CASE STUDY

1 tool for every need: Accelerating abandoned mine monitoring

RAG Aktiengesellschaft | *Germany*



Industry

- Government & Public Sector

Solutions

- Octave Imagine, Octave Imagine Photogrammetry, Octave Alto Data Management

Challenges

- Monitoring former mines
- Identifying potential damage
- Unified project management

Results

- Depressions detected and remedied earlier
- Ground movement calculated to cm accuracy
- 50% reduction in aerial survey processing time

For decades, coal was mined extensively in the Ruhr region in North Rhine-Westphalia, Germany. Deep mining has strongly shaped the area, but in recent years, efforts have been undertaken to end coal mining and reverse its adverse effects. In fact, in 2017, the city of Essen, where Germany's largest coal mining corporation – **RAG Aktiengesellschaft** – is headquartered, won the European Union Green Capital Award. The city was recognized for its work toward transitioning to more sustainable forms of energy.

Coal mining ceased in 2018, and RAG has devoted itself to making the area more livable. Years of excavations contributed to sink holes and other environmental hazards. RAG is now responsible for monitoring the former mines and identifying locations of potential damage so preventive measures can be taken before sink holes or subsidence occur.

To do this, RAG worked with longtime Octave partner GEOSYSTEMS GmbH to implement a solution including remote sensing, aerial photography and photogrammetry components. More recently, it needed a system that would offer a consistent catalog, automated processing of aerial image data and management of photogrammetric products, unified project management for each step and high-performance distribution of results. It again turned to GEOSYSTEMS.

Monitoring for instability

Decades of coal mining in the area caused land fragility, hollows and sinkholes. To protect the environment, these areas must be monitored to prevent or remediate potential and actual damages. RAG's monitoring system uses airborne laser scanning (ALS) and aerial photo data. From there, high-resolution digital terrain models (DTMs) are generated. In addition to old mining areas, RAG also makes photo flights over waste rock piles and surface facilities and processes them photogrammetrically to create site plans, digital terrain models and orthophotos. The combination of ALS and aerial photography must be used when dense vegetation, such as in forest regions, makes it impossible to measure the actual surface height of the terrain.

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Andreas Schlienkamp
Remote Sensing
Team Manager
RAG Aktiengesellschaft



The web client displays the list of all flights for a selected area. In addition to the footprints, the orthophotos are also displayed via Alto Data Management.

For photogrammetric processing of aerial images and terrain model generation, RAG uses software from Octave, including Octave Imagine (formerly ERDAS IMAGINE) and Octave Imagine Photogrammetry (formerly IMAGINE Photogrammetry). With the help of DTMs, even the smallest depressions can be detected and remediated at an early stage to prevent a possible sinkhole or subsidence. Comparing terrain models from different points in time, ground movement can be calculated to centimeter accuracy.

Cataloging and processing data

While the technology allowed RAG to monitor former mining sites, the amount of data was overwhelming. Petabytes worth of data have been collected in the monitoring process. Each aerial image added 2 gigabytes to data storage. All this data needed to be processed with photogrammetry and homogeneously cataloged, with sorted metadata. RAG also struggled to organize the data because flight planning was done in spreadsheets, lists were kept in documents and external service providers delivered results in a separate filing system. RAG needed a system that would offer a consistent catalog, automated processing of the aerial image data and management of the photogrammetric products, unified project management for each step and high-performance distribution of results. For these functions, RAG chose Octave Alto Data Management (formerly ERDAS APOLLO).

"For the cataloging of aerial data and photogrammetric products, Alto Data Management has proven itself at RAG. This geodata management system has already been in use at RAG since 2017 and manages the entire data stock, which is in the petabyte range," said Andreas Schlienkamp, manager of RAG's remote sensing team. "The performance of Octave Alto Data Management in terms of data storage, data exchange and publishing services is outstanding. Alto Data Management is significantly leaner, faster and less error prone than other products."

Making a standardized administrative tool

To accelerate its monitoring activities and for aerial imagery archival purposes, RAG again turned to GEOSYSTEMS GmbH, implementing an organizational system powered by Alto Data Management called the Luftbildarchiv Admin Tool.

The tool maps the entire aerial image processing cycle and is available as a both a desktop application and a browser-based web client. It ensures uniform, verifiable monitoring; standardizes the working environment; quickly displays data; automates data processing; preserves evidence and evaluations of mining damage; and makes all data available to all RAG employees.

All processes – from monitoring to processing can be completed without leaving the Luftbildarchiv Admin Tool. The steps to process the surveys are now automated. New data is simply added to the tool. When new aerial flights need planned, they are stored in the system and linked to their geographic location. Most importantly, the time to process aerial surveys has been reduced by 50%. The provision of photogrammetric products (orthophotos, digital terrain models, etc.) is done via geoprocessing – without leaving the tool.

A particular advantage of the tool is that it can hold aerotriangulation data with image center and orientation angle parameters. GEOSYSTEMS GmbH was able to integrate this photogrammetric expertise within the tool. The integration of triangulated data has the additional advantage that it allows the direct manual stereo evaluation of the block file, e.g., it can survey buildings in more detail.

"We are highly satisfied with the new Luftbildarchiv Admin Tool from GEOSYSTEMS GmbH," continued Schlienkamp. "The GEOSYSTEMS team has implemented all our wishes. The great technical know-how of the developers is remarkable; no questions remained unanswered. The application runs stable and performant, and is integrated into the geodata infrastructure of the RAG."

Looking ahead

GEOSYSTEMS GmbH is looking ahead to further develop the Luftbildarchiv Admin Tool. With the tools from Octave and the add-ons from GEOSYSTEMS, RAG can access higher-quality data with better usability. The homogeneous catalog and procedures from the tool allow RAG to look toward future projects with ease.

"We see the Luftbildarchiv Admin Tool as the perfect tool for the coming years, which will allow us to fulfill our monitoring tasks very efficiently and reliably, even with increasing data volumes and limited staff," Schlienkamp said.

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property and assets – for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

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