

# Blend Quality Monitoring Protocols (Last 6 Months)

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## 1. Introduction

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This document defines the standardized procedures for monitoring and recording the quality of blends at plant intake over the last six months. It encompasses measurement protocols, classification criteria, response

actions, error troubleshooting, and maintenance requirements. The goal is to ensure consistent product quality, optimize process efficiency, and facilitate compliance with internal specifications and external regulations.

Effective quality monitoring is essential for maintaining the integrity of the production process, minimizing deviations, and ensuring customer satisfaction. These protocols align with the plant's baseline equipment specifications and the Product Specification Sheets (PSS) for targeted key quality metrics.

## 2. Scope

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This protocol applies to all blending operations at the plant over the last six months, specifically focusing on core equipment including the **Cutting Machines (e.g., CUT-2000)** and **Fryer Lines (e.g., FRY-XL)**. It covers the measurement of dry matter (DM), defect percentage, fry color range, and associated parameters as specified in the latest PSS documents.

The procedures herein are designed to monitor hourly blend quality, document deviations, and trigger corrective actions to maintain target parameters within prescribed tolerances, notably  $\pm 0.3$  percentage points (pp) of the target DM.

## 3. Related Documents

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- **Equipment Manuals:** Include detailed technical specifications, rated throughput, and maintenance steps for each machine (e.g., CUT-2000, FRY-XL).
- **Process Safety Solutions (PSS) Quality Specifications:** Include SKU targets, tolerance bands, defect and color specifications, and downgrading protocols.
- **Error Code Manuals:** List and describe diagnostic error codes such as DOW-PI-45xx.
- **Maintenance Logs and Historical Monitoring Data.**

## 4. Equipment Overview

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### 4.1 Cutting Machines

The CUT-2000 machine is rated for a throughput of 8.5 tonnes per hour (t/h) under optimal conditions. Key features include:

- Automated feeding system
- Precision cutting blades
- Integrated sensors for real-time throughput monitoring
- Regular maintenance every 500 operational hours

## 4.2 Fryer Lines

The FRY-XL equipment is rated for 6.0 t/h with features including:

- Temperature control units
- Oil quality sensors
- Color measurement systems for fry quality
- Scheduled calibration and cleaning routines

## 4.3 Maintenance and Error Management

Scheduled maintenance includes blade sharpening, sensor calibration, and lubrication, with error codes such as `DOW-PI-45xx` indicating sensor or mechanical malfunctions. Troubleshooting requires following the error code manual for diagnostic procedures.

# 5. Monitoring Procedures

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## 5.1 Frequency and Timing

Monitoring occurs hourly during operational shifts. Samples are collected at the start, midpoint, and end of each hour to ensure representative data collection.

## 5.2 Sampling Methodology

Samples are obtained directly from the blend stream using automatic samplers where available, or manually taking a representative slurry sample. Samples are then prepared according to standardized procedures for moisture analysis and color testing.

## 5.3 Data Recording

All measurements are entered into the centralized monitoring system with timestamp, operator ID, and machine details. Data integrity checks are performed daily.

## 6. Quality Parameters & Specifications

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### 6.1 Key Quality Metrics

Parameter	Target Range / Specification	Tolerance	Notes
Dry Matter (DM)	21.8%	±0.3pp	Based on SKU specifications, e.g., SC-9mm
Defect Percentage	Less than 2%	N/A	Includes broken, discolored, or damaged items
Fry Color Range	Color index 3.0 - 4.5	N/A	Measured via colorimeter

### 6.2 Tolerance Bands & Specifications from PSS

Example: For SKU SC-9mm, the dry matter target is 21.8%, with a permissible variation of ±0.3pp, i.e., acceptable range is 21.5% to 22.1%.

Defect percentage should not exceed 2%. Fry color must remain within specified RGB indices as per PSS documentation.

## 7. Measurement and Recording Procedures

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### 7.1 Dry Matter Content

DM is measured via oven drying at 105°C for 24 hours. The procedure includes:

- Weighing a representative sample (~50g)
- Drying in calibrated oven
- Weighing dried sample
- Calculating moisture loss to determine DM percentage

## 7.2 Defect Percentage and Fry Color

Defects are visually inspected during sampling; fry color is measured using a calibrated colorimeter, with results logged in RGB index.

### Example Data Entry

Timestamp: 2025-04-15 09:00  
Machine: CUT-2000  
Sample ID: SMPL-0458  
Dry Matter (%): 21.7  
Defect Rate (%): 1.8  
Fry Color Index: 3.5  
Operator: J. Doe  
Comments: No anomalies observed.

## 8. Calculating Blend Dry Matter (DM)

The blend DM is calculated based on the weighted average of individual ingredient batches and their respective moisture contents. The formula is:

### Formula for Blend DM

$$\text{Blend DM (\%)} = (\sum (\text{Component Weight} \times \text{Component DM})) / \text{Total Blend Weight}$$

Example calculation:

Component	Weight (kg)	Component DM (%)	Weighted DM (kg)
Ingredient A	500	20.5	102.5
Ingredient B	300	22.0	66.0

Total	800		168.5
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Calculated Blend DM =  $168.5 / 800 = 21.06\%$

## 9. Classification of Blend Quality (Under/Over-Quality)

### 9.1 Classification Criteria

Based on measured DM and defect parameters, each hourly sample is classified as follows:

- **Acceptable:** Within target  $\pm 0.3\text{pp}$  and defect percentage below 2%
- **Under-Quality:** DM below 21.5% or defect > 2%
- **Over-Quality:** DM above 22.1%

### 9.2 Examples

- Sample with DM = 21.4% → Under-Quality
- Sample with DM = 22.2% → Over-Quality
- Sample with DM = 21.8%, Defect rate = 1.5% → Acceptable

## 10. Response Triggers and Corrective Actions

### 10.1 Trigger Thresholds

Actions are initiated when predetermined thresholds are exceeded:

- DM < 21.5% or > 22.1%
- Defect rate > 2%

### 10.2 Corrective Procedures

1. **For Under-Quality:** Adjust ingredient feed rates, increase mixing time, verify sensor calibration.

- 2. **For Over-Quality:** Reduce ingredient inclusion, check for equipment issues affecting moisture content, and verify calibration settings.
- 3. **For Defects:** Inspect for equipment malfunctions, clean screening systems, and replace damaged blades if necessary.

### 10.3 Documentation and Escalation

All actions and observations are documented. Persistent deviations require escalation to process engineering for root cause analysis.

## 11. Error Codes and Troubleshooting

### 11.1 Common Error Codes

Error Code	Description	Symptoms	Recommended Action
DOW-PI-4510	Sensor Calibration Error	Inaccurate moisture readings	Perform calibration as per manual, verify sensor connections
DOW-PI-4560	Mechanical Jam	Machine halts, abnormal noise	Stop equipment, clear jam, inspect blades and feeding mechanisms
DOW-PI-45xx	Other Sensor Failures	Invalid data, sensor offline	Inspect wiring, replace sensor if necessary

**Note:** All error codes and troubleshooting procedures are documented in the Equipment Manual and should be followed strictly to prevent downtime.

## 12. Maintenance Procedures

### 12.1 Scheduled Maintenance

- Blade sharpening every 500 hours or quarterly

- Sensor calibration every 2 weeks or after error incidence
- Lubrication of moving parts every month

## 12.2 Troubleshooting Technical Faults

Follow step-by-step diagnostic flowcharts included in the equipment manuals to address errors like sensor misreads or mechanical jams.

**Best Practice:** Maintain detailed logs of all maintenance activities, error incidents, and corrective actions for audit purposes.

## 13. Monitoring Logs & Data Management

All measurement data are logged in the centralized system with the following fields:

- Date/Time
- Machine ID and Location
- Sample ID

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