MAPTEK™ I-Site™

CASE STUDY

Laser scanning for stockpiles

Maptek I-Site™ is the ideal solution for measuring outdoor and indoor stockpiles, combining ease of use with accurate volumes.

Setting up the I-Site 4400 for stockpile survey

I-Site 4400 scanner inside a clinker shed

HIGHLIGHTS

- Laser scanning gives a far more detailed model of the surface than other methods, providing greater accuracy
- Safety benefits - remote measurement means no need to physically access the stockpile
- Efficient processing produces final results with a rapid turn-around
- Measure material samples of a known weight to accurately calculate material density

While the I-Site system is portable and easy-to-use in a wide range of environments, each site presents its own set of challenges. On the first visit visit some thought needs to be given as to how the stockpile base position is to be determined.

An indoor facility may have pre-existing floor plans; an outdoor site may have survey-derived coordinate data. Information may exist from previous scans, or a new base may need to be created.

Outdoor stockpiles

Preparation is the key! Outdoor operators need to know if scans will be registered to pre-existing survey or processed using matching surface registration.

Newcrest's Telfer Gold Mine used Maptek consulting services to measure crushed ore stockpiles for end-of-month survey reconciliation, with a combination of survey registered ground points and scans captured from an overhead conveyor walkway over the stockpile. Laser scanning is much quicker than other methods for field acquisition, producing a more detailed model with more accurate results.

Importantly, the safety of the surveyors is not compromised where physical access to a stockpile is restricted due to surface instability. Ground-based tripod scans are registered using set-up coordinates.

The overhead conveyor scans are then registered against the combined point set.

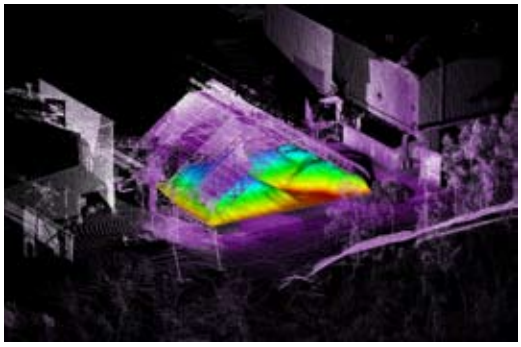
Cement Australia Rockhampton operates a manufacturing plant with indoor and outdoor stockpiles. Outdoor stockpiles are scanned using ground-based scanner set-ups. The scans are registered using I-Site's registration tools. Complex surfaces on the top of larger stockpiles are scanned from surrounding elevated positions.

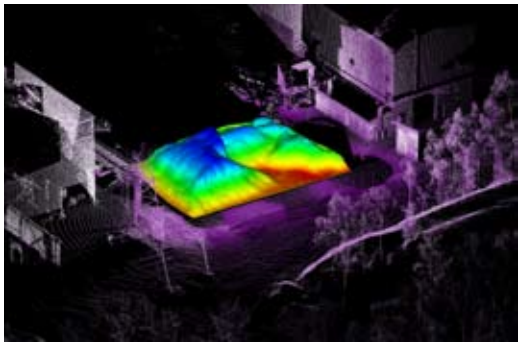
Indoor stockpiles

At the Rockhampton faciility, two sheds have overhead conveyor walkways, allowing the scanner to be suspended from the kick-plate using the stairwell bracket.

The main clinker shed has an enclosed walkway above it, so access hatches were cut into the floor and a hatch bracket used to suspend the scanner over the stockpile (above).

This bracket is more stable than the stairwell bracket, but harder to transport. Different size hatches require set-up before commencing the job.





Modelled stockpile shown before and after filtering with I-Site Studio™ to remove unwanted structural data

SUMMARY

Speed, efficiency, safety

- Laser scanning is a quick and easy method for calculating stockpile volumes, with OH&S benefits accruing by remote measurement of surfaces.

Accuracy

- The high level of detail captured leads to improved volume accuracy. When using matching surface registration, appropriate checks ensure accuracy of registration (e.g. visual analysis of data, especially with the interactive sectioning tool).

Modelling

- I-Site's model creation tools and volume calculation methods are easy to use. The same principles can be applied to density determination, allowing better understanding of the stockpile mass.

Different methods can be used to determine the stockpile base, and then the surrounding infrastructure can be spherically triangulated. Future scans can then be easily registered into the same position as the base, allowing the base to be reused. Access and safety must also be considered for indoor stockpiles; the scanner must be secured (e.g. by tying onto a rail).

Hierarchy of base creation methods in order of reliability:

- As-built scan data which captures the base exactly can be difficult as the stockpile needs to be empty.
- Survey or CAD drawing models can give details when the base is obscured, but may not reflect the true base.
- Known offset measurements from visible features to measure down to an obscured base is effective, but care must be taken measuring offsets and finding correct positions of features.
- Fitting a plane surface to the known floor points is easy, but is only as good as the points chosen - extrapolation errors occur especially when the plane is expanded.

Conditions must be suitable; high dust levels lead to false data points and lack of detail on the surface, as well as an unacceptable occupational health and safety risk to operators. It is desirable, but not always possible to have a static stockpile, and it is important to ensure the scanner is steady so scan data is consistent. It is also important to make sure the stockpile can be seen from your access points.

Post-processing, modelling, volume and density determination

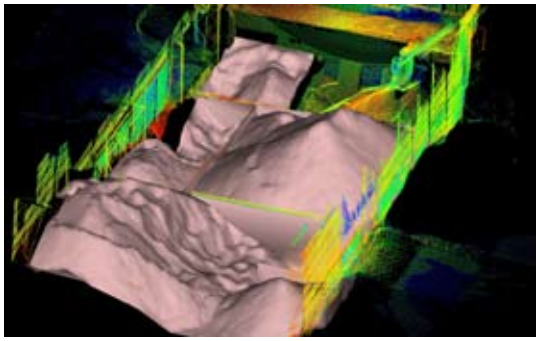
A topographic filter is used to thin the data and remove unwanted, obscuring overhead scan points. The filter grid size reflects the stockpile size and the level of detail required.

Further manual deletion of unwanted points may still be needed. A topographic triangulation is then created, and the stockpile volume is calculated.

After determining the volume, the density is needed to calculate the weight of the material in the stockpile. Truck scanning can be used to determine material density. An empty truck tray is modelled for a base, then the material is scanned and weighed. The density is calculated: D = W/V.

This is still only an approximation, as the density varies within the stockpile. The ability to accurately measure the volume can also be compromised by range noise.

Results are available quickly, including volume results, density readings and screen captures. Video output can also be generated for use in formal presentations.



I-SITE scanner (left) measuring truck loads, and resultant modelled scan data (above)

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