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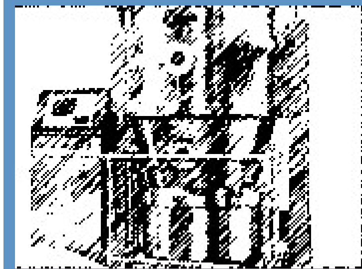


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Product and Filter Differential Pressure: What Influences the Readings, and the Importance of Collecting this Data.

Process troubleshooting relies on collected data (preferably electronic). The type of data and the collection interval vary by vendor and user, but the preference is to take as much as possible and as frequently as possible. For a fluid bed processor, this would minimally include all temperatures (dew point, inlet, product and exhaust), process air volume, atomizing air pressure (and volume, where applicable) and spray rate. Dependent variables should also be collected – product and outlet filter differential pressure, liquid line pressure. In systems with complex air handling units (AHU), total air volume, pre-heater temperature, ambient air dew point and dehumidification dew point may be added to the list. Some users don't stop here: they may also include the output values for the control devices so that when trouble starts, there are many places to look for the 'fingerprints' responsible for the digression.

Unfortunately, some companies do not realize that extensive data collection is often a gold mine for identifying the root cause of processing problems or failures. In one such case, a QA group demanded that the batch record include operating limits for product and filter differential pressure. Realizing the difficulty in so doing, manufacturing stopped collecting this data, removing it from the in-process data sheets in the batch record. These 2 are dependent variables influenced by a multitude of factors. In reality, the absolute value is not as interesting as the trends, and they are often vitally important to confirm the cause of a failure or deviation – they should always be recorded and unbound by an arbitrary operating limit.

The confounding nature of fluid bed variables (one influences at least one other) is borne out by the behavior of product and filter differential pressures. Product dP responds principally to batch size and process air volume for a given product container orifice plate and retention screen. Its values can help to confirm the accuracy of the process air volume (in concert with the inlet and product temperatures) or as an indicator for agglomeration in a pellet layering or coating process.

The first step in seeing the value of these data is to understand where and why they get their readings. While some fluid bed equipment uses electronic sensors and transmitters, the vast majority use three open sensing points to derive product and filter differential pressure – one in the lower plenum (below the product container), one in the upper expansion chamber or lower filter housing and one above the outlet air filter. The sensing point which is common for isolating product and filter dP is the one 'in the middle'. Unfortunately this point is directly exposed to product flow (and water during cleaning) and it and its interconnect tubing may be clogged rather easily. If this occurs, a partially or completely occluded sensor opening will result in artificially high readings for the outlet filter and low readings (including the possibility of a reading below '0' mmWC) for product.

The readings must be accurate to be of any use. A sudden decrease in outlet filter dP may indicate a bag rupture and rapid loss of product. An astute operator can intervene and salvage the batch without suffering a significant yield loss. However, if this event also shows an offsetting rise in product dP, it would be a false alarm – it was likely caused by breakage of a clump of material in the open sensor tubing.

Keeping the middle sensing point and its tubing clean is critical. If product enters and is wetted by water during cleaning, mold, microbial or cross-contamination problems (for the next product) may ensue. Cleaning SOP's and/or equipment design criteria must address this vital area. When the sensors perform correctly, the data generated is very useful for process troubleshooting.