CostView®

WASTEWATER COST MANAGEMENT PROGRAM

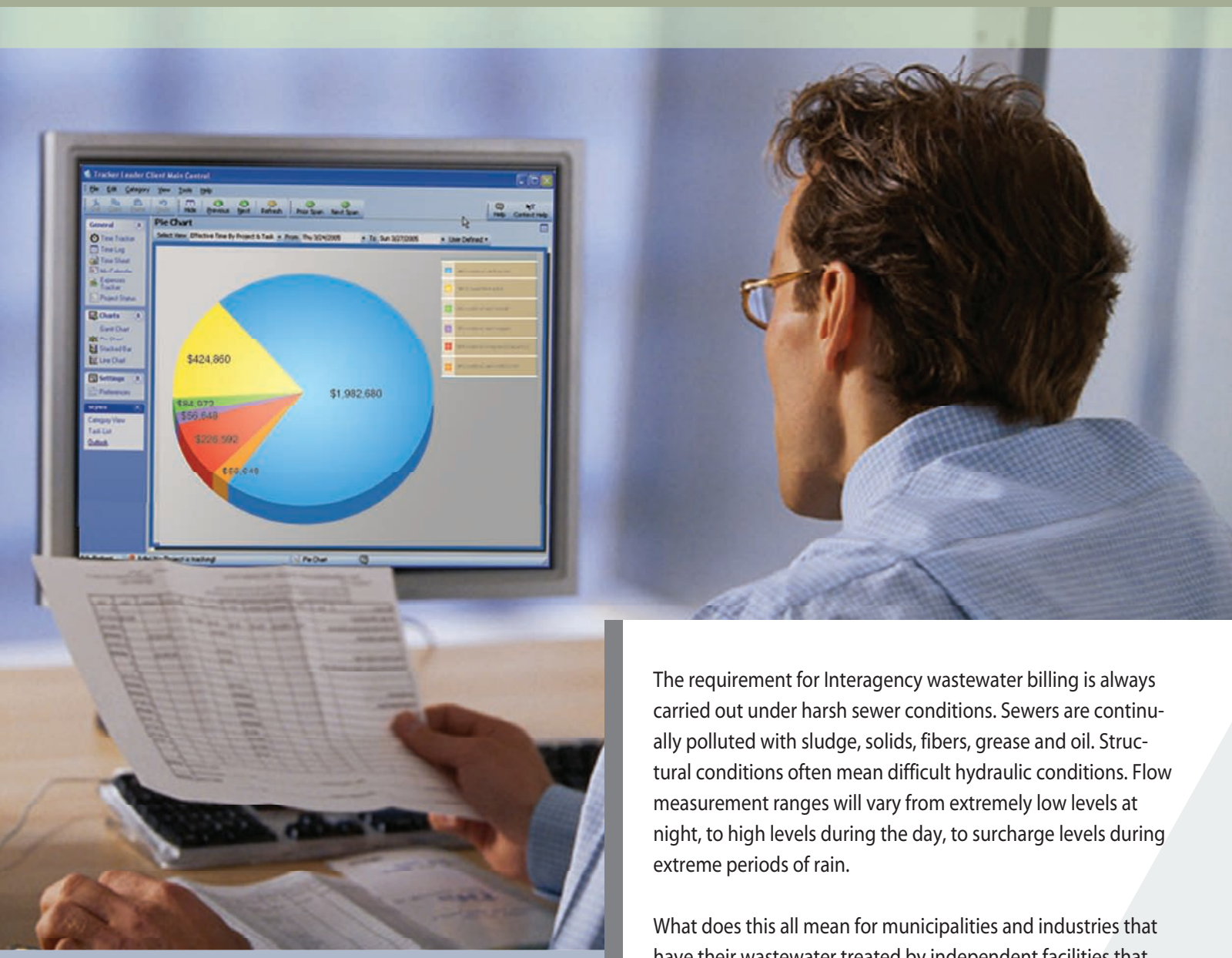
A Billing and Flow Analysis System for Controlling Municipal Sewage Treatment Costs

CONSULTING ENGINEER

LOCAL MUNICIPALITY

WASTEWATER DISTRICT

CostView®



The requirement for Interagency wastewater billing is always carried out under harsh sewer conditions. Sewers are continually polluted with sludge, solids, fibers, grease and oil. Structural conditions often mean difficult hydraulic conditions. Flow measurement ranges will vary from extremely low levels at night, to high levels during the day, to surcharge levels during extreme periods of rain.

What does this all mean for municipalities and industries that have their wastewater treated by independent facilities that charge for these services? It means that anyone involved with the process of either paying for sewage treatment or charging for that treatment should be totally familiar with the myriad of conditions that can quickly add up to thousands of dollars.

UNLESS A BILLING COST MANAGEMENT SYSTEM IS PUT INTO PLACE THAT CAN RECOGNIZE FLOW UNDER ALL CONDITIONS, THOUSANDS OF DOLLARS IN QUESTIONABLE BILLINGS OR LOST INCOME WILL QUICKLY ACCUMULATE FOR RAIN EVENTS, REVERSE FLOWS, STAGNATION, BLOCKAGES, SURCHARGES AND NON-UNIFORM HYDRAULIC CONDITIONS.

THE SOLUTION FOR CONTROLLING MUNICIPAL SEWAGE TREATMENT COSTS

Every Municipality and large industry in the country is under intense pressure to cut costs from their yearly operating budgets. Cost-allocation billings to communities that contribute flowage into municipal systems are now changing over from prorated population-based cost assessments to billings that are calculated from actual volumetric data. A recent survey by the NUS Consulting Group determined that during the past five years the average national wastewater treatment rate rose 28.6%. The Average National Billing Rate in 2007 was calculated to be $3.88/1000 Gal.

In addition, the U.S. Department of Justice has penalized more than 50 city and county wastewater systems for violations of the U.S. EPA's 1994 combined sewer overflow rules and now, Congress has proposed a bill that would toughen enforcement with requirements for monitoring and community notification of both Combined and Sanitary Sewer Overflows.

CostView addresses each of these issues by providing both the hardware and diagnostic tools for ultimately reducing potentially escalating treatment costs and eliminating governmental agency fines through a system of constant monitoring and analysis of conditions within the wastewater collection system.

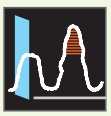
THE COSTVIEW PROGRAM

High Performance Billing Meter

The Municipality responsible for satisfying wastewater treatment charges can either purchase or lease a CostView Billing and Flow Analysis Meter from Eastech Corporation. A Hybrid Technology Flow Meter (see page 8), capable of monitoring and measuring volumetric wastewater flow under all open channel conditions, is installed within the collection system at an agreed upon point of measurement. Proprietary algorithms compile and convert the collected data into cost form, which in turn, is presented to the Municipality in a simple and easy to read pie chart format (see Page 4).

Billing Cost Analysis

Graphically displayed Cost Analysis Reports (see Page 4) are generated on a monthly basis that describe in detail billing costs for distinct categories of flow conditions. Municipal managers may now access a highly accurate window depicting the exact conditions under which wastewater charges are being generated. Billing cost treatment charges are categorized into six major areas that include normal diurnal flows, inflow and infiltration, reverse flows, stagnation, surcharges and non-uniform flow conditions. Upon review of the categorized data, areas for potential cost savings can be highlighted for immediate or future action.



Collection System Flow Analysis

Once cost-intensive collection system conditions are pinpointed, municipal administrators may begin developing plans for a reduction in capital outlays. Whether in partnership with a professional consulting firm or through the utilization of in-house personnel, CostView's Flow Analysis Program (see Page 5) will assist in determining the problematic areas on which to focus. Through the continual capture of historical flow data, diagnostic algorithms are presented in a simple graphical format for review by those familiar with the intricacies of the wastewater collection system.

CostView's High Performance Billing Meter, in conjunction with it's Cost and Flow Analysis reporting capability, provides the insight required to make intelligent decisions concerning the physical state of a municipalities collection system network while providing the necessary data for deciding whether a capital improvement project is economically justifiable.

CostView®

BILLING ANALYSIS REPORTS

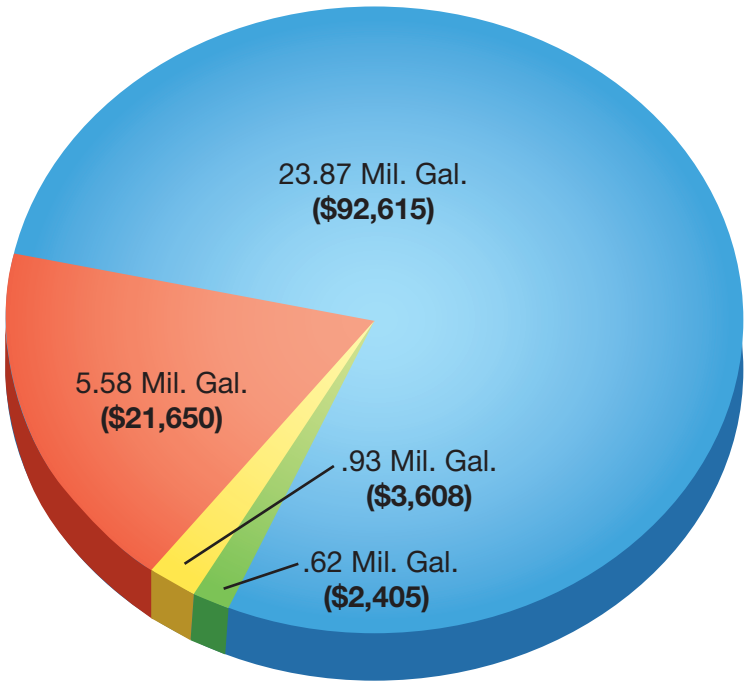
CostView Billing Analysis Reports not only bring documented proof to all parties concerned that the charges levied for wastewater treatment are both fair and correct, but when utilized to their fullest extent, create the potential for either lowering existing costs or maintaining them under tight fiscal control.

MONTHLY BILLING COST REPORT (Typical Example, May, 2008)

WASTEWATER VOLUME (Mil.Gal.) AT-A- GLANCE
WASTEWATER COST ($) AT-A-GLANCE

Monthly Treatment Volume: 31 million Gallons
Wastewater Billing Cost: $3.88/1000 Gal.[1]

- Normal Flow Conditions (77%)
- Inflow & Infiltration[2] (18%)
- Reverse Flow Conditions (3%)
- Non-Uniform Flow Conditions (2%)

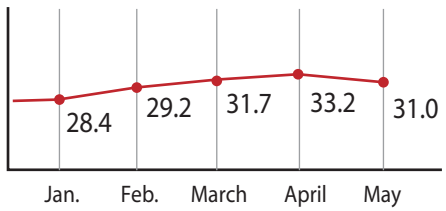


Surcharge Events 2
Stagnation . . . . . 14.88 hours

[1] A survey by the NUS Consulting Group determined that the average national wastewater rate rose 28.6% during the past five years. Average National Rate (2007): $3.88/1000 Gal.

[2] According to a recent AMSA survey (Association of Metropolitan Sewage Agencies), inflow and infiltration (along with storm water that goes to a treatment plant) comprises almost 25% of total flows. The Massachusetts Water Resources Authority (MWRA), in 1998, calculated inflow and infiltration as accounting for 60% of total flows.

2008 Monthly Volume History (Mil. Gal.)



TREATMENT COST: YEAR TO DATE (5/31/08)

Normal Flow	$476,464
Probable I & I	$89,337
Miscellaneous	$29,779
TOTAL ANNUAL COST	$595,580

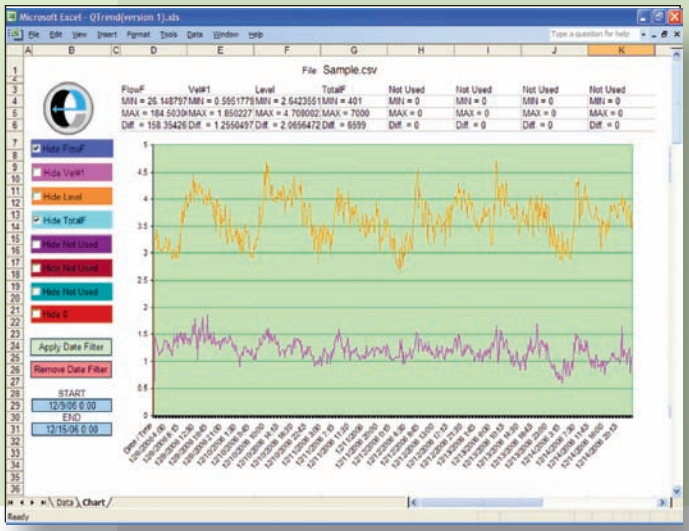
EXAMPLE

In the above example, Cost Savings of over $250,000 per year can be achieved by reducing I&I from 15% to 5%, detecting Reverse and Stagnant Flows, eliminating EPA fines for Sewer Overflows and avoiding Potential Lawsuits for sewage backing up into residential developments.

CostView®

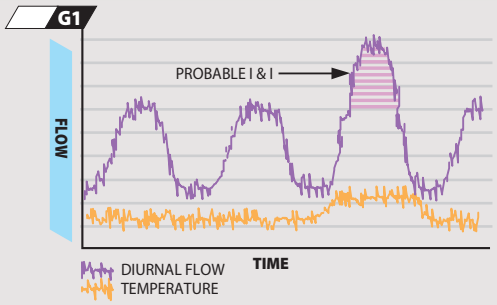
FLOW ANALYSIS REPORTS

CostView Flow Analysis Reports provide operating personnel with a clear picture of exactly what is transpiring within the collection system environment. This detailed information may be employed as a proactive tool to identify areas of potential surcharges, inflow and infiltration, maintenance issues and prevention of illegal discharges. If utilized in conjunction with a local consulting engineering firm, CostView Analysis Reports become an important first step towards the implementation of discovering weaknesses within the system. Once rectified, the elimination of these weaknesses can lead to substantial reductions in wastewater treatment charges.



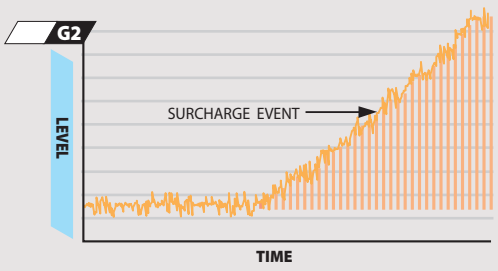
G1 Inflow & Filtration

Upon establishment of a Normal Dry Day Flow baseline, abnormally high flows, plotted against both the Dry Day baseline and the temperature data acquired from the thermocouple embedded within the Sensor Cartridge, will alert to the possibility of inflow from local rain events or infiltration due to groundwater or parking lot runoff.



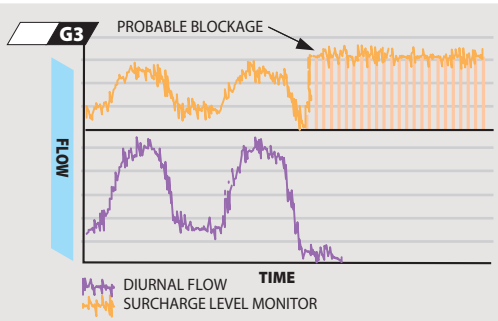
G2 Surcharge Events

An integrated ultrasonic level sensor with cellular transmission capability will proactively alert local operating personnel of the possibility of a sewer overflow event. The capability for early warning of a potential surcharge will lead the way to reductions in governmental agency fines. In the event that the Surcharge incident cannot be avoided, Costview will graphically record the time and duration of the overflow for adherence to current EPA reporting requirements.



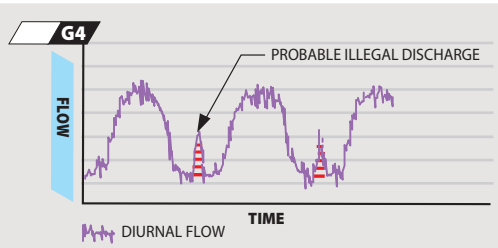
G3 Stagnation

The monitoring of Normal Dry Day Flows and Levels against periods of Stagnation may be utilized to alert maintenance crews to possible conditions of upstream or downstream blockages.



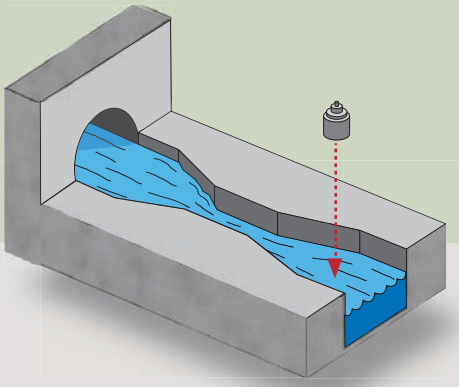
G4 Illegal Discharges

Illegal discharges have always been an issue for every community. Whether it is from a large industrial facility or from the connecting of rain gutters to the nearest sewer line, these discharges translate into additional treatment fees for each taxpayer in the community.
By detecting abnormal spikes graphically captured within Normal Dry Day Flow sequences, a plan of action may be put into place in order to discover the source of illegal discharge, eventually leading to a recovery of costs through court mandated monetary restitution.



COMPARATIVE COST ANALYSIS

Flume / Level Sensor Combination



Flumes, besides being time consuming and expensive to install, lose their ability to measure flow in the event of debris or blockages, require non-turbulent flow conditions, are incapable of detecting reverse flows, cease to function during periods of extreme wet weather and recognize stagnation and zero flow as normal flow.

Normal Flow Conditions (70%)

Inflow & Infiltration (15%)[2]
A Flume is incapable of identifying I&I

Reverse Flow Conditions (3%)
Flumes recognize reverse flows as normal forward flow

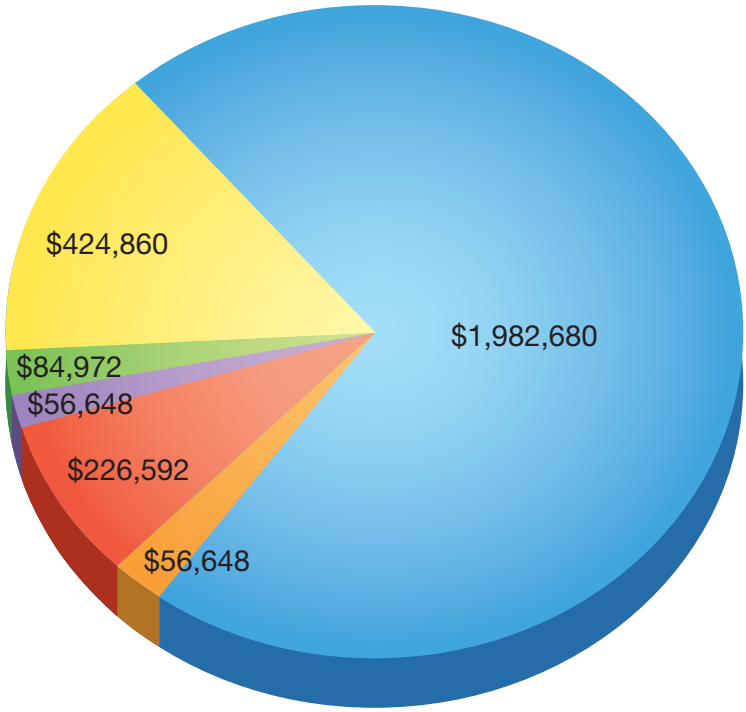
Stagnant Flow Conditions (2%)
Flumes recognize zero flow as normal forward flow

Surcharge/Submergence Conditions (8%)
Flumes cease to function under conditions of submergence

Non-Uniform Flow Conditions (2%)
Flumes lose their accuracy doing turbulent flow conditions

COST ANALYSIS

Wastewater Billing Cost:	$3.88/1000 Gal.[1]
Daily Treatment Volume:	2 MGD
Yearly Treatment Volume:	730 Million Gallons



ANNUAL COST

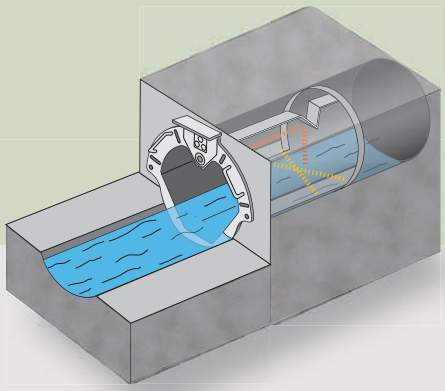
Normal Flow	$1,982,680
Inflow & Infiltration	$424,860
Reverse Flow	$84,972
Stagnation	$56,648
Surcharge/Submergence	$226,592
Non-Uniform Flow	$56,648
TOTAL ANNUAL COST	$2,832,400

[1] A survey by the NUS Consulting Group determined that the average national wastewater rate rose 28.6% during the past five years. Average National Rate (2007): $3.88/1000 Gal.

[2] According to a recent AMSA survey (Association of Metropolitan Sewage Agencies), inflow and infiltration (along with storm water that goes to a treatment plant) comprises almost 25% of total flows. The Massachusetts Water Resources Authority (MWRA), in 1998, calculated inflow and infiltration as accounting for 60% of total flows.

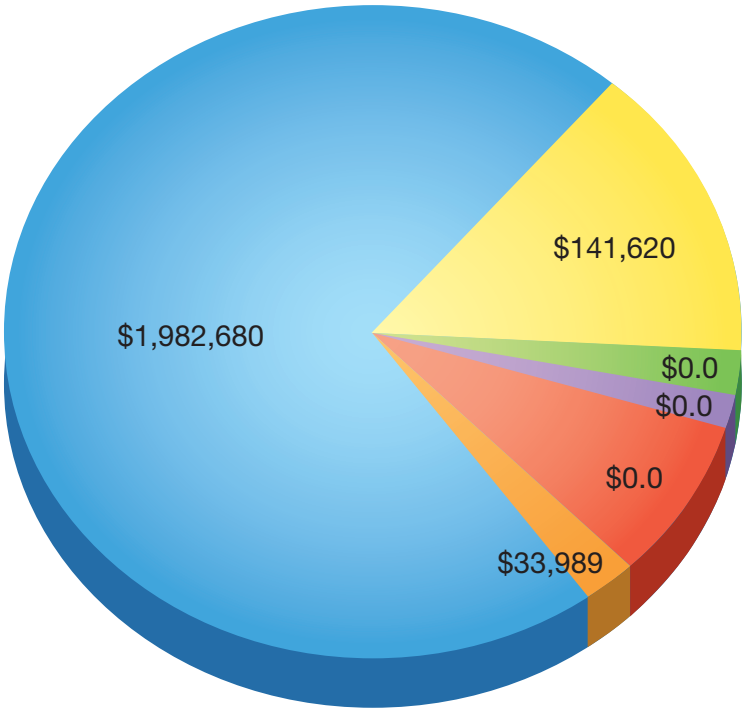
Hybrid Cartridge Meter

Hybrid Cartridge Meters combine U.S. Bureau of Reclamation computer aided Hydraulic Structure design with high accuracy Custody Transfer multipath technology and NIST Traceable Flow Lab Calibration to create the first High Performance Wastewater Billing Meter. The Cartridge Meter's technology allows for precise and highly accurate wastewater measurement that include periods of reverse, surcharge, stagnant and non-uniform flow conditions.



COST ANALYSIS

Wastewater Billing Cost:	$3.88/1000 Gal.[1]
Daily Treatment Volume:	2 MGD
Yearly Treatment Volume:	730 Million Gallons



Normal Flow Conditions

Inflow & Infiltration[2]
I&I identified through temperature gradient analysis

Reverse Flow Conditions
Velocity sensors recognize and identify reverse flows

Stagnant Flow Conditions
Velocity sensors recognize and identify zero flow

Surcharge/Submergence Conditions
Integral Level Monitor alerts to impending surcharge conditions

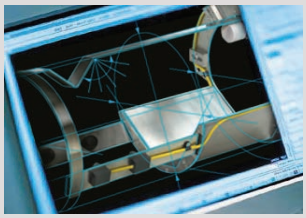
Non-Uniform Flow Conditions
Multipath technology accurately measures non-uniform flow conditions

ANNUAL COST

Normal Flow		$1,982,680
Inflow & Infiltration	*Identified & Reduced*	$141,620
Reverse Flow	*Identified & Deducted*	$0
Stagnation	*Identified & Disregarded*	$0
Surcharge/Submergence	*Identified & Eliminated*	$0
Non-Uniform Flow	*Accurately Measured*	$33,989
TOTAL ANNUAL COST		$2,158,289

ANNUAL COST SAVINGS **$674,111**

CUSTODY TRANSFER BILLING METERS



Measurement of minimal flows is accomplished through WinFlume* Hydraulic Structure technology supported by NIST traceable Flow Lab design confirmation.
*Bureau of Reclamation

Measurement of average to maximum flows is accomplished through dual path transit- time technology specifically developed for the custody transfer of hydrocarbons.

Measurement of non-uniform flows is accomplished through crossed path transit-time technology specifically developed for the custody transfer of natural gas.

HIGH PERFORMANCE HYBRID TECHNOLOGY

The engineers at Eastech concluded that in order to provide a solution that was capable of achieving any degree of reasonable accuracy during the majority of the billing period, a new "application specific" flowmeter technology would have to be developed. CostView® Billing Meters couple WinFlume computer aided Hydraulic Structure design with high accuracy Custody Transfer technology. Today, multipath transit-time flow meters are the first choice for custody transfer applications in the oil and natural gas industry. This is why Eastech has chosen to provide this identical technology for custody transfer measurement of wastewater.

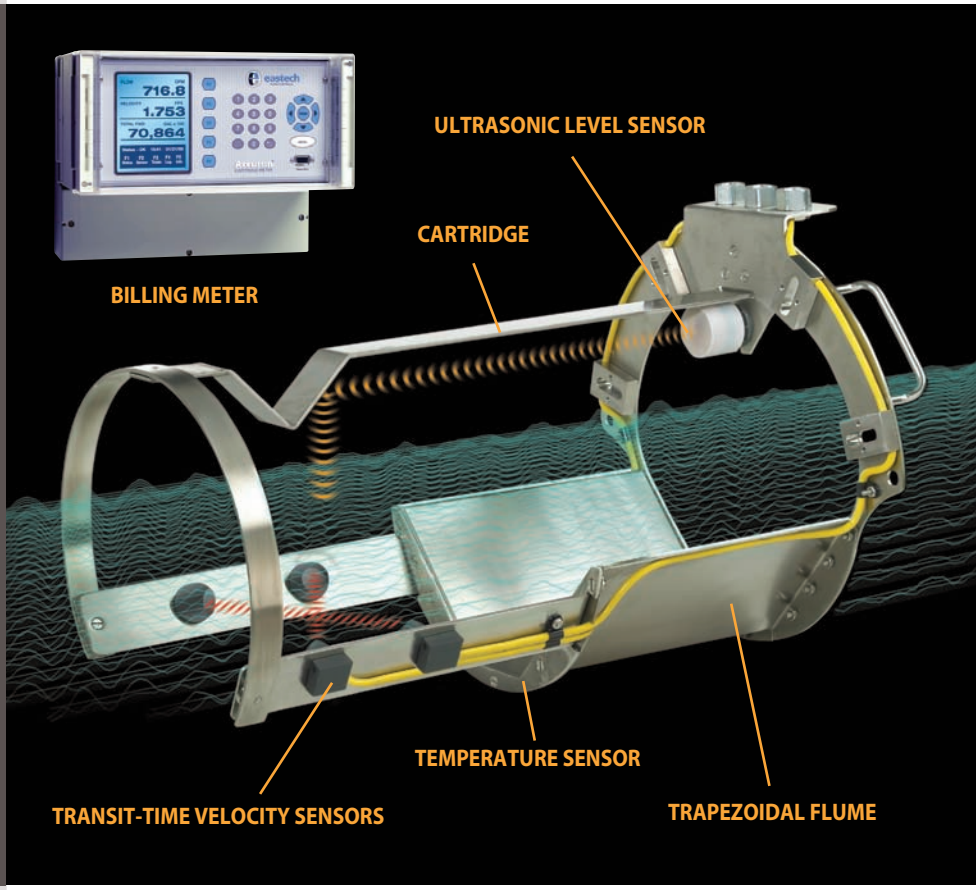
CostView combines two proven flow measurement technologies, Hydraulic Structures and Multiple Transit-Time Sensors, with NIST Traceable Flow Lab Calibration to create the first High Performance Sewer Billing Meter.

CARTRIDGE: 304 Stainless Steel.

TRAPEZOIDAL FLUME: Bureau of Reclamation WinFlume software is utilized for the design of every trapezoidal flume. Winflume software was developed to meet unique operational requirements while eliminating the need for laboratory calibrations.

ULTRASONIC LEVEL SENSOR: In a 5 year level sensor study by the Bureau of Reclamation, Eastech was the only sensor to successfully penetrate through dish soap foam while displaying almost perfect linearity, hysteresis close to zero, and excellent long-term reliability.

TRANSIT-TIME VELOCITY SENSORS:
In 1998, the American Gas Association approved AGA Report #9. AGA-9 sets the standard for multiple path transit-time flow meters in natural gas custody transfer applications. Eastech has followed the lead of the AGA by utilizing the identical technology in order to provide the municipal market with a Custody Transfer Wastewater Billing Meter.



OPEN CHANNEL FLOW TECHNOLOGY FOR THE 21ST CENTURY

Laboratory Traceability

Prior to shipment, every High Performance Billing Meter is individually tested, calibrated and certified at Eastech's in-house Flow Metrology Lab. All flow meter calibrations are directly traceable to Standards established by the NIST and are available for real time viewing through scheduled Internet access.

Guaranteed Installed Accuracy & 30 minute Installation

A stainless Cartridge, pre-sized for its specific application, arrives at the job site as a fully integrated unit. Every component is factory precision aligned, calibrated and programmed in strict accordance to customer supplied operating specifications.

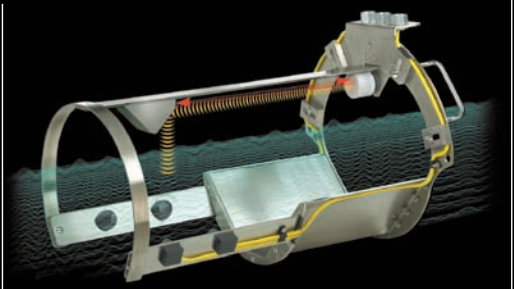
Maintenance-Free Operation

By utilizing "above the flow" ultrasonic level sensors and non-fouling velocity sensors, the Cartridge Meter remains free from the ongoing problems of sediment build-up, fouled sensors and accumulated debris. The flat straight through bottom of the trapezoidal flume permits debris to pass quite easily and reduces the problem of sediment build-up upstream of the flume.

SENSOR SELF-VALIDATION

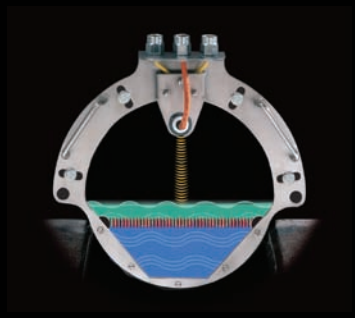
Self-Validation

CostView provides state-of-the-art technology for self-validation of sensor calibration stability without the need for confined space entry. STATUS IQ eliminates manhole entry safety concerns through remote verification of flow meter sensor accuracy.



Level Sensor Validation

During normal operation, ultrasonic level sensor readings are self-validated by continuously recording and comparing the ultrasonic signal to a known reference distance securely fixed within the stainless frame of the Cartridge. This method also allows for self-recalibration of the level sensor during daily temperature variations.



Velocity Sensor Validation

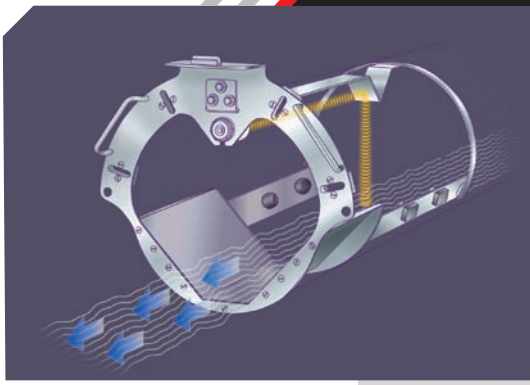
Also during normal operation, velocity sensor readings are self-validated by repeatedlycomparing volume at a certain height calculated by the area-velocity transit-time method to the known volume at this identical height previously calculated by the flume/level sensor combination.

HIGH PERFORMANCE UNDER ALL FLOW CONDITIONS

Minimal Flows

(Accuracy: ±1–2%)

In 95% of sanitary sewers, average flow is only 30% - 40% of the pipe diameter with nighttime flows hovering around 5% - 10%. The trapezoidal flume permits for a wider measurement range than other flumes while efficiently passing sediment and debris. Eastech's Flow Laboratory has confirmed accurate measurements down to 15 GPM in a 12" I.D. pipe.



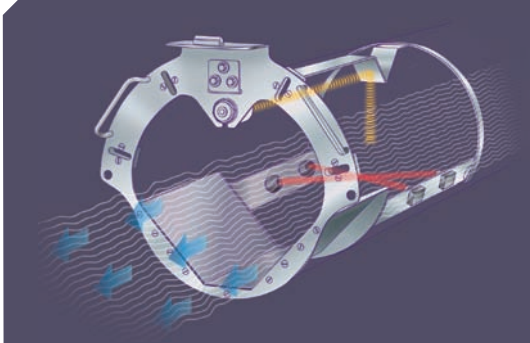
During periods of minimal flow (0 - 30% Pipe I.D.), trapezoidal flume technology in combination with an "above the flow" precision accuracy (+/-.02") ultrasonic level sensor is utilized to ascertain the correct volume of wastewater.

Average to Maximum Flows

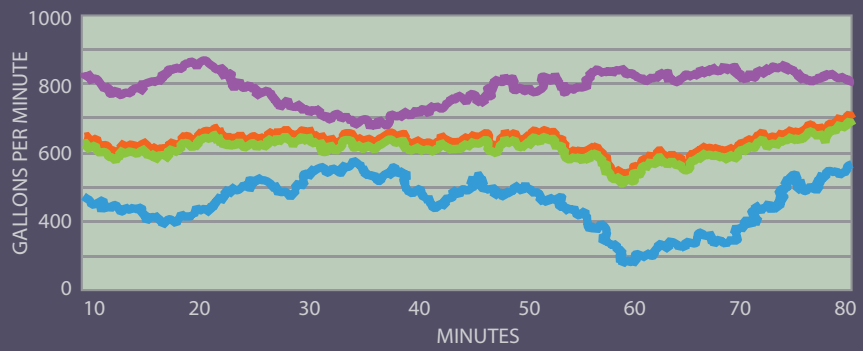
(Uniform & Non-uniform)
(Accuracy: ±1–2%)

The recently published EPA Report 600/ R-06-120-2006 states that "Accuracy of flow measurements vary greatly depending on flow conditions. Depending upon the assumed flow profile, errors can exceed 25% of the true flow rate under poor conditions. MULTIPATH INSTRUMENTS MAY HAVE ERRORS AS LOW AS 1% TO 3% OF THE TRUE FLOW RATE."

Borrowing from the multipath technology utilized for custody transfer of oil and natural gas, a dual pair of transit-time velocity sensors are strategically positioned within the Cartridge at 30% of the sewer I.D. Depending upon severity and type of non-uniformity, the crossed pattern sensors will provide high accuracy measurement during turbulent, disturbed and asymmetrical flow conditions.



During periods of average to maximum flows (30 –100% Pipe I.D.), wastewater volume is measured by a dual pair of highly accurate transit-time velocity sensors in conjunction with a precision (±.02") ultrasonic level sensor.

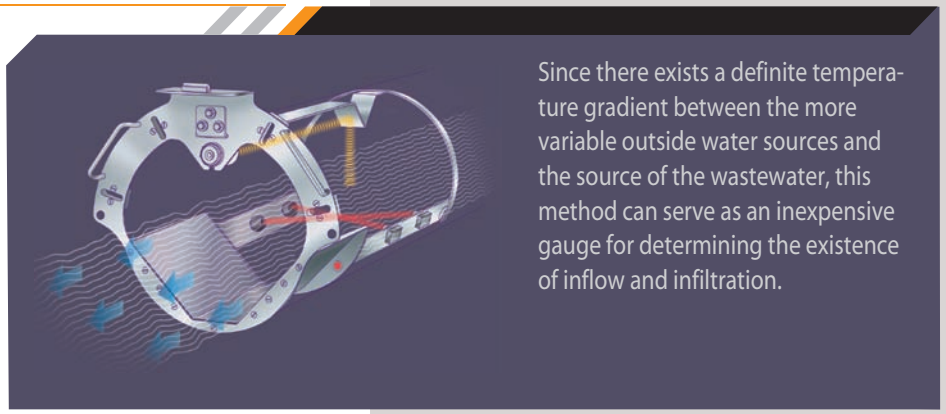


As can be seen from the following graph generated during months of testing at our Flow Metrology Lab, a non-uniform flow disturbance is negated by averaging the volumetric totals of each separate Path. Path 1 and Path 2 added together and then averaged creates the volumetric average shown as Dataline A. When compared to the actual volume, Dataline B, calculated simultaneously from volumetrically determined reference measurements recorded at the Flow Lab, we see that the average of both paths, Dataline A, and the actual volume, Dataline B recorded by the Flow Lab, are practically identical.

Inflow & Infiltration

(Accuracy: ±1–2%)

A standard thermocouple is incorporated within the housing of each Sensor Cartridge in order to monitor the temperature of the wastewater. Wastewater temperature, emanating from homes and businesses, hardly varies during the year as compared to external watershed temperature

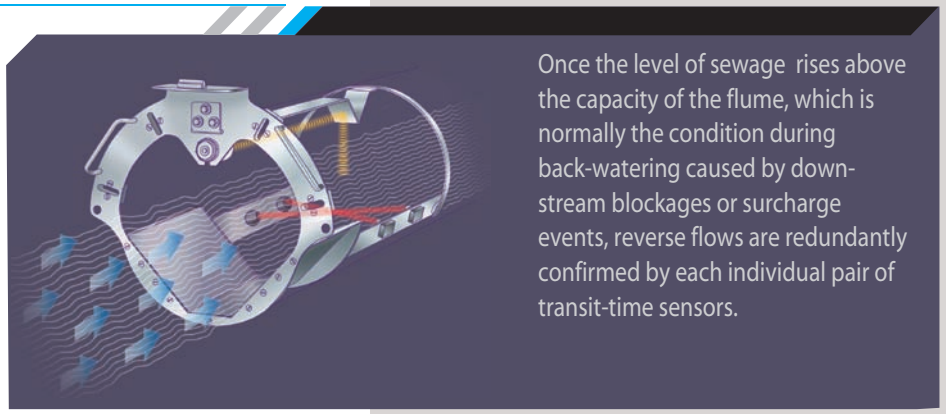


Since there exists a definite temperature gradient between the more variable outside water sources and the source of the wastewater, this method can serve as an inexpensive gauge for determining the existence of inflow and infiltration.

Reverse Flow

(Accuracy: ±1–2%)

Reverse flows, caused by instances of backwatering or surcharges, may cause errors in the billing process. Hydraulic structures, in combination with a level sensor, recognize all manner of flow as traveling in a forward direction. The CrossFire provides redundant monitoring of flow under both forward and reverse conditions.

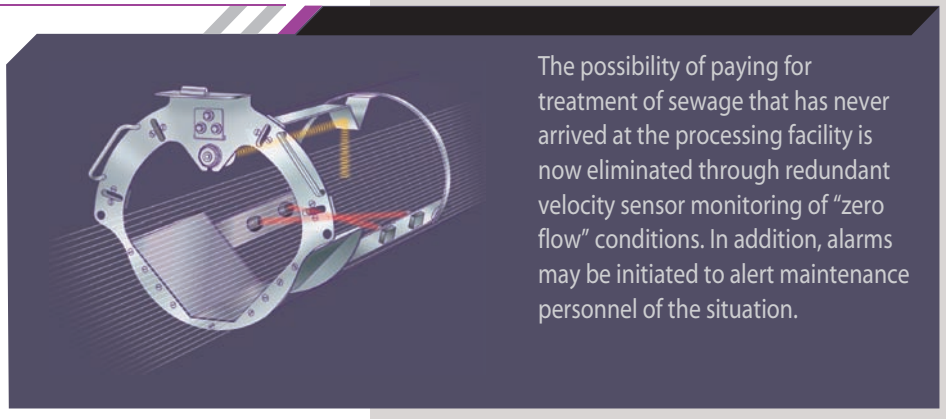


Once the level of sewage rises above the capacity of the flume, which is normally the condition during back-watering caused by downstream blockages or surcharge events, reverse flows are redundantly confirmed by each individual pair of transit-time sensors.

Stagnant Conditions

(Accuracy: ±1–2%)

Stagnation is primarily caused by a downstream blockage requiring maintenance for reinstatement of normal flow conditions. Since this type of blockage will usually cause a rise in level, a hydraulic structure only Billing System will consider these high levels of sewage as maximum periods of flow, thereby elevating treatment charges.

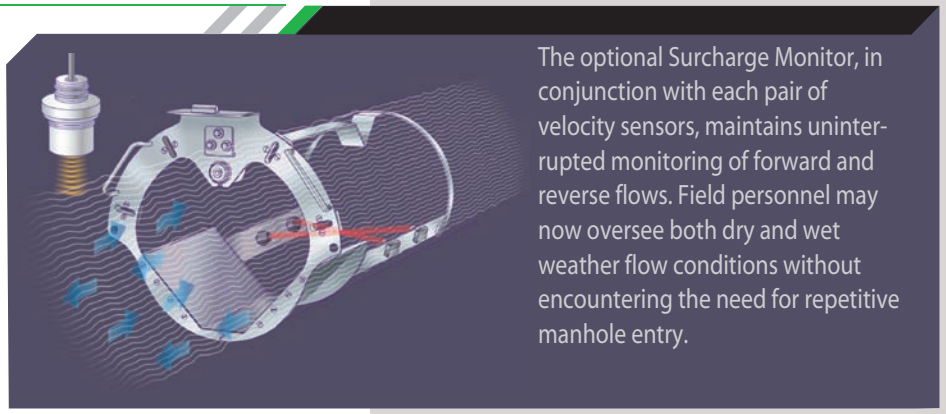


The possibility of paying for treatment of sewage that has never arrived at the processing facility is now eliminated through redundant velocity sensor monitoring of "zero flow" conditions. In addition, alarms may be initiated to alert maintenance personnel of the situation.

Surcharge Conditions

(Accuracy: ±1–2%)

To allow for the monitoring of conditions that change from normal open channel flow to submerged flow, as experienced during a storm event or downstream blockage, an independent, maintenance-free level sensor is located at the highest point of the manhole capable of immediately detecting surcharging conditions..



The optional Surcharge Monitor, in conjunction with each pair of velocity sensors, maintains uninterrupted monitoring of forward and reverse flows. Field personnel may now oversee both dry and wet weather flow conditions without encountering the need for repetitive manhole entry.

eastech
FLOW CONTROLS

4250 S. 76th E. Ave.
Tulsa, OK 74145
email: info@eastechflow.com

918-664-1212
800-226-3569
Fax: 918-664-8494

www.eastechflow.com