



Optimizing ROI in the Waste Water Process

Highly Efficient and Easy-to-Install Turbidity Sensors can Save a Dairy up to \$120,000 Per Year

A common concern facing Dairy Processing Facilities is the amount of product that is lost in the production process. When these product losses occur they impact the bottom line of a Dairy Processing Facility in two ways: Reduced profits due to the product lost (also known as “shrinkage”), and higher operational costs due to the surcharges that local sewer municipalities charge the plant for handling the organic waste that was formerly product.

This sewer surcharge is usually expressed as the Biological Oxygen Demand (BOD) component of a plants sewer bill. Sewer municipalities charge more for this type of organic waste because of the dissolved organic solids that require additional waste treatment processing by the sewer treatment facility.

Waste water monitoring and management of solids and BOD is vital to managing the overall costs of your dairy. Adding a turbidity sensor, which is far more effective than conductivity for measuring solids, can save you thousands of dollars every year.

How a Typical Dairy Loses Money without Turbidity Sensors:

- Higher water consumption
- Higher consumption of cleaning agents
- Higher process costs
- Much lower process efficiency and lower process availability
- Higher sewage costs due to excess solids in your waste water.

Saving \$129,000 Every Year

How much money could a dairy plant save by reducing its BOD load to only 1 pound per thousand pounds of milk?

Consider two plants that each process 645,000 pounds of milk per day. Both pay a BOD surcharge of 20 cents per pound. The first plant discharges 1 pound of BOD per thousand pounds of milk processed (1 pound for every 116 gallons). The second dairy discharges 5 pounds in processing the same amount of milk.

The savings looks like this:

	Dairy 1	Dairy 2	Savings
Waste load (lb of BOD5 per thousand lb of milk)	1	5	4
Daily BOD5 surcharge	\$129	\$645	\$516
Annual Surcharge	\$32,250	\$161,250	\$129,000
Cost per thousand pounds of milk processed	\$0.20	\$1.00	\$0.80
Cost per thousand gallons of milk processed	\$1.72	\$8.60	\$6.88

*Source: http://drinc.ucdavis.edu/dairyp/dairyp8_new.htm



Plus, in addition to the charge for excess BOD, surcharges may also be made for excessively high levels of COD, TSS, FOG and TKN.

Achieving Lower BOD Costs and Higher Efficiency

“We had no idea that our old timer based method was wasting an average of \$63.93 per day in profit or \$16,621.80 annually after payback.” -- Southeastern US Ice Cream Manufacturer

BOD/COD related sewage cost and excess water cost, once viewed as a normal operating cost, have become something every profit oriented manager must optimize. Steadily rising sewage rates and even brand reputation in our environmentally conscious market place mean waste loads can have a significant impact on operating profit.

Switching from ineffective conductivity only monitoring to leading turbidity sensor for the dairy industry, the Anderson Instrument ITM-3, can drive your profit higher, enhance your brand.

Being able to divert automatically and consistently at the optimal time using Anderson Instrument ITM-3 turbidity sensors can give you the confidence and conviction that you are enhancing your balance sheet while minimizing your waste water related expense.

How It Works

Turbidity is the phenomenon where by a specific portion of a light beam passing through a liquid medium is reflected by undissolved particles. The sensor measures the light that is reflected by these particles to determine their concentration in the liquid. Purified water would have close to zero undissolved particles, while ice cream mix has a high concentration of undissolved particles.

An inline turbidity sensor is installed at leverage points in the dairy product (see Fig. 1) handling process to facilitate instant detection of the following phase changes:

- Product-to-Product
- Product-to-Water

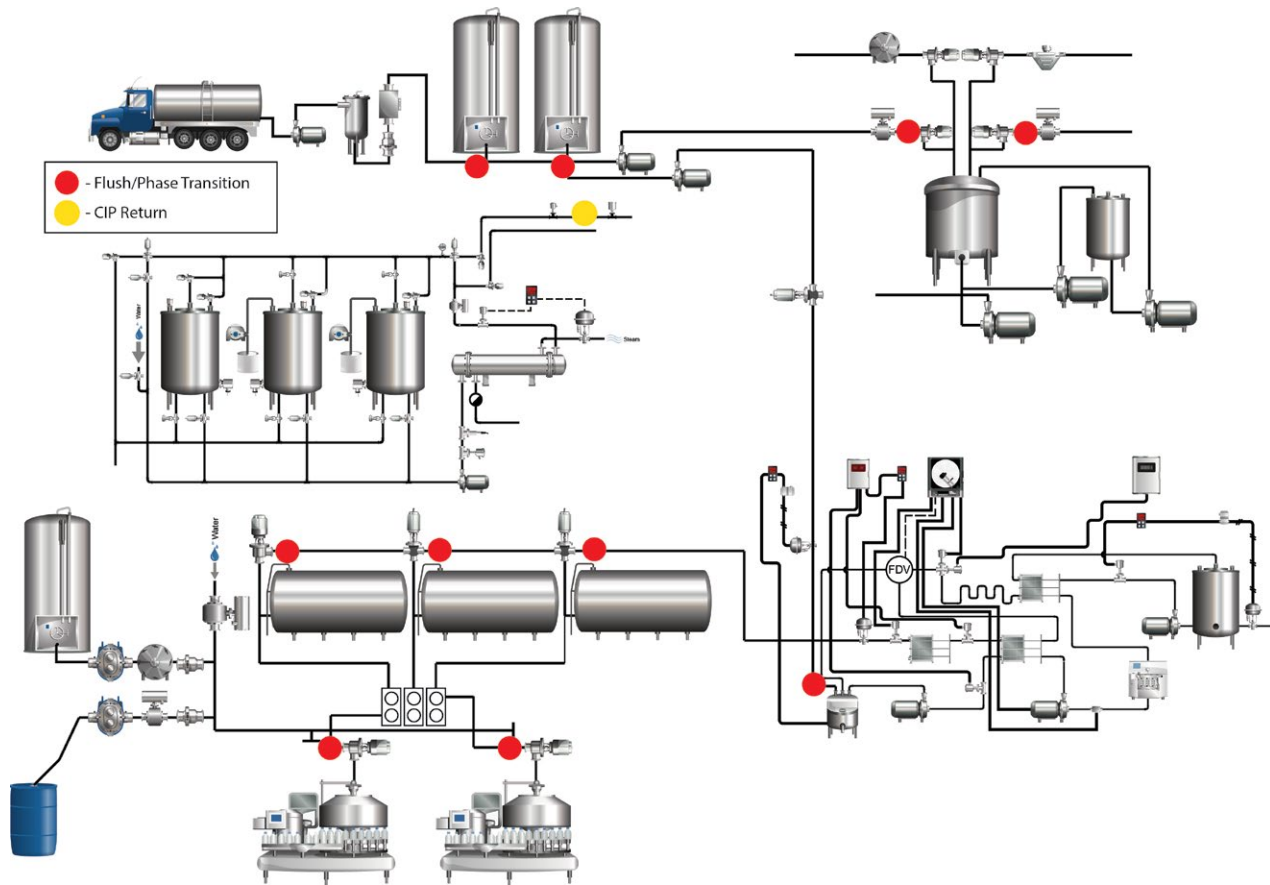


Figure 1 - Possible locations of Turbidity Sensors

Biochemical oxygen demand or BOD is the amount of dissolved oxygen required by aerobic biological organisms in water to neutralize organic material at a given temperature over a specific time. The BOD value is often used as a reliable measure of the degree of organic pollution suspended in water.

BOD is usually used by regulatory agencies as a gauge of the effectiveness of wastewater treatment plants. It is listed as a conventional pollutant in the U.S. Clean Water Act.

BOD measures are important for two primary reasons:

- BOD load is a valid measure of dairy process inefficiency and product waste.
- Many municipalities determine sewage fees for industrial users by measuring the BOD load in the plant's waste water.

The fundamental objective is to send high load BOD waste water to a recovery tank/system and low load BOD out to the municipality or plant waste water system.

Many plants use conductivity measures to determine where to divert the waste water flow. The problem with this approach is that it often errors on the high side due to caustic chemicals presence in the waste water. This error leads to overloading the high BOD treatment system at the plant and often pushing the pH levels to unacceptable levels.

The turbidity sensor allows instant and accurate monitoring of the media and product changeovers or CIP



programs. During the phase separation of the media or during the start-up and emptying of the process, the media must be differentiated. The turbidity sensor can detect *the instant* a liquid media reaches a pre-defined specification, automatically switching media to its appropriate container, and thereby significantly reducing BOD costs in waste water.

The infrared light is directed to the center of the pipe. This eliminates any potential variances caused by temperature, changes in viscosity, or build-up on the pipe. The measurements are always accurate and repeatable.

For example, here are the principles of operation of the ITM-3 turbidity sensor:

- An Infra-red LED emits light into media through the sapphire lens
- The receiver measures the amount of light reflected back by particles suspended in the media
- It generates a signal that is proportional to the amount of particles. **This is the relative turbidity**

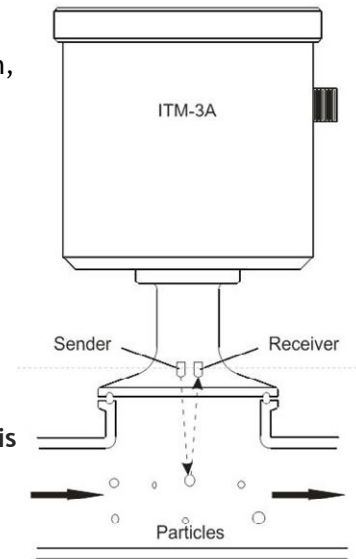
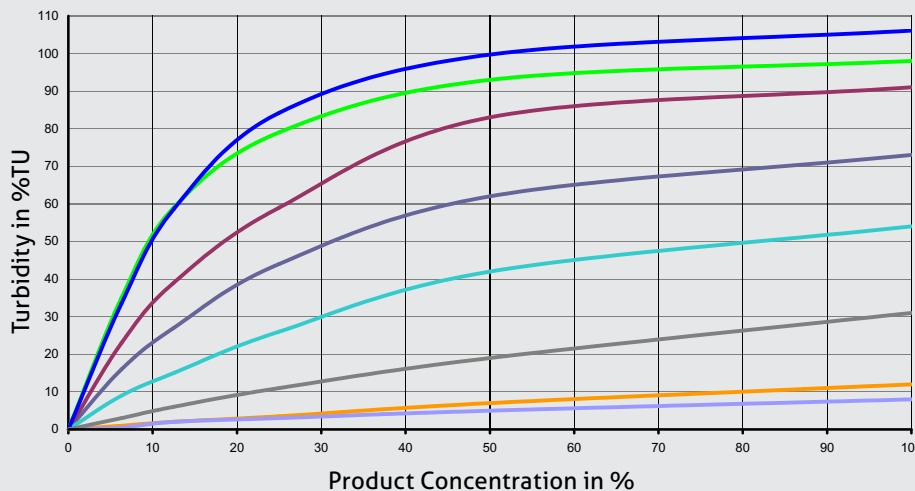


Figure 2 - ITM-3 Operation

Showcase Diagram of different Media



- Cream (40 % fat)*
- Cream (32 % fat)*
- Sour Cream (10 %)*
- Full Cream Milk (3.5 % fat)*
- UHT-Milk (1.5 % fat)*
- Whey*
- Tomato Juice
- Orange Juice

* Average turbidity of customary milk products at different dilutions.

Figure 3 - Turbidity Readings of Typical Products

Advantages of Turbidity Sensors

Using the Anderson Instrument ITM-3, even minor changes to the dairy product can be detected and acted upon by the system - automatically and instantly. Your personnel and systems can be in total control and Instrument outputs automatically recorded for quality control records.

The stainless steel sensor resists corrosion, and the highly resistant sapphire glass optics provides incredible precision and a lifetime of five years or more (versus the required annual maintenance of quartz glass).



Overall, you'll see:

- Improved product quality
- Quicker product changeovers
- Product waste reduction
- Reduced in sewage and water usage costs
- Lower BOD fees
- Less chemical use
- Enhanced process availability and reduced water consumption from cleaning efficiency
- Improved process control
- A return on your minimal investment in months or weeks

The improvement oversight, time control or volume acquisition is immediate and consistent.

Installation and Reliability Considerations

Generally, the ITM-3 is easy to install because it is a fully-contained unit. It is extremely durable and rarely fails in the dairy environment. In the unlikely event of a failure you won't have to wait long for a replacement sensor because the Anderson Instrument ITM-3 is always available.

Which Turbidity Sensor is Best?

There are dozens of turbidity sensors on the market. How do you compare apples to apples? Here are a few questions you can ask either your Anderson Instrument Regional Sales Manager or your dairy process control integrator:

1. **Cost:** Cost is always a consideration, and "more" isn't always better. That 240mph Porsche might be fun, but it's not going to get you back and forth to work any faster than your trusty Ford pickup. Always consider what you need along with the cost.
2. **Reliability and maintenance:** What kind of glass does it use, and what's the lifetime cost of maintenance? Does it contain an extension on the lens to keep it clean and free of build-up?
3. **Ease of installation and use:** Does it contain one or multiple pieces that have to be installed? What control systems, electrical connections, and mechanical connections does it require? Does it contain an operator interface and an easy way to reprogram it for different ranges?
4. **Output types:** Does it contain a secondary output, such as a relay output in case you'd like to do simple automation without requiring a computer?
5. **Designed for Dairy:** Has the product been adapted from other uses, or is it designed for the rigorous demands of the dairy industry?



The Anderson Instrument ITM-3 provides the fastest ROI, costs 40% less than comparable products, and is the only turbidity sensor designed with 80+ years of dairy experience for rigorous demands of the dairy industry.

We guarantee no other product on the market in 2014 can outperform the ITM-3 in accurate detection of phase transition for product optimization, CIP optimization and BOD mitigation. The vast majority of Dairy process control integrators insist upon the Anderson Instrument ITM-3 turbidity sensor in their designs because nothing works better, is more reliable, and is more accurate while providing the best value.

Sewer Surcharge Savings for Your Plant

	Current	Target
Enter current and target waste load in pounds of BOD5 per thousand pounds of milk processed		
Enter daily production in thousands of pounds of milk		
Multiply current and target waste loads by daily production to find daily waste load in pounds		
Enter your BOD5 surcharge cost per pound		
Multiply the daily waste load by the surcharge cost to find your daily surcharge cost		
Enter the number of days your plant operates each year		
Multiply the daily surcharge cost by the number of days your plant operates annually to find the annual surcharge cost		
Subtract the annual surcharge cost for the target waste load from the annual cost for the current waste load to find your annual savings		

Find Out for Yourself

Speak today with your dairy process control integrator or your Anderson Instrument Regional Sales Manager to confirm that the Anderson Instrument ITM-3 is right for your situation.

You can be using the ITM-3 in as little as three to four weeks, quickly reduce your product loss, and begin seeing a return on your investment within a relatively short time.

The Anderson Instrument ITM-3 is the easiest turbidity sensor to install and implement. Using the Anderson Instrument ITM-3 is the fastest and most reliable way to reduce product waste and increase your profits without changes to your production process or product mix.



Key Advantages of the Anderson Instrument ITM-3

- Patented frontal sensor (EHEDG-compliant)
- Equipped with sapphire glass optics which are significantly more durable and abrasion -resistant than the competitor's quartz glass approach
- No interference from reflections even when used with small nominal widths or electro-polished surfaces
- Four measurement ranges can be elected in analog
- Illuminated integral display
- Meets the CIP/SIP, etc. dairy industry process requirements