PPC’s previous method of calculating its lignite volumes and excavator deposits was to use terrestrial surveying instruments such as LiDAR scanners. However, these ground-based methods took a long time and were dangerous.

"Fumes, gases and dust are dangerous for people to breath," says Dimitris Michailidis, Surveyor Engineer, Head of Surveying Subsector of Kardia Mine. "To survey our excavations, my team would need to scan five or six separate points on deposits, which would require us to create additional access points for each of them."

Because of the challenging and dangerous geography of PPCs mines, as well as the size and the strategic importance of their lignite extraction, PPC’s survey team needed a faster and safer method of surveying each mine than was possible with terrestrial survey equipment. They still needed, however, a method that would provide geographically accurate data.

“With drones, it’s now easier to survey the entire mine, which was very difficult in the past because it’s too big for terrestrial surveying.”

PPC’s mining operation spans 170 square kilometres. At the Kardia mine alone, the company excavates around 40 million cubic metres of materials, of which 10 to 20 percent is lignite. Lignite is extremely important to the country’s energy needs and is the material that—once processed—powers many of Greece’s homes. In fact, PPC produces roughly 40 percent of Greece’s power using lignite (Greece also depends on mix of hydroelectric and gas plants for its energy). Lignite is abundant in the subsoil of Greece, and the country is the second largest producer of lignite in the European Union, sixth in the world.

How **Survey Drones** Are Improving **Mine Operations** & Helping Power Greece’s Homes

**COMPANY**

*Public Power Corporation S.A. (PPC) is the largest electric power company in Greece. PPC operates several mining operations across the country, including four mines in West Macedonia (Amintaio, Kardia, Main and South field).*

**CHALLENGES**

- Survey faster way while maintaining high mapping accuracy
- More accurate volume measurements
- Find a safer method to survey the mine, specifically inaccessible areas and the unreachable areas
- Find a more efficient way to respond to emergencies at the mine, such as landslides

**Enables the surveying of previously unreachable areas of the mines while increasing the accuracy and frequency of the mine surveys**

**Dramatically improved the accuracy of the mines’ volume calculations, resulting in potential savings of €10k on contractor excavations**

**Reduced mine survey time from one week to seven hours**

**Improved safety of survey team**

**Saved approx. 50,000 Euro savings per mine (4 in total) per year vs. using external terrestrial surveying suppliers**

**“The mine is huge, and thanks to the drone, we can survey the area much faster than we could before.”**
To overcome their challenges, PPC’s team decided to explore the drone mapping tech benefits provided by senseFly’s eBee fixed-wing drone.

According to Kostas Pilalidis, Surveyor Engineer, Head of Surveying Subsector at PPC’s South Field Mine, it used to take the team more than a week to complete a full survey of one mine, and only to areas that were accessible to the team. But with its vast coverage area and easy-to-use eMotion flight-planning software, the PCC team found that they could use the eBee to reduce surveying times.

“When we bought the eBee we didn’t realise just how much we’d benefit from it,” says PPC Surveyor Engineer Loukas Myronidis. “The mine is huge, and thanks to the drone, we can survey the area much faster than we could before.”

The teams’ enthusiasm for the eBee is a sentiment shared by Michailidis, who found the drone more than capable of fulfilling the mine’s diverse surveying requirements.

“Every month we need to survey all the excavations of the mine, all the lignite stockpiles and all the depositions of barren excavation products,” Michailidis explains. “And every two or three months we survey the rest of the mine. With drones, it’s now easier to survey the entire mine, which was very difficult in the past because of its size.”

From there the surveyors, like Loukas, execute the flight plan. “We mostly use the drone to measure volumes of lignite and the volumes of deposits from the mine excavators,” he says.

The PPC team then process all their flight data with Pix4Dmapper and use the resulting digital surface model (DSM) and orthomosaic generated to create a Virtual Surveyor file. Next, Michailidis’ team remove all the unnecessary information from the DSM, such as tracks and excavators before they measure volumes and draw break lines so that they can print drawings of the mines and share those drawings with other departments.

“Before we started using drones, whenever I had to survey a large area with nine excavators and nine levels, the reality was that I might get hurt. I might fall. Now that we use drones, I can stand in a safe area and launch the drone.”

“The eBee has made it much easier for us to collect survey data and share this data across other departments and with engineers at the mines,” says Lukas.

But what good is sharing data if that data isn’t geospatially accurate? Thankfully, Michailidis and his team have found the eBee to be more than adequate when it comes to providing accurate mapping data.

“But we started using drones, whenever I had to survey a large area with nine excavators and nine levels, the reality was that I might get hurt. I might fall. Now that we use drones, I can stand in a safe area and launch the drone.”

“The eBee has made it much easier for us to collect survey data and share this data across other departments and with engineers at the mines,” says Lukas.

By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost.”

The eBee has also proven successful in streamlining Michailidis survey workflow, along with that of his teams.

“We do the flight planning using eMotion in the office before the flight. I select the area to survey. I set the resolution in the overlap settings, and after I finish, I give the plan to an operator and they execute the flight,” he says.
The use drone technology has been successful for both PPC and the company’s survey team. The visuals possible and geospatial accuracy achieved with drones has left Michailidis thrilled by the results, stating that productivity has increased while surveying cost has decreased.

In terms of money saved, prior to using drones, Michailidis explained that each mine had to pay a minimum of 50,000 Euro per year to a surveyor contractor to perform a complete survey of the mine.

“We immediately went and surveyed it with eBee Plus RTK/PPK,” recalls Michailidis. “The next morning, all the results of the surveying were ready for us to present to the president of PPC, the minister of environment & energy (Mr. G. Stathakis), the mayors of the area and all the directors of PPC. That’s something that would have been unthinkable in the past, especially in just one day.”

Results

- Complete survey of the mine now takes two hours for flights and five to process the data (down from one week)
- Survey team can map the mines from a safe distance thanks to drone’s remote-mapping capabilities
- Site has maintained a high level of geospatial accuracy with drones
- Reduction in surveying costs and increase in productivity

We usually fly the eBee about 100 or 200 meters in the air, but that depends on what level of detail/resolution we need,” says Myronidis. “We always use the drone’s RTK function, and we have two GPS stations that belong to us, so we connect to our GPS stations, which is a short distance from the mines, and that results in greater accuracy, down to almost 5 centimetres, which is good enough for us.”

“We with drones, our surveying is accurate and detailed, and that’s important to us because we can produce better mine plans and execute these plans better.”

in the Amintao Mine, resulting in 90 million cubic metres of earth being moved.

“We immediately went and surveyed it with eBee Plus RTK/PPK,” recalls Michailidis. “The next morning, all the results of the surveying were ready for us to present to the president of PPC, the minister of environment & energy (Mr. G. Stathakis), the mayors of the area and all the directors of PPC. That’s something that would have been unthinkable in the past, especially in just one day.”

“With drones, our surveying is accurate and detailed, and that’s important to us because we can produce better mine plans and execute these plans better.”

in the Amintao Mine, resulting in 90 million cubic metres of earth being moved.

“With drones, our surveying is accurate and detailed, and that’s important to us because we can produce better mine plans and execute these plans better.”

In terms of money saved, prior to using drones, Michailidis explained that each mine had to pay a minimum of 50,000 Euro per year to a surveyor contractor to perform a complete survey of the mine.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in 25 to 30 minutes with a drone.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.

“By using drones, we have seen a great increase of our productivity and at the same time we’ve reduced our surveying cost,” says Michailidis. “With the drone’s accurate measurements, we can reduce our surveying cost. We sometimes pay 50 to 100 million Euros to contractors for excavations, so even one percent better volume measurements with our constructor excavations could mean, for example, saving 100,000 Euro annually.”

What used to take a surveyor more than a week can now be accomplished in seven hours (two hours for flights and five hours to process the data),” says Pilalidis.