**INSIDE: MODERN HAMMERMILLS HANG TOUGH**

# BPT biomass PRODUCTS & TECHNOLOGY

May 2011
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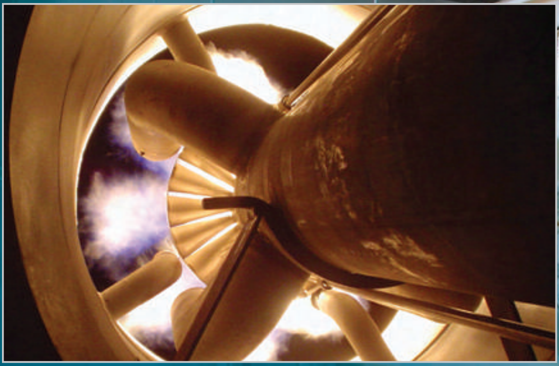

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# Advanced detection using point level sensors, microwave flow detectors

By Gregory DeRudder and Andy Bowman

Is solid flow detection the same as plugged chute detection? Answers vary depending on the individual's viewpoint, so let's examine each condition to note the differences and similarities.

When thinking of solids flow detection in a process, material is either flowing or it is not flowing. If material is not flowing, it is either not present, or the chute or pipe is plugged in such a way that material cannot flow. When thinking of plugged chute detection, we are looking for ways to detect and report the fact that there is material present in the chute and that it is not moving or flowing.

## Microwave solids flow detector employed to monitor the flow or no-flow state of the process material

When the subject of solids flow detection arises in conversation, most people tend to think of microwave-type sensors. These units use microwave Doppler radar technology and are extremely reliable in most applications. To have a successful application, the material being sensed must have a dielectric constant that is high enough to provide adequate reflected RF energy that the sensor can detect. Ensuring there is a sufficient amount of material moving in the pipe or chute so that a good "radar target" is obtained also greatly influences the amount of RF energy necessary for detection. In other words, the smaller particle sizes combined with very low flow rates will not necessarily yield a successful application. A microwave solids flow detector's rugged design withstands the rigors of the installation and process extremes. Solids flow detectors can be used in a variety of applications to detect flow/no-flow conditions of powders and solid materials, including feed mills and grain processing, consumer foods (cereal, flour, sugar, cocoa, coffee), dry chemicals, pesticides, detergents and more. For example, one company uses microwave solids flow detectors to verify the flow of feed pellets through various transport lines that involve a process where a horizontal screw auger is conveying pellets to a vertical gravity chute. The chute then directs the pellets to a process down below. They have carefully placed the unit so that it detects the pellets as they fall directly past the sensor face. See Figure 1.

A major benefit for using a solids flow detector is that it provides a non-intrusive option for monitoring a flow condition. Also, a variety of available options from manufacturers make these units even more versatile. For instance, stainless steel mounting adapters with a choice of process seals are usually offered. Some units have optional saddle couplings that can provide a means of mounting the transceiver without welding a coupling to the process line. In addition, some manufacturers provide solids flow detectors with a choice of analog or relay outputs.

One item to keep in mind is that a microwave Doppler radar-type solids flow detector cannot differentiate between a plugged no-flow condition and an empty no-flow condition. A logic function of some type must be employed to definitively determine the distinction between an empty chute and a plugged chute. There are various ways that this distinction might be concluded, but the easiest solution could simply be to add a point level sensor to the process to signal a plugged chute

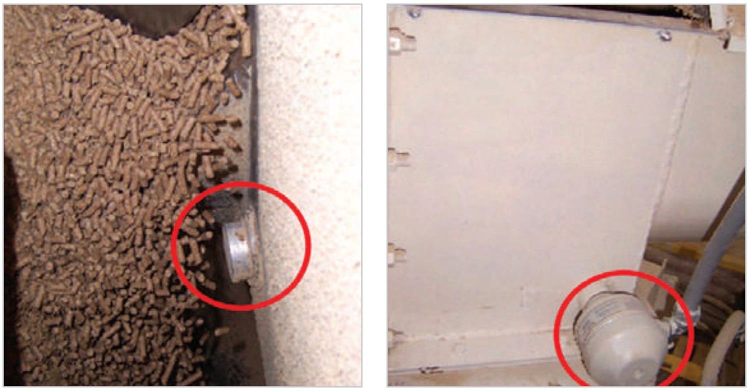

Figure 1. Flow detectors located for most effective monitoring

condition, should one exist. This is often less expensive and less time consuming than trying to make a conclusion based on other process conditions elsewhere in the system.

### Point level sensors used for detecting plugged chute or plugged pipe conditions

Including point level sensors or switches, such as a rotary paddle sensor, vibratory sensor or an R.F. Capacitance probe, that can be employed to detect the presence or absence of material that would be exposed to the sensor only during a plug condition, is a simple addition to a system that only requires a minor modification to a pipe or chute. For added safety, a "truly" fail-safe rotary paddle sensor that analyses its own sensor health, and system power failure, should be considered.

The main benefit to this type of set-up is that it is a low-cost detection of material backed up in the chute or line; a condition indicative of a flow obstruction. The average cost range for this type of solution is around $200-$600 per sensor, depending on the sensor technology and specific model chosen.

As previously mentioned, it is often necessary to make some modification to the process line to isolate the level sensor from the material flow stream. It is almost impossible to mount a point level type of sensing probe directly into a flow stream to monitor for a plugged pipe or chute condition. This is because a point level sensor cannot differentiate between a highly saturated dynamic condition (e.g. dense flow stream) and a highly saturated static condition (e.g. line plugged).

If the process involves a round pipe, it is common to make use of a pipe "Y" with the level monitor installed in one leg of the "Y." It is important that the level sensor be installed to ensure that the material clears away from the sensing element when the plug condition passes. See Figure 2.

### Conclusion

Although using two different sensor technologies to accommodate both solids flow and plugged chute/pipe detection nicely covers both conditions, it might not be necessary in cases where a plugged chute condition cannot occur. For example, the likelihood of a dry free flowing material with no appreciable packing factor plugging a chute or pipe with a vertical drop is highly unlikely. However, a full surge bin below the same pipe or chute would cause material to fill the pipe or chute and flow would cease. So, if this were to happen, what would you want in your system? Would you want only a solids flow detector, a plugged chute detector or both? The choice is yours. Most manufacturers can be contacted to assist in determining what options would be best for your particular process.

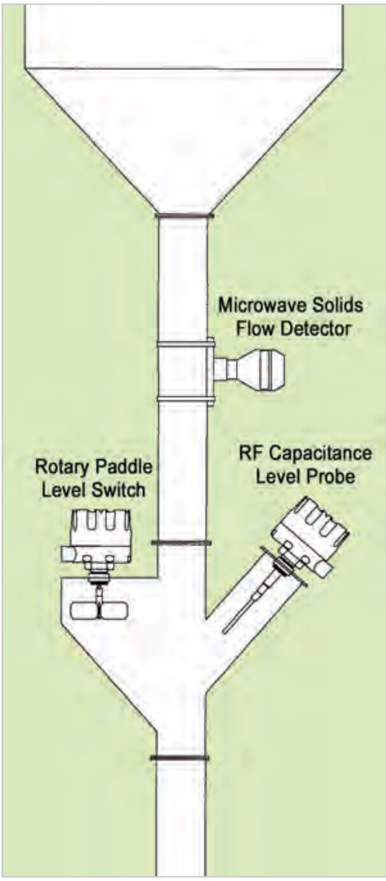


Figure 2. Ideal installation of level sensor

*Gregory DeRudder has been with Monitor Technologies, LLC for more than 12 years. For the past three years he has been a product manager at Monitor, and before that he held the position of Technical Sales Support manager. DeRudder graduated from the DeVry Institute of Technology (Chicago, Ill.) in 1971 with a bachelor's degree in Electronics Engineering Technology. You may contact him by e-mailing bpteditorial@woodwardbizmedia.com.*

*Andy Bowman has been an employee of Monitor Technologies, LLC working in level measurement for more than 20 years. After working with the Tank Mate liquid level line, Bowman moved to the traditional Monitor level control products, where he has been serving in an application engineer capacity for the last 14 years. His current position is Technical Service manager. Prior to joining Monitor, Bowman received his bachelor's degree from Northern Illinois University.*