point system that mixes the factors listed above in a formal reporting and review process. The advantage to this is that it removes most of the politics and emotions from the replacement process while providing the facts that all the stakeholders (end-users, management, fleet staff, finance staff, etc.) need in order to understand and buy into the program. A variety of software and various point system programs are used by many fleet agencies across the country. Some are based on an overall replacement program using an average while others customize the program to fit different classes or types of equipment.

The chart on A6 is a sample replacement point system used by Charleston County, SC, for an old pumper.

Applying the chart, I will use a 15-year-old fire pumper planned for replacement in 2–3 years. The unit has 110,000 miles and over 10,000 engine hours, is in poor condition, and includes massive amounts of downtime, poor reliability and repair costs that exceed more than 80 percent of its original purchase price. The points would be assigned as follows:

- **Age** = 5 points
- **Miles or engine hours** = 10 points
- **Type of service is severe** = 5 points
- **Reliability** = 5 points
- **M&R costs** = 3 points (quickly approaching 5)
- **Condition** = 5 points

The total is 33 points, so it falls into the “Needs Immediate Consideration” category.

As previously mentioned, some systems are based on vehicle types or categories based on the application, preventative maintenance program in place, and the end-user application. In many instances, downtime can be used as an indicator more than how many trips have been made to the shop. Other agencies may use the overall M&R costs average for an entire class or type of vehicle rather than the percentage of the original replacement cost as a key factor.


The next step is developing a fleet replacement policy to define practical conditions and guidelines for the replacement of fleet units. This would be pri-
Fire & Emergency Apparatus

Commonly used on fire and EMS vehicles to project the life cycles of those units. The replacement guidelines outlined in this area generally reflect the operational, technological, downtime and financial criteria.

**Life-cycle cost analysis**

The life cycle of fleet units is based on the Best Practices Method recommended by industry standards. This method involves an internal customer survey using replacement guidelines set forth in the vehicle replacement guide in most fleet software programs. The results are compiled, and adjustments are made in order to take into account factors unique to our fleet, such as utilization and type of use. Once the vehicle has met the replacement criteria, it goes through a review process by the fleet manager/director and the user department to determine if the vehicle should be replaced, retained for limited use, or extend the vehicle’s life cycle. The overall goal is to replace vehicles at the lowest life-cycle cost before the operating cost exceeds vehicle capital.

**Straight-line method of depreciation**

Don’t forget to include depreciation. To comprise the straight-line depreciation method, depreciation is charged uniformly over the life of an asset. We first subtract the residual value of the asset from its cost to obtain the depreciable amount. The depreciable amount is then divided by the useful life of the asset in number of accounting periods to obtain depreciation expense per accounting period.
period. Due to the simplicity of the straight-line method of depreciation, it is the most commonly used depreciation method.

The formula to calculate the straight-line depreciation of any asset for a full financial period is: \( \text{Depreciation} = \frac{\text{Cost} - \text{Salvage Value}}{\text{Life in Number of Years}} \).

For example, on Jan. 1, 2017, Fire Department A received a new pumper for $575,000. It is expected to have an approximate value of $10,000 at the end of 15 years of service. First, find the depreciable amount which is $575,000 - $10,000 residual value = $565,000. Then divide the depreciable amount by 15, which is the useful service life years of the pumper. This provides a figure of $37,667 for the yearly depreciation.

**Replacement class system**

The Replacement Classes and Replacement Guidelines are used to categorize the various types of fleet units and their target replacement miles, hours and age in addition to each unit’s operational feasibility while analyzing the most current technology. Some of the considerations for replacement:

- Units that have met replacement criteria
- Units with replacement deferred from prior years
- Units that have reached maximum points using the Fleet Software Replacement program
- Units that have excessive operating costs

**In sum**

Regardless of the specific program your agency chooses to practice or create, using a point system is an excellent way to bring credibility and ownership to a process that can be bursting with politics and emotions. Recognize that the most economical method provides the lowest net cost since vehicle replacement funds usually will be in short supply. Having a well thought out and credible plan will not only benefit the fleet operation but also the direction of those future funds.

Brian Brown is the bureau chief of the South Metro, CO, Fire Rescue’s Fleet Services, overseeing the department’s purchasing and annual inspection service. He also chairs the Authorities Apparatus Committee, and teaches the fire apparatus maintenance and fire pump theory and operation classes for the department’s engineer academy.

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If your department has formed a committee and has your funding approved, please contact Jon Rogers to learn more about this program: (610) 656-3611 or jon.rogers@firehouse.com.
Fire apparatus design varies around the world. Understanding how designs were developed to meet solutions for different countries and their operations can provide useful insights for an apparatus design committee making critical decisions about apparatus design.

Here we’ll review some of the differences between North American and European apparatus design so as to better understand the “why” behind these evolutions and how they can be applied in the design process.

Cabs and chassis
When it comes to cabs and chassis, consumers in the North American fire apparatus market have many more choices than anywhere else in the world. In fact, it is estimated that in North America, 60–70 percent of all major fire trucks sold are built with custom chassis. Specialty manufacturers offer short cabs, medium cabs, long cabs, raised-roof designs, and many alternative configurations. The interior of these machines can be specified by many manufacturers to be upholstered “heavy
duty,” with exposed metal surfaces or any combination in between.

Outside North America, there are very few custom fire apparatus chassis and cabs. Chassis and cabs are constructed specifically or exclusively for vocational application. More specifically, most chassis and cabs for major firefighting apparatus are what could be defined as “commercially available trucks” adapted for fire apparatus use. In this style of manufacturing, the vehicle starts with basic chassis and cabin, which can be modified and adapted for the fire service organization. This tradition has given the North American market a different evolutionary path than comparative markets.

The European evolution to this style of apparatus is a design solution to many countries in Europe having domestic chassis manufacturers within their country that are popular and easily serviced. Certain fire departments will favor local brands, such as Ivecio in Italy, Renault in France, Mercedes in Germany, Scania in Sweden, and so on. Many larger European builders will offer their up-fits and body work across many chassis styles and brands, yet there remain imbedded regional producers that will specialize in a specific country with a locally favored brand that is designed specifically for that area.

For decades, European commercial cabs have benefitted from being crash-tested and certified. The European design preference uses a commercial chassis, which offers a safety advantage. This testing eventually made its way to North America through global chassis builders, and after some time, it migrated to fire apparatus cabs. It was many years between the adoption of the standard in Europe and being used on North American fire truck cabs.

Specialized cab manufacturers add crew seating and additional space to these commercial cabs in some applications. Crew seating at the front of the bodywork is also popular in European design, which creates a similar crew environment to North American custom cab crew areas. Thus with the acceptance of nationally recognized vehicle standards—as opposed to the country-by-country standards often seen in Europe—North America has become a unique location for the growth of the specialized fire apparatus market. This simple truth drives many of the visual distinctions between North American apparatus and those from other parts of the world.

The standard that drives much of North American design—NFPA 1901—covers a broad area and guides the consumers and manufacturers into a market that’s driven by standards but that still allows for customization within the tolerances of those written recommendations. In Europe, standards and requirements can vary from country to country, which affects the design of firefighting vehicles in smaller regional markets.

One example involves some safety-driven cultural design requirements in Europe. In both the United Kingdom and the Netherlands, the fire apparatus design for major vehicles seeks to minimize operating firefighters from climbing on the apparatus (other than getting into and out of the cabin). As a result, the North American-style hosebeds, upper coffin compartments and body designs evolved differently in the context of reduced climbing risk. In these designs developed to minimize climbing, the attack lines and
supply hose are stowed in lower positions and carried within the lower bodywork. Long tools and ladders are mounted to be safely deployed from the ground or accessed with rack systems.

**Equipment and pump systems**

The design of equipment deployments and pump operations has also evolved differently between North American and European products. North American design, in many cases, reveals preplanning of hose loads and an emphasis on rapid deployment upon arrival on the scene. By contrast, most global design vehicles favor an “enclosed transit” design where the hoses and firefighting equipment are mounted and stowed within the vehicle.

In terms of pumping and design, we see that engine output power in global designs is typically matched to the pump performance requirements. In Europe, the relative energy (horsepower/hp) to drive the pump determines the engine and chassis component combinations to be used. The firefighter often stays very close to that minimum requirement. In contrast, in the North American market, we see a large pool (20–25 percent) of fire apparatus with high horsepower and large transmissions that greatly exceed the minimum power requirements to have the pump perform as expected.

By design, a European pumper is typically a rear-mounted (pedestal-style) pump with a minimum number of discharge valves (two to four) in an operation where the pump operator sets the pump pressure and then adjusts each discharge with “turn-down” valves. North American vehicles can have 7 to 14 different discharge valves, each purchased under the guise of “what if . . .?”, whereas the European concept is a blank pump with hoses rolled and stowed in the exterior lower compartments, which is then set up on site to handle that specific evolution. The North American model is based on pre-connected lines; the global design is more a stowed and set-up-as-needed design.

**Ladders and platforms**

Regarding aerials and platforms, standards and performance expectations have sent the designs in slightly different directions. Europe prefers a tighter package for a 100-foot (32-m) aerial. Conceptually, the smaller (maneuverable) package turn-table ladders with limited ground ladders and increased truck-mounted “below-grade” performance capabilities serve the environment of the European operations.

In North America, the standards and recommendations applied to similar 100-foot (32-m) products typically focuses on larger apparatus, as we carry more ladders, equipment and tools. Much of the explanation of the North American design is rooted
in the 115-foot minimum ground ladders (per NFPA 1901, 8.8.1.2). North American designs stabilize and level the aerial via the base vehicle, whereas many European-designed units stabilize via the frame but level via the device itself. The term "reaerial" is prevalent in the European design process.

North American ground ladder-carrying requirements make the domestic aerial truck body a larger and higher box, which limits below-grade performance of the aerial device. The European "rescue aerial" expectations have evolved to create a device that sets up and levels quickly, and can raise, retract and extend at a fast pace to evacuate victims.

Platform design has evolved in North America to hold significant weight at the tip and provide breathing air, power, scene lights, dual monitors and tools in the basket to be a working platform. Once again, we see that the expectation of a complement of ground ladders drives the body design. In Europe, the ground ladders are not designed into the aerial and platform as is so common in North America.

Additionally, weight capacities, water flow requirements and ancillary tool stowage reveals the differences in design. Many of these differences are in response to the operating environment in which the apparatus will be placed. European platforms commonly have articulation capabilities in the fly section to get over parapets. The popularity of various articulation designs makes the egress access ladder found in North American standards a bit difficult to design. Many North American platform designs with full use ladders become much larger and heavier than their European counterparts.

**Ideas and lessons**

The operating environment and design theory of European fire apparatus may be different than that of North American apparatus, but there is much to be learned from both industries. Components like shutter doors, Storz connections, large-diameter hose, compressed air foam systems (CAFS) and many other components have migrated to become truly global designs.

Perhaps the most important lesson is to study and understand the theory behind any good design. Fire apparatus are evolving and continue to do so every year. Globally, there are many approaches to safety. The lessons of safety applied to design should resonate to fire apparatus designers.

Innovation in the world of fire apparatus is a truly global endeavor.

Keith Purdy has more than 30 years of fire service experience. He has been directly involved in fire, rescue and EMS vehicle manufacturing as well as a life member of the Vestal, NY, Fire Department. Purdy is a consultant with Emergency Vehicle Response (EVR), a full-service agency that specializes in fleet evaluations, specification writing, emergency vehicle operations and department studies.

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Today’s fire apparatus are taller and larger, and may not fit in the aging fire stations across the country, especially in the Northeast. As such, many fire departments are opting to refurbish an older piece of equipment, rather than buying new, particularly as they keep an eye on their budget.

It is important to remember that reserves can be just as important as first-line apparatus. However, we need to recognize when repairs end up costing more than they are worth, meaning it’s time to call it quits and look for something new.

**Deciding factors**

Picking a good, solid truck to update is essential. Some factors to consider include the engine, transmission, pump, water tank, cab, body, aerial (if equipped) and chassis and body corrosion.

One of the first things that should be done when assessing a truck is to thoroughly check the chassis and body for corrosion. If the truck is equipped with a multi-layered chassis, look for bulges between the layers and bulges in the web and spreading in the flanges. Typical areas are over the rear springs, just in front of and behind the front and rear springs. On pumpers, check where the pump mounts to the chassis for corrosion and spreading. Also inspect all body and cab mounts.

On a ladder, check the torque box, outriggers, rotation bearing and gear box, and hydraulic hoses and lines. The stick should be inspected closely for wear to the rails from the slides or rollers, whichever the truck uses. Sometimes, the slides will wear out and make grooves in the rails. Look for ironing (i.e., flat spots) from the rollers and fire-damaged spots in the rails. Pay particular attention to the swivel at the base of the ladder; all the hydraulic and electrical lines and a waterway (if equipped) run through the swivel. Check for leaks and loose mounting brackets. The annual aerial inspection procedure will guide you in this process.

If you find corrosion, you may need to have the truck sandblasted or deslagged. Then, the thickness must be measured ultrasonically to ensure the integrity of the metal. The truck manufacturer can provide you with the acceptable limits. After this, it is necessary to prep the metal and then use a good chassis epoxy paint to prevent future corrosion. Painting over corrosion—although easier—is not a good idea.

Once you have checked out the chassis, you can look at the springs, brakes and rims. Springs and brakes can be easily

This government surplus pumper had a few mechanical problems but, overall, was a very good pick for repurposing as a reserve truck.

Photos by Robert Corsi
There are several factors to consider when selecting an apparatus to refurbish. Replacing rims can be cost-effective and saving money. Rims can be reconditioned. Furthermore, the engines of older trucks (pre-diesel particulate filter emissions) can be overhauled in-chassis. This makes the repair much more cost-effective than to replace the whole engine. By repairing it in-chassis, there is also no need to update to DPF emissions. On pre-DPF apparatus, doghouses are smaller, which creates more space for the driver and officer.

Older trucks can be retrofitted with LED lighting upgrades, lowering electrical loads. Older systems used relays that were overloaded by incandescent lights. With LED lights, the load demand is much lower, so the systems work fine. Newer multiplex systems are not, however, without problems: They can have electrical connection issues. They also take a higher level of expertise to repair them compared to the old relay systems.

Additionally, upgrading to newer and stronger SCBA-mounting brackets improves cab safety in case of an accident. Some older trucks have very high entrance steps leading to injuries. This can be easily changed by adding lower steps to the bottom of the truck, whether it’s the cab or the dovetail. Also, adding a retarder to the braking system can improve stopping distance.

If the truck is equipped with a fire pump, a thorough pump test—which must be conducted annually—should be performed by an EVT-certified mechanic. This will ensure that the priming pump, valving, pump transmission and pressure-regulating system are in good working order.

Tires are an easy fix, but we still need to verify that the tires have not exceeded the recommended usable life.

The newer electronic transmissions generally don’t have mechanical problems; most of the time, a problem will be related to sensors or wiring. Take a look at the wiring harnesses coming out of the transmission. If they look like they’ve been spliced and repaired, you might want to replace them.

Cab design is another factor in this process. Some of the older trucks have non-tilting cabs, which decreases access to the engine, transmission and radiator, which then increases the...
The radiator should be visually inspected for corrosion on the cooling fins. When doing an in-chassis overhaul, always flush and pressure test the radiator.

A polypropylene water tank is a good sign that the truck is not too old to upgrade. If it has a steel tank, the truck may be just too old. Most poly tanks have a substantial warranty.

**Things to avoid**

There are several factors that could signal that an apparatus is not right for a refurb:

- Old ball-and-socket steering linkage with adjustable sockets
- Older truck cabs that do not have enough personal space for safety (i.e., head room, leg room)
- Older engines that have poor track records
- Under-powered apparatus
- Trucks with a history of electrical problems or poorly repaired electrical systems

Before starting a major repair, be sure to consider the rest of the vehicle. There may be multiple parts and systems that need to be changed. Be mindful of the time and costs of the total job.
Finding the diamond in the rough

There are several sources to find used apparatus that are suitable for fire department use. One that we have used is government surplus. We received a pumper that had a few mechanical problems but, overall, is a very good pick for repurposing as a reserve truck. The chassis and body have virtually no corrosion, and it has a tilt cab and roll-up doors. The pump is in excellent condition, and the engine type—though not my first choice—runs very well.

To make the pumper ready for service, the lighting has been upgraded to LED, and we installed new SCBA brackets and a Federal Q siren. We also added a shore charger to maintain battery voltage and supply power to accessories.

Another option for used apparatus is a dealer trade-in.

Final thoughts

Annual third-party tests are a good baseline to use as a guide. Always have the vehicle third-party tested once the repairs are completed. A good source for information on this subject is NFPA 1912: Standard for Fire Apparatus Refurbishing.

Robert Corsi is the chief mechanic for the Cranston, RI, Fire Department. He has been with the department almost 30 years. In January 2017, he was awarded the Firehouse Magazine Emergency Vehicle Technician of the Year Award. Corsi is the chairman of the Board of International Association of Fire Chiefs’ Emergency Vehicle Maintenance Section (EVMS) as well as a board member of the EVMS Steering Committee, and he serves as the EVMS representative for all of New England. He is also an active member of the New England Fire Apparatus Maintenance Association.
A PPC Guide to ACQUIRING APPARATUS

How an apparatus purchase will affect a community’s ISO rating

Fire chiefs have to consider several factors when purchasing new apparatus—capabilities, effectiveness, appropriateness and budgetary considerations.

In addition, many will ask themselves how the purchase will affect their community’s ISO Public Protection Classification (PPC) rating. What effect will the new apparatus have, if any? Are they buying too much? Not buying enough?

Basic business

To clarify the process that ISO uses to review fire apparatus, let’s start with two basics. First and foremost, fire chiefs should conduct a risk assessment of the community to guide resource-acquisition decisions. Next, chiefs should have a general understanding of the PPC evaluation process for apparatus so they know how their purchase will affect the rating.

PPC evaluates four primary categories of fire protection services in a community: the fire department, water supply, emergency communications, and community risk reduction. The tool that ISO uses is the Fire Suppression Rating Schedule (FSRS), which follows certain standards set by the National Fire Protection Association (NFPA). In evaluating apparatus, ISO analyzes its use and reviews to see if the equipment meets minimum survey requirements.

Apparatus grading process

The evaluation of the fire department accounts for 50 of the 105.5 points available in the total PPC grading. It’s based on the fire department’s first-alarm response and initial attack to minimize potential loss. ISO reviews such items as engine companies, ladder or service companies, deployment of fire companies, equipment carried on apparatus, pumping capacity, reserve apparatus, company personnel, and training.

When it comes to evaluating fire engines, ISO relies on NFPA 1901: Standard for Automotive Fire Apparatus. The main items reviewed include tank capacity, pump size, quantity of attack and supply hose, and pump and hose testing. There’s no age limit for an engine, and as long as it meets minimum...
requirements, the engine can be used in the grading. The analysis of the pump test program and hose test program—if a department does those processes annually—can account for 25 percent of total engine points.

There isn’t an age standard for ladder trucks either. A ladder truck can have a straight stick or an aerial platform, rear-mounted or mid-ship. It should be equipped with ground ladders and other ladder company operations equipment. ISO reviews the ladder test program, which includes an annual destructive test and a 5-year nondestructive test. The aerial device should be as tall as the highest building in the community, up to 100 feet. For example, if the community has a seven-story building, the department needs an aerial device of 75 feet or higher. If the community has a 15-story building, height of the aerial is capped at 100 feet.

Many departments ask about the meaning of the term “service truck.” A service truck is a ladder truck without an aerial device. It can carry ladder company operations equipment similar to a ladder truck, such as ground ladders, ventilation fans, rescue tools, a generator and lights. As to whether a fire department needs a ladder truck or a service truck, the answer depends upon the number of buildings three stories or higher and whether needed fire flows (NFF) are greater than 3,500 gallons per minute.

For communities that haul water or use alternative water supply sources, ISO reviews tankers in these operations. ISO credits apparatus based on the community’s needs, which are determined by its basic fire flow or how the fire department operates. If the survey reveals the community requires two fire engines, ISO expects the community to maintain two, and they can be housed in separate fire stations. Additional fire engines and ladder/service trucks can receive credit as reserve units. Reserve need is based on the amount of in-service apparatus. Automatic-aid fire engines and ladder/service trucks can meet the requirement for trucks in a community.

The review defines automatic as aid dispatched to all reported structural fires every time, all year round, and it must meet ISO minimum requirements.

Finally, the equipment on the apparatus is also a factor. ISO evaluates that equipment and follows the recommendations for equipment outlined in NFPA 1901.

**For more**

To learn more about ISO community hazard mitigation, PPC and the FSRS, visit isomitigation.com.

Joseph W. Fratantaro is manager of Community Hazard Mitigation for ISO, a Verisk Analytics business.
Almost by accident, the Redmond, WA, Fire Department found that when it came to poisonous gases in firefighters’ blood streams, being outside near the apparatus was worse than going inside a burning structure with an SCBA.

Specifically, officials found that the carbon monoxide emitted from idling apparatus was a huge contributor to the elevated CO levels found in the department’s engineers and incident commanders.

“We were becoming more concerned about general CO levels in firefighters,” said Redmond Battalion Chief Mike Hilley, who is the department’s medical services administrator. “We started measuring everyone and found that firefighters going inside, with air packs, had 0 to 1 to 2 percent levels of CO. Then, we tested engineers and battalion chiefs and found that they had 5, 6, 7 percent CO levels.”

That was a startling discovery, Hilley said, noting that when levels are 15 percent or higher, patients are hospitalized for hyperbaric treatments.

“We found our larger CO exposures were from standing around the apparatus,” said Hilley, who is also Northeast King County’s medic and Redmond’s public information officer and safety officer. “Even if the engine is not actually pumping, and they are two, three or four deep, that’s a lot of CO.”

Some of Redmond’s older apparatus currently have systems to idle up the engines to ensure that the electrical systems are not compromised. That just makes conditions worse with engines sitting at high idle.

Going green
Hilley said Redmond is a “green” community that strives to be environmentally and health conscious. So based on the findings, it made sense for the department to find a way to reduce or eliminate as much of those noxious emissions as possible.

Redmond’s ecofriendly efforts had already begun years before with the purchase of alternative fuel, hybrid and all electric vehicles for use throughout the city’s fleet as a way to reduce emissions and save fossil fuels. So it made sense when Redmond officials started thinking about purchasing new fire apparatus that it looked at systems to reduce idling and the associated emissions. With idle-reduction technology, only the apparatus that is doing the pumping or the aerial operations needs to have chassis engines running; all the other apparatus in staging or working other assignments are shut down.

Hilley said Redmond worked with Pierce Manufacturing to come up with apparatus that was equipped with idle-reduction technology. He added that Redmond is an all-Pierce
department, which has helped standardize the fleet, not only for training purposes but with maintenance, too. The department recently purchased three Pierce engines and a Pierce aerial with idle-reduction features.

The system Redmond uses includes a small generator and a system of batteries that keep vital apparatus systems functioning without having the big, diesel engines running.

“When you pull up and put it in park, a small generator kicks on after a certain period of time and shuts down the big engine,” Hilley explained. “That way you can still have all the lights on, the compartment lights, and still plug in things without all the engines running. We reduce idling, reduce the hours on the engine and reduce all the emissions.”

**Safety and health first**

Hilley said one of the things that pushed Redmond into installing the equipment on new apparatus was the discovery of an exhaust leak on a brand new SUV command vehicle. The operator had vague symptoms of headaches and other odd feelings, he said. The source was found by accident after a CO meter was put on him and the source of the poisoning was discovered.

Redmond didn’t purchase the new idle-reduction systems with that solely in mind, but the health and safety of the personnel was a big factor. Hilley said every medic unit in the city has CO monitors, and checking CO levels in firefighters has become routine during rehab: “We are hoping to see a real reduction in CO levels,” he said.

Last year, Redmond had a total of 10,955 responses with a breakdown of 4,916 aid calls, 3,825 paramedic calls and 2,214 suppression calls, Hilley reported. He added that with three-person stations, the apparatus get used a lot and end up idling at scenes, producing a lot of emissions that the environment and the firefighters can do without.

“Where we really noticed it was nursing homes and stores,” Hilley said, adding that crews would pull up for assisting an ambulance or checking an alarm and suddenly find the lobby areas filled with fumes from the trucks.

“Even on a car wreck, we’d be working the scene with the rig idling right next to where we’re working, throwing CO everywhere,” Hilley said, noting that now, with the new technology in place, the scenes are a lot quieter with fewer big apparatus running. “Now we can have a nice quiet scene and we can hear what we’re doing,” he said.

Hilley credits Redmond’s Fire Apparatus Program Supervisor Doug Jones, whom he said did a lot of research to come up with the system best suited for the city’s application.

Redmond’s venture into idle-reduction technology has piqued interest from neighboring fire departments that are looking at the benefits and seeking advice.

“We have the unions and the fire chief’s associations getting behind this, as we are all concerned about preventing cancer,” Hilley said, adding that he couldn’t imagine the city buying additional apparatus without idle-reduction features. “It’s a matter of safety. It wouldn’t be appropriate to have some firefighters have the benefit and others do without it.”

**Other systems**

Many of the major apparatus manufacturers offer some form of idle reduction or auxiliary power units as an option.

Rosenbauer America was one of the first to the market with its Green Star IRT system in 2009. The feature has been installed on literally hundreds of apparatus across the U.S. and Canada.

The company has three systems, one that uses a 7.9-kW generator that produces AC current to run everything on the apparatus and provide 120 and 240 volts for scene operations.

For nearly 30 years Ward Diesel Filter Systems has been protecting the air you breathe by stopping harmful diesel exhaust at its source, both in the station and on-scene.

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Rosenbauer also has two battery systems. The first system replaces chassis batteries with lithium batteries to provide up to 8 hours of scene operations without the engine running. It requires LED scene and warning lights, as well as a 120-volt AC inverter and a diesel-fired cab heater. The second battery system uses deep cycle batteries and works much like the lithium system, but with a 3-hour run time.

E-ONE also offers auxiliary power units for apparatus. Winnipeg Fire Paramedic Service in Manitoba, Canada, recently purchased an E-ONE 100-foot aerial platform with the technology incorporated into the apparatus.

“Our innovation committee is dedicated to making equipment smarter,” said Kevin Munoz, fleet commander for the City of Winnipeg.

Winnipeg serves a population of over 700,000 spread across 184 square miles. The city responds to an average of 64,000 incidents per year, so Munoz said efficiency is important.

The system on Winnipeg’s E-ONE platform is an IRT 10K160 diesel Auxiliary Power Unit (APU) manufactured by Harrison Hydra-Gen. It is designed to reduce fuel use as well as engine wear by taking over the core power functions when the chassis engine shuts down. It starts automatically when the truck is stationary, providing power for such functions as heating and light.

“This integral component of the E-ONE platform has proven to save fuel,” Munoz said. “Just as importantly, it reduces maintenance costs for our department, saving the city money.”

Ed Ballam is the industry and products associate editor for Firehouse, a captain with the Haverhill Corner, NH, Fire Department, and a National Registered EMT.
You dream it. We build it.

Vancouver Fire and Rescue

Vancouver has a population of over 600,000 people and rests on top of the Cascadia fault line, one of the most dangerous fault lines in North America. So when Vancouver Fire & Rescue decided to purchase their new Technical Rescue, the choice to go with SVI Trucks was clear. SVI has produced Heavy Rescue trucks for the largest cities throughout Canada and the US. With SVI’s expertise in designing, fabricating and delivering rock solid trucks - as well as mounting specialized equipment - we make your purchasing decision a clear choice. Learn more about this truck and others at svitrucks.com.
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