# Fuel Quality & Product Conformity Pack (EN 14214)

**Document ID:** [Project Name]-QA-PROD-001 **Version:** 1.0 **Effective Date:** [Date] **Author:** [QA Manager Name/Title] **Approver:** [Plant Manager Name/Title]

### **1.0 Purpose and Scope**

**1.1. Purpose** This document establishes the comprehensive Quality Assurance (QA) and Quality Control (QC) framework for [Project Name] to ensure that all Fatty Acid Methyl Ester (FAME) produced and supplied meets or exceeds the specifications of **EN 14214:2012+A2:2019**. The procedures herein are designed to guarantee product conformity, traceability, and customer satisfaction, while supporting regulatory compliance under the UK RTFO and EU RED II/III frameworks.

**1.2. Scope** This pack applies to all stages of the biodiesel production process, from the reception of Used Cooking Oil (UCO) feedstock to the final testing, storage, and dispatch of finished B100 biodiesel. It governs the activities of all personnel involved in production, quality control, logistics, and management.

### **2.0 Product Specification: EN 14214**

All B100 biodiesel produced must conform to the following critical parameters as defined by the EN 14214 standard. A full Certificate of Analysis (CoA) demonstrating compliance with these specifications is required for the release of every product batch.

| Parameter | Unit | Lower Limit | Upper Limit | Test Method |
| --- | --- | --- | --- | --- |
| **Ester Content** | % (m/m) | 96.5 | - | EN 14103 |
| **Density @ 15°C** | kg/m³ | 860 | 900 | EN ISO 3675 |
| **Viscosity @ 40°C** | mm²/s | 3.50 | 5.00 | EN ISO 3104 |
| **Flash Point (PMCC)** | °C | 101 | - | EN ISO 2719 |
| **Sulphur Content** | mg/kg | - | 10.0 | EN ISO 20846 |
| **Cetane Number** | - | 51.0 | - | EN ISO 5165 |
| **Monoglyceride Content** | % (m/m) | - | 0.70 | EN 14105 |
| **Diglyceride Content** | % (m/m) | - | 0.20 | EN 14105 |
| **Triglyceride Content** | % (m/m) | - | 0.20 | EN 14105 |
| **Free Glycerol** | % (m/m) | - | 0.020 | EN 14105 / EN 14106 |
| **Total Glycerol** | % (m/m) | - | 0.25 | EN 14105 |
| **Water Content** | mg/kg | - | 500 | EN ISO 12937 |
| **Total Contamination** | mg/kg | - | 24 | EN 12662 |
| **Oxidation Stability @ 110°C** | hours | 8.0 | - | EN 15751 |
| **Acid Value** | mg KOH/g | - | 0.50 | EN 14104 |
| **Iodine Value** | g I₂/100g | - | 120 | EN 14111 |
| **Methanol Content** | % (m/m) | - | 0.20 | EN 14110 |
| **Group I Metals (Na+K)** | mg/kg | - | 5.0 | EN 14108 / EN 14538 |
| **Group II Metals (Ca+Mg)** | mg/kg | - | 5.0 | EN 14109 / EN 14538 |
| **Phosphorus Content** | mg/kg | - | 4.0 | EN 14107 |
| **Cold Filter Plugging Point (CFPP)** | °C | - | [Specify value based on season/customer] | EN 116 |

**Note:** The CFPP limit is subject to seasonal variation and specific customer requirements as outlined in the national annex or customer quality agreement.

### **3.0 QA/QC Procedures**

Quality is managed through a multi-stage control process, mirroring a Hazard Analysis and Critical Control Points (HACCP) methodology adapted for chemical production.

**3.1. Incoming Material Quality Control (Feedstock)** - **Supplier Vetting:** All UCO suppliers must be approved and certified under a recognized scheme (e.g., ISCC). Verification of the supplier’s active certificate is mandatory before procurement. - **Reception Testing:** Each incoming tanker of UCO is sampled prior to unloading. - **Key Tests:** Free Fatty Acid (FFA) content, water content, and visual inspection for impurities. - **Acceptance Criteria:** FFA must be within the process tolerance of [Specify FFA % limit]. Deliveries exceeding this limit or showing excessive contamination are rejected and documented in the Non-Conformance Register. - **Traceability:** Each accepted delivery is assigned a unique Goods Inward Number (GIN) which links to the supplier’s Proof of Sustainability (PoS) document.

**3.2. In-Process Quality Control (IPQC)** Critical process parameters are monitored to ensure the transesterification reaction proceeds to completion.

| Control Point | Monitored Parameter | Frequency | Action if Deviated |
| --- | --- | --- | --- |
| **Transesterification Reactor** | Temperature, Agitation Speed | Continuous | Adjust heating/motor controls. |
| **Post-Reaction Sample** | Conversion Rate (via GC) | Per reaction vessel | Allow additional reaction time or adjust catalyst dosage for next run. |
| **Washing/Purification** | pH, Water Clarity | Each wash cycle | Continue washing cycles until neutral pH and clear water is achieved. |
| **Drying** | Water Content (Karl Fischer) | Post-drying | Continue vacuum drying until water content is < 100 ppm. |

**3.3. Final Product Quality Control (FPQC)** - **Batch Homogenization:** The finished product is transferred to a dedicated Final Product Tank and circulated to ensure homogeneity. - **Final Sample:** A representative sample is drawn from the tank using a specified methodology (e.g., [Specify sampling standard, e.g., ASTM D4057]). - **Full Specification Testing:** The sample undergoes comprehensive testing against all EN 14214 parameters as listed in Section 2.0. - **Release:** A batch is only approved for release upon successful completion of all tests and generation of a compliant Certificate of Analysis.

### **4.0 Sampling, Testing, and Laboratory Requirements**

**4.1. Batch Definition** A **“batch”** is defined as a discrete, homogeneous quantity of biodiesel produced and held within a single, designated Final Product Tank (e.g., Tank [Tank ID]). No additional product may be added to a tank after the final batch sample has been drawn. The maximum batch size is [Specify volume, e.g., 500 m³].

**4.2. Sampling Frequency and Plan**

| Stage | Sample Point | Frequency | Purpose |
| --- | --- | --- | --- |
| **Goods Inward** | UCO Tanker | Per Delivery | Feedstock acceptance |
| **In-Process** | Reactor Vessel | Per Reaction | Monitor reaction conversion |
| **In-Process** | Purifier Outlet | Per Wash Cycle | Confirm removal of impurities |
| **In-Process** | Dryer Outlet | Post-Drying | Confirm water removal |
| **Final Product** | Final Product Tank | Per Batch | Certification and Release |

**4.3. Laboratory Requirements** - **On-site Laboratory:** Equipped for rapid in-process testing (e.g., FFA, water content, pH, GC for conversion rate). Equipment must be calibrated according to a defined schedule. - **External Accredited Laboratory:** All final batch release testing for the Certificate of Analysis must be performed by a third-party laboratory accredited to **ISO/IEC 17025** for the relevant EN/ISO test methods. - **Laboratory Selection:** An approved list of accredited laboratories will be maintained by the QA department. Performance and turnaround times will be reviewed annually.

### **5.0 Batch Traceability Procedure**

A robust traceability system is essential for quality control, auditing (ISCC, RTFO), and potential product recalls.

**5.1. Batch Numbering System** Each batch of finished biodiesel is assigned a unique Batch Number upon transfer to a Final Product Tank. - **Format:** [YY][MM][DD]-[TankID]-[Seq#] - **Example:** 250828-FPT01-01 signifies the first batch produced on August 28, 2025, stored in Final Product Tank 01.

**5.2. Batch Production Record (BPR)** A BPR is maintained for every batch. It serves as the central traceability document and includes: - Batch Number. - Date of Production. - GINs of all UCO feedstock used. - Quantities and batch numbers of catalyst and methanol used. - Key IPQC results and operator sign-offs. - Link to the final Certificate of Analysis. - Dispatch details (customer, tanker ID, date, volume).

BPRs must be retained for a minimum of **7 years**.

### **6.0 Non-Conformance & CAPA Protocol**

**6.1. Identification and Quarantine** Any material (feedstock, in-process, or final product) that fails to meet its specified quality criteria is immediately identified with a **“QUARANTINE - DO NOT USE”** tag. The material is segregated physically or administratively in the control system to prevent accidental use or dispatch.

**6.2. Non-Conformance Report (NCR) and Investigation** - An NCR is raised, documenting the batch number, the failed parameter, and the result. - A Root Cause Analysis (RCA) is initiated by the QA Manager to determine the cause of the failure (e.g., raw material issue, process deviation, equipment malfunction).

**6.3. Disposition** Based on the RCA, the QA Manager, in consultation with the Production Manager, will decide on the disposition of the non-conforming material: - **Reprocessing:** The batch may be re-worked to bring it back into specification (e.g., re-washing, re-drying, blending). The reprocessed batch must undergo full re-testing. - **Downgrading:** The batch may be sold for a lower-grade application if a suitable market exists and the customer accepts the deviation in writing. - **Disposal:** The batch must be disposed of as waste in accordance with environmental regulations, with all movements documented via Waste Transfer Notes.

**6.4. Corrective and Preventive Action (CAPA)** For any significant or recurring non-conformance, a CAPA plan is created to prevent recurrence. This involves implementing changes to procedures, training, equipment, or maintenance schedules. The effectiveness of the CAPA will be tracked and verified.

### **7.0 Product Dispatch: Labeling & Documentation Bundle**

**7.1. Product Labeling** All transport containers (road tankers, ISO tanks) must be correctly labeled before leaving the site. The label or accompanying placard must include: - **Product Name:** Biodiesel (B100) - **Standard:** Conforms to EN 14214 - **Batch Number:** [Batch Number] - **Net Quantity:** [Volume] L or [Weight] kg - **Hazard Information:** Relevant ADR/CLP pictograms and information.

**7.2. Dispatch Documentation Bundle** Every dispatched load must be accompanied by the following documents: 1. **Certificate of Analysis (CoA):** The official CoA for the specific batch being shipped (see template below). 2. **Safety Data Sheet (SDS):** The current, compliant SDS for B100. 3. **Bill of Lading / Delivery Note:** Containing details of the product, quantity, customer, and destination. 4. **ADR Transport Document:** If classified as a dangerous good for transport.

### **8.0 Templates**

**8.1. Certificate of Analysis (CoA) Template**

[Your Company Name & Logo]  
 [Company Address]  
 [Company Contact Info]  
  
 CERTIFICATE OF ANALYSIS  
 BIODIESEL B100  
  
----------------------------------------------------------------------------------------  
Customer: [Customer Name] Certificate No: COA-[Batch Number]  
Product: Biodiesel (FAME) Production Date: [Date]  
Standard: EN 14214:2012+A2:2019 Sample Date: [Date]  
Batch Number: [Batch Number] Report Date: [Date]  
Quantity Shipped: [Volume] Litres  
----------------------------------------------------------------------------------------  
  
ANALYTICAL RESULTS  
----------------------------------------------------------------------------------------  
| Property | Unit | Specification | Result | Test Method |  
|-------------------------|-----------|---------------|--------|-------------|  
| Ester Content | % (m/m) | min 96.5 | [Value]| EN 14103 |  
| Density @ 15°C | kg/m³ | 860 - 900 | [Value]| EN ISO 3675 |  
| Viscosity @ 40°C | mm²/s | 3.5 - 5.0 | [Value]| EN ISO 3104 |  
| Flash Point | °C | min 101 | [Value]| EN ISO 2719 |  
| Sulphur Content | mg/kg | max 10.0 | [Value]| EN ISO 20846|  
| Cetane Number | - | min 51.0 | [Value]| EN ISO 5165 |  
| Total Glycerol | % (m/m) | max 0.25 | [Value]| EN 14105 |  
| Water Content | mg/kg | max 500 | [Value]| EN ISO 12937|  
| Oxidation Stability | hours | min 8 | [Value]| EN 15751 |  
| CFPP | °C | [Spec Value] | [Value]| EN 116 |  
| ...[Add all other parameters from Section 2.0]... |  
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Conclusion: The batch detailed above conforms to all tested parameters of the EN 14214:2012+A2:2019 specification.  
  
Authorised By:  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
[Name of QA Manager]  
Quality Assurance Manager  
[Project Name]

**8.2. Customer Quality Agreement (Template Outline)** A formal Customer Quality Agreement should be established with all long-term customers. It should cover: - **1. Scope & Purpose:** Defines the agreement’s applicability. - **2. Key Specifications:** References EN 14214 and any customer-specific requirements (e.g., seasonal CFPP). - **3. Responsibilities:** Outlines the duties of [Project Name] (the supplier) and the customer regarding quality. - **4. Change Control:** Procedure for notifying the customer of significant process or material changes. - **5. Non-Conformance & Complaints:** Defines the process for handling out-of-spec deliveries and customer complaints. - **6. Audits:** Customer’s right to audit the production facility. - **7. Documentation:** Agreement on the format and delivery of CoAs and other documents. - **8. Term & Termination:** Duration of the agreement.

### **9.0 Sources**

This document was created in accordance with the principles and data outlined in the following foundational research documents: - biogas operations compliance document outline.md - EN 14214 biodiesel fuel standard.md - UK RTFO biodiesel UCO.md - ISCC certification biodiesel UCO.md - UK EU biodiesel Used Cooking Oil UCO regulations.md - EU RED II RED III biodiesel UCO.md