3D Bin Level Sensors for Increased Accuracy

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Bin Measurement Challenges

- Dusty environments
- Uneven material surfaces
- Sidewall buildup
- Improving inventory accuracy
- Estimating material volume

Coal

Ethanol

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Photos of actual installed locations!

Common Sensor Shortfalls

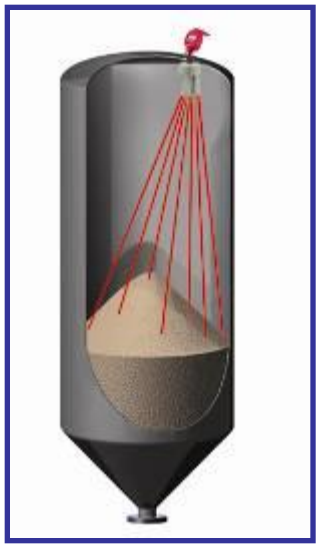
Food Processing

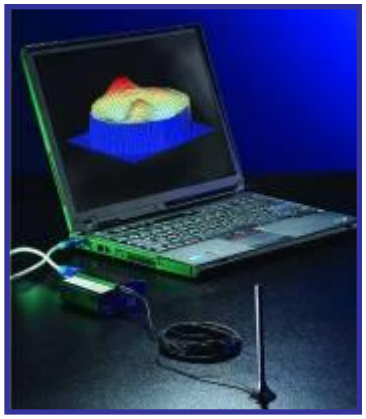
Cement

- Don’t work in dusty environments
- Measures level at a single point
- Provides level, but not volume
- No visual of material in the silo
- Don’t detect sidewall buildup
- Limited communication options

Photos of actual installed locations!

3D Scanner Solution





Scanner mounts on top of bin

Multiple measurements

Data sent to PC

Software records data and 3-D map of contents & calculates level, volume and mass

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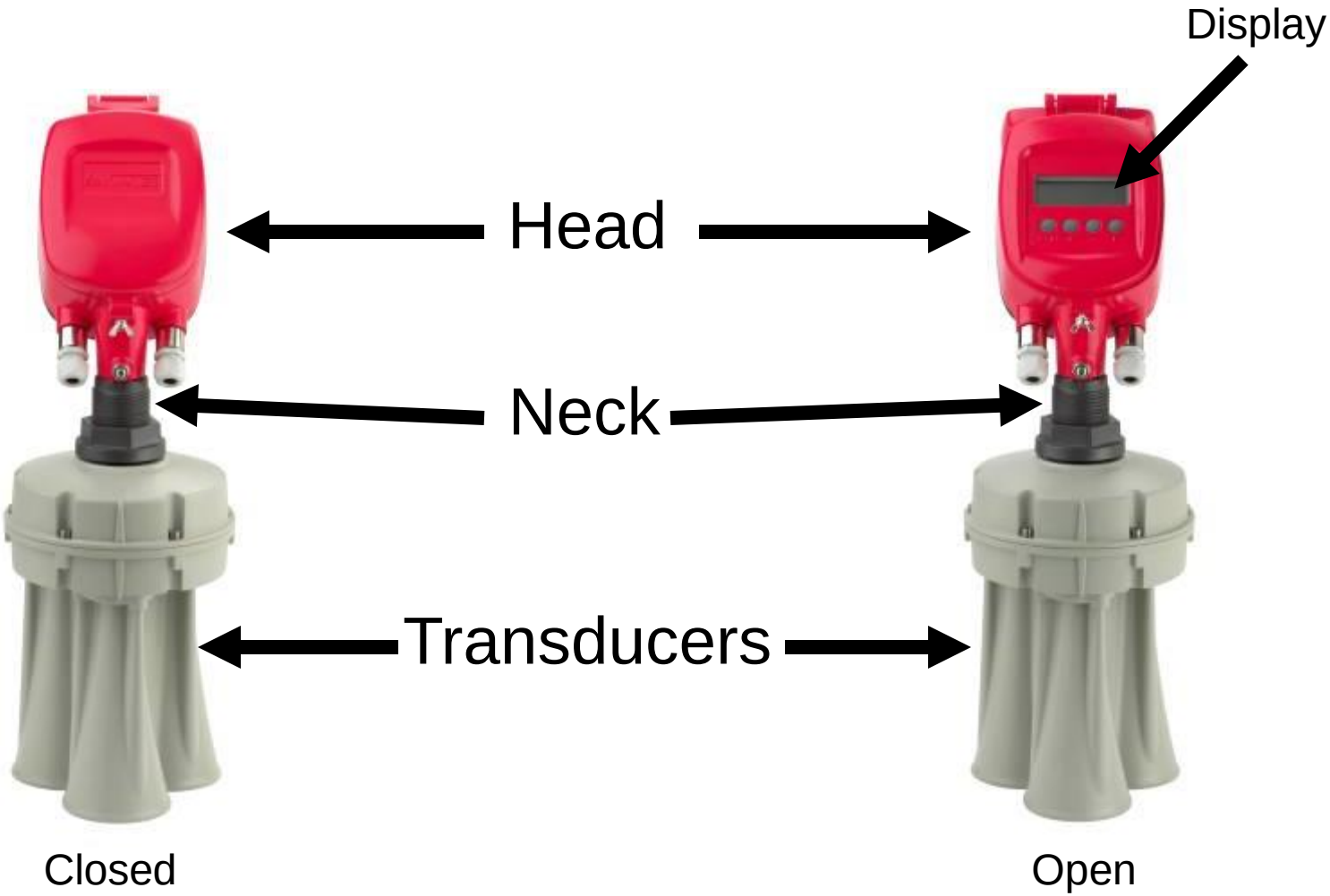
The 3DLevelScanner



3D Technology Advantages

- Low frequency, dust-penetrating technology
- Multiple-point measurement
- Non-contact measurement
  - No risk of contamination
- Requires no calibration
- Continuous measurement
- Built-in temperature sensor
  - Compensates for temperature influence on signal running time

Three independent transducers ensure high accuracy.

Works in challenging environments !

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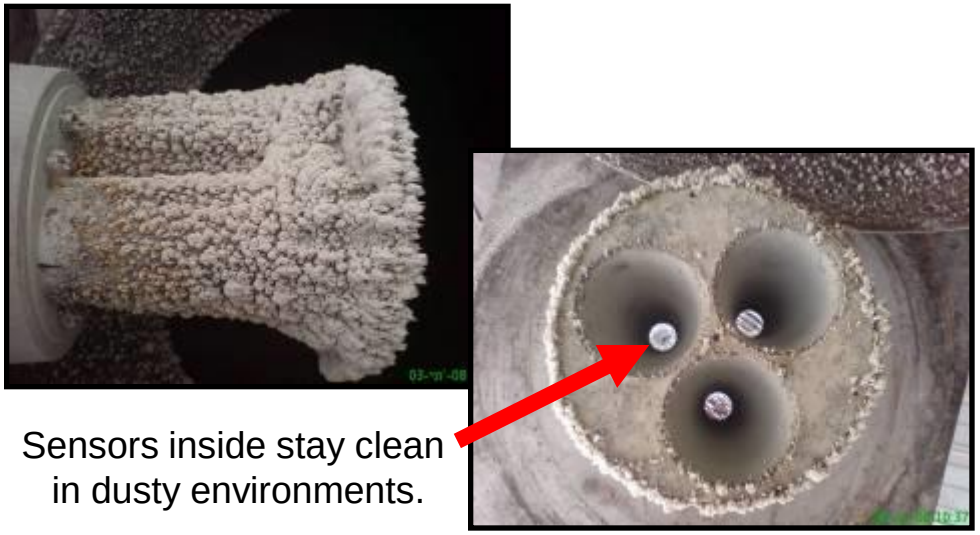
Benefits of Multiple Point Measurement

- Eliminates guesswork and inaccurate readings
- Maps uneven topography that randomly forms inside bins
- Accounts for cone up, cone down, or material buildup along bin sides
- Detects irregular surfaces caused by multiple fill and empty sites
- Calculates absolute surface level values, volume and mass inside a bin

Low Frequency Technology Penetrates Dust

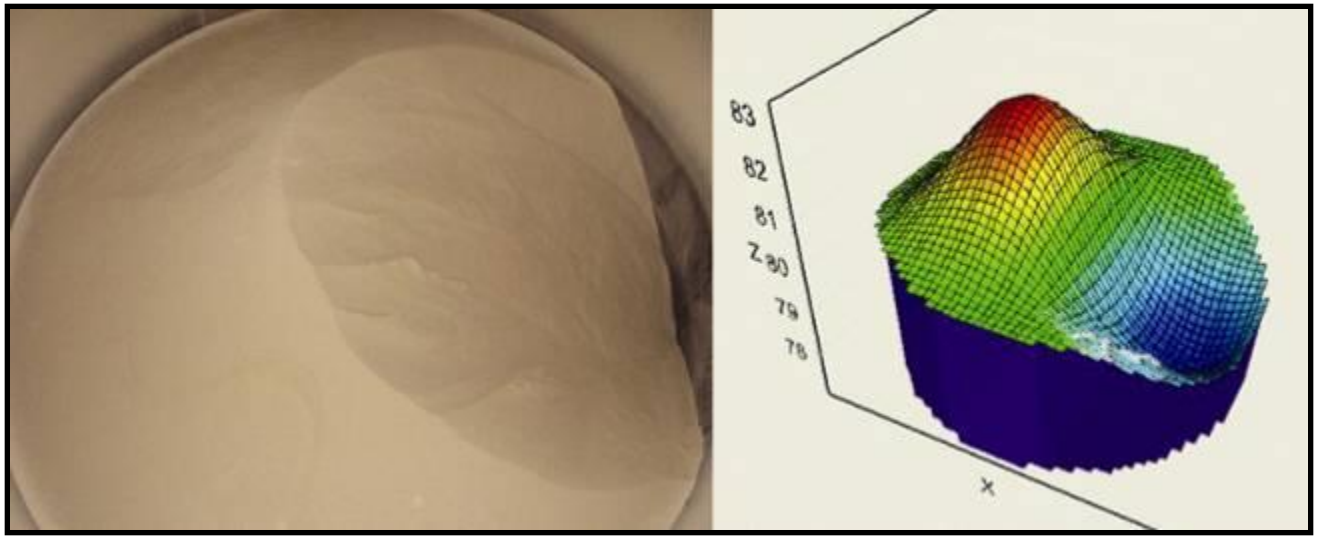
- Works where other technologies have failed
- Sensors perform reliably with minimal maintenance



Sensors inside stay clean in dusty environments.

Flour mill install

Detects Irregular Surfaces



Customer's Taped Distance: 20.6 ft.

3D Average Distance: 20.16 ft.

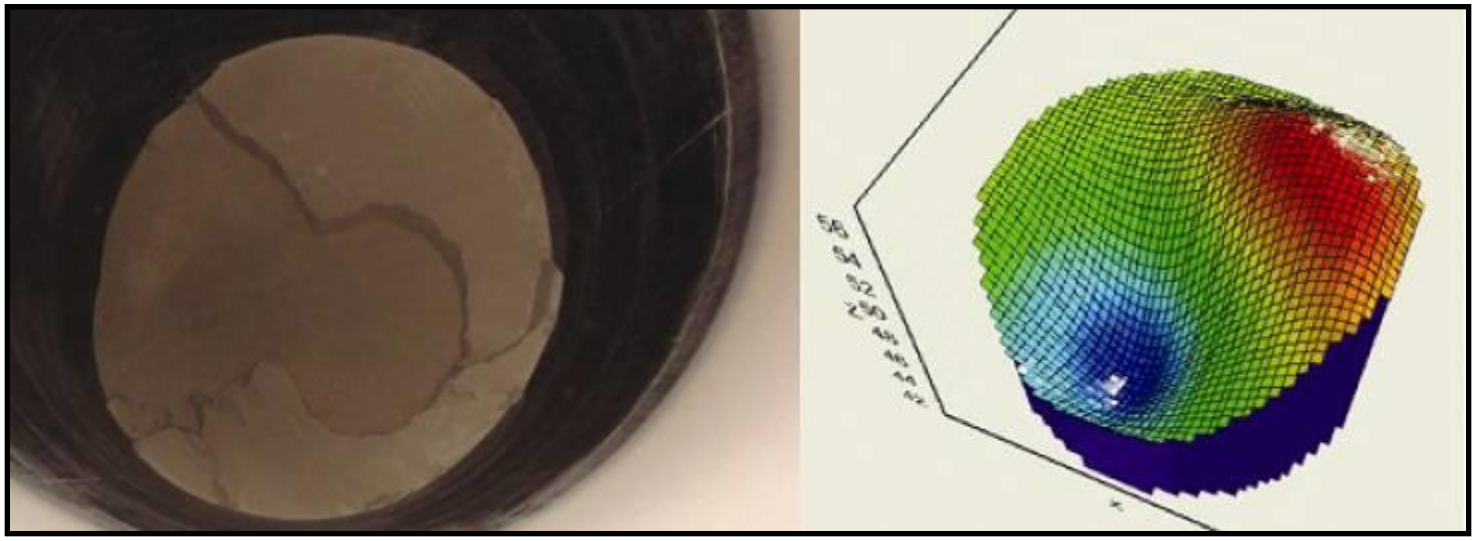
3D Minimum Distance: 17.87 ft.

3D Maximum Distance: 22.48 ft.

3D VOLUME: 82.65%

Single point measurement won't detect uneven material surface.

Accounts for Sidewall Buildup



Customer's Taped Distance: 47.7 ft.

3D Average Distance: 48.97 ft.

3D Minimum Distance: 43.93 ft.

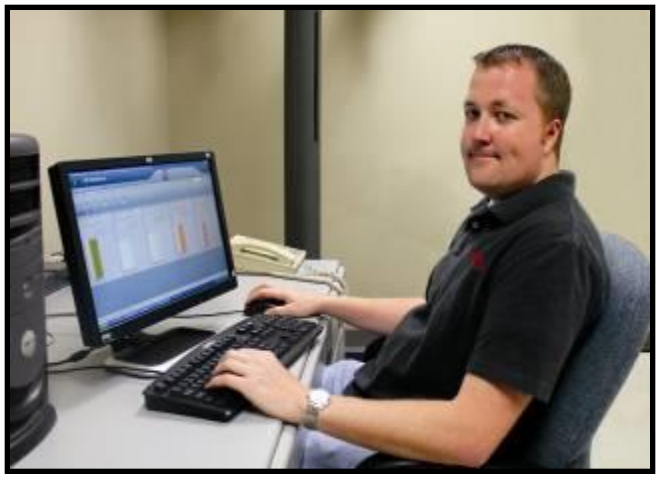
3D Maximum Distance: 58.11 ft.

3D VOLUME: 47.34%

3D Safety & Reliability

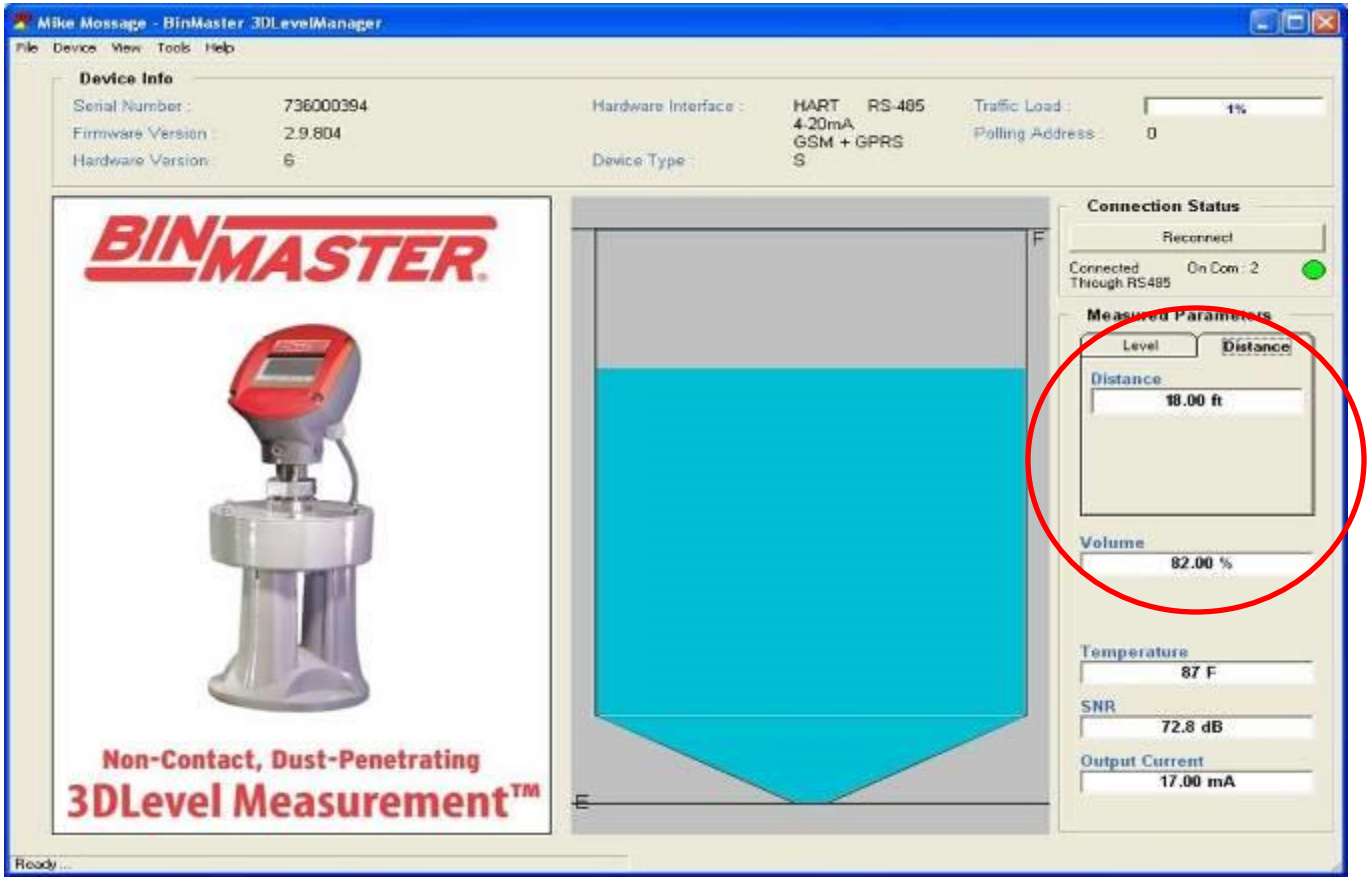
- No need to go on-site, outdoors or climbing ladders to measure bins manually
- Minimal routine maintenance required; material resists buildup on sensor
- Uses three independent channels to transmit and receive, to ensure accuracy

Bin levels from here?



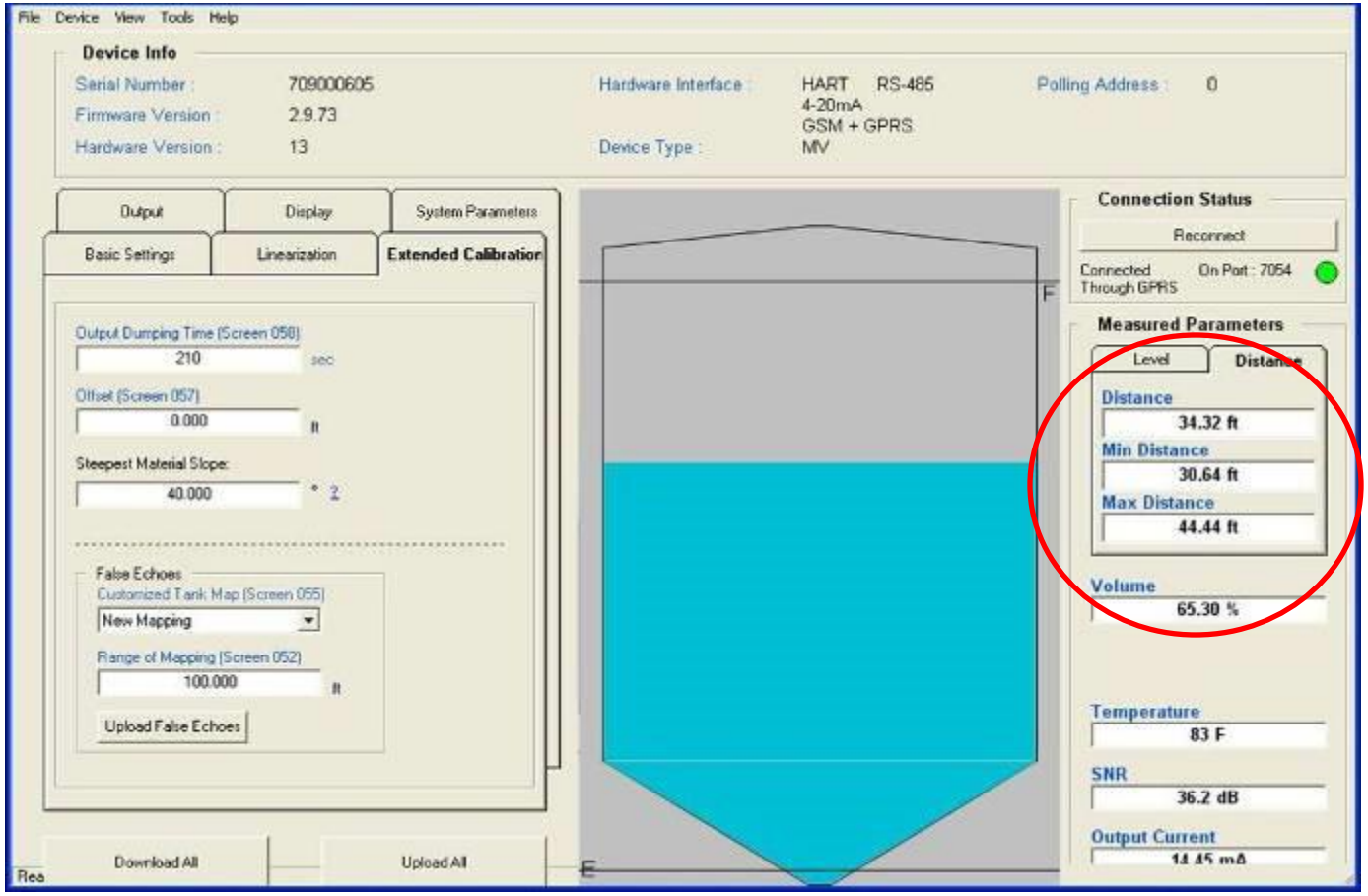
Or here?

3DLevelManager Software for S Model



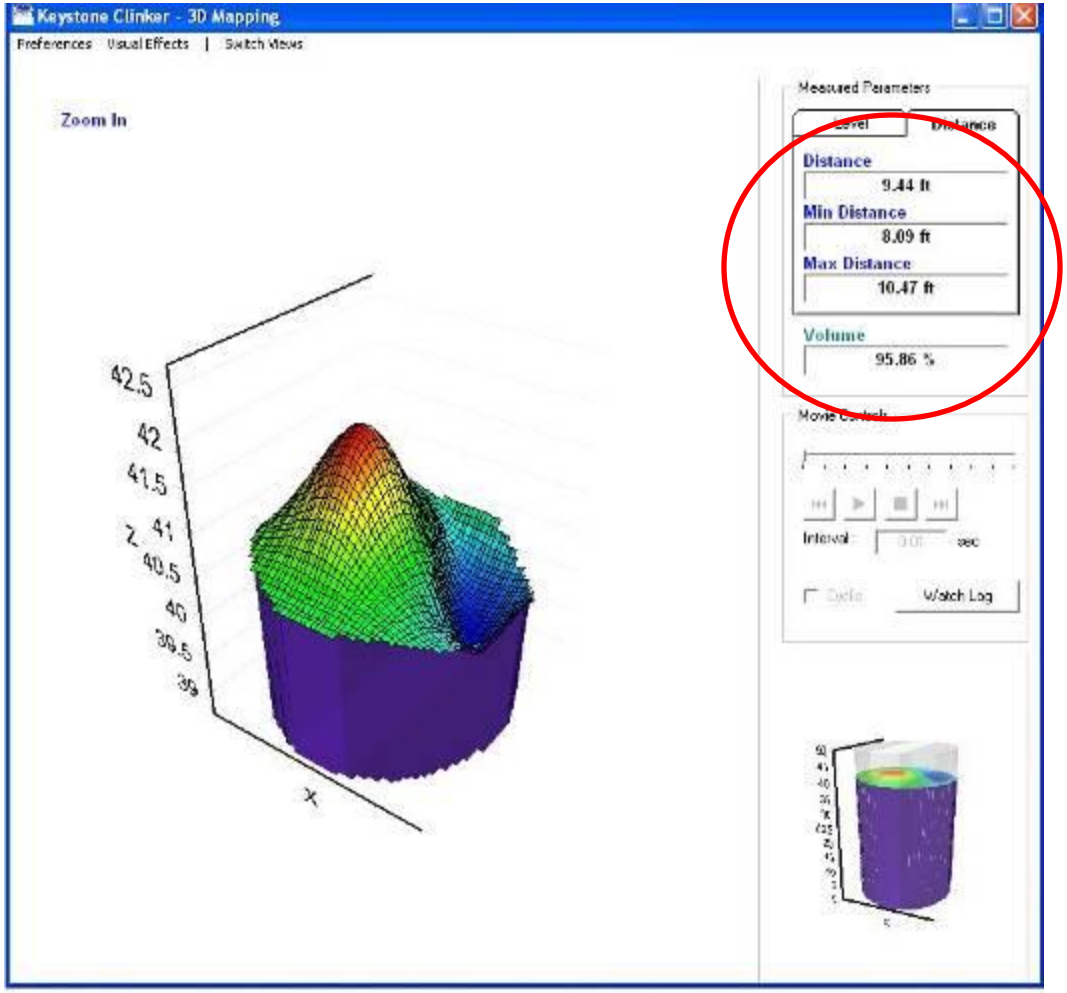
S model software displays Average Distance and Volume %.

Software for M Model



M model software displays Average, Minimum and Maximum Distances, and Volume %.

Software for MV Model



Main display screen displays 3D image plus Average, Minimum and Maximum Distances, and Volume %.

Selecting the Right 3D Scanner

Model	S	M	MV	MVL-2
Bin Height	Up to 200’	Up to 200’	Up to 200’	Up to 200’
Bin Diameter	Up to 14’	Up to 45’	Up to 45’	Up to 105’
Beam Angle	30°	70°	70°	70° for each scanner
3D Visual	No	No	Yes	Yes
Output Data	Average distance	Estimated volume plus minimum, maximum, and average distance	3D visual, estimated volume plus minimum, maximum, and average distance	3D visual, estimated volume plus minimum, maximum, and average distance
Best Application	Tall, narrow bins with little or no corrugation	Wide bins, taller than they are wide	Wider bins, taller than they are wide	Very wide bins
All models can be used in silos with a larger diameter than specified, but with decreased accuracies as the beam angle will not span the entire surface of the material.				

MVL Multiple Sensor System for Very Wide Bins

- Two or more scanners installed in a single vessel
- Covers greater surface area for more measurement points for greater accuracy
- Combines data from multiple scanners to provide a single 3D visual
- Most common in large grain bins

Grain Bin Installation

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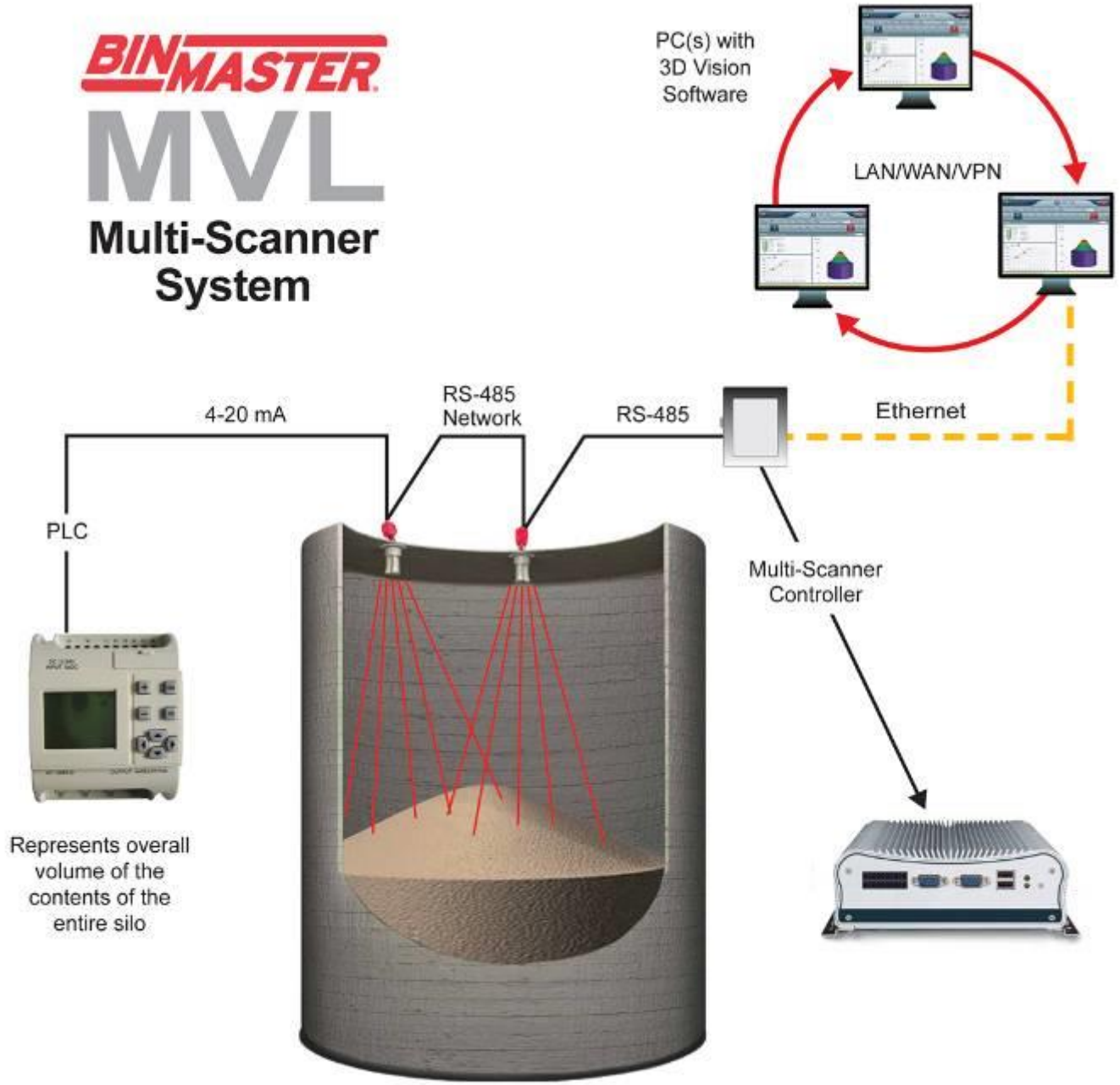
MVL

Multi-Scanner System



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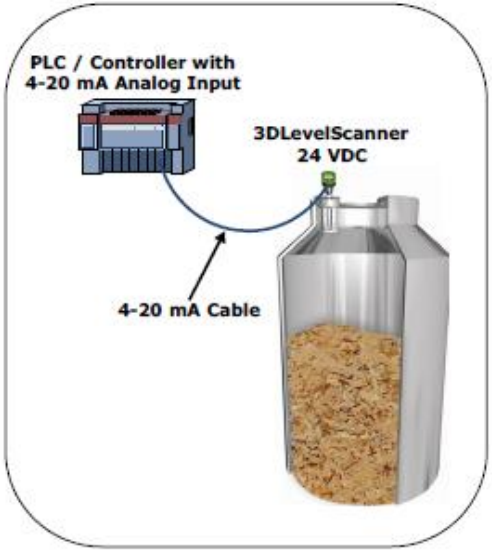
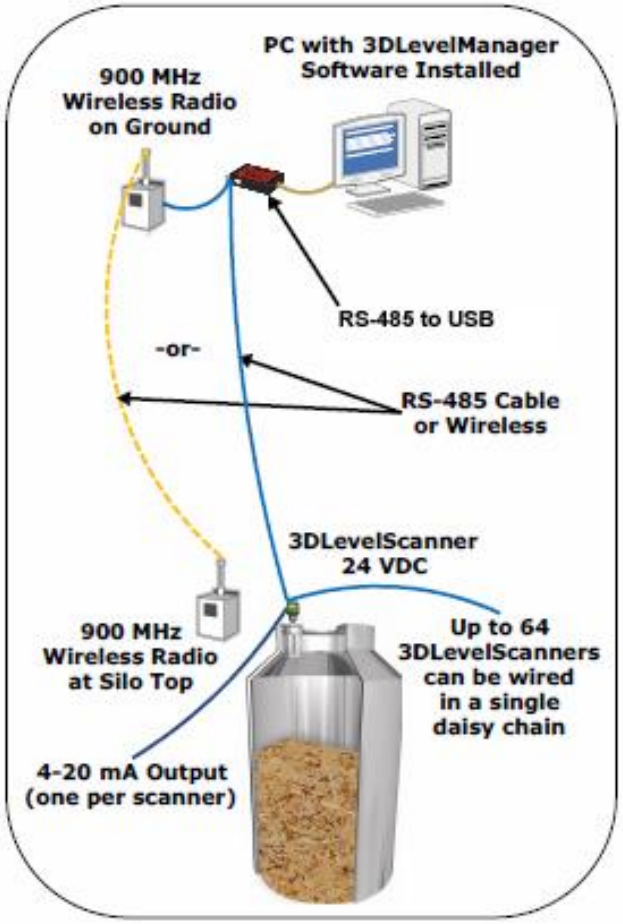
Communication Options

- Most Common
  - 4 – 20 mA
  - RS-485
- Other options
  - Modbus
  - TCP/IP
  - HART

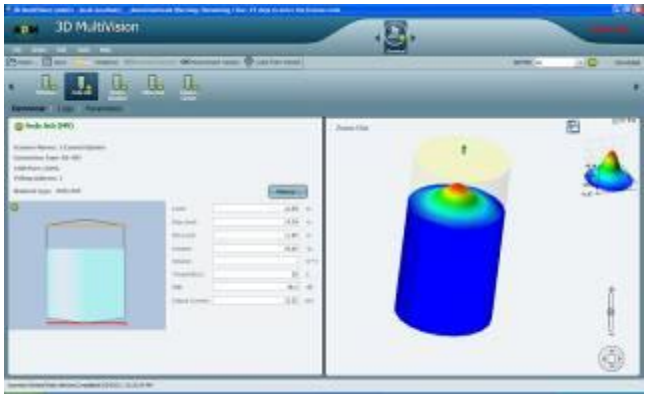




MultiVision Software

- View all bins on a single screen
- Click on a bin for a detailed view
- Compatible with all scanner models
- Data is stored and accessed on Local Area Network (LAN)
- Multiple users from multiple departments or locations
- Customize views for just the tanks and data needed

View all bins at once.



Zoom in on a single bin.

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Ethanol Plant

- Challenges
  - Corn bins extremely dusty
  - Large bins with uneven topography
  - Needed greater accuracy
- Solution
  - MV model with 3D visualization
  - MultiVision software
- Benefits
  - Works in dusty environment
  - Tracks level during fill and empty
  - Improved inventory accuracy

Scanners are installed on all 4 large silos.

Food Processing

- Challenges
  - Better accuracy and stability
  - Primary interest is headroom distance
  - Desired 3D visualization
  - Wanted to track during emptying and filling
  - Material prone to rat-holing and bridging
  - The old equipment wasn't working properly

Irregular topography when emptying.

Food Processing

- Solution
  - MV scanners installed on all 21 tanks at the facility
  - One of the first customers to use 3DMultivision software
- Benefits
  - 1: More precise headroom
  - 2: Mapping and visualization for material prone to bridging and rat holing
  - 3: Ability to monitor multiple bins with one solution

Scanners are installed on 21 silos.

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