



# Reach Your Ideal Weight

Learn how weighing equipment and their suppliers can help you increase return on assets and achieve consistent product quality in your process applications. *By Felix Klebe, Mettler-Toledo Inc.*

**>>** Weighing traditionally has been an integral part of critical operations occurring in a production process. Typical process operations that use weighing include material filling into a container, dosing from a container, blending and batching. The design and performance of a weighing system affects the user's ability to achieve high return on assets, consistent product quality and production flexibility.

Typically advanced systems support repetitive, fixed sequences of operation.

Manufacturers across a variety of industries face similar challenges in their production processes. These challenges include:

1. Increase return on assets.
  - Increase productivity
  - Increase uptime
  - Greater flexibility to handle changes in production demands
2. Achieve consistent product quality.
  - Easy capturing and sharing of production information
3. Manage workforce constraints.
  - Reduced staffing
  - Educational mismatches

So how can these challenges be addressed from a weighing equipment supplier perspective?

Weighing equipment can provide three primary functions that affect process performance: measurement, control and analysis. Each of these three areas is interrelated, and an effective system requires the tight integration of each of these three elements.

## Measurement

The success of a weighing system hinges upon the ability to accurately and consistently measure a weight value under a variety of conditions. Environmental factors that affect the performance of the measurement signal include vibration, temperature variations and electrical interference as well as the sensor design, manufacturing quality, and how well they're integrated into the structure.

Analog load cells are most commonly used; however, alternate sensor technologies such as ultrasonic level detectors also are used for applications requiring lower accuracy, such as inventory monitoring.

A typical process weighing application includes a vessel supported by multiple weigh modules, and the vessel contains an analog strain-gauge load cell as part of the structure (see **Figure 1**). Vessel weighing capacities can range from less than 10 kg to more than 1,000 tons, and a sensor is used to provide accurate measurements.

**Figure 1.** A typical process weighing application includes a vessel, such as the material hopper shown here, supported by multiple weigh modules. The vessel contains an analog strain-gauge load cell as part of the structure, and a sensor provides measurements.



## >> Basic versus Advanced Control of a Material Transfer Process

|        | Basic Control   | Enhanced Control   |
|--------|---|--|
| Why?   | Simple to apply; only related to controlling the flow of material                     | Controls a repetitive process; control of more than material transfer needed (e.g. controlling a sequence of steps perhaps including external equipment) |
| How?   | Uses target comparisons, outputs and some type of communications (e.g. PLC interface) | Uses target comparisons and outputs; could be directly tied to related equipment (e.g. mixers or heating jacket)   |
| Where? | Usually integrated with controller like PLC or PC                                     | Stand-alone or integrated  |
| Who?   | Minimal operator interaction with the weighing terminal                               | Usually operator driven or initiated; could be fully automatic   |
| What?  | Basic functionality target control (set point)  | Filling, dosing, blending, batching application solutions  |

**Figure 2.** Filling, dosing, blending and batching use material transfer control to solve specific, but more demanding, application requirements. These application solutions can be considered enhanced control solutions.

### Control

Material transfer is the process that controls the amount of material that's being delivered to the next step of a process. Filling, dosing, blending and batching use material transfer control to solve specific, but more demanding, application requirements. These application solutions can be considered enhanced control solutions. **Figure 2** provides a comparison of basic versus advanced control of a material transfer process.

Control of the material transfer operation includes functionality such as integrating timers and interlocks, monitoring targets and automatic control of necessary adjustments to delivered material quantities to bring out-of-tolerance initial deliveries into tolerance.

Typically, advanced systems support repetitive, fixed sequences of operation. Systems may also require direct communication with other control equipment that's programmable logic controller-based (PLC) or PC-based via a variety of fieldbus, serial or Ethernet TCP/IP methods.

The ability of a weighing system to complete the material transfer process quickly, accurately and consistently has a significant impact on meeting the operational challenges of increasing productivity and product quality.

### Analysis

Information about the status of material transfer, historical performance, alarms and events, and predictive maintenance-related data must be available to both the local operator and higher-level systems. Having a system that allows for simple, transparent operational analysis of key metrics, such as batch-to-batch consistency and diagnostics of weighing performance problems, allows for productivity analysis, troubleshooting and improvement that boost productivity.

Terminals with seamless communications integration with control systems using open communication protocols, such as EtherNet/IP, allow for improved productivity and lower integration cost.

The capability of a weighing terminal to provide customized data structure, data visibility and data communication that satisfies unique application specific requirements is critical. Operational consistency between different levels of weighing equipment also helps meet the user objective of lower integration, operator training and service costs.

### A Competitive Edge

New capabilities in the latest-generation weighing equipment can be used to create a production advantage in a variety of manufacturing operations. The combination of improved processing power, communication with higher-level factory automation applications, application-specific software solutions, and advanced diagnostics provide users with a compelling reason to invest in the latest generation of weighing technology. □

*Rockwell Automation Encompass™ Product Partner Mettler-Toledo, Columbus, Ohio, specializes in precision weighing and process transmission instruments for applications ranging from receiving raw materials through various manufacturing processes, in-line process control and end-of-line packaging control, to logistics and shipping. The company provides weighing equipment for process applications in industries such as pharmaceutical, food and beverage, chemical and home products.*

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