



Beginner's Guide to Industrial Representative Sampling

Maximize your operations through the collection of real-time data provided by representative sampling.



What is Representative Sampling?

Representative sampling is the act of capturing a small volume of material from a process stream that accurately reflects the condition of the entire lot, batch or process stream. Operators can sample most process materials, either within a production environment or after it is stored or transported. Engineers then analyze the sample for product quality and process monitoring.

There are two primary methods for collecting representative samples:

Grab Sampling: The process technicians use a spigot to duct the sample into a bucket or scoop it into a bin. These grab sampling methods reflect the condition of the process stream at the point in time at which the sample was collected.

Representative Sampling: Composite sampling, which collects multiple individual samples at regular intervals over a defined period. Composite sampling uses application-appropriate sampling techniques, an approach that enables a more customized strategy.

Reliable & Accurate Analytical Results

The accuracy of sample analysis is only as good as the condition of the sample material for both external and in-line sample analyses. In addition, it is critical to design the sampling method for the specific process stream type, process conditions, sample type, and material properties. The table below outlines the particular sample application criteria needed for reliable and accurate sample analysis.

The most crucial factor is that many samples may need to be conditioned by bringing the temperature, pressure, and flow rate to a state suitable for reliable analysis. Without proper conditioning, the sample analysis results could lead to misguided operational decisions that directly impact customer loyalty, profitability, or safety.

REPRESENTATIVE SAMPLING BENEFITS

- Produce reliable and accurate analysis results
- Reduce cost by minimizing waste and downtime
- Protect the safety of operators and the environment
- Assure product quality and regulatory compliance

PROCESS STREAM	PROCESS CONDITIONS	SAMPLE TYPE	MATERIAL CHARACTERISTICS
Conveying	Area Classification	Gas	Abrasive
Distillation Towers	Composition	Liquid	Boiling Point
Mixers	Corrosiveness	Powder	Density
Pipes	Flammability	Slurry	Explosive
Reactors	Flow Rate	Solid	Freezing Point
Storage Vessels	Pressure	Steam	Hardness
	Radioactivity	Water	Magnetic
	Temperature		Moisture Content
	Toxicity		Particle Size & Shape
			Material Compatibility
			Thermal Conductivity

Reducing Waste and Downtime



Process Monitoring

Plant capital assets are a significant investment but are vital to maximizing production output and profitability. Therefore, monitoring is critical for many industries, especially power generation, oil & gas, petrochemicals, and chemicals.

Technicians should regularly collect, condition, and analyze representative samples to obtain a real-time view of the stream condition and assess its impact on processing equipment. Neglecting to monitor the process increases the risk of catastrophic equipment failures, environmental spills, and fatal accidents.

Yield Improvement

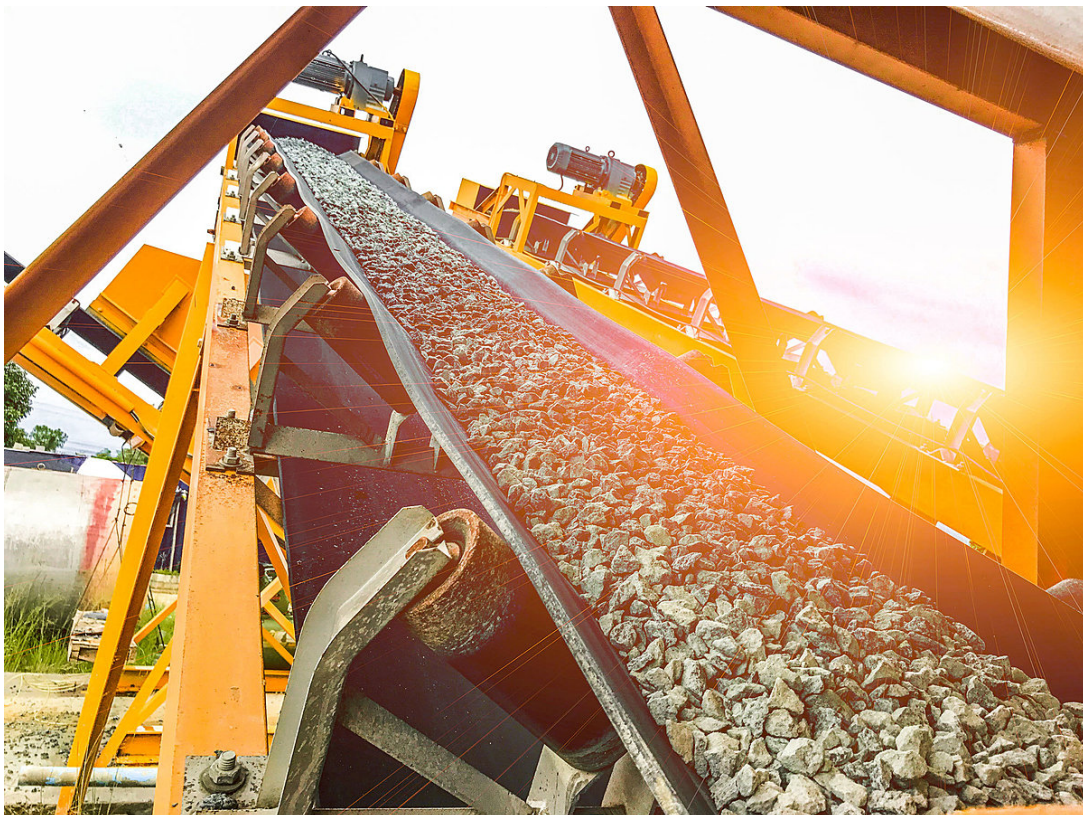
A plant can improve its yield by taking samples to ensure the ingredients' moisture content stays within the specification range. If the amount of water vapor is too low, a plant may be overfilling products. If moisture is too high, the product will deteriorate more quickly through oxidation. Out-of-tolerance moisture content also influences product shrinkage or expansion, a response that directly affects the volume a product occupies in its packaging.

Sampling can also improve yield by monitoring product breakage by identifying potential disruptions or inconsistencies within the process. If the plant equipment no longer produces in-spec products, this shift can result in a direct increase in scrap rate or force the manufacturer to offer discounts to recoup lost revenue for its customers.

Process Optimization

Process optimization aims to maximize the operating efficiency of a plant task. Including automated sample conditioning and analysis, systems assess the process safely and efficiently while assuring sample integrity with limited human interface. Benefits of automated sampling include:

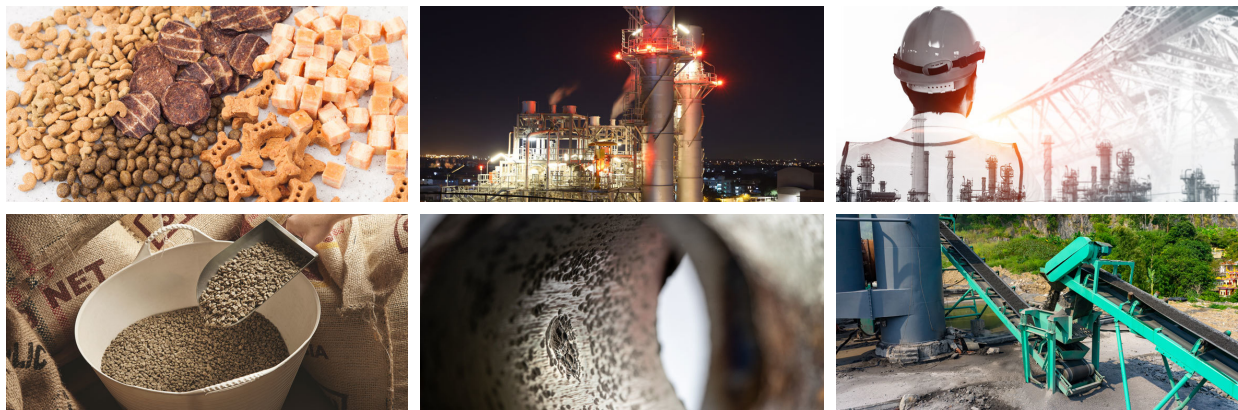
- Continuous production during sampling to avoid downtime
- Retrofitting the sampler controller into existing equipment to allow sampling to begin without operator engagement
- Operators do not come in contact with potentially harmful equipment pressure and temperatures
- Consumer protection is enhanced because operators cannot inadvertently contaminate the process
- Plants can increase their throughput, saving time and money



Protect Operators and the Environment

Process streams are maintained in many manufacturing plants or facilities at certain temperatures, pressures, and flow rates. Therefore, it is essential to consider how the technicians will retrieve the sample (pipes, tanks, mixers, conveying belts, chutes, towers, reactors, or other equipment) to develop the safest sampling method.

For example, many operational environments must handle hazardous products or wastes such as deadly H₂S (hydrogen sulfide), sour gas or water, materials that are either explosive, toxic, abrasive or corrosive if not a combination of some of those traits.



Operator Safety

The design of closed-loop samplers protects operators by:

- Fully containing liquids and gases to eliminate worker exposure to hazards
- Using a series of valves and vents for sampling control
- Leveraging sampling automation to reduce the need for human interaction
- Minimizing the potential for contaminate spills
- Stopping the prolonged release of toxic vapors
- Reducing sample testing sizes, eliminating leftover sample waste

Food Safety

In addition to speeding up the process, automated, representative sampling solutions reduce food risk by:

- Ensuring food safety testing is accurate and reliable
- Helps to identify and prevent microbial, allergen or chemical contamination
- Validating raw ingredients' authenticity and quality
- Aiding producers in confident reporting and product tracing to comply with food safety regulations
- Ensure sample integrity with easy-to-clean, sanitary designs and FDA-approved seals

Ensure Product Quality & Regulatory Compliance



REGULATORY COMPLIANCE BRANCHES

- Occupational Safety and Health Administration (OSHA)
- International Labour Organization (ILO)
- Environmental Protection Agency (EPA)
- United Nations Environment Programme (UNEP)
- Food and Drug Administration (FDA)
- Department of Transportation (DOT)

In addition to complying with local, national and international regulations, a manufacturer's commitment to quality and safety leads to maintaining the highest industry standards and numerous national and international certifications. With how the standards and rules work to foster customer loyalty, profitability and safety, they could also apply to your sampling method. This application is particularly true in markets like food and beverage, power generation, oil and gas, petrochemical, chemicals, concrete and more, where safety and quality aren't goals - they're requirements.

To meet these concerns it is recommended that you select sampling equipment that meets these quality requirements:

- The American Society of Mechanical Engineers (ASME) certification
- National Association of Corrosion Engineers (NACE)
- Hazardous Location (HAZLOC) requirements
- Department of Transportation (DOT) certification
- ISO 9001 Certification
- International customers should consider:
 - The Canadian Registration Number (CRN)
 - Conformité Européene (CE)
 - Pressure Equipment Directive (PED)
 - European Directive for Equipment for Potentially Explosive Atmospheres (ATEX).



With proven sampling expertise since 1924, Sentry products and services provide business operations with the critical insights to optimize process control and product quality. Standing behind our commitments, we are determined to tackle any application, anywhere.

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