

The fiery debate over smoke-alarm efficiency

Gillette's ad claims for its photoelectric detectors anger makers of ion devices

Next month Gillette Co. plans to kick off a \$3 million advertising campaign for its Captain Kelly smoke alarms that will rub salt on a wound that has been festering for years. Gillette will claim that its smoke detectors give precious minutes of extra time to escape from the usual household fire - up to half again as much "escape time" as the kind of smoke alarm that now has 80% of the residential market.

The ads have already touched off a furor that could end up in court. Competitive smoke alarm companies such as General Electric, Honeywell, and Pittway vehemently deny Gillette's claims. And they worry that its ad campaign could confuse consumers, perhaps to the point of turning them off altogether on smoke alarms. Even the normally staid National Bureau of Standards is embroiled. Its tests are the ones Gillette cites as "proving" its advertising claims, but the NBS contests Gillette's interpretation.

The ads are only half the dispute. In a parallel action, the manufacturer of the Gillette alarms, Electro Signal Lab Inc., a subsidiary of American District Telegraph Co. (ADT), has persuaded Underwriters Laboratories Inc. to propose a stiff new standard for smoke detectors. The new test is so tough that some manufacturers could be wiped out of the market if it is adopted.

At stake is a market that has mushroomed from a paltry 50,000 units in 1972 to 5 million alarms worth \$175 million last year. And with 29 state building codes now stipulating smoke detectors in new homes, predictions for sales this year start at close to 10 million units and \$300 million. One of the leading manufacturers thinks that the total could climb to 12 million or even 15 million alarms. And most companies look for a 40% gain next year.

Government tests. Gillette figures to boost its market share - now a distant third or fourth - by claiming that government tests prove its photoelectric alarms are more effective than competitive ionization alarms in detecting the smoke

from typical household fires. That claim amounts to deceptive advertising, according to one competitor, "We are now gathering information for our lawyers, and I feel we may be able to make a case to stop them," says King Harris, executive vice president of Pittway Corp. Its BRK Electronics Div., which he boasts is now neck-and-neck with GE for the lead in smoke alarms.

But Robert E. Ray, president of Gillette's Appliance Div., is not intimidated by Harris' plans. "We are satisfied with our facts," he retorts, adding that the ad has been cleared by attorneys for Gillette and its advertising agency - and by the television networks. So he is going ahead.

Rival systems. Photoelectric detectors use a light source and a photo receptor - a light-emitting diode (LED) and a photo diode in the unit being made for Gillette, which ADT claims is the only battery operated photoelectric alarm available. The two devices are not lined up, so normally the receptor "sees" no light. But smoke particles entering the chamber scatter the light, and some of it "splashes" onto the receptor. If the receptor picks up enough light, the alarm sounds.

Ionization detectors work by bombarding the air in a small chamber with radioactive particles. These ionize or "charge" the air so that it will carry a weak electric current. However, when particles released by combustion enter the chamber, they interfere with the current's flow, and at a certain drop-off, the alarm triggers.

Comparison tests of the two types have been run by various labs, including Consumers Union of U.S. Inc., which published its ratings in the January, 1977, *Consumer Reports*. It found that ionization detectors respond more quickly to flaming fires. On the other hand, photoelectric units are much faster to respond to smoldering fires.

Overall, though, CU said it was unable to come up with "a clear answer to the question of whether the photoelectric or ionization detector represents a better bet for safety in the home." The optimum system, CU suggested, would be at least one of each type of alarm.

So far as ADT and Gillette are concerned, the crucial tests of the two

systems were made for the NBS by Underwriters Laboratories and the Illinois Institute of Technology's Research Institute. The NBS wanted to locate the best spots for smoke detectors in homes. So UL and IITRI installed both types side-by-side at numerous points in houses that were scheduled for demolition at the Indiana Dunes National Lakeshore. Then the researchers started various types of fires and timed how long it took for the alarms to go off.

The official report of the Indiana Dunes tests goes along with *Consumers Reports*. It states that "there is no apparent difference in life-saving potential between ionization and photoelectric detectors."

Interpretations. But ADT does not see it that way. The Gillette supplier dug into the statistical tables supporting the conclusion and came up with a different interpretation. "In smoldering fires, photoelectric detectors gave a great deal more escape time - on a weighted average, 11 to 12 minutes more," says Ulysses J. Brualdi, ADT's product marketing manager. That finding gave ADT and Gillette the ammunition they needed - Gillette for its upcoming ads and ADT for a road show that hard-sells the photoelectric story.

So far ADT has made its pitch in eight cities, talking to fire fighters, insurance executives, codes and standards people, and government officials. "We take a very basic position: We believe that smoke detectors should detect smoke," declares Brualdi. He says that smoke is the only universal signal in all dangerous fires, and the lethal agent in 90% or more of all home fatalities.

Responding to particles. But smoke is not what ionization alarms detect, Brualdi asserts. He says that they respond to invisible particles of combustion, not visible smoke. These tiny particles are always present in smoke, ADT admits "but their concentration drops rapidly with distance from the fire.

Thus an ionization detector that goes off at 4% smoke (smoke that obscures vision 4% per ft.) when it is 2 ft. from a fire might not blow the horn until 20% smoke when it is 10 ft. away. ADT claims that it is possible for smoke to build up to lethal levels without ever triggering an ionization detector in the far

corner of a room.

ADT's strident horn blowing has alienated fire experts at the NBS. Comments Bright: "They're not telling the whole story. It's unfortunate because it's going to confuse the public."

Time to escape. And Thomas E. Waterman, engineering advisor for IITRI and one of the three authors of the NBS Report on Indiana Dunes, thinks ADT has missed the point. "You generally have more time to react" to smoldering fires in the first place, he says. It only takes three minutes to get out of a house without climbing through a window, he figures, and ionization detectors give much more warning than that. "If you already have enough time to escape, why do you need a few minutes more?"

What is more, Harris of BRK turns the Gillette-ADT argument around. "In fires that are really scary - the kind that break out fast and spread fast - seconds count, not minutes. And ionization detectors are faster than those slow acting photoelectric units in flaming fires," he says, "so you better put your life on an ionization detector." That, Harris says, is the sort of ad that he could run, but he acknowledges that it would be as much a distortion of the facts as he says the Gillette claims are. The key question is, he says, "Will you have enough time to get out?" The answer: "Yes, you would - even with a photoelectric detector."

Harris considers the Gillette ad a desperation move. "I think Gillette is hurting. They're just not getting good market penetration." And since Gillette is the major private label outlet for Electro Signal, which ADT acquired early this year, ADT is also "going to any extreme" to produce results, he charges.

Gillette's Ray denies that there is trouble with the Captain Kelly line. He admits that the alarms got off to a slow start, but he insists that they already are profitable, "though barely so." And Donald F. Steele, president of Electro Signal, adds that the campaigns by his company and Gillette are merely a reaction to ads that claim ionization units respond "before signs of visible smoke appear." That may be so, he says, "but only if the detector happens to be 6 in. from an open fire."

The alarm's father. Steele's advocacy of photoelectric detectors is a new role for the man widely regarded as the father of the smoke detector. Since 1960 he has devoted himself to making the public aware of the benefits of smoke alarms, regardless of kind. He was the first to fix the alarm point at 4% smoke. In 1961 he

invited five friends to join him in a closed room where they burned all sorts of combustible materials. He found that no matter what was burning, when the smoke level got to 4%, everyone was choking and heading for the door. Later tests by UL and National Fire Protection Association "legitimized" the 4% limit.

If Gillette and ADT succeed in squelching some competition and changing the UL test standards, it will be poetic justice, says Richard M. Patton, a consulting fire-protection engineer. He points out that the ionization detector

manufacturers were the ones who first made a fuss over smoky fires. "They wanted to prove that they were much faster than a sprinkler system, so they downgraded the flaming fire and talked about smoldering fires, which are really the lesser problem," he says.

"But now that they've convinced the world that the smoldering fire is so dangerous, these other [photoelectric] people come along" and threaten their business, says Patton, adding: "It's like Shakespeare said -hoisted by your own petard."

AN ULTRA-STIFF TEST FOR SMOKE DETECTORS

Late last month, members of the Industry Advisory Council for Fire Detection met in Chicago at Underwriters Laboratories Inc. to discuss a new and much tougher qualifying test for smoke alarms. Partly the result of jockeying for advantage among manufacturers of the alarms, the proposed test is so stiff that, according to George Saunders, the UL managing engineer in charge, "some present models are not capable of meeting the requirements."

The proposed test would require smoke detectors to sound off at no more than 7% smoke (smoke that obscures vision by 7% per ft.) in a large room that is slowly filling with smoke from a smoldering source. UL had been mulling over such a test for months in response to charges that its current test regimen does not measure an alarm's ability to signal danger from a smoldering fire even though up to three-quarters of all fires in the home begin that way.

UL originally proposed that the alarms had to go off before 17% smoke. That percentage alarmed the National Bureau of Standards because it considers 15% smoke to be the maximum point for a safe evacuation. The NBS urged UL to drop the limit to 10%, but Electro Signal Lab Inc., a subsidiary of American District Telegraph Co. (ADT), argued for a still lower 4% standard. UL compromised at the 7% point.

Neither the original limit nor the ADT proposal was arbitrary. The 17% figure was set by testing the alarms that had already passed the current test series of four room-size flaming

tests plus a "smoke-box" calibration test. Virtually all of the units that got through those tests went off under smoldering conditions by 17% smoke, so UL figured that was a reasonable limit.

ADT's tests, on the other hand, showed that few ionizationtype detectors, which are more sensitive to flaming fires, could pass a room-size smoldering smoke test at much below 10% smoke. But its own photoelectric devices could breeze through at even 2% smoke. So a 4% limit would probably freeze out many of the ionization detectors, which now command 80% of the market.

NBS backing. The NBS is all in favor of the tougher tests, says Richard G. Bright, senior research engineer at the NBS Center for Fire Research. For example, he thinks the smoke limits for the flaming tests are also too high. The standard for the flame tests now ranges from 27% smoke for a paper fire down to 13% smoke for a polystyrene plastic fire. And he points out that UL will certify a given alarm even if half of the units fail the tests. But if UL proposed a test that not even the best ionization units could pass, the NBS would step in and recommend a change, Bright says.

If the 7% smoldering smoke test is adopted, some detectors will "without a doubt" need reengineering, says Joseph E. Johnson, president of Pyrotronics, a division of Baker Industries Inc. But he joins General Electric Co. and Pittway Corp. - leading makers of ionization detectors - in asserting that his company's alarms will have no trouble meeting the 7% smoke limit.