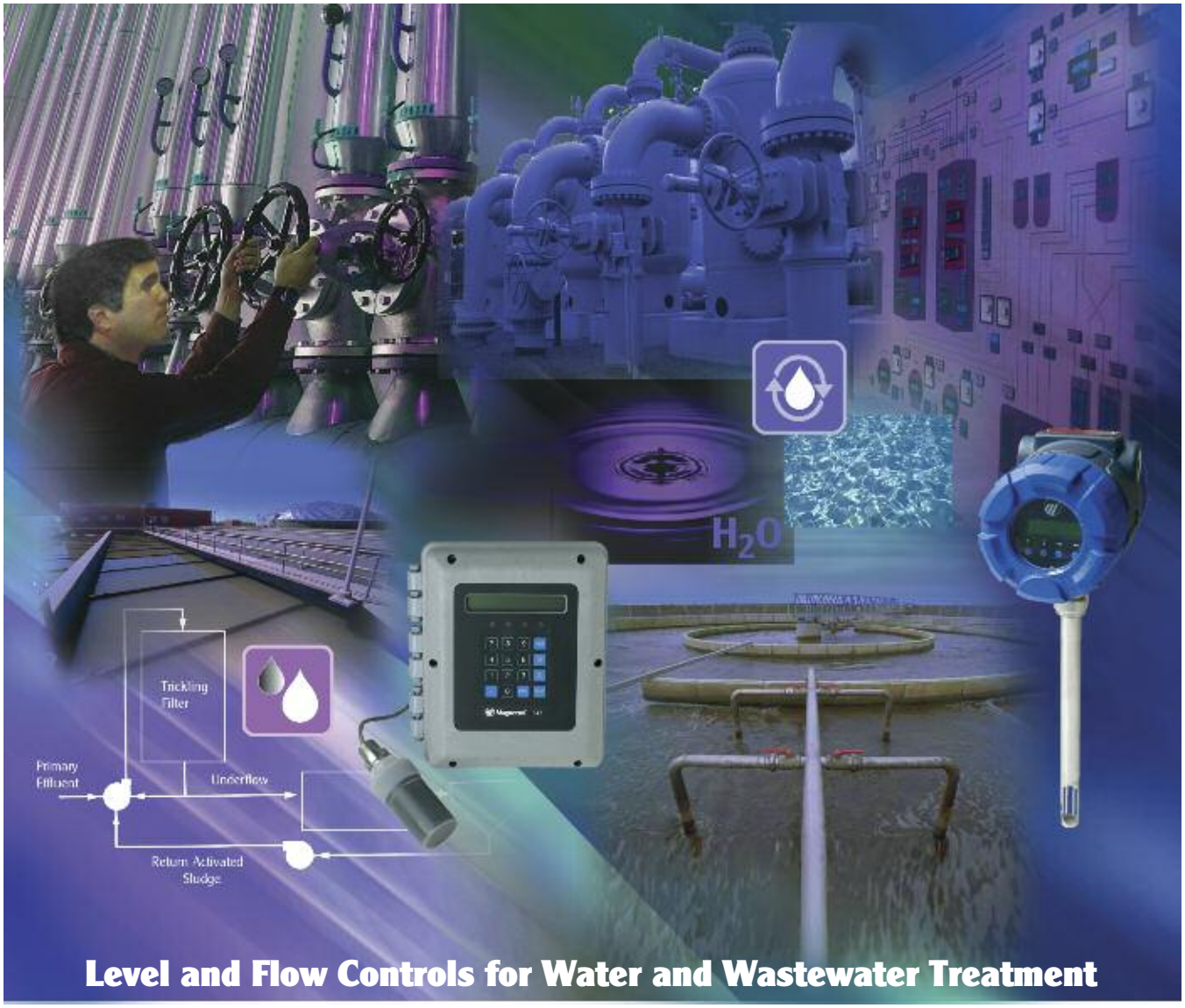
WATER & WASTEWATER

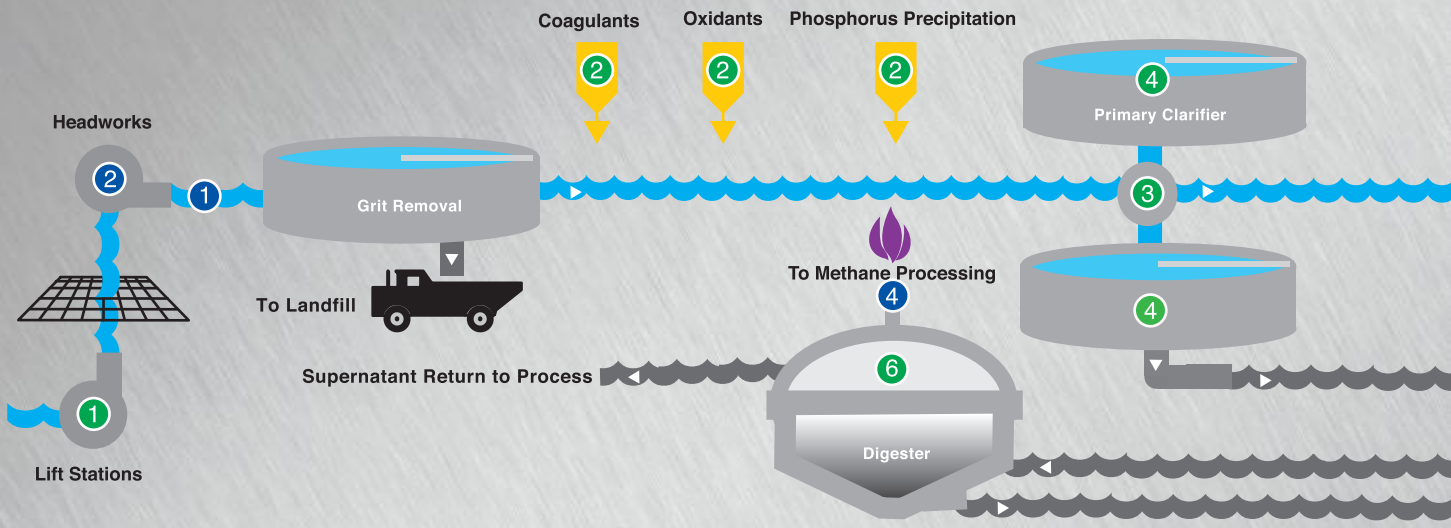


Level and Flow Controls for Water and Wastewater Treatment

Magnetrol®
ENVIRONMENTAL

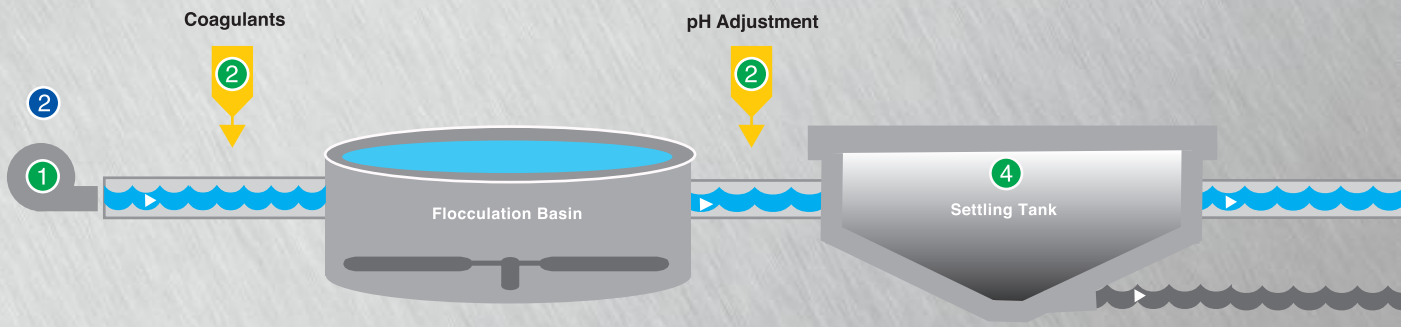
WASTEWATER TREATMENT

COLLECTION SYSTEMS INFLUENT PUMPING PRIMARY CLARIFICATION



WATER TREATMENT

PUMPING AGGREGATION CLARIFICATION



APPLICATIONS

- Liquid Level
- Air, Gas or Liquid Flow

KEY	LEVEL APPLICATION	PAGE
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2	Chemical Feed Tanks	4
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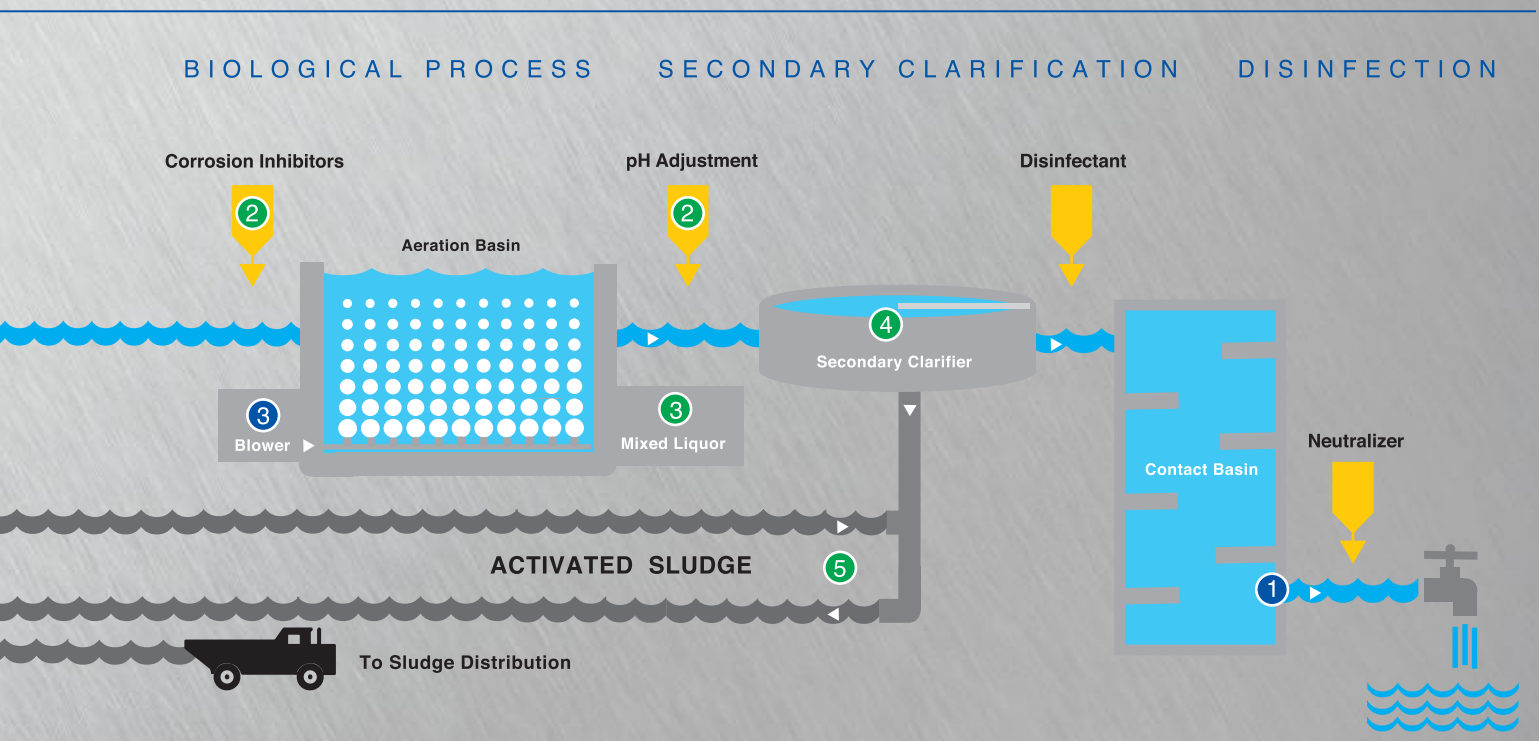
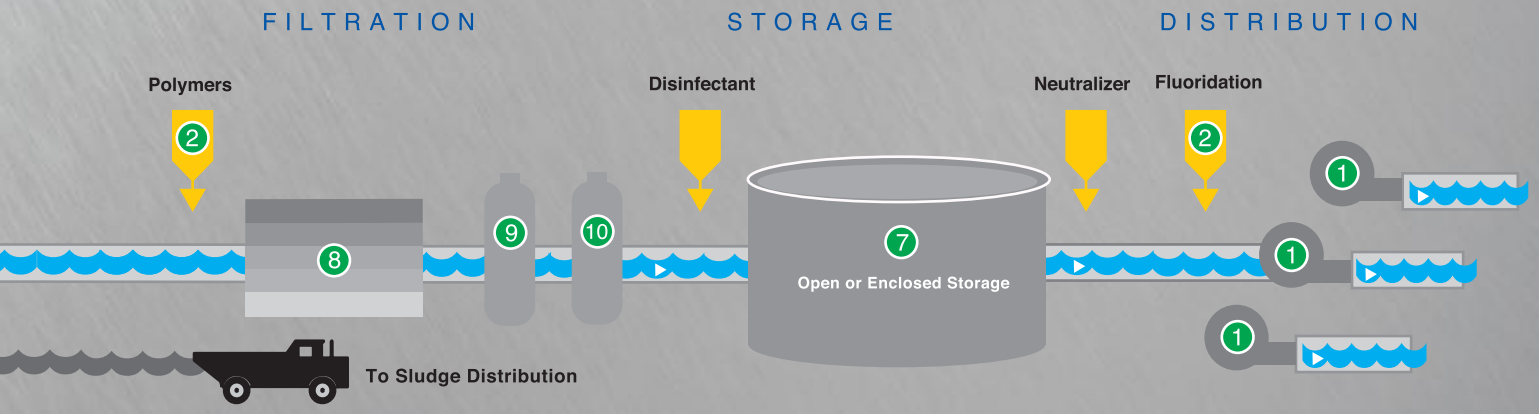
Level and Flow Controls in Wastewater Treatment and Water Treatment

Water Flow Sludge Flow Chemical Treatments





KEY	LEVEL APPLICATION	PAGE
9	Lime Slurry Level	8
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KEY	FLOW APPLICATION	PAGE
1	Open Channel Flow	9
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Please Note: The instruments recommended in this guide are based on field experience with similar applications and are included as a general guide to level and flow control selection. Because all applications differ, customers should determine suitability for their own purposes.

1 LIFT STATION PUMP CONTROL

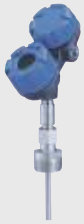

Sewage Pumps

Application: Pre-treated wastewater is brought up from inlet trunk sewers to ground level by centrifugal pumps, where it continues on by gravity flow to subsequent treatment. To maintain a desired level in the headworks wetwell, pump speed is often varied. Pumps turn on and off automatically according to an operator selectable sequence.

Challenges: A desired wetwell level reduces the drop downstream of the influent flumes to minimize turbulence and air entrainment, and eliminates frequent pump cycling associated with variable level control. Proper level control maintenance in the wells can alleviate pump surging, which disrupts settling by causing currents and eddies in the clarifier.

INSTRUMENTATION

▲ **Continuous Level:** Echotel® model 344 ultrasonic transmitters



▲ **Continuous Level:** Eclipse® model 705 or Horizon™ model 704 guided wave radar transmitters

▲ **Continuous Level:** Pulsar™ model R95 pulse burst radar transmitters

2 CHEMICAL FEED TANKS


Liquid Storage

Application: In both wastewater and water treatment facilities, a wide array of chemicals are added from feed tanks for purposes that include water softening, pH adjustment, taste and odor control, coagulation and sedimentation, scale and corrosion treatment, pathogen control, neutralization, and fluoridation.

Challenges: Liquid solution storage and day tanks require stringent level monitoring to ensure ongoing chemical treatment. The nature of the chemical, the geometry of the holding vessel, and the presence of mixing systems or other hardware are factors that will help determine the most suitable level control technology for the application.

INSTRUMENTATION

▲ **Continuous Level:** Echotel model 355 ultrasonic transmitters

▲ **Continuous Level:** Eclipse model 705 or Horizon model 704 guided wave radar transmitters

▲ **Visual Indication:** Atlas™ Magnetic Level Indicators can be supplied with switches or transmitters

3 SPLITTER BOX LEVEL


Primary Clarifier Splitter Box

Application: Wastewater treatment facilities with a large number of primary clarifiers often employ a concrete tank with chambers and gates known as a splitter box, or distribution box, to split the influent flow into multiple streams that are routed into the bank of clarifiers. A similar device may also be used to split mixed liquor flows between secondary clarifiers.

Challenges: Level control in the splitter boxes helps maintain balanced routing of influent wastewater in the primary sedimentation process where 50 to 70 percent of the suspended solids are removed, and in the secondary sedimentation process where remaining suspended solids are removed.

INSTRUMENTATION

▲ **Continuous Level:** Echotel model 355 ultrasonic transmitters

▲ **Continuous Level:** Eclipse model 705 or Horizon model 704 guided wave radar transmitters

4 CLARIFIER LEVEL


Primary Clarifier

Application: In small wastewater treatment facilities with only one clarifier, it is advantageous to know the clarifier's surface level. In larger plants where influent flow is routed through a splitter box to many clarifiers, there may be insufficient room inside the splitter box to accommodate level instrumentation. In this instance level monitoring of the clarifier will help attain proper load balance.

Challenges: Continuous monitoring of the clarifier level will maximize efficient treatment flow within primary and secondary sedimentation areas where the majority of suspended solids are removed.

INSTRUMENTATION

▲ **Continuous Level:** Kotron® models 82CE, 804, or 805 RF capacitance transmitters

▲ **Continuous Level:** Echotel models 344 and 345 ultrasonic transmitters

▲ **Continuous Level:** Eclipse model 705 guided wave radar transmitters

5 SLUDGE LEVEL


Sludge Concentrator

Application: There are several areas within a wastewater treatment facility where solids settle and are subsequently removed as sludge. These include hoppers, holding tanks, gravity thickeners, and other sludge collection systems. Sludge level is monitored to control against incomplete discharge or dilution of the sludge.

Challenges: Non-contact measurement is often preferred since sensors are located above the process fluid and beyond direct contact with the sludge. Sensors of contact technologies should be single rod types to minimize material buildup—or bridging—that occurs in twin rods configurations.

INSTRUMENTATION

▲ **Continuous Level:**
Echotel model 345 ultrasonic transmitters

▲ **Continuous Level:**
Eclipse model 705 or Horizon model 704 guided wave radar transmitters

6 DIGESTER LEVEL


Anaerobic Digester

Application: The principal biological methods employed in wastewater treatment for sludge stabilization are aerobic and anaerobic digestion. The former utilizes aerobic bacteria to convert organic matter and stabilize biosolids while the latter accomplishes this goal with anaerobic bacteria working without oxygen. Both processes are monitored for level within their tanks.

Challenges: The gas-injection and mechanical stirring systems of anaerobic process, and the aeration systems of aerobic process, create large amounts of foam that have traditionally hampered mechanical level controls. Recent developments in radar technologies have advanced measurement accuracy despite the foam content of these digesters.

INSTRUMENTATION

▲ **Continuous Level:**
Echotel model 355 ultrasonic transmitters

▲ **Continuous Level:**
Eclipse model 705 or Horizon model 704 guided wave radar transmitters

▲ **Continuous Level:**
Pulsar model R95 pulse burst radar transmitters

7 WATER STORAGE TANKS

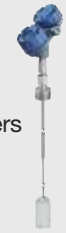

Reclaimed Water Storage

Application: Storage for reclaimed water ranges from small tanks for potable and service water use, to large, open or enclosed, reservoirs. Large capacity storage—most commonly in open reservoirs—is necessary for off-line storage of peak flows, flow-through in-line storage, and long term storage of seasonal flows that are discharged during alternate seasons.

Challenges: Level monitoring is essential for large and small water storage tanks. Controls are specified according to the size and geometry of the bulk storage vessel. Level controls in open atmosphere reservoirs must frequently withstand punishing weather conditions.

INSTRUMENTATION

▲ **Continuous Level:** Echotel model 344 ultrasonic transmitters



▲ **Continuous Level:** Eclipse model 705 guided wave radar transmitters with model 7X1 flexible single rod probes

▲ **Continuous Level:** Pulsar model R95 pulse burst radar transmitters

8 FILTER TANK LEVEL


Filter Building

Application: Following the clarification phase of water treatment, pre-filtered water passes from an inlet channel and onto a filtration bed. As it passes through the bed's media—sand or anthracite in depth-filtration types; cloth or synthetic membranes in surface-filtration types—the water is cleansed of its fine-grained suspended solids.

Challenges: Filter tank level triggers the backwash cycle. As solids accumulate within the filter, headloss begins to build up and water level increases in the filter tank. A pre-determined tank level indicates that terminal headloss value has been reached, and that the filter must now be backwashed to remove the suspended solids.

INSTRUMENTATION

▲ **Continuous Level:** Echotel model 355 ultrasonic transmitters

▲ **Continuous Level:** Echotel model 345 ultrasonic transmitters

▲ **Continuous Level:** Pulsar model R95 pulse burst radar transmitters

9 LIME SLURRY LEVEL


Lime Tank

Application: In terms of annual tonnage, lime ranks first among water treatment chemicals. Lime is used for pH adjustment, phosphate removal, sludge and biosolids conditioning, and in association with other chemicals for precipitation. Lime is initially mixed with water in lime slakers to form a slurry referred to as slake lime. The slake lime is then added to raw water for formulation under carefully controlled conditions.

Challenges: Often contained in an agitated tank, lime slurry is slightly abrasive, and can be corrosive depending upon the other chemicals involved. Contact level sensing should use single rod probes to avoid media buildup.

INSTRUMENTATION

▲ **Continuous Level:**
Echotel model 355 ultrasonic transmitters

▲ **Continuous Level:**
Pulsar model R95 pulse burst radar transmitters

▲ **Continuous Level:**
Eclipse model 705 guided wave radar transmitters

10 CARBON SLURRY LEVEL


Carbon Tank

Application: Carbon is employed in adsorption processes for the removal of organic, inorganic, and taste and odor control compounds. Granular Activated Carbon (GAC) and Powder Activated Carbon (PAC) are two leading adsorption treatments, the former utilizing a carbon bed and the latter employing a contact basin. Carbon slurry tanks require level monitoring.

Challenges: Handling and safety problems are associated with the fly-away dust and difficult-to-wet characteristics of carbon. As carbon buildup often chokes mechanical level controls, non-contact monitoring technologies are popular. Contact level sensing should use single rod probes to avoid media buildup.

INSTRUMENTATION

▲ **Continuous Level:**
Pulsar model R95 pulse burst radar transmitters

▲ **Continuous Level:**
Eclipse model 705 or Horizon model 704 guided wave radar transmitters

▲ **Point Level:**
Thermatel® models TD1 and TD2 thermal dispersion switches

1 INFLUENT/EFFLUENT FLOW


Influent Flow

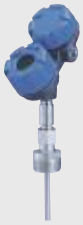
Application: Flow measurement is accomplished by a transmitter programmed to convert a level reading into units of volume per time, as liquid passes through a flume or weir in an open channel. A flume is a specially shaped portion of the open channel, with an area or slope that is different from the channel's slope or area. A weir resembles a dam placed across an open channel positioned so that liquid can flow over it.

Challenges: Measurement devices are configured according to the geometry of the flume or weir. Devices must provide reliable measurement despite turbulence, solids content, corrosive chemicals, or varying flow velocities and flow depths. Environmental requirements often mandate the use of a totalizer and data logger.

INSTRUMENTATION

▲ **Continuous Flow:**
Echotel model 355 ultrasonic transmitters

▲ **Continuous Flow:**
Echotel models 344 and 345 ultrasonic transmitters



▲ **Continuous Level:**
Eclipse model 705 guided wave radar transmitters

2 PUMP PROTECTION


Centrifugal Pump

Application: A centrifugal pump operating in a no-flow condition will quickly sustain damage. Whether caused by a closed valve or plugged line downstream, or by cavitation, restricted flow can overheat the media and cause seal damage. A flow switch along the pump's discharge piping will shut down the pump when liquid flow drops below the minimum selectable flow rate.

Challenges: Solid state switches provide the highest level of reliability for pump protection by offering low flow sensitivity, wide temperature operation and high turndown.

INSTRUMENTATION

▲ **Flow Alarm:**
Thermatel models TD1 and TD2 thermal dispersion switches

▲ **Flow Alarm:**
Model F10 vane type flow switches

▲ **Flow Alarm:**
Model F50 globe valve type flow switches

3 BLOWER AIR FLOW


Aeration Basin

Application: Air flow measurement is required in aerobic digesters and aeration basins. In digesters, oxygenation allows microbes to decompose complex organic compounds. Concrete aeration basins utilize fine or coarse bubble diffusers to aerate the water. In addition to digesters and aeration basins, air flow monitoring may also include air going to an aerated grit tank, to a flow equalization tank, or to secondary sludge holding tanks.

Challenges: Aeration blower systems must supply a wide range of airflows with a relatively narrow pressure range under varied conditions. In addition to detecting the presence or absence of air flow, the flow switch should be able to detect low-flow conditions.

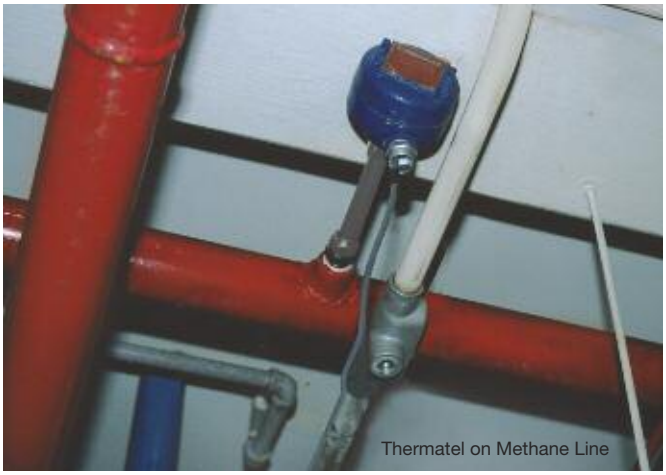
INSTRUMENTATION

▲ **Continuous Flow:** Thermatel models TA1 and TA2 thermal dispersion mass flow transmitters

▲ **Flow Alarm:** Model F10 vane type flow switches

▲ **Flow Alarm:** Thermatel models TD1 and TD2 thermal dispersion switches

4 DIGESTER GAS FLOW


Thermatel on Methane Line

Application: In the anaerobic decomposition process, organic matter is converted into stable solids and energy-rich gas, mainly methane (60%) and carbon dioxide (40%). A combustible hydrocarbon of high fuel value, methane can serve as a fuel for in-plant heat exchangers, blower engines or other systems, marketed to the local industrial community, or burned off.

Challenges: Safe and reliable flow measurement is essential in the collection, disposal or re-use of methane gas. Because methane is highly combustible, flow instrumentation must be certified for operation in these hazardous locations.

INSTRUMENTATION

▲ **Continuous Flow:** Thermatel models TA1 and TA2 thermal dispersion mass flow transmitters

▲ **Flow Alarm:** Model F10 vane type flow switches

▲ **Flow Alarm:** Thermatel models TD1 and TD2 thermal dispersion switches

Water treatment professionals know that good water originates with the help of level and flow controls that deliver reliable service in the most demanding applications. This is why so many rely on level and flow controls from Magnetrol Environmental.

Magnetrol's buoyancy products first entered service in 1932. Later, we were among the first to apply ultrasound, thermal dispersion and other electronic technologies to water treatment challenges. More recently, we pioneered Eclipse Guided Wave Radar and Pulsar Pulse Burst Radar to bring customers the leading-edge in control instrumentation.

But what makes Magnetrol Environmental the clear choice for so many water treatment professionals is the company's applications engineering skills and a service network that's second to none. That's the difference between buying an instrument and partnering with a world class level and flow measurement specialist.

Contact your Magnetrol Environmental sales representative to learn how our level and flow solutions not only help produce quality water, but can also lower the profitability threshold of your treatment operation. ■

Magnetrol®
ENVIRONMENTAL

WATER & WASTEWATER

AN INDUSTRY GUIDE TO LEVEL MEASUREMENT AND CONTROL FROM MAGNETROL

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- ***Petroleum Refining***
- ***Power Generation***
- ***Pulp & Paper Mills***
- ***Renewable Energy***
- ***Steam Generation***
- ***Tank Bridle Level Measurement***
- ***Understanding Safety Integrity Level (SIL)***
- ***Water & Wastewater***

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