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SUCCESS STORY

Smartphone - Based Borehole Deviation Measurement in Mining

INTRODUCTION

Accurate drilling is essential to ensure effective rock fragmentation, avoid floor irregularities, control fly rocks, and improve overall safety and productivity in blasting operations. Traditional deviation measuring devices like the Rodded Boretrak are reliable but expensive and complex. This study investigates the viability of replacing such systems with a standard **smartphone** using **in-built 3D accelerometer and magnetic sensors.**

Representation of phone case

The research conducted by O-Pitblast, engineers, sought to validate this approach by comparing measurements from a **Samsung Galaxy S8** to those from the Boretrack in a real quarry environment.

OVERVIEW

The smartphone solution involved 2 Android applications:

- **Deviation Measuring App:** Periodically records sensor data (once per second), calculating azimuth and inclination **using the LSM6DSL accelerometer and AK8963 magnetometer.**
- **Control App:** Captures metadata like hole number, offset, and step size, and synchronizes timing with the measurement app.

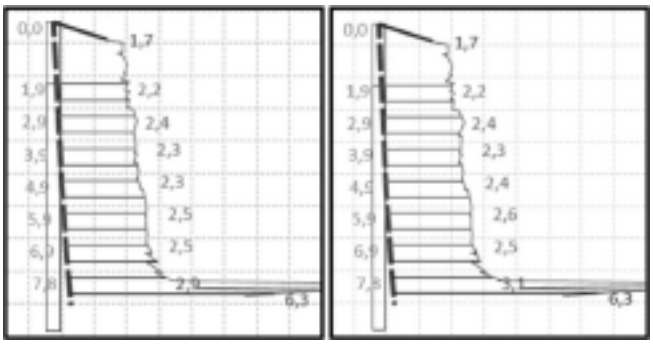
A custom waterproof capsule was developed to safely lower the smartphone into the hole. Measurement steps were marked every meter using cable markings.

Bench Height	10 m
Hole Diameter	89 mm
Burden	3.2 m
Spacing	3.2 m
Subdrilling	1 m
Stemming	2.7 m

Blast Pattern Parameters

GOAL MEASUREMENT

- Validate smartphone-based hole deviation measurements.
- Compare against traditional Boretrack measurements.
- Statistically analyse accuracy.
- Evaluate field usability and economic feasibility.



Side-by-side comparison of Boretrack measurement and phone measurement

CHALLENGES

1. **Physical Compatibility**
   The smartphone case did not fot boreholes smaller than 79mm in diameter.
2. **Magnetic Interference**
   Limits usage to non-magnetic rock environments.
3. **Data Quality**
   9 values were removed for cleaner statistical analysis due to presence of outliers.
4. **Sensor Sensitivity**
   Some fluctuations requires averaging to reduce measurement spikes.

RESULTS

The smartphone system showed high accuracy compared to traditional Boretrack equipment across 123 measurements in 8 boreholes.

- **Mean error**: < 3 cm
- **Standard deviation**: < 5 cm
- **Maximum deviation**: < 8 cm (for 10 m deep holes)
- **Visual comparison**: Borehole profiles nearly identical.

Benefits

- Easy to use with minimal training.
- Mobile app records and syncs data automatically.
- Ideal for small to mid-sized.

To read the full article, don't hesitate to reach out to the O-Pitblast team!
info@o-pitblast.com

FUTURE PLAN

- **Wider Field Testing:** Apply the solution in diverse geological settings and with more hole samples to strengthen validation.
- **Device Compatibility:** Extend app support to other smartphone models with similar sensor capabilities, beyond the Samsung Galaxy S8.
- **Casing Improvements:** Redesign the waterproof housing to fit smaller-diameter holes (under 79 mm).
- **App Enhancements:** Develop new features such as real-time visualization, direct export to blast design software, and automatic error detection.
- **Data Integration:** Improve compatibility with platforms like O-PitSurface to streamline the workflow from field measurement to blast planning.
- **Training and Documentation:** Create user manuals, tutorials, and quick-start guides to support adoption in small and medium mining operations.

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www.o-pitblast.com info@o-pitblast.com
Rua Professor Manuel Baganha 249, Porto - Portugal
Call to find out more
+351 910 222 599