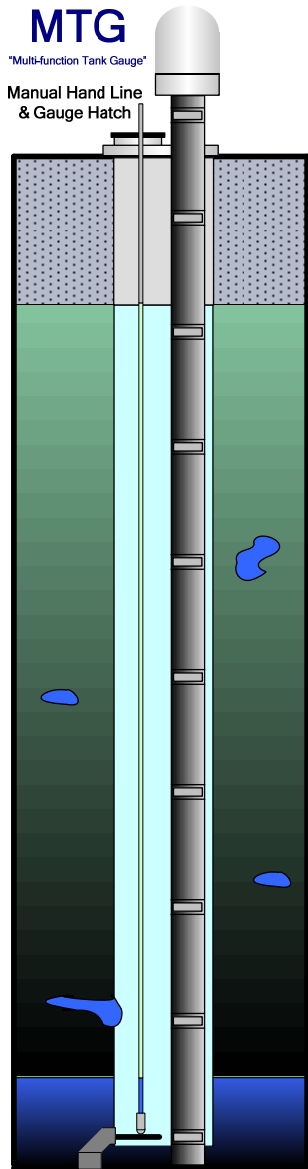




Competitive Analysis

MTG™ Vs. Hydrostatic Nitrogen Bubblers



- **Certified accuracy**
- **No Moving parts**
- **No Bubbles**

Recently a Hydrostatic Nitrogen Bubbler manufacturer published a chart entitled "Tank Gauging Technology Comparison" showing their gauge vs. a variety of gauge technologies. It was obvious in the comparisons to other technologies (Mechanical Tank Gauges, Radar, Servo, Hydrostatic, Magnetostrictive, and MTG) that they had made both false and misleading statements. After reading and reviewing literature from all manufacturers, GSI makes the following "Tank Gauging Comparison between MTG and Hydrostatic Nitrogen Bubblers.

Metrology Certifications:

MTG is OIML (International Organization of Legal Metrology) R-125 Certified for "Measuring systems for the mass of liquids in storage tanks" through NMI for Custody Transfer. MTG is also certified to GOST standards for mass measurement by automatic tank gauge to Custody Transfer accuracy.

Hydrostatic Nitrogen Bubbler systems to our knowledge have never received certification from any industry recognized Metrology organization for mass measurement by automatic tank gauge. Thus, we question the validity of the accuracy claims made by these manufacturers.

Electrical Certification:

MTG is certified as Intrinsically Safe; Class 1, Division 1, Groups C & D by UL, CSA, CENELEC, PTB, DEMKO, GOST, with others pending. Note: MTG operates on 9 - 12 Vdc. MTG is normally supplied with an Aluminum Cast Transmitter Housing, but can also be furnished with a Plastic NEMA 4x enclosure.

Hydrostatic Nitrogen Bubblers show Intrinsically safe for various components of the product assembly by CSA; but do not clarify whether or not the system is certified Intrinsically safe by CSA. The spot temperature (s) are installed within the tank, however, no verbiage or drawings are provided showing how temperature meets I.S. certification within the system topology. The controller uses 120/220 VAC and must be located in a non classified area.

Point of reference measurement:

MTG can be mounted (in service) within 6" or larger gauge well, providing both Automatic Tank Gauging and Manual Hand Lines & Sampling at the same time. This provides a direct comparison for testing of the MTG vs. the manual hand line & sampling for both Hybrid (Level, Temperature, Density, and Water) and Hydrostatic (Mass & Density).

Hydrostatic Nitrogen Bubbler systems state that they can be mounted (in service) through a 3" or larger opening and reference a magnetic bottom coupling to the datum plate. If mounted on the datum plate, a direct comparison for testing of the Hydrostatic Nitrogen Bubbler and the manual hand line & sampling can not be made. Thus, providing no way to test the claimed measurement accuracies in accordance with API (3.1A, 7, or 9.1). Non-repeatability of level and mass measurement in stagnant tanks from Hydrostatic Nitrogen Bubbler is an issue.

Both MTG and Hydrostatic Nitrogen Bubblers can be installed (in service) within locations other than the gauge well.

Reference Point Error:

Both MTG and Hydrostatic Nitrogen Bubblers can be installed as bottom or top referenced measurement.

MTG is normally bottom referenced when using the gauge within a gauge well or stable tank bottom. This eliminates reference point error due to roof or shell movement. Optionally, Top mounting is achieved with a clamp collar & centering sleeve with the MTG suspended from the tank roof or standpipe. This eliminates reference point error between manual and automatic gauging points on tanks with unstable tank bottoms.

Hydrostatic Nitrogen Bubblers only make reference to mounting on the datum plate within their literature (see Point of Reference Measurement).

Measured Data:

The patented MTG design provides the following direct measurements: Multiple direct pressure reading of product, vapor, atmosphere, and direct Multi-point spot temperature reading of product, vapor, and atmosphere. Calculated or indirect data provided: Level, Mass, Average product temperature, Multi-strata density, Average product density, Free water, Entrained water, Leak detection, and Tank tightness testing. The data supplied provides volume measurement to custody transfer accuracy by either API Hybrid or Hydrostatic standards (Quantitative measurement). However, MTG also provides Qualitative measurement, i.e., temperature or density stratification, percentage of free and entrained water in product based upon multiple direct pressure and temperature readings from within the tank.

Hydrostatic Nitrogen Bubblers provide the following direct measurements: Three or four pressure readings of nitrogen gas within pneumatic tubes controlled by a mechanical solenoid switch connected to a single pressure transducer, located up to 400 feet from the tank or product and one or two spot temperature RTD's. Note: A reference sample is also measured within the control unit. Calculated or indirect data provided: Level, Mass, Average temperature, Average density, Water is optional, and Tank tightness testing. The data supplied provides volume measurement by Hydrostatic method, to what accuracy (See Metrology certifications)? Since the Hydrostatic Nitrogen Bubblers do not provide multi-strata density, multi-point spot temperature, or both free and entrained water they can't make a realistic argument for Qualitative measurement.

Points of Failure (Maintenance):

MTG has no moving parts and rigid construction. It utilizes multiple pressure transducers for accurate mass, accurate level, multi-point spot temperature, accurate multi-strata density measurement, accurate water calculation, accurate volume calculation, self diagnostics, and self calibration. MTG will not fail based upon a single transducer failure; it automatically recognizes the failed transducers and the last tank status, and adjusts to measuring only with working sensors. Note: MTG is available with redundant sensors in key positions (bottom or vapor space) on the probe.

Hydrostatic Nitrogen Bubblers utilize multiple tubes hung by a chain within the tank, connected to a single mechanical solenoid switch up to 400 feet away, connected to a single pressure transducer and a regulated Nitrogen bottle. First, A single transducer per every two aboveground (four underground) tanks is simply bad design i.e., single point of failure (also see Metrology certifications). A mechanical solenoid switch has moving parts and again is subject to failure. If you should have condensate (from normal temperature changes) freeze within any switched tube; if a leak occurs within a tube (example: from UV light); a tube pinched (example: from the chain used in lowering the unit into the tank); or the Nitrogen runs out; the system readings are worthless. Note: All examples represent documented failures.

System Topology and Integration:

MTG 3012 processes all data within the Dual-processor transmitter card and stores this data to non-volatile memory for communications through the I.S. barriers to any host device (PLC, RTU, DCS, etc.) that can utilize an IEEE RS 485 (Four wire) electrical interface and MODBUS RTU protocol. GSI does offer a communications interface to house the I.S. barriers and provide the following: 1) Local display, 2) Data concentrator, 3) Protocol converter, 4) Topology converter (fiber, radio, satellite, etc.), or 5) RTU. Fiber Ethernet Topology supplied as our standard topology on new systems.

Hydrostatic Nitrogen Bubblers, some use "LON Network" over AC lines from the controller. Thus, you have a minimum of two conductors (RTD) and three tubes from each tank to the controller. From the controller you have AC lines wired into the control room, instead of using a local source for power (No cost savings here). Connectivity to any existing host device in the field is a problem or an integration issue, unless optional MODBUS RTU output is purchased.

	NBS - Nitrogen Bubbler	MTG - Mass Tank Gauge
Maintenance Cost:		
No Moving Parts	NO	Yes
Self Calibrating	Not to our knowledge	Yes
Self Diagnostics	Not to our knowledge	Yes
Multiple primary sensors	No (One Single Point of failure)	Yes
Remote Configuration / Trouble Shooting	Not to our knowledge	Yes
Installation Cost:		
Gauge or stilling well required	No (sits on datum plate)	No (but gauge well is preferred)
Tank entries required	One	One - 3" flange or larger
Nitrogen Bottle (Gas Required)	Yes	No
Gas Tubes	Yes	No
Voltage required (Electrical)	120/220Vac / 50/60 Htz	9-12 Vdc
Wiring	AC Lines / RS 232	Four wire bus (IEEE RS 485)
Communications / Integration	LON Works / ASCII	MODBUS RTU, Others
User configurable register map	No	Yes
Alternative communications	No	Ethernet, Radio, Satellite, Cellular
Equipment (Cost):		
Nitrogen Tubes	Required	No
Rigid Tank Probe Construction	Chain, tubes, and mini-probe	Standard
Local display	Required	Optional
Controller / Manifold	Required	No
I.S. Certification	Maybe	Yes
Electrical Certifications	CSA	UL, CSA, PTB, DEMKO, Etc.
Metrology Certifications	None to our knowledge	OIML / GOSTANDARD
Data provided: (Primary Instrument)		
Mass	Yes	Yes
Level	Calculated from bottom sensor	Yes
Multi-point spot temperature	No, average temperature only	Yes
Multi-strata density over tank height	No, average density only	Yes
Free water (Interface)	Optional	Yes
Entrained Water	No	Yes
2nd Interface	No	Yes
Leak detection (By Mass)	Tank tightness testing	Yes
Vapor & atmospheric pressure	Optional	Yes
Vapor & atmospheric temperature	No	Yes
Quantitative and qualitative measurement	No	Yes
Alarm - Multiple level sensors	No	Yes
Alarm - Mass	Maybe	Yes
Alarm - Multi-point spot temperatures	No	Yes
Alarm - Multi-strata density layers	No	Yes
Alarm - Vapor pressure	Maybe	Yes
Alarm - Vapor temperature	No	Yes
Real-time tank profile	No	Yes
Patented technology	Assumed to be patented	Yes - Multiple Patents

NOTE: MTG™ and Multi-function Tank Gauge™ are registered trademarks of Gauging Systems Inc. (GSI) and can not be used without our expressed written permission.