U.S. Consumer Product Safety Commission
LOG OF MEETING

SUBJECT: Teleconference meeting with PGMA

DATE OF MEETING: July 13, 2017

LOG ENTRY SOURCE: Janet Buyer, Engineering Sciences

DATE OF LOG ENTRY: September 7, 2017

LOCATION: Bracewell Law Office, Washington, D.C.

CPSC ATTENDEE(S):

Name	Affiliation
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Janet Buyer	CPSC
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Jonathan Midgett	CPSC
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NON-CPSC ATTENDEE(S):

Name	Affiliation
Tom Kim	Honda
Gary Koga	Honda
Shosaku Chiba	Honda
Kazuya Miwa	Honda
Koichi Asai	Honda
Patty Hanz	Briggs & Stratton
Greg Marchand	Briggs & Stratton
Brandon Nigh	Briggs & Stratton
Mark Willer	Briggs & Stratton
Ryan Janscha	Briggs & Stratton
Mark Sarder	Champion
Greg Pauken	Champion
Dennis Lamberty	Champion
Greg Wischstadt	Genera
Brandon Schmidt	Generac
Kevin Cole	Generac
Robert Motl	Wack Neuson
Tom Pugh	Yamaha
`Dereck Schoeberle	Yamaha

Ed Krenik	Bracewell
John Lee	Bracewell
Susan Orenga	PGMA
Joe Harding	PGMA
William Wallace	Consumers Union
Steven Emmerich	NIST
Greg Knott	OPEI
Dale Hamilton	City of Montgomery
Ed Stetter	Spec Sensors
Michael Gardner	Techtronic Industries
George Brandon	Techtronic Industries
Roger Gault	EMA
Mark Swanson	Walbro
John Galeotafiore	Consumer Reports
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Scott Stefaniak	Champion
Mike Savage	City of Rio Rancho
Mike Flegel	Reliance Controls
Brad Van Otterloo	Mi-T-M
Jim Wilson	PGMA
Marian Heyman	CT Dept of Health
Charon McNabb	National CO Awareness Assoc

SUMMARY OF MEETING:

- The purpose of this meeting was to review test results and simulation results from PGMA members to date and provide a detailed rationale for the proposed revisions the ANSI/PGMA G300 standard, *Safety and Performance of Portable Generators*, to limit carbon monoxide (CO) exposure in the event of misusing a portable generator in an enclosed space.
- PGMA defines unsafe usage as scenarios that allow CO to accumulate. They conducted testing with different size generators in shipping containers (with partition to represent two zones), 2-story house (in basement, entryway, and "attached garage" simulated with plastic sheeting set up outside entryway), attached garage (with door closed and partially open), between garage and shed that are about 5' apart from one another. They also showed video of this testing.
- Graphs were shown with data of CO at cold start and during load transients and CO accumulation at different load levels.
- They tested for CO migration in a 15'w x 20'l x 10'h using an array of 16 sensors located a few feet above the generator powered by a 439 cc carbureted engine that shutoff when the CO at the generator reached 200 ppm. Maximum difference among the CO sensors was 89 ppm when the generator shutoff and the difference decreased to less than 20 ppm afterward. They found that in the source location that the CO mixes to a relatively uniform concentration very quickly.

- They also conducted migration testing with an 8-kW carbureted generator in the shipping container mentioned above to represent a single-car garage and in a 2-car garage.
- They conducted testing in a basement with a generator producing 149 g/hr of CO.
- They also conducted testing in a partially-enclosed 2-car garage with a simulated attached living space. The generator's exhaust was pointed both inward and outward during the testing. Oxygen dropped very little at time of shutoff (assuming it shutoff at 800 ppm.
- They conducted testing in a basement with 2 generators, one producing 150 g/hr CO. Shutoff limit was 1200 ppm for the shutoff-equipped generator and also when they put a shutoff system on the generator producing 150 g/hr. The same shutoff limit of 1200 ppm for the 150 g/hr generator produced slightly higher predicted COHb to occupants in the basement than the other high-CO generator.
- They did "false alarm" testing to prevent nuisance shutdowns. They did this by testing both indoors and outdoors in a variety of scenarios. When generator is indoors, the CO constantly rises. When used outdoors, the CO constantly fluctuates or stays low, depending on the wind direction relative to the generator.
- They assessed sensor reliability and have a number of those issues addressed in G300, other issues they say has no impact, such as exhaust particulate. Sensor drift is less than 2% per year, validated by talking to multiple manufacturers of CO sensors. Temperature and humidity affect sensor reliability by less than 5-10% over the life of the sensor. They are confident that CO sensors are reliable over the expected life of the generator.
- They are considering revisions to G300 for self-monitoring so continual check is done to ensure system is functioning, otherwise set an electrically-detectable fault to shutdown the system, and tamper resistance so the system cannot easily be disabled. Also looking at requirements for CO sensor to comply with requirements in UL 2034, doing bench and room tests on the CO shutoff module, and complete testing on the generator. There will also be notification requirements after the system shuts the generator down.
- They listed the benefits of shutdown.
- They talked about intervention model, as opposed to hierarchy model, to reduce the hazard, because it stops the CO source.
- They showed 2 human factors videos with a generator that has reduced emissions that does not shut down and one that has a shutdown system on it. Shutdown system is a teaching tool because notification alerts consumer what is wrong. Shutdown is automatic, no shutdown requires proper human response to avoid hazard.
- They said CO shutdown will avert nearly all deaths. Also, it has minimal cost, so it will be more affordable to consumers and thus would penetrate the market quicker.
- Because of simplicity of the CO shutdown system compared to reduced emissions, it will be much quicker to implement. They also said the system is broadly applicable regardless of the type or size of the generator.

- The proposed limits in G300 were discussed. The limits need to balance protection with the utility of the generator so that the system can distinguish between hazardous and nonhazardous scenarios. The PGMA technical committee initially looked at the alarm activation points required in UL 2034 but found that the rapid accumulation of CO when a generator is operated in an enclosed space is too fast for those limits to provide protection.
- A single low level CO point for shutoff could protect in an enclosed space before too much CO accumulates but it could cause nuisance shutoffs when the generator is used outdoors in an area where the CO does not accumulate. To differentiate between the two scenarios, a time weighted average could be used instead, but that alone would not address rapid accumulation of CO because it doesn't respond fast enough. Therefore, they are going to use a high-level single point concentration and a time-weighted average to differentiate between accumulation and non-accumulation scenarios.
- To determine what the values for the single point and the time-weighted average should be, they looked at how COHb is calculated and used the death criteria used in the NPR and that injury is below the death criteria but above or equal to 20% COHb.
- PGMA's goal is to limit COHb to 10% at time of shutoff so that the user is still able to think clearly when the notification for shutdown occurs.
- They showed a graph showing that their data from testing a generator in a garage matches with CONTAM output.
- Using CONTAM, they found that the limits they chose show COHb is less than 4% at time of shutoff. They chose 800 ppm single point limit, to be responsive to rapid CO accumulation, and 400 ppm time-weighted average limit to maintain generator utility.

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