POTENTIAL PROBLEMS SURROUNDING 10-YEAR FIRE ALARMS WITH SEALED BATTERIES

What You Need to Know to Stay Safe!

Proposed state legislation mandating the installation of “10-Year Smoke Alarms” with “Sealed Batteries” may unwittingly put consumers at risk. The potential premature expiration of lithium batteries coupled with spurious alarms are cause for concern.

There is a burgeoning movement underway that would require households to install "10-Year Smoke Alarms" powered by "tamper-proof /non-replaceable batteries". Based in part on the fact that all batteries, no matter what the chemistry, technology or brand, are prone to premature expiration and that current test methods do not adequately simulate "real-world" applications, Energizer and Duracell believes that this policy is misguided and will actually make consumers less safe.

Introduction

In 2013, we saw the introduction and/or passage of legislation in various states, aimed at requiring that all batteries that power smoke alarms be "sealed" or "tamper-resistant" (i.e. inaccessible to the consumer) and capable of providing power to the alarm for 10 years. The prevailing motivation for this legislation is to try and prevent casualties that may arise as a result of smoke alarms and their power supplies not being adequately maintained in working order by consumers. Evidence suggests that a contributing factor to fatalities in house fires is alarms that are inoperable due to a disconnected, missing or "dead" power source. It is thought, by some, that by mandating a 10-year battery, in a sealed housing, that this will mitigate the possibility of consumers either forgetting to replace their batteries on a periodic basis or prevent them from removing batteries as a means of silencing nuisance alarms, thus making the consumer safer.

Premature Expiration

Energizer and Duracell have always held that consumer safety is of paramount concern, however, the proposed mandate that would require the installation of 10-year smoke alarms with "tamper-resistant" batteries, although well meaning, is equally misguided. Regardless of brand, technology or chemistry, all batteries are subject to the potential risk of premature expiration. The lithium manganese dioxide batteries that currently power these 10-year alarms are no exception. In fact, a cursory review of consumer comments regarding their experiences with these alarms consistently speaks to batteries which only lasted a few months to a few years before failing, far sooner than the purported 10-year claim. The problem of premature expiration might in fact be more systemic in nature than the consumer complaints allude to. One study, conducted for the Center for Disease Control, for a subset of homes that had participated in the "Smoke Alarm Installation and Fire Safety Education Program", concluded that only 78% of the smoke alarms that still had the lithium batteries installed were functional at the time of evaluation[1]. In another study, it was found that failure rates of alarms increased with age, and that after 10 years, approximately 30% of the smoke alarms were inoperable[2]. These numbers, from two separate studies are more than a little disconcerting, in that they speak to failure rates that lie between 20-30%. If a specific technology is going to be mandated by the Government, the consumer would expect or rather demand a success rate far closer to 100% especially given the criticality of the application.

Questionable Test Methods

Unfortunately, some of these results may not be surprising, especially when one considers that the current UL testing guidelines allows for "provisional listings" of alarms. So although some 10-year battery smoke alarm products are indeed tested for 10 years, others, which receive a provisional listing, may only be tested for as little as 1 year. Furthermore, in conversations with UL Engineering Representatives,[3] it was confirmed that under current UL testing guidelines, 1 in 6 batteries is allowed to fail the testing regimen and still receive a favorable rating. Whether or not a particular brand or product gets tested longer than 1 year is completely up to the manufacturer and the risk they are willing to assume in the event of a product recall. Unfortunately, the manufacturer isn't the only stakeholder who assumes some risk in this scenario – the consumer unknowingly also inherits this "life-safety risk" by relying on a 10-year product that has not been tested for 10 years.

The other notable problem most often cited by consumers is the high frequency of spurious nuisance alarms. Not only do these alarms erode the confidence of the consumer, and call into question the ability of the alarm to distinguish a true casualty condition but it also serves to drain the battery unnecessarily. Standard UL 217 requires that non-replaceable batteries be able to power the unit for their stated life (10 years in this case) at ambient conditions in the standby mode and then be able to operate the alarm for a minimum of 4 minutes, followed by 7 days of trouble signals (i.e. chirping). We believe that the accelerated testing methods that UL employs to ensure this, artificially inflates the capacity / energy left in the battery at "end-of-life" and doesn't actually reflect or replicate the efficiency of the battery during an actual alarm. During an accelerated test that lasts a matter of days as opposed to 10 years, the detrimental and harmful environmental corrosion effects associated with the ingress of water and carbon dioxide into the battery are drastically minimized. Additionally, the formation of films on the internal electrode surfaces, which result in decreased battery performance are also greatly reduced – having the net effect of over-predicting the batteries performance at end-of-life.

Another potential short-coming in the UL test methods is that temperature transients common in consumer homes are not considered as UL tests in climate controlled laboratories. Even small swings in temperature can have a pronounced and detrimental effect on battery performance and service life, as transients promote corrosion reactions and can increase the solubility of impurities in the electrolyte.

False Sense of Security

In marketing these units as "10-year alarms", consumers may be unintentionally left with the impression that these units are "maintenance free" and require no attention after initial installation. This is a false and dangerous pretense however, as these units do require periodic testing and dusting to keep them in working order. The consumer will more than likely be less inclined to do this maintenance if they no longer have to replace the conventional 9V battery every 6 months as advised in the long standing "Change your Clock, Change your Battery" public service campaign. This potential failure to monitor the alarms functionality on a monthly basis, as recommended by alarm manufacturers, is a probable result of a false sense of security felt by the consumer, which will ultimately increase the risk borne by them if

they no longer feel compelled to carry out such routine inspections.

To further complicate the issue of using sealed batteries in 10-year alarms, when and if the batteries fail, the entire alarm must be replaced, as opposed to just the batteries. In an age of conservation, this is a marked departure from what would be considered a sustainable design. Since these units also sell at a price premium to the more conventional units with replaceable batteries, this places an additional financial burden on the consumer. Fire safety professionals advise that at least 1 alarm be placed on each floor of a house, in addition to an alarm outside of each separate sleeping area. The higher price point commanded by the long-life alarms will undoubtedly have the unintended consequence of discouraging consumers, especially lower income households, from installing the alarms in all recommended locations, once again increasing their risk and compromising their safety.

Conclusion

Energizer and Duracell have been and will continue to be a staunch supporter of fire safety initiatives and a partner to those in the industry. In keeping with our long standing tradition of working with Fire Safety Professionals, we felt compelled to address some of the limitations and inherent problems associated with the reliability of the lithium manganese dioxide batteries that power some of the 10-year fire alarms that are currently being mandated for residential installation, at the state level.

While we would ultimately like to see a solution which improves the safety of all consumers and diminishes the chances of fatalities attributed to faulty alarms and exhausted or missing power supplies, we believe that a mandate advocating the use of a 10-year alarm is premature and unwarranted. The battery technology, in its present state, does not support 100% reliance on these devices and it is the consumer, not the Government, that should ultimately have the final say as to which technology gets implemented in their homes lest you diminish their autonomy.

1 National Association of State Fire Marshal Science Advisory Committee, "Recommendation on Updates to the NASFM Smoke Alarm Guidance Document Regarding the Use of 10-Year Long Life Batteries, April 2012 Page 4

2 Ibid Page 3

3 UL Conversation dated 12/16/13