GEOLOGY

Mud Eruption Threatens Villagers in Java

As a torrent of hot mud swamped rice paddies and inundated villages on the Indonesian island of Java, emergency crews last week started drilling a well to plug the eruption. A gas exploration project appears to have punctured a 2700-meter-deep geologic formation, releasing an unprecedented volume of pressurized steam and water that is carrying a river of mud to the surface. The geyser, which began in May, has made more than 10,000 people homeless and put many out of work as well. Experts say it may take until late November to shut down the leak.

The accident occurred near the coastal city of Sidoarjo, about 700 kilometers east of Jakarta, reportedly while the firm Lapindo Brantas Inc. was drilling an exploratory gas well. According to Rudi Rubiandini, a petroleum engineer at Institut Teknologi Bandung and adviser to Indonesia's Ministry of Environment, drilling had reached a depth of about 2800 meters when the accident occurred on 29 May. The drill string had become stuck in the well, he says, and while the crew was trying to free it, a geyser of mud and water erupted from the ground about 150 meters away.

Rubiandini says the well goes through a thick clay seam from 500 to 1300 meters, then sands, shales, volcanic debris, and into permeable carbonate rock. Highly pressurized hot water and steam from the carbonate formation, he says, appear to have broken out below the point where the equipment was stuck in the well and either eroded a channel to the surface or followed natural fractures. Along the way, the river of hot, brackish water is eroding the clay layer to brew the hot mud that eventually rises to the surface. Some have speculated that this is a naturally occurring mud volcano, but L. William Abel, an American drilling expert advising Lapindo Brantas, says he believes the mud flow results from a drilling breach of a deep, pressurized reservoir.

Abel, whose ABEL Engineering/Well Control Co., based in Houston, Texas, has been involved in containing well accidents worldwide, says the volume of mud flowing out of the ground—about 50,000 cubic meters per day—is unprecedented. The mud has spread over 240 hectares, swamping whole villages, factories, shrimp farms, and rice paddies. The first attempt to block the flow was stymied in early August when the site was threatened by the rising tide of mud.

Efforts to block the flow had to wait while workers erected a higher retaining wall around a work site about 500 meters away from the original well. On 18 September, a drilling crew started on the first of two relief wells that they hope will intercept the original well within the shale formation 1500 to 1800 m down. They will then pump in high-density drilling mud to hydrostatically plug the leak.

Abel says this is a standard drilling industry technique; he is confident it will work. "There has never been one blowout in the history of drilling that was too tough to fix," he says.

The land around the geyser, meanwhile, is subsiding as the underlying clay erodes. Some 1400 military personnel are building containment ponds to hold the mud and water that continues to flow to the surface. Local and national officials are considering diverting the gunk into a local river and the sea. But that would be "a big disaster for fisheries and tourist areas," says Eko Teguh Paripurno, a geologist who heads a disaster research center at the University of National Development in Yogyakarta. Until the geyser is capped, Indonesian officials face a difficult choice between fouling additional land or the sea.

–DENNIS NORMILE

Liquid landscape. Steam and water from a deep carbonate formation are spreading mud over villages near Java's coast.

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