

PA CHEMICALS UTILIZES AERIAL DRONE TECHNOLOGY TO CAPTURE DATA IN REAL TIME ON A LARGE ETHANE CRACKING PLANT



MANAGING A MULTIBILLION DOLLAR CONSTRUCTION PROJECT

As a full-service unmanned aerial vehicle service provider, Eye-bot Aerial Solutions captures highly accurate reality data at a rate of 250 acres per hour. The Pennsylvania-based company produces high-resolution 3D reality models and images for organizations in oil and gas, construction and infrastructure, power and utilities, and insurance. Its services include inspection, monitoring, aerial survey, and 3D modeling.

In June 2016, Shell Polymers took the Final Investment Decision to construct a world-scale ethane cracking plant in western Pennsylvania, United States, to create polyethylene. The multibillion "Pennsylvania Chemicals Project" is positioned in a strategic location where 70 percent of North America's polyethylene demand is within 700 miles. With proximity to rail, river, and interstate transportation, PA Chemicals can easily bring heavy equipment onto the site and, when the project is completed, easily transfer the polyethylene offsite.

The plant is being built where a former zinc smelting facility had been on a 386 acre plot that is approximately 3 kilometer long and 1km across at its widest point. The PA Chemicals includes the Ethylene Cracker Unit (ECU) with seven furnaces and 3x polyethylene manufacturing units producing high- and low linear density polyethylene. The process is driven by 250-megawatt of electricity generated by the on-site power plant equipped with three gas-fired turbines.

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Project Stats

- 300 miles of pipe,
- Over 1,600 items of manufactured equipment
- 294 pre-assembled modules.
- Organization employs 6,500 workers at the peak of construction in 2019 – 2020.
- The plant will support 600 full-time permanent jobs when it is operational.

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FINDING A SOLUTION

To manage a project of this size, the project team knew it needed to conduct aerial surveys of the site to capture accurate data in real time. The organization awarded Eye-bot Aerial Solutions a multi-year contract to provide unmanned aerial survey services. The commercial drone services provider uses a variety of software to generate 2D orthophotos and 3D reality meshes on a weekly basis using aerial photos of the site. The company also produced 2D and 3D deliverables of the staging areas, parking lots and laydown yards.

Eye-bot faced several challenges performing the aerial surveys, including capturing the data while workers are on-site, negotiating the varying heights of more than 120 cranes (one of them 695 feet tall), and dealing with the often cold and unpredictable weather in western Pennsylvania. Moreover, when the data is captured the team has less than 48 hours to process 8,000-plus images into an orthophoto and 3D reality mesh.

In addition to developing the 2D and 3D data, Eye-bot captures video that is analyzed using AI to detect any potential safety risks or violation. The consistent and quality data captured by the Eye-bot team allows the AI to analyze the data and is then shared with the site safety team.



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HIGH-SPEED CAPTURE AND PROCESSING CREATE ACCURATE DATA

To keep the project on schedule, Eye-bot utilized ContextCapture Center which supports parallel processing using multiple high-powered computers. The high-speed processing engines produce a dimensionally accurate 3D reality mesh and digital twins, which enabled the team to identify and resolve the root cause of construction clashes. The software application is an integral part of the project, allowing the team to process the collected data into a 3D reality mesh, and enabling PA Chemicals Project team to compare the mesh with 3D snapshots of the site on a regular basis.

In addition to the 3D reality mesh, Eye-bot generates a 2D orthophoto that is processed into a series of formats. The availability of this data helped the team plan and execute the construction. The 3D reality mesh of the existing site condition served as a single source of truth for lookahead and retrospective progress analysis, which helped to optimize collaboration and decision making between the client and the engineering, procurement, and construction (EPC) contractors.

The variety of output formats available in ContextCapture has made organizing the vast amount of data into an easily consumable format much more manageable.



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PA Chemicals Project

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ESTABLISHING A SINGLE SOURCE OF TRUTH

Dmitry Gurevich, IT Director, PA Chemicals Project, said, “Constructing the plant of the future means embracing digitalization. In construction, Digital is about advancing the technology that helps us staying on top of progress and assure quality, while keeping people safe. In that respect, the 3D reality mesh modeling technology has made a profound impact on ways of working on the Project, rendering benefits above and beyond what we had imagined when starting the modeling program at the onset of the main construction phase.”

The 3D/2D data generated has helped to maintain a strategic perspective of the existing site condition and progress, giving a common truth between the client and the EPC contractors,” he added. “The results are shared among 30+ companies, a community of 1,000+ end users across construction, procurement, safety, quality, engineering, and project management teams.”

The project team used the 3D models to measure the amount of backfill needed along with stockpile volumes, distances, slopes, and available laydown area. For example, using the reality mesh resulted in an eight-fold reduction in the amount of time the construction engineers spent analyzing progress on the backfill. The reality mesh is also used to monitor the soil erosion, manage inventory, and identify hazards.

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PROJECT SUMMARY

Organization: Pennsylvania Chemicals & Eye-bot Aerial Solutions

Solution: Drones and Reality Modeling

Location: Pennsylvania, United States

Project Objectives:

- Construct a world-scale ethane cracking plant to create polyethylene
- Conduct aerial surveys of the site to capture accurate data in real time
- Generate 2D orthophotos and 3D reality meshes using high quality aerial photos of the site

Fast Facts

- To date, 7.5 million yards of soil have been moved during construction (2.5x the Great Pyramid of Giza)
- 300 miles of pipe on the project could stretch across the State of Pennsylvania
- More than 750,000 drone images have been taken on the project to date
- Over 2,500 drone flights have occurred over the site



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