Badger Meter

# Technology Advancements in Engineered Polymer Meters

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## White Paper

# Table of Contents

## Summary

Badger Meter has made significant discoveries and has developed the most expertise in the use of engineered polymers for metering technology. This white paper discusses those advancements specific to Badger Meter products and as they relate to the water utility market.

As an industry leader in metering technology, Badger Meter released its first engineered polymer meter in 1972. Since their introduction, Badger Meter has manufactured and sold over 4 million engineered polymer meters. Leveraging significant knowledge, know-how and field experience with engineered polymer meters, Badger Meter continues to make design enhancements. Through improvements to the thread geometry (Higbee thread design) and by transitioning to a stronger engineered polymer, Badger Meter expertise provides a robust and reliable meter to meet continuing market demands.

## Background

The current economic climate is forcing water utilities to search for ways to stretch available budgets even further while still maintaining their revenues and providing the highest level of customer service for their end customers. In addition to these budgetary pressures, water utilities may see price increases in lead-free bronze meters as new NSF/ANSI Standard 61 requirements are enforced. Eventually, when changes in the U.S. Environmental Protection Agency (U.S. EPA) Safe Drinking Water Act (SDWA) come into effect, customers will be required by law to purchase lead-free material instead of the less-expensive standard 81 bronze that has traditionally been used in the manufacture of water meters.

As water utility budgets continue to get tighter, the cost of raw materials such as copper continues to rise, and lead-free regulations take hold, utilities will see further benefits in an alternative to the traditional bronze meter.

## Advantages

Before moving forward with a meter change-out program, water utilities may wish to consider engineered polymer meters, as they offer many advantages over bronze meters.

### Cost Effective

The engineered polymer meter presents an economic benefit over traditional bronze and copper-based alloys. Badger Meter engineered polymer meters provide the same flow range and accuracy as their bronze counterparts. And, they maintain the same accuracy warranty and unprecedented 30-year housing warranty that is offered for our 81 metal bronze meters. Yet, the price of an engineered polymer meter is less than the bronze meter. Furthermore, the materials used to construct the meters weigh less, which can reduce shipping expenses.

### Lead-Free Metering Solution

Pending revisions to NSF/ANSI Standard 61 and the federal Safe Drinking Water Act make engineered polymer meters a true lead-free metering solution that is economically attractive, complies with current lead-free regulations, and provides the durability, strength and reliability of bronze meters.

### Corrosion Resistant

Not only do engineered polymer meters comply with lead-free regulations, they also are corrosion resistant which provides a solution in geographic areas with aggressive water.

### Theft Deterrent

With the rising cost of copper, scrap value goes up making bronze meters an easy target for theft. Engineered polymer meters are a great alternative in those areas where meter theft may be an issue.

## Threaded Spuds

Badger Meter engineered polymer meters incorporate reinforcing glass fibers for added thread spud strength and durability. This engineering enhancement was developed to ensure superior performance. These glass fibers act like reinforcing rods in concrete and give meter components greater rigidity and strength. The Badger Meter engineered polymer spud geometries differ from those used in their bronze spuds, leveraging injection molding process refinements. For example, our 5/8 x 3/4, 3/4 inch bore polymer spud configuration, when being stressed with both a shear load and a bending load, actually has a higher static load capability than many bronze models.

Not only is spud strength important to durability, but spud length also is important. For example, spud length on Badger Meter engineered polymer meters are comparable to bronze meters. However, competitive polymer meters on the market today have thread connections that protrude only a short distance out of the plastic shroud. This can cause difficulty when installing meters in meter settings or with wrench clearance, which can affect the ability to properly seal the ends of the meter.

Pictured Left: Badger Meter engineered polymer meter spud length (7.5 threads)

Pictured Right: Competitive polymer meter spud length (6 threads)

Water utilities that use standard meter setters will see no difference in strength characteristics between the engineered polymer meter spud end and a bronze meter spud end. Remember, a water meter, regardless of whether it is bronze or engineered polymer should not be used to bring piping into alignment. This could negatively affect meter accuracy and the quality of meter installation.

## Stainless Steel Thread Inserts

Polymer meters from manufacturers other than Badger Meter (e.g., Hersey) use a three-part spud consisting of a polymer housing body, stainless steel thread insert, and a polymer spud retaining tip. These may appear stronger because of the stainless steel threads, but in actuality they have an inherent weakness in wall thickness. Because the wall thickness must be split between two or three separate components, the polymer walls are much thinner and thus weaker than a one-piece polymer wall design. The three-piece design compromises the load-carrying areas of the meter, resulting in weaker spuds prone to spud breakage. For these reasons, Badger Meter does not utilize the three-part spud design in its engineered polymer meters.

## Fatigue and Burst Strength

Badger Meter engineered polymer meters meet AWWA requirements for fatigue resistance and hydrostatic strength to accommodate pressure transients within the home or distribution system.

AWWA C710-09, Sections 4.2.5.1 and 4.2.5.2, require that pressure casing, covers and bottoms shall be capable of withstanding:

- 300 psi for 15 minutes without leakage or structural damage
- 600 psi as a minimum burst pressure (450 psi for breakable covers/bottoms)
- 150 psi without leakage, after sustaining 100,000 pressure cycles, with pressure being varied from 100 psi to 300 psi and then back to 100 psi

While most service lines have delivery pressures of less than 100 psi, AWWA C710 includes these elevated performance requirements in order to assure a design safety factor even under unintended system pressure transients. Badger Meter engineered polymer meters meet and exceed all of these AWWA pressure requirements.

### Cross Threading

Engineered polymer meters introduced to the market a number of years ago were more prone to cross-threading damage. Damage occurred when the threads on the field mating coupling nuts were not properly aligned with threads on the meter spuds. This was exacerbated if the coupling nut threads were worn, dirty, corroded, or had poor leading-thread geometry.

Through the use of strong housing materials and refinements in design features such as thread geometry (Higbee thread design), Badger Meter has helped prevent cross threading. The Badger Meter design incorporates a short cylindrical lead-in before the start of the lead thread which helps to engage and align the coupling nut before any attempt is made to start thread engagement. This leading thread has an abrupt or blunt start that makes it more difficult for the lead thread on the coupling nut to force thread engagement at any point other than the actual start of the plastic lead thread.

## Conclusion

Through the implementation of several key design enhancements, engineered polymer meters from Badger Meter provide an exceptional value to water utilities. The robust design and durable construction of a Badger Meter engineered polymer meter feature the same accuracies as bronze meters, but at a lower cost. And, their inherently lead-free status provides a ready solution to impending lead-free standards. Water utilities can stretch available budgets even further and simultaneously meet federal lead-free regulations.

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