Trimble Tank Calibration Solution

Trimble

POWER, PROCESS & PLANT

For many years Trimble has been the leading manufacturer of high-precision measurement technologies. Now, Trimble's new system for calibrating storage tanks combines Trimble's wealth of expertise in 3D scanning and streamlined workflows to create a more efficient solution that delivers vastly superior accuracy.

THE TRIMBLE TANK CALIBRATION SOLUTION

In industries dealing with liquids such as oil and petroleum, vertical and horizontal tanks are critical for storage and volume measurement. To accurately determine and certify tank volumes, the traditional method of storage tank calibration employs complex, labor-intensive techniques to achieve the required standardized results. Now, the Trimble Tank Calibration Solution introduces an entirely new way of determining the volume of standing storage tanks—one that is set to transform your industry and your business.

The Trimble solution is certified in Germany by the Physikalisch-Technischen Bundesanstalt (the German national metrology Institute, PTB) in Braunschweig.

Trimble 3D Extractor software with Tank Module software supports the collection of scanned data from the Trimble CX and provides all controls necessary to perform volumetric calculations.

The Trimble Tablet™ Rugged PC Software combines the toughness and portability of a field controller with the operating power and larger interface of a laptop. Running the Trimble Access™ software it provides a rugged platform to perform data capture with the Trimble CX 3D Scanner.

The Trimble Tank Calibration Solution introduces the new Trimble® CX 3D Scanner. This advanced 3D laser scanner is placed directly inside the storage tank to accurately gather enormous amounts of position information.

CONTACTLESS MEASUREMENT OF THE ENTIRE TANK INTERIOR: HOW IT WORKS

Determining the volume of a storage tank is divided into two parts: measuring the volumes of the sump and the divided measuring space. However, the unique Trimble solution places the Trimble CX 3D Scanner inside the storage tank to measure the actual cavity—the points for both sump and divided measuring space are recorded in a single operation, and no estimation is required. The entire Trimble calibration process comprises just three easy steps: Measure, Register, and Calculate.

1. MEASURE: After a very simple installation, the high-accuracy Trimble CX 3D Scanner quickly and easily measures the space inside the tank. It captures accurate measurements at 50,000 points per second, providing an immensely detailed interior view of the tank, which can be used for volume calibration and stability analysis.

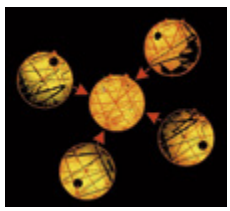
Tank – Point cloud

Trimble 3D scanners and dedicated software allow you to produce high-quality 2D and 3D deliverables that add value far beyond your clients' expectations.

2. REGISTER: When multiple scans have been collected from different locations inside the storage tank, the Trimble software offers tools to combine the data into into a standard position and height system:

- a best-fit algorithm (based on measured point clouds)
- transformation of position and target point coordinates (local into global)

The scanned data from the multiple locations is combined into a single, comprehensive data set for volume calculations.



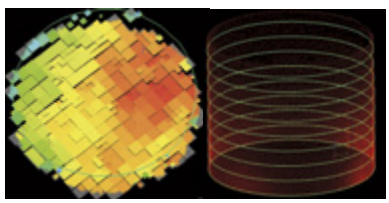
Trimble 3D Extractor software shows a registration using best fit.

3. CALCULATE: Once data is registered, the Trimble software calculates storage tank volume in just a few mouse-clicks:

1. The datum plate is used to set the dividing plane.
2. The sump volume is determined from the point cloud.
3. The remaining volume is calculated via horizontal sections created at defined heights.

All calculations take into consideration the tank's internal fixtures, and measured values are temperature corrected using the linear expansion coefficient of the wall material.

The tank sump (right) and volume filling levels (far right) as shown in Trimble 3D Extractor software.



NO.	HEIGHT	REL HEIGHT	SHARE OF HEIGHT	AREA	PARTIAL VOLUME	CUMULATIVE VOLUME	CIRCUMFERENCE
1		0.00 m	0.00 m	416.393 m²	0.00 m³	0.00 m³	72.395 m
2	3.80 m	2.20 m	2.20 m	416.328 m²	915.99 m³	915.99 m³	72.346 m
3	6.40 m	4.80 m	2.60 m	416.133 m²	1082.20 m³	1998.19 m³	72.331 m
4	8.90 m	7.30 m	2.50 m	415.861 m²	1039.99 m³	3038.18 m³	72.315 m
5	11.50 m	9.90 m	2.60 m	415.418 m²	1080.66 m³	4118.85 m³	72.382 m
6	14.00 m	12.40 m	2.50 m	415.040 m²	1038.07 m³	5156.92 m³	72.263 m
					SUBTOTAL	5156.92 m³	
					Sump volume	78.24 m³	
					TOTAL	5235.16 m³	

Results are displayed in a filling table.

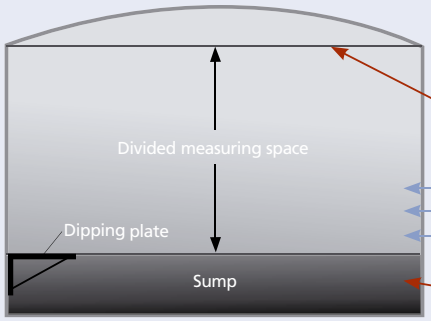
A CERTIFIED STORAGE TANK CALIBRATION SOLUTION THAT IS FASTER, MORE ACCURATE, MORE COST-EFFECTIVE

INTERNATIONAL STANDARDS FOR STORAGE TANK CALIBRATION

The International Organization for Standards (ISO), International Protection (IP) and American Petroleum Institute (API) specify standards for the calibration of large vertical storage tanks. These standards are typically achieved via external measurements and estimation, including:

1. The tank circumference along a reference plane.
2. The vertical deviations of the tank surface at several locations using plumbing methods.
3. The tank sump below the datum plate.

Storage tank volume is calculated using this data.



Filling Level above Datum Plate	Volume up to filling level of section with sump	Filling Value for Vertical Section
mm	L	L / mm
13 526	10 8000 007	
		2 972.5
4 374	13 600 263	2 972.5
1 923	6 315 156	2 972.5
897	3 265 884	2 972.5
		2 972.5 (Sump)
0	600 000	

The diagram shown is an example of the table created for each tank upon commission. The table is "updated" with the results of any calibration performed.

NEW APPROVED METHOD PUTTING SMART TECHNOLOGY TO WORK

In collaboration with the Physikalisch-Technischen Bundesanstalt in Braunschweig (the German national metrology Institute, PTB) and Eichdirektion Nord (office of legal metrology), Trimble has developed a storage tank calibration solution that achieves these organizations' measurement standards using an entirely new methodology that bypasses the inaccuracies and inefficiencies of the traditional method. Advanced Trimble 3D scanning is central to this new solution.

The Trimble Tank Calibration Solution meets all legal requirements of measurement engineering and delivers the standardized results demanded with optimal accuracy.

In Germany, calibration regulations demand a measurement uncertainty below 0.5%. Official approval of the Trimble method in this country guarantees at least this level of accuracy anywhere around the world.

GREATER ACCURACY, CERTIFIED

The Trimble solution delivers accuracy and results you can stand behind.

The traditional calibration method determines the internal volume of each storage tank via external measurement. Casing and paint thickness, and casing plate overlaps, must be estimated, and reference and vertical cross-sectional areas are assumed to be circular. Results may therefore offer questionable accuracy. Because the Trimble CX 3D Scanner measures the actual cavity inside the storage tank, you can determine the real volume of the tank and achieve optimally accurate, reproducible results.

FASTER AND MORE EFFICIENT, LESS COSTLY

One worker can measure in the morning and complete analysis in the afternoon.

The speed and efficiency of the Trimble solution offers multiple benefits to make your business vastly more competitive:

- Decrease your costs for each job.
- Win more jobs by outbidding your competitors with lower rates.
- Increase your profits.
- Take on more jobs—you will have more time and employees available.

ADDS VALUE WITH DETAILED TANK STABILITY INFORMATION

Rich clouds of point data offer more than just measurements; they also contain valuable information about tank condition.

The Trimble CX gathers comprehensive tank information at the same time it is measuring volume. This information reveals any stresses to the tank, and can help you or your client to accurately determine the tank's stability for future storage contracts. Providing clients with this added value increases your business competitiveness even further—at no additional cost.

ENVIRONMENTALLY RESPONSIBLE

The Trimble solution prevents water waste and contamination, and environmental pollution.

Sump capacity is frequently measured via large amounts of water pumped into the sump space. During this process the water is contaminated—often by oil or petroleum. The Trimble solution omits this step entirely.

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