

# The Value of an E-Coder®-based AMR System



In 2003, Neptune introduced a revolutionary new product to the water industry – the E-Coder® solid state absolute encoder. The E-Coder provides enhanced **VALUE** to our customers.

At Neptune, evolution and revolution are one and the same. When we launch a new product as part of Neptune’s ARB® Utility Management Systems™, we strive to ensure that the customer’s existing Neptune system is compatible with these new products. In 2006, we integrated the field-proven R900® and the E-Coder solid state absolute encoder into one device – the E-Coder|R900i™ – and introduced

the industry’s first solid state wireless automatic meter reading solution. The total cost-of-ownership benefit was greatly enhanced, installation costs were reduced, the potential for tamper was virtually eliminated, and the E-Coder PLUS data continued to be available (leak and reverse flow detection). This total product concept is evolutionary.

Deployment of E-Coder-based AMR systems allows utilities to take control of their water and sewer costs for increased water sustainability. Water conservation and loss management programs, as well as homeland security, are enhanced with proactive leak detection and

35-day reverse flow monitoring. Several of our competitors have tried to copy this product concept, yet none have come close.

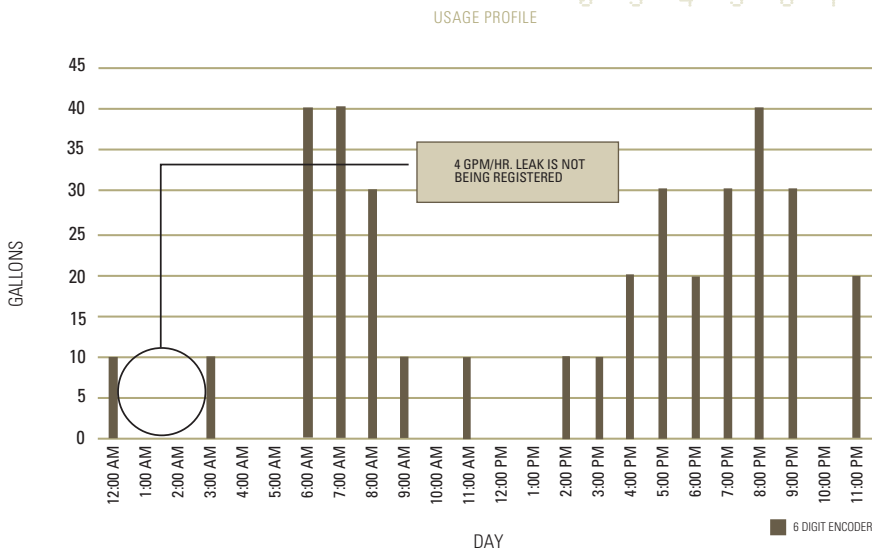
Let’s take an in-depth look at the **VALUE** of the PLUS data from E-Coder-based AMR systems.

## ENHANCED 8-DIGIT RESOLUTION: LEAK DETECTION & METER SIZING

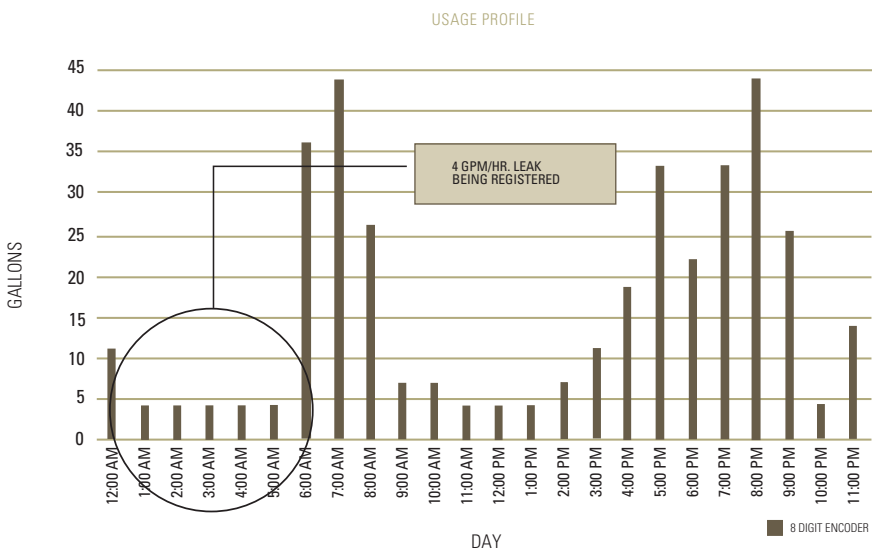
Conventional 6-digit encoders, such as the ProRead™, provide remote resolution of 50-gallon (residential), 500-gallon (light ICI), and 5,000-gallon (large ICI) applications. The E-Coder provides 1/10th of a gallon resolution

### Features/Benefits of E-Coder-based AMR Systems:

Features	Benefits
<ul style="list-style-type: none"> <li>enhanced 8-digit resolution versus traditional 6-digit encoders</li> <li>water loss/non-revenue water management</li> <li>proactive leak notification</li> <li>enhanced meter diagnostics</li> <li>35-day reverse flow monitoring</li> </ul>	<ul style="list-style-type: none"> <li>leak detection and meter sizing</li> <li>monthly leak and tamper reports</li> <li>enhanced customer service</li> <li>identification of potential theft of service or stopped meters</li> <li>control of security and backflow breaches</li> </ul>



Graph #1 - Traditional Competitive 6-digit Encoder Graph



Graph #2 - Neptune's 8-digit E-Coder Graph

remotely for residential and 10-gallon resolution remotely for large Industrial, Commercial, and Institutional (ICI) applications. The **VALUE** of 8-digit resolution is enhanced accuracy in testing of water meters and more meaningful data for usage profiling.

The consumption graphs further illustrate the **VALUE** of the Neptune E-Coder's enhanced 8-digit resolution. Graph #1 shows a typical residential utility service connection with a traditional 6-digit encoder that has a visual registration of 10 gallons. Graph #2 is the same residential utility service connection with E-Coder's enhanced 8-digit resolution. This residence developed a 4-gallon-per-hour leak at

12:00 a.m. (see the circled area on graph 2). The E-Coder's 8-digit resolution not only identifies the leak but also begins to register the consumption when the leak starts. Additionally, the E-Coder sets flags for each 15-minute interval during a 24-hour period that this leak is present. With a 6-digit encoder, the leak could be masked, as this consumption would not register for three hours, and in all likelihood would appear as normal consumption.

When monitored hourly, the E-Coder's 8-digit resolution can also be used to ensure proper meter sizing. Both the Hexagram STAR® Network System and Neptune's EZGate™ targeted fixed network system can provide this degree

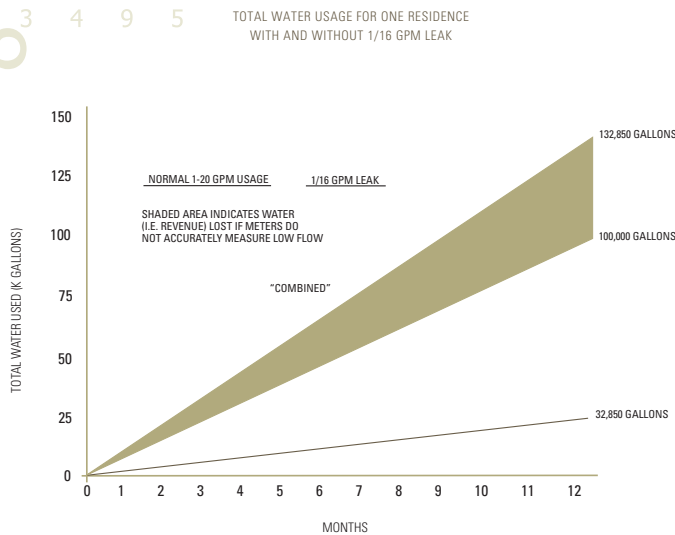
of consumption profiling. Reports that list leak, tamper and reverse flow status are available.

**MONTHLY LEAK & TAMPER REPORTS: WATER LOSS / NON-REVENUE WATER MANAGEMENT**

The E-Coder-based AMR systems provide leak data that allows the utility to address water loss/non-revenue water management. By taking a proactive approach, utilities can notify their customers of leakage problems to avoid complaints and billing issues.



# The Value of an E-Coder-based AMR System: continued



As published in the Spring 1987 issue of *Neptune News*, article "Low Flow Lowdown" by D.J. Kullmann

Studies conducted by various utilities and university cooperative extensions, such as Normal, IL and Colorado State University, show that dripping faucets and leaking toilets can account for as much as 14% of all indoor water use, equivalent to 10 gallons (38 liters) per person of water lost per day. Typical annual water consumption for a household family of four is approximately 100,000 gallons. A 14% water loss equates to approximately 14,000 gallons per year! Research also indicates that many household leaks occur at less than 1/8 gpm; for example, an undetected leak at 1/16 gpm for an entire year equates to 32,850 gallons of water loss. As water conservation programs continue to grow, the value of E-Coder-based AMR systems and their ability to detect leaks will

become more and more valuable — not only to the utility but also to the homeowner.

This is the case for the Florida Keys Aqueduct Authority (FKAA). The FKAA expects to achieve a multitude of goals by implementing its E-Coder-based AMR project. (The FKAA deployment includes the installation of the E-Coder)R900i.) These goals include:

- Eliminating errors in meter reading
- Reducing safety hazards
- Reducing the number of estimated bills
- Automating the processing of meter reading data
- Obtaining water consumption data on a more frequent basis
- Monitoring for leaks and reverse flow
- Tamper and theft detection to reduce both

- Monitoring consumption trends and usage profiles
- Providing usage data to customers
- Lowering costs of ownership (installation and maintenance).

According to Carl Brewster, FKAA Director of Information Technology, "After the first 12 months of implementation, we have experienced a great benefit as a result of the leak detection capability of the E-Coder)R900i. There have been many occasions when our staff and customers have identified leaks on the customer side of the meter. This feature allows our organization to be more proactive with leak detection for the benefit of our customers, as well as to continue managing a limited resource in South Florida."

METER APPLICATION	CONVENTIONAL ENCODER		SOLID STATE E-CODER	
	VISUAL	REMOTE	VISUAL	REMOTE
Residential (5/8" -1" T-10)	10 gallons	50 gallons	1/100 gallon	1/10 gallon
Light C&I (1 1/2" & 2" T-10; 1 1/2" -4" HTP)	100 gallons	500 gallons	1/10 gallon	1 gallon
Large C&I (6" -20" HPT, HPPIII, & TF)	1,000 gallons	5,000 gallons	1 gallon	10 gallon

**TABLE 1** provides a comparison of the resolution — both visual register and remote meter readings — of conventional 6-digit encoders and the enhanced 8-digit resolution of the E-Coder.

**PROACTIVE LEAK DETECTION:  
ENHANCED CUSTOMER SERVICE**

Every utility is faced with resolving high water bill complaints from its customers. In some cases, customers can be irate and spend a lot of valuable time and resources arguing high water bills. The **VALUE** of the E-Coder's ability to indicate leak detection is that it allows utilities to provide proactive leak notification to their customers and improve their customer service. Utilities can use the leak reports generated by the E-Coder as a proactive tool to notify the homeowner of suspected leaks using such methods as letters or door hangers. These types of proactive measures not only provide notification of a water leak but also highlight possible causes. Another proactive approach is to display the leak status information directly on the customer's bill, providing documentation of the leak to support complaint resolution. Not only is the information displayed on the customer's bill, but it's also at the fingertips of customer service representatives to further support complaint resolution.

Three utilities that have taken advantage of the proactive customer service **VALUE** of the E-Coder are the Village of Carthage, New York; Elkins, West Virginia; and Opelika Utilities in Opelika, Alabama.

With the new Neptune E-Coder-based ARB Utility Management System in place, the Village of Carthage has realized instant improvements across the board:

- Time to read the Village's meters reduced from 80 hours to half an hour
- Customer complaints virtually eliminated

"Our initial reading with this system identified 167 individual accounts with some kind of intermittent or continuous leak," says System Superintendent Ernie Prievo. "We hand-delivered letters to each of those accounts informing them that they need to have their house checked for a leak. Since then, we've seen a reduction of 80-85% in high bill complaints."

According to Assistant Superintendent Mark Roberts, dealing with high bill complaints is easier because of information the Neptune system revealed after the initial read. "Before, when we went to a customer about a complaint, we didn't have any firm data to back us up," Roberts said. "Now we can show them they have 35 days of continuous leakage that is causing their bill to go up."

This proactive approach paid off for one resident in particular, a soldier who had recently left for duty in Iraq. Readings from the Neptune system showed that his water had not been turned off and that a severe leak had developed. "The hot water supply line to his washing machine was broken," Prievo said. "He was using 750 gallons per hour. He was very appreciative that we were able to notify him about the problem."

According to Rick Smith, Supervisor of the Water Distribution System for Elkins, West Virginia, the conversion has allowed the utility to take a more proactive approach to billing problems and other issues that may arise.

"We've already had situations where the system has alerted us with high readings and we were able to let customers know they had a leak," he said. "They were then able to find the leak and have it repaired. In summer months, people watering yards and washing cars might account for extra usage, but now we know when we have an area we need to check – we can pinpoint it through the E-Coder reports."

Without the burden of two weeks' worth of reading time, Smith is now able to allocate more manpower to other tasks within the utility, such as maintenance and customer service. Confidence in the E-Coder-based AMR system has reduced "truck rolls" to investigate high water bill complaints.

"Since this system has been installed, we've only had to test two meters with the customer present to prove the readings were correct – and they were," Smith said.

Opelika Utilities General Manager Dan Hilyer was concerned about residential water leaks, especially in older subdivisions where many fixed-income families reside. He saw the **VALUE** of E-Coder-based AMR in the potential to enhance customer service efficiency. The savings became obvious after a board meeting in the summer of 2002 when one of Opelika Utilities' customers addressed the board with a high water bill concern. The customer did not deny use of the water but merely wanted to inquire why the board did not have technology in place to identify residential water leaks and provide early leak notification to customers to help them avoid exorbitant water bills.

With assistance from Neptune and Continental Utility Solutions, Inc., the Continental CIS software was enhanced to interpret and display the value-added data provided by the E-Coder. Now, leak notification is printed directly on billing statements.

**CUSI**  
COLUMBUS WATER & SEWER UTILITY, INC.  
P.O. Box 1515  
Jenkinsville, AL 37403  
Customer Service: 800.945.1400  
Fax: 601.232.2528

CUSI  
300 South Church Street 2nd Floor  
Jenkinsville, AL 37403

Account Number	00000001
Delinquency Date	05/12/2006
Service Address	300 SOUTH CHURCH STREET 2ND FLOOR
Amount Due	\$213.37

**CONTINUOUS LEAK DETECTED**

Service ID	Service	From Date	To Date	Meter No.	Previous Reading	Current Reading	Usage	\$ Amount
00000000000001	Water	01/18/2006	02/15/2006	49336029	550	583	33	106.98
	Sewer	01/18/2006	02/15/2006				33	70.67
	Fire Protection	01/25/2006	02/25/2006				0	35.16

Period	Days	Water	Irrigation
Current	31	33	0
Last Month	31	39	0
Year Ago	31	32	0

Flushing the System  
March 9, 2006 to March 31, 2006

Current Charges	\$ 268.31
Tax	\$ 4.26
Pre Bill Amount	\$ 244.92
Misc Charges	\$ 0.09
Payments	\$ -245.92
Previous Balance	\$ 0.00
<b>Total Amount Due</b>	<b>\$ 213.37</b>

A continuous leak has been detected on your water service. Causes may include a toilet that is running or a faucet that drips continuously. You may have a broken water line under your house or out in the yard. You may want to have a licensed plumber inspect your water lines.

**Your Account Is Paid Via Automatic Bank Draft. This Statement Is For Informational Purposes Only. Please Do Not Pay.**

RETAIN THIS COPY FOR YOUR RECORDS  
PLEASE DETACH AND RETURN THIS PORTION WITH PAYMENT

Account No.	Service ID	Cycle No.	Route No.
00000001	00000000000000	4	44

Delinquency Date	Previous Balance	Total If Paid Late	Total Due
05/12/2006	\$0.00	\$227.37	\$213.37

**CUSI**  
COLUMBUS WATER & SEWER UTILITY, INC.  
P.O. Box 1515  
Jenkinsville, AL 37403  
Return Service Requested

CUSI  
300 SOUTH CHURCH STREET 2ND FLOOR  
JENKINSVILLE, AL 37403

**CUSI**  
P.O. Box 1515  
Jenkinsville, AL 37403

**ENHANCED METER AND TAMPER DIAGNOSTICS: IDENTIFICATION OF POTENTIAL THEFT OF SERVICE OR STOPPED METERS**

Unauthorized water usage is perhaps one of the toughest of all water losses for utilities to detect. Fortunately for utilities, E-Coder-based AMR systems have the ability to flag accounts with consecutive days of zero consumption, allowing utilities to monitor and identify potential theft concerns before they develop into huge losses of revenue. The zero-consumption flag can be used to prioritize investigations into potential theft of service. This flag can also be used to identify meters that have malfunctioned (stopped) and generate the corresponding reports.

**35-DAY REVERSE FLOW MONITORING: PROACTIVE HOMELAND SECURITY AND BACKFLOW INITIATIVES**

In the wake of events over the last several years, homeland security and backflow

initiatives have increased throughout the water industry. Today, many utilities are required to install a double check detector along with the normal residential water meter; this has been a requirement for larger commercial applications for some time. How does your utility know that these detector checks are working properly? Typically, utilities have to test detector checks on an annual or biannual basis. Between annual or biannual testing, using the 35-day reverse flow monitoring capabilities of an E-Coder-based AMR system provides a more frequent level of assurance that the detector checks are functioning properly.

As the Florida Keys Aqueduct Authority (FKAA) continues to move forward with deployment of its E-Coder-based AMR project, it plans to enhance its backflow program using the E-Coder's reverse flow detection feature. Several years ago the FKAA implemented an aggressive backflow program using the Neptune Double Check T-10 meters. This program was implemented to enhance customer relations, compliance and public health. The reverse flow

detection flag sent with the meter reading transmission allows the FKAA to monitor for backflow as meter readings are collected. The visual directional flow icon on the LCD display of the E-Coder)R900i allows customers to visually detect a backflow occurrence.

These proactive, value-added features available with Neptune's E-Coder-based AMR systems offer utilities like the Florida Keys Aqueduct Authority, Opelika Utilities, the Village of Carthage, and Elkins, along with many others, the unique opportunity to maximize the return on their AMR investment – through operating efficiencies, improved customer service, improved water sustainability through water loss and non-revenue water management, and homeland security concerns. 📡

Page 2 of 2 5/9/07		Equinox Report Continuous Leak Report							
Route	Reader Id	Read Seq	ID Cap	Reading	Disp11	Leak Status	Days of Leak	Date/Time	
01-0101-01-32	EZNET	002500	1440124626	1297	105 S UNION ST	Continuous Leak	35 Days	4/23/07 0:01:00	
						<b>Total 35 Days:</b>	<b>43</b>		
01-0101-01-03	EZNET	225000	1440277564	0037	220 WITHERSPOON AVE	Continuous Leak	22-34 Days	4/22/07 23:59:00	
01-0101-01-04	EZNET	125000	1440126426	0006	316 ANN ST	Continuous Leak	22-34 Days	4/22/07 14:56:00	
						<b>Total 22-34 Days:</b>	<b>2</b>		
01-0101-01-03	EZNET	200000	1400123632	0089	317 LAWRENCE ST	Continuous Leak	8-14 Days	4/22/07 14:57:00	
01-0101-01-06	EZNET	102500	1440123510	0184	234 W WATER ST	Continuous Leak	8-14 Days	4/23/07 2:03:00	
						<b>Total 8-14 Days:</b>	<b>2</b>		
01-0101-01-02	EZNET	282500	1440121444	0052	123 KEYSTONE AVE	Continuous Leak	3-7 Days	4/22/07 23:58:00	
						<b>Total 3-7 Days:</b>	<b>1</b>		
01-0101-01-32	EZNET	007500	1440122224	00297	400 S UNION ST REC5	Continuous Leak	1-2 Days	4/22/07 23:48:00	
						<b>Total 1-2 Days:</b>	<b>1</b>		
						<b>Grand Total:</b>	<b>49</b>		