



## Transmitter accuracy on a Mechanical (Float & Tape) Gauge

A competitor recently published a magazine article on a “New Transmitter for for mechanical float and tape tank gauges.” In the article they claim to have improved the level measurement accuracy.

The article starts with comparing the new transmitter to transmitters manufactured over the last 35 years. They criticized almost all prior transmitter / encoder designs manufactured. However, they need to remember that they were comparing the design of the new transmitter to mostly their own past encoder designs (Brush, reflective optics, Linear optics, Non-absolute, partial absolute, etc.).

Brush encoders are not generic or all the same. Gauging Systems Inc. manufactures an Absolute “Linear Geared” Brush Encoder that is accurate, reliable, and easy to maintain.

To compare transmitter / encoders (such as brush from one manufacturer to another) you must first have product knowledge of the products being compared. It would also be good to look at the MTBF rates between your own equipment and those you are criticizing.

*Example:*

*One brush encoder design has two (2) zero levels on their gray code. This means that you can calibrate the transmitter to zero level and think it will provide a count to 79' 11 – 15/16". However, it could be calibrated at the other zero level point and only count to 11' 11 – 15/16" and then fall to zero level. If it goes unnoticed, you will have nearly 12 additional feet of product in your tank as you approach an overflow level. Note: The GSI 2000 encoder has only one zero level of calibration and no liability issues.*

*One brush encoder uses two different code disks, one for the foot side and the other for the inch & 16ths (or decimal). Note: The GSI 2000 code disk can be used as either the Foot side or the Inch side, to reduce parts, wear, and extend the encoder life. The two code disks can be swapped to equalize wear.*

*One brush encoder uses a Geneva gear to actuate the movement of the foot disk, thus, synchronizing the level indication. The problem is that the Geneva gear when set too loosely, it misses the foot actuation. If it is set too tightly, it will not only bind the transmitter, but can hang-up the mechanical gauge as well. In most instances it will break teeth on the Geneva gear and send false level information. If the mechanical gauge is hung, the teeth on the Geneva gear break, the float drops, tape is pulled out of the gauge, negator motor uncoils, counter assembly gears are stripped, etc.. Note: The GSI 2000 Encoder is linear geared between code disks. There has never been a false level or hang-up from linear gearing.*

*One brush encoder uses very thin traces on their code disks (both inches and feet). Note: the GSI 2000 uses not only twice the trace width, but also three times the trace thickness. Thus, it minimizes false level data and has three times the code disk life.*

*One brush encoder uses two thin wires connected to a brush block at one end. When the wires are being pulled by the moving code disk they seem to stay on the gray code correctly most of the time. However, when they are pushed the two wires have a tendency to feather apart, thus giving erroneous or false level data. Note: The GSI 2000 brushes are “V” shaped and controlled in both directions by the brush block, thus no erroneous or false level data.*



*One brush encoder will take a good technician 1-2 hours to change out a set of worn brushes.*  
Note: The GSI 2000 Encoder “Drawer Mounted” design allows for the change out of the brush block assembly by even a “salesman” in less than two minutes.

The GSI 2000 Transmitter Cards have changed over the years to add additional protocols (integration with other manufacturers and gauge technologies), topologies (Ethernet, Radio, etc.), Input/Outputs, discrete, and improve functionality.

GSI standardized on MODBUS RTU protocol in 1987 and seems to be the standard protocol of all tank gauging manufacturers since that time. NOTE: MODBUS RTU and MODBUS TCP/IP allow for additional data registers more easily than other protocols. Some other (DCS or Foundation) protocols limit the number of tank gauging registers to five (5) – Volume, Level, Temperature, Density, and Water. It takes customized programming to add usable registers from more advanced technology.

Some manufacturers push “Wireless” tank gauging, but don’t advise customers that wiring for power and I.S. grounds may be required. Hardwire (& Fiber optics) allow for stronger security, faster polling of the tanks, and more data throughput.

Back to the other competitor’s New Transmitter:

**Fact:** Most mechanical (float & tape) gauges provide ¼” to ½” accuracy at best. This is due to the mechanical hysteresis within the transmitter coupling, drag over sheave elbows or within the gauge, the hole punch accuracy of the tape, strength of the negator motor, etc.

**Question:** So why does a company introduce a new encoder (transmitter) design every five years on average over the last 35 years?

**Question:** So how does this other manufacturer support the notion that their new transmitter’s accuracy is better than the primary instrument (the mechanical gauge) accuracy on level measurement?

**Question:** In accordance with API 3.1a – The manual reference hand lines used within the U.S. for custody transfer measurements are graduated to 1/8”. Why would you design a transmitter with 1/32” resolution to work on a mechanical gauge with 1/8” to ¼” level accuracy?

### **What is new about the competitor’s latest transmitter technology?**

Better Encoder resolution (but it isn’t the primary instrument); additional I/O; ability to use other devices on the same communications bus; an electronic local display; and configuration of the transmitter using the local display.

### **In comparison:**

The GSI 2570 mechanical (float & tape) gauge, (has less hysteresis, less drag, accurately punched tape, better designed and manufactured parts, and provides 1/8” – ¼” level accuracy) and also provides a mechanical local display.

The best “absolute digital transmitter” to work with the GSI 2570 Mechanical Tank Gauge is the GSI 2000-APT3.

The GSI 2000 Absolute Digital Transmitter is comprised of three parts;

1. GSI 2000 Housing Assembly



2. GSI 2000 Absolute Encoder Assembly has the lowest MTBF over the last 32 years in the tank gauging industry. A linear geared brush encoder using the same code disks for both sides (foot and inch), a removable/replaceable replaceabl“drawer” mounted (V shaped) brush assembly, with all gears and hardware made of 316 SS or anodized aluminum plate. Optional: Limit Switches (2-6), multi-point Tank Temperature Probe (TTP), RTD (and Thermo-well), and I/O.
3. GSI Transmitter Board Assembly; APTB3 “All Purpose Transmitter Board” allows expanded transmitter capabilities; serial ports, diagnostics, remote calibration, added communications protocols, and topologies.

**What is new that can provide better accuracy with a Mechanical Gauge?**

If you want custody transfer accuracy from a mechanical tank gauge (GSI 2570) with absolute digital transmitter (GSI 2000/APTB3), add a Multi-function Tank Probe (MTP 3025) for Volume, Level, Mass, Multi-point or Average product temperature, Multi-strata density or Average product density, and Total water (Free, emulsified, and entrained). For more information contact Gauging Systems Inc.

