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Community devises ways to deal with lava

Students build a vog air scrubber, while scientists work on heat-resistant materials

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POSTED: 01:30 a.m. HST, Nov 17, 2014

LAST UPDATED: 11:17 a.m. HST, Nov 17, 2014

Vog air scrubbers made from off-the-shelf parts from a Pahoehoa hardware store. Heat-resistant fabrics to allow cars to drive over still-cooling lava. A water-cooled, heat-resistant bridge.

While Kilauea Volcano has been erupting since Jan. 3, 1983, the current flow that began spewing from one of its vents on June 27 has inspired innovation like never before.

Many of the ideas kicking around among government officials and scientists are still in the "what if" stages. But a few dozen students from Pahoehoa's Hawaii Academy of Arts and Science charter school will see their idea for a vog scrubber become reality Monday when it goes on sale at the Pahoehoa ACE Hardware store.

One of Logan Treaster's friends at the Hawaii Academy of Arts and Science had to move out of Puna two weeks ago because of the vog from Kilauea, which Treaster smells almost every day.

"It smells like rotten eggs," said Treaster, a 17-year-old senior.

ACE Hardware will sell the component parts for the students' vog scrubber for \$100. A fully assembled scrubber put together by the students will go for \$150, which means the school's science, technology, engineering and math (STEM) program will get the extra \$50 for future research.

But Treaster said it's more important to do something "really nice" for people affected by vog.

"It feels good to be able to help our community," he said.

The scrubber pulls the vog out of the ambient air with a fan and neutralizes the acidity with a compound similar to baking soda.

The students have come up with three other lava-related ideas. One is similar to new technology that Hawaii Electric Light Co. used to protect six poles directly in the path of the lava that has already crossed Apaa Street in Pahoehoa. And after lava undermined one pole wrapped in HELCO's anti-lava technology, the students came up with another idea they think is even better. They've also come up with designs for a water-cooled bridge that would dissipate heat and allow drivers to span roads overrun by lava.

"We teach giving back," said Eric Clause, Hawaii Academy of Arts and Science's STEM coordinator. "I also teach the kids, 'You can work the problem — or you can let the problem work you.'"

Every day, the lava flow has been met with 21st-century technology unavailable in 1990 when lava overran the coastal community of Kala-pana 11 miles away.

Janet Babb was a volunteer at the Hawaiian Volcano Observatory as lava approached Kala-pana, requiring her to mark aerial maps with colored pencils to painstakingly trace the path of the flow and point out critical landmarks for government officials and nervous residents.

Today, using GPS technology, computer software and a website monitored by scientists and amateur volcanologists around the world, the work that took hours now appears within minutes — and with far greater precision.

"In 1990 it was very different," said Babb, now a geologist and spokes-woman for the observatory. "We would go out to the flow field and do mapping and come back for a debrief, and we would have to use 35-mm cameras to make slides that would have to be filmed and reproduced. One of my jobs was to take colored pencils and color in maps before distributing them to emergency managers. Today what we do is available almost in real time, and now somebody sitting in a living-room chair in Wisconsin can be tracking Kilauea with much more accuracy. We know because we do hear from people on the mainland who go to our website faithfully every day."

Ken Hon, a geology professor at the University of Hawaii at Hilo, used road surveying equipment in Kala-pana to measure the then-new concept of "inflation" to gauge how much lava was filling in behind the front of the lava flow.

These days, Hon relies on thermal-imaging cameras, satellites, hand-held GPS devices and drones flown by his UH-Hilo colleagues to more accurately measure the rate of inflation and to monitor various hot spots hiding beneath cooling lava.

"Compared to what we were doing in Kala-pana, the accuracy of these maps has gone up a couple orders of magnitude," Hon said.

Ryan Perroy, an assistant professor of geography and environmental science at UH-Hilo, flies a \$10,000 drone with a 31.5-inch wingspan over the lava field to bring back high-resolution images that are turned into three-dimensional topographical maps.

"We can see how the flow is able to puff up and inflate," Perroy said. "It's not just interesting scientifically, but if we can better understand how the volcano's behaving, we can start to make predictions on where it might break out next. No one has ever done this before. It's pretty exciting stuff, and we're excited to be part of it."

Scientists at the Hawaiian Volcano Observatory are still in the thick of tracing the flow and marking its progress before they can even start to analyze all of the new data that's pouring in using modern equipment, Babb said.

But plenty of new ideas for dealing with the effects of the flow continue to percolate.

Hon worked with HELCO to develop its lava-resistant technology to protect HELCO's critical power poles on Apaa Street.

HELCO crews wrapped the 70-foot poles in an initial layer of insulation that's used to keep power plant boilers from overheating; a concrete base with holes normally used to let water flow through dry well culverts; and cinder held onto the pole by "horse wire."

But the first pole in the path of the lava began smoking and suddenly dropped 10 feet. Although it's now surrounded by lava, the pole still stands. But HELCO took it out of service just in case.

Looking back, Hon said the pole-wrapping idea had a crucial flaw: The holes in the concrete culvert apparently allowed methane gas to seep in and ignite the pole.

"When we modeled the pole, we modeled it as a piece of wood, not a piece of wood (that already had been) soaked in petroleum products. It turned out to be a crucial error because we thought it would take a week to burn. But it burned almost immediately."

Firefighters have since soaked the remaining poles in water and flame-retardant foam.

Hon is now talking to various officials about employing different gravels and "some sort of geo-fabrics" to be placed on top of cooling lava that has crossed highways.

Although county and state road crews have built three emergency roads out of lower Puna in case it gets cut off from lava, Hon said the idea for a quick and temporary way to drive over cooling lava would cut commutes by hours.

"The question is, Can we engineer something that's safe?" Hon said. "We're trying to come up with fabrics to put down to aid with structural integrity. You don't want people driving when there's actual lava moving, and it would have to be highly supervised and regulated."

Even if some of the ideas never become reality, Hon said it's important for worried residents to know that lots of things are being considered.

"Just for the psychological effect," Hon said, "it's good for people to know that people are trying lots of different things, rather than just sitting back and passively waiting for it to happen."

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Hawaii Academy of Arts and Science students Chalongrat Prakopdee, Jordan Drewer, Maya Andersen and Logan Treaster assemble a Vog air scrubber that they began selling at the Pahoia ACE Hardware store on Monday.