Theory and Practice of Stockpile Volume Calculations Using Drone Data

“How accurate is it?” It’s the most common question asked by people considering using drones in conjunction with the Propeller Platform to calculate stockpile volumes.

Understanding conventional surveying techniques

Using traditional ground-based surveying methods to calculate the volume of a stockpile means a surveyor must take their equipment on site and capture the coordinates and elevation of multiple points. These include around the base of the stockpile, on top of the stockpile, and along all of the breaklines.
Once these points are captured, the surveyor returns to their desk and generates a surface model. This model is compared against previous survey data, or a baseline surface or a virtual reference plane, to calculate volume changes.

Measuring all the stockpiles in a large stockyard using this method can take days to complete. The surveyor is generally exposed to hazardous conditions (walking near heavy equipment, climbing up unstable stockpile surfaces, etc.) and it’s often necessary to halt operations while surveying work is in progress.

The alternative: Using drones and Propeller

The more points that are captured, the more accurate a surface model will be—and a drone can capture thousands more points than a surveyor using traditional methods, in a fraction of the time.

As an added benefit, using a drone means nobody needs to scramble up and down a stockpile, and site operations can continue uninterrupted.

By stitching together geotagged drone photos with high overlap, captured from multiple angles, Propeller allows users to generate very dense 3D point clouds. While ground-based surveys capture just one point every 6-12ft (2-3m), an average stockpile surface within the
Propeller Platform is modeled using tens of thousands of points.

The result is more precise 3D surface models for higher accuracy volume calculations, safer and faster than before.
How it works in practice

Let’s say, you want to find how much material has been added or removed from a stockpile since your last survey.

Simply draw a line around the base of your stockpile in the Propeller Platform. In an instant, Propeller will “take” the thousands of recorded height samples within the boundary of this polygon. Conceptually, this is similar to a surveyor climbing across a stockpile taking thousands of elevation points—though clearly much safer!

Next, Propeller compares these height readings to those from your previous survey (at the same horizontal locations). Volume changes are expressed as either positive change, where material has been added (labeled Fill) or negative change, where material has been removed
(labeled Cut).

You can also see the “Net” change (Fill + Cut). A record of these values over time can be 
\textit{easily exported} for reporting purposes.
It's also possible to view changes in stockpile volumes as a cross section. In this case, Propeller reads the recorded height samples from various distinct datasets along the line you drew, and renders the results on an interactive chart.
Best practices for volume measurements using the Propeller Platform

Our internal testing has found that “tight” polygons around stockpiles produce the most accurate volumetric results.
So, when drawing your measurement polygon, it’s best to stick to the edges and not go too broad.

Want to use Propeller for stockpile volumes calculations? Get in touch with us to find a Propeller solution that suits your needs.
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