
Carbon Footprint Estimation Policy for Industrial Shops

1.0 Program Objective & Scope

The objective of this Carbon Footprint Estimation Policy is to establish a standardized methodology for quantifying greenhouse gas (GHG) emissions generated by shop floor operations, including all production equipment, HVAC systems, lighting, compressed air systems, and material handling vehicles. This policy applies to all departments within the facility—maintenance, production, logistics, and facilities management—and aims to provide actionable data for reducing the facility's carbon footprint, aligning with corporate sustainability targets, and meeting emerging regulatory requirements for emissions reporting. By integrating carbon estimation into daily operations, the program supports lean manufacturing principles by identifying energy waste and inefficiencies that directly impact operational costs and environmental performance.

2.0 Key Performance Indicators (KPIs) & Metrics

The following KPIs will be tracked monthly to measure progress and drive improvement:

- (1) Total Scope 1 & 2 Emissions (tCO₂e) – calculated from natural gas consumption (m³), diesel/propane usage (L), and purchased electricity (kWh) using regional emission factors from Environment and Climate Change Canada.
- (2) Carbon Intensity per Production Unit (tCO₂e/unit) – total emissions divided by total units produced, normalized for product mix.
- (3) Energy Intensity (kWh/unit) – total electricity and fuel energy consumed per unit of output.
- (4) Renewable Energy Percentage (%) – proportion of total energy sourced from on-site solar, wind, or purchased green power.
- (5) Waste-to-Landfill Emissions (tCO₂e) – estimated from waste disposal tonnage using default landfill methane conversion factors.
- (6) Fleet Fuel Efficiency (L/100km) – for material handling vehicles and on-site trucks. All data will be collected via utility bills, fuel logs, production counts, and waste manifests, and entered into a central digital tracking system (ServiceGrid or equivalent CMMS) for automated calculation.

3.0 Roles & Responsibilities

Maintenance

Manager: Oversees the installation and calibration of sub-meters for electricity, gas, and compressed air; ensures all energy-consuming assets are logged in the CMMS with accurate runtime data; reviews monthly emission reports and identifies high-impact reduction opportunities (e.g., replacing inefficient motors, optimizing HVAC schedules).

Machine Operators: Record daily production counts and any abnormal energy events (e.g., prolonged idle times, leaks) on digital checklists; report fuel consumption for mobile equipment at shift end. Plant Leadership (Plant Manager, Sustainability Officer): Set annual carbon reduction targets (e.g., 5% reduction in tCO₂e/unit year-over-year); approve capital expenditures for energy-efficient upgrades (e.g., LED retrofits, VFDs, solar panels); communicate progress to corporate and external stakeholders. Environmental Coordinator (if applicable): Maintain emission factor database, calculate monthly carbon footprint, and prepare reports for regulatory filings (e.g., NPRI, provincial GHG reporting).

4.0 Program Execution & Data Collection

Data collection is executed through a combination of automated metering and manual entry.

(1) Energy

Data: Utility meters and sub-meters for electricity, natural gas, and propane are read automatically via IoT sensors or manually on the first day of each month. Readings are entered into the CMMS (ServiceGrid) under the 'Utilities' module.

(2) Fuel

Logs: Operators of forklifts, yard trucks, and other mobile equipment record daily fuel consumption

(L) and hours of operation on a digital form.

(3) Production

Data: Daily production counts are pulled from the ERP or manually entered by shift supervisors.

(4) Waste

Data: Monthly waste disposal tonnage is recorded from waste hauler invoices and entered into the system.

(5) Refrigerant

Losses: Any refrigerant recharge events (e.g., for chillers, HVAC) are logged with the type and mass of refrigerant to calculate fugitive emissions. All data is timestamped and stored in a centralized database. The system automatically calculates Scope 1 (direct fuel combustion, refrigerant losses), Scope 2 (purchased electricity), and limited Scope 3 (waste disposal) emissions using pre-loaded Canadian emission factors. Data is reviewed for completeness by the Maintenance Manager within 5 business days of month-end.

5.0 Review, Reporting & Continuous Improvement

Monthly: The Maintenance Manager and Environmental Coordinator generate a Carbon Footprint Dashboard showing actual vs. target emissions, energy intensity trends, and top emission sources. This dashboard is reviewed in the monthly operations review meeting with Plant Leadership.

Quarterly: A deeper analysis is conducted to identify root causes of emission spikes (e.g., a failed steam trap, inefficient compressor operation). Findings are documented in a Continuous Improvement Register, and corrective actions (e.g., adjusting setpoints, scheduling repairs) are assigned with due dates.

Annually: A full carbon footprint report is prepared for corporate sustainability reporting and regulatory compliance. This report includes a cost-benefit analysis of potential CapEx projects (e.g., heat recovery systems, solar PV installation) with payback periods and emission reduction potential. The program itself is audited annually against ISO 14064-1 standards to ensure data quality and methodology accuracy. Lessons learned are incorporated into the next year's target setting and training materials for operators and maintenance staff.

Regulatory Disclaimer: This program document is a generic strategic template. The end-user assumes all liability for aligning these metrics, KPIs, and reliability frameworks with specific corporate goals and OEM engineering standards.