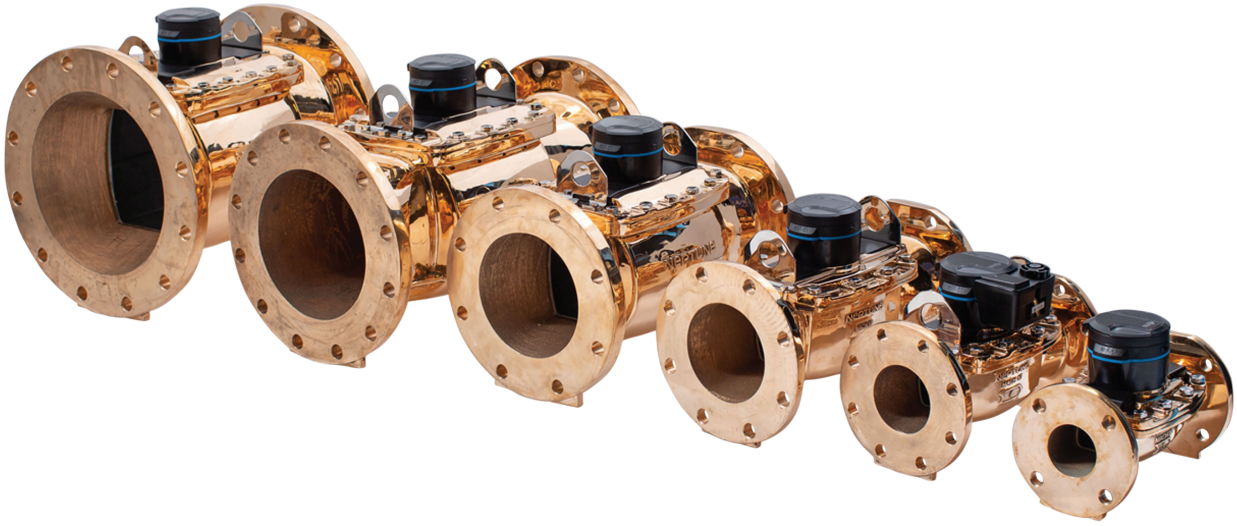
C&I MACH 10®: A Fire Ready Meter

A WHITE PAPER BY NEPTUNE TECHNOLOGY GROUP INC.



HOW ULTRASONIC TECHNOLOGY IS HEATING UP THE FIRE SERVICE METERING MARKET

Each new day seems to bring a flood of advancements in technology that impact our lives. This is true for utilities and municipalities across North America looking to take advantage of smart products and city-wide networks designed to improve the efficiency of municipal services and lower the cost of ownership, while minimizing the financial impact to the community.

The latest technology making waves in the water industry is the ultrasonic water meter. Ultrasonic meters use targeted sound waves to measure the velocity of water moving through the meter. The most notable characteristic of these meters is the lack of moving parts, which results in several advantages over traditional (mechanical) water meters.

These advantages are useful across a wide range of application types, especially for a city's critical fire service infrastructure. This application often requires a costly, specially certified water meter, despite minimal consumption and revenue when not combined with a potable water line. A look at the evolution of fire service technology helps to illustrate the benefits that can be realized by utilities switching to ultrasonic meters.

PROTECTING US: A BRIEF HISTORY OF FIRE SERVICE METERS

Historically, regardless of the application, mechanical water meters have been the only option for utilities. The primary types of meters have been positive displacement (disc), turbine, and compound – which combine the turbine with a disc meter.

HP PROTECTUS® III

For decades, these mechanical meters have served the industry well for potable, reclaim, and fire service applications. However, many mechanical meters are not "fire service ready" without additional testing to obtain certification, a requirement set by AWWA as part of their C703 Cold-Water Meters, Fire-Service Type standard[1]. Fire service meters must include either a listing with Underwriters' Laboratory (UL) or approval by Factory Mutual Research (FM). Therefore, manufacturers have had to design and test specially certified assemblies which often come at a higher cost to utilities.

The HP PROTECTUS® III (HPPIII) manufactured by Neptune Technology Group is a fire service meter comprised of Neptune's HP Turbine® and T-10® meters assembled with a basket-style strainer. A compound assembly, the HPPIII is UL Listed and FM Approved. The HP Turbine, which is known for its high flow capabilities, complements the T-10's low flow measurement capabilities, providing an ideal meter to serve both potable water usage and fire service demand on the same line. The HPPIII's compound design serves both low and high flow conditions by utilizing disc and turbine meters; however, there are some drawbacks to consider as well.

MOVING PARTS

The use of a strainer upstream of a mechanical meter is commonplace to protect the moving parts within the meter as well as any components downstream of the meter. These sizeable strainers must be routinely checked and cleaned to ensure there is no disruption to the water flow of a fire service water line. The HPPIII combines two mechanical meters resulting in moving parts that can wear out and break over time, impacting the meter's ability to accurately measure consumption. Therefore, utilities typically need to conduct regular costly and time-consuming maintenance and testing for their fire service meters.

CROSSOVER

Crossover occurs on a compound meter when the flow is significant enough to open the main valve. Water will begin to flow through the turbine element as the main valve begins to open. However, the accuracy of the meter can be reduced as the transition to high flow occurs. The AWWA standard defines crossover as "when accuracy of registration falls below 97 percent caused by the operation of the automatic valve mechanism, and the end of the changeover is when the accuracy of registration again reaches 97 percent."[2] In addition, the drop in accuracy allows for as low as 85 percent. This dip in accuracy results in lost revenue (or Non-Revenue Water) for the utility. The HPPIII uses this main valve to transition from low flow to high flow. However, the ultrasonic meter measures a wide flow range comparable to a compound meter without the loss of accuracy. Unlike a mechanical meter, the Neptune® MACH 10® sustains its specified flow capabilities over the life of the meter because there are no parts to wear or break and ultimately lead to inaccurate measurements.

SIZE AND WEIGHT

Many fire service assemblies are either a compound meter or certified with a strainer to protect the meter's moving parts. The result is a sizable and heavy meter which can lead to unsafe and challenging installation and maintenance. Additional equipment is often required to safely lift, move, and set these large assemblies. Technological advancements have enabled ultrasonic meters to measure water electronically using smaller, lighter (non-moving) parts.

Although The HPPIII and similar fire service meters have previously been an invaluable part of a utility's fire service infrastructure, the time has come for utilities to take advantage of newer technology to help put out fires.

A VERSATILE APPROACH TO FIRE SERVICE METERING

Ultrasonic meters are still relatively new to the water industry, although more utilities are starting to realize their benefits. Ultrasonic meters, like Neptune's C&I MACH 10, have had an immediate and positive impact on a utility's revenue and operational efficiencies. The meter's core benefits offer better solutions than past fire service metering options.

NO MOVING PARTS

Unlike traditional mechanical meters, ultrasonic meters have an open flow chamber and zero moving parts. The meters use fixed transducers to produce ultrasonic sound waves that travel through the flow which is translated to consumption. With no parts to wear and tear, the ultrasonic meter maintains the same level of accuracy from its first day to its last, whereas a mechanical meter can suffer loss in accuracy if not maintained properly. Routine maintenance of a mechanical meter increases the total cost of ownership due to the need for labor and replacement parts. A loss in profit is experienced due to added maintenance costs or Non-Revenue Water because of the potential loss of accuracy. A lack of moving parts means sustained accuracy, lower operational expenses, and more time dedicated to customer-related issues.

Table 1 provides an example of a HPPIII's estimated cost of ownership versus the new C&I MACH 10 after ten years of usage. During this span, the expenses related to the installation, testing, and maintenance of a HPPIII meter are three times as high as a MACH 10 due to the size, weight, and wear on the moving parts of a HPPIII meter.

TABLE 1: 10-YEAR ESTIMATED COST OF OWNERSHIP

Fire Service Meter Expenses	8" HP PROTECTUS III	8" C&I MACH 10
Installation Costs	$16,000[3]	$7,500
Maintenance & Parts (~$2-2,500K per year)*	$25,000[3]	$6,000
Total Cost of Ownership (10 Years)	$41,000	$13,500
Average Annualized Cost	$4,100.00	$1,350.00

**AWWA recommends testing 8" Fire Service (mechanical) meters annually[4]*

NO CROSSOVER

Any compound fire service meter necessitates that two meters share the responsibility of measuring an entire range of flows from low to high. This ultimately means the existence of crossover when the flow rate transitions from low to high. An ultrasonic meter's capability of measuring a wide flow range is comparable to a compound meter, yet it does so without the loss of accuracy experienced during crossover (the AWWA allows for a drop in accuracy during the crossover period to as low as 85%). Furthermore, unlike a mechanical meter, the MACH 10 sustains its specified flow capabilities over the life of the meter because there are no parts to wear or break and ultimately lead to inaccurate measurements.

SMALLER AND LIGHTER

One of the other benefits of the C&I MACH 10 is its size. The meter's design allows for a significant reduction in size and weight compared to its compound predecessors. With no moving parts, there's no need to protect meters with oversized strainers. The smaller size also simplifies the installation design, which can often be challenging with oversized meters. With its smaller footprint, the C&I MACH 10 can save on installation costs related to rental equipment, vaults, hot boxes, or other plumbing needs. The inherent result is a significantly lighter meter, making for an easier, safer, and more cost-efficient installation process.

TABLE 2: 6" FIRE SERVICE METER COMPARISON

	6" HP PROTECTUS III	6" C&I MACH 10
Meter Type	Mechanical Compound	Solid State Ultrasonic
Normal Flow Range	1.5 to 2,500 gpm	2 – 2,000 gpm
Low Flow @ Accuracy %	0.75 gpm @ 95% -101%	1.0 gpm @ +/- 3%*
Crossover	Yes	No
Pressure Loss @ Max Flow	> 18 psi	4 psi
Moving Parts	Disc, Turbine, Magnets, Valves	None
Maintenance	Every 1-2 years	Every 10 years (battery life)
Construction	Stainless Steel or Epoxy-Coated	Lead-free Bronze
Weight	570 lbs	91 lbs**
Billing/Registration	Combined Reads (x2)	Single Read
UL/FM Certification	Standard	Standard
Basket Strainer	Included	Optional
Warranty (Accuracy)	1 Year	10 Year

**Ultrasonic meters measure low flow at a more stringent accuracy standard than mechanical meters. **Optional UL/FM basket strainer adds approx. 232 lbs when assembled to the meter.*

VERSATILITY

Ultrasonic meters, like the C&I MACH 10, are UL Listed and/or FM Approved for the purpose of fire service installations. The combination of these certifications and the many benefits previously covered make for an extremely versatile meter capable of serving all types of applications. The MACH 10 enables utilities to standardize on a single meter type for potable, reclaim, or fire service applications, simplifying inventory control and creating consistency throughout a utility's infrastructure. Table 2 compares key characteristics of the C&I MACH 10 versus the HPPIII.

CONCLUSION

Fire protection services are of paramount importance to any city's infrastructure; however, the need for a fire service meter can often be costly and burdensome for a utility. The return on investment for a fire service meter may be minimal considering how little revenue is typically collected from a fire protection line. Ultrasonic technology allows utilities to eliminate the time and resources allocated to maintaining these fire service installations while simultaneously eliminating Non-Revenue Water related to crossover in a compound meter. Additionally, utilities can improve operational efficiency and reduce their commercial, industrial, and fire service meter inventory to a single, versatile meter option – such as the C&I MACH 10.

Adopting new technology can be challenging, especially in an industry with complex infrastructures delivering a critical resource to millions of people. However, the latest advancements in technology are improving our daily lives in ways we never imagined. Utilities with a vision to the future need look no further than the versatile and reliable Neptune C&I MACH 10 for their water metering systems.

Sources: 1) Sec 1.1 of AWWA Standard, Cold-Water Meters – Fire-Service Type; ANSI/AWWA C703-11 (Revision of ANSI/AWWA C703-96 [R04])
2) Sec 4.2.6.2 of AWWA Standard, Cold-Water Meters – Fire-Service Type; ANSI/AWWA C703-11 (Revision of ANSI/AWWA C703-96 [R04])
3) Hydro Utilities, Inc. – Bid Pricing Estimates for Installation and Maintenance
4) Sec A:6 Periodic Tests of AWWA Standard, Cold-Water Meters – Fire Service Type; ANSI/AWWA C703-11 (Revision of ANSI/AWWA C703-96 [R04])

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