Implementing PACT: How mechanical engineering is standardizing and making its carbon footprint transparent

A guide to seamlessly integrating the WBCSD PACT standard into the supply chain and reporting through SaaS solutions.

Abstract

This whitepaper demonstrates how the machinery industry can use the **WBCSD PACT Standard** to make the carbon footprint of its products transparent and comparable. It outlines the challenges of complex supply chains and highlights the role of **CarbonBlock by CircularTree** as a SaaS solution that seamlessly connects standardization, automation, and reporting. A step-by-step roadmap is presented – from initial assessment to full-scale implementation. Case studies illustrate how companies can achieve efficiency gains, compliance security, and competitive advantages within just a few months. In this way, a regulatory obligation becomes a strategic opportunity for the entire industry.

2. Management Summary

The Challenge

The machinery industry faces mounting pressure:

- **Regulation**: With CSRD, the EU Taxonomy, and sector-specific requirements, disclosure of CO_2 emissions is becoming mandatory.
- **Customer demands**: Global buyers are requesting detailed, auditable CO_2 data – often already in tenders.
- **Competition**: Companies capable of providing transparent climate data secure contracts and strengthen their market position.

The greatest obstacle lies in **Scope 3 emissions**: They account for more than 80% of the total footprint in machinery manufacturing and originate from complex, globally interconnected supply chains.

The Solution

The **WBCSD PACT Standard** establishes, for the first time, a **common language for CO_2 data**:

- Clear, internationally aligned rules for calculating the Product Carbon Footprint (PCF).
- An interoperable network (the **Pathfinder Network**) for secure, standardized, and auditable data exchange.

This paves the way beyond Excel files and proprietary formats toward a **globally accepted approach**.

The Implementation

With **CarbonBlock by CircularTree**, the step from theory to practice is achievable:

- **Seamless integration**: CarbonBlock connects internal systems (ERP, PLM, MES) to the Pathfinder Network.
- **Automated data management**: Supplier data is standardized, validated, and made actionable.
- **PACT-compliant PCF calculations**: Companies can reliably assess their own products with direct inclusion of supplier data.
- **One-click reporting**: CSRD-compliant reports, customer-specific requests, and tenders are generated automatically.

The Value

The combination of PACT and CarbonBlock delivers measurable benefits:

- **Cost reduction**: Up to 80% less effort for data collection and reporting.
- **Competitiveness**: Transparent and auditable CO_2 data secures new business.
- **Risk mitigation**: Compliance certainty and protection against greenwashing claims.
- **Future readiness**: Investment in a standard that is both regulatory and market-driven – with no alternative.

Conclusion: Companies that implement PACT today and rely on CarbonBlock transform a regulatory burden into a **strategic strength**, positioning themselves as trusted partners in a decarbonized industry.

3. Introduction: The Machinery Industry at a Crossroads

The machinery industry in the EU and the United Kingdom is the backbone of industrial value creation. With a strong base in Germany – but also a significant presence in other European countries and the UK – the sector is considered an engine of innovation and a world export champion in many specialized markets.

Yet this success is increasingly shaped by the imperative of **decarbonization**: The industry must bring transparency to its supply chains, comply with regulatory requirements, and at the same time safeguard its global competitiveness. European initiatives such as the **Industrial Clean Deal** support this transition – but without the standardization of CO_2 data, machinery manufacturers risk getting stuck in the **Scope 3 trap**.

The Dilemma: The Scope 3 Trap

While companies can relatively well control their own emissions (Scope 1 and 2) through efficiency measures, renewable energy, or energy savings, **Scope 3 emissions** represent both the greatest lever and the biggest challenge.

- More than **80% of total emissions** in machinery manufacturing stem from purchased goods, materials, and services.
- These data are often not standardized: each supplier calculates and reports differently.
- The result: **gaps, lack of transparency, and non-comparable figures** – a nightmare for sustainability teams and auditors.

Fragmentation: Everyone Does It Differently

To date, CO_2 data in machinery manufacturing are often collected via **Excel spreadsheets, PDFs, or bespoke tools**. These fragmented approaches lead to:

- **Inefficiency**: High manual effort for data collection and consolidation.
- **Error-proneness**: Divergent calculation methods prevent reliable comparisons.
- **Missed opportunities**: Lack of transparency hampers participation in sustainability-driven tenders.

The Thesis: Without Standardization, Transformation Will Fail

Climate goals, regulatory requirements, and customer demands leave no doubt:

- Companies need a **common denominator** to make CO_2 data comparable across the supply chain.
- This denominator is the **WBCSD PACT Standard** – the first globally coordinated methodology and infrastructure for product-level carbon footprints at industrial scale.

Without standardization, machinery manufacturers will not succeed in decarbonizing their supply chains. With PACT, for the first time, there is a viable path forward.

4. Understanding PACT – The Global Standard for Carbon Transparency

What is the WBCSD and the PACT Initiative?

The **World Business Council for Sustainable Development (WBCSD)** is a global coalition of more than 200 leading companies from industry, energy, and consumer goods. Its mission: to link sustainability with competitiveness.

With the initiative **PACT – Partnership for Carbon Transparency**, the WBCSD has created a standard that, for the first time, provides companies with a **common language for CO_2 data**. PACT is not a "nice-to-have" – it is rapidly evolving into the **globally accepted benchmark** for transparency across supply chains.

The Two Core Components of PACT

1. **The Methodological Standard**
    - Clear rules for how the **Product Carbon Footprint (PCF)** is calculated.
    - Harmonization of previously divergent approaches through consistent definitions, allocation principles, and data quality criteria.
    - **Result:** Comparable and auditable CO_2 balances for products, components, and materials.
2. **The Pathfinder Network**
    - A secure, scalable **data infrastructure** for companies to exchange PCF data.
    - Standardized **APIs and interfaces** that seamlessly connect ERP, PLM, or SaaS systems.
    - Auditability enabled by digital signatures and certificates.
    - **Result:** Trusted, interoperable data exchange across complex supply chains.

Why PACT Is a Game Changer

Until now, companies have faced a patchwork of **isolated solutions**: proprietary tools, national standards, or company-specific Excel logic. The outcome has been high costs, duplicated efforts, and poor comparability.

With PACT, an **interoperable ecosystem** is emerging:

- **Accepted across industries** (from machinery to FMCG).
- **Technically connectable** through open interfaces.
- **Future-proof**, as regulatory frameworks such as **CSRD** and the **EU Taxonomy** increasingly require PACT-compliant data.

In short: PACT is the key to turning a fragmented data landscape into a robust foundation for decarbonization, reporting, and competitive advantage.

5. The Challenges of Implementing PACT in Day-to-Day Business

The benefits of PACT are undeniable. Yet for many machinery companies, the pressing question remains: **How can we move from theory to practice?**
Implementing the standard in day-to-day operations brings several challenges that are difficult to overcome without the right technology and expertise.

1. Technical Integration

Most machinery manufacturers operate with complex IT landscapes: **ERP systems, PLM solutions, MES platforms**, and often industry-specific software.

- **Problem:** The Pathfinder Network needs to be integrated into this heterogeneous environment.
- **Hurdle:** Proprietary interfaces, unclear data flows, and limited IT resources.
- **Risk:** High integration effort if no standardized bridge is in place.

2. Data Management

Collecting and managing **PCF data** is more than a technical challenge:

- Suppliers are at different maturity levels – ranging from Excel sheets to advanced LCA software.
- Data must be **validated, harmonized, and versioned**.
- Without centralized management, companies risk **redundancies, inconsistencies, and lack of auditability**.

3. Internal Processes

PACT impacts not only sustainability departments but also multiple areas of the business:

- **Procurement:** PCF data becomes part of supplier selection.
- **Engineering:** Material and design choices influence the climate footprint.
- **Controlling & Reporting:** CSRD demands transparent, verifiable numbers.

Challenge: Processes, roles, and responsibilities must be adapted – requiring time and organizational change.

4. Costs and Effort

Decision-makers often fear that introducing PACT will turn into a **cost trap**:

- **Initial project costs** for consulting, training, and system adaptation.
- **Ongoing effort** for collecting data and liaising with suppliers.
- **Lack of scalability** if automated workflows are not established.

Conclusion: Complexity Without the Right Partner Is Hardly Manageable

Without specialized technology and experienced partners, PACT risks becoming a **bureaucratic burden**. This is where **CarbonBlock by CircularTree** comes in: as a SaaS platform that acts as the **bridge between standard and practice**, making implementation not only feasible but also efficient and scalable.

6. Building the Bridge – How SaaS Revolutionizes PACT Implementation

The previous chapters have shown: **PACT is the standard of the future**, but bringing it into everyday operations is complex. The key lies in a specialized **SaaS solution** that translates the standard into **concrete, usable processes** – making it efficient, scalable, and economically viable for machinery companies.

From Standard to Practice

CarbonBlock by CircularTree serves as a **translator and enabler** between internal systems and the Pathfinder Network:

- Complex data streams are **centralized**.
- Different supplier maturity levels are **harmonized**.
- Compliance and reporting requirements are **automated**.

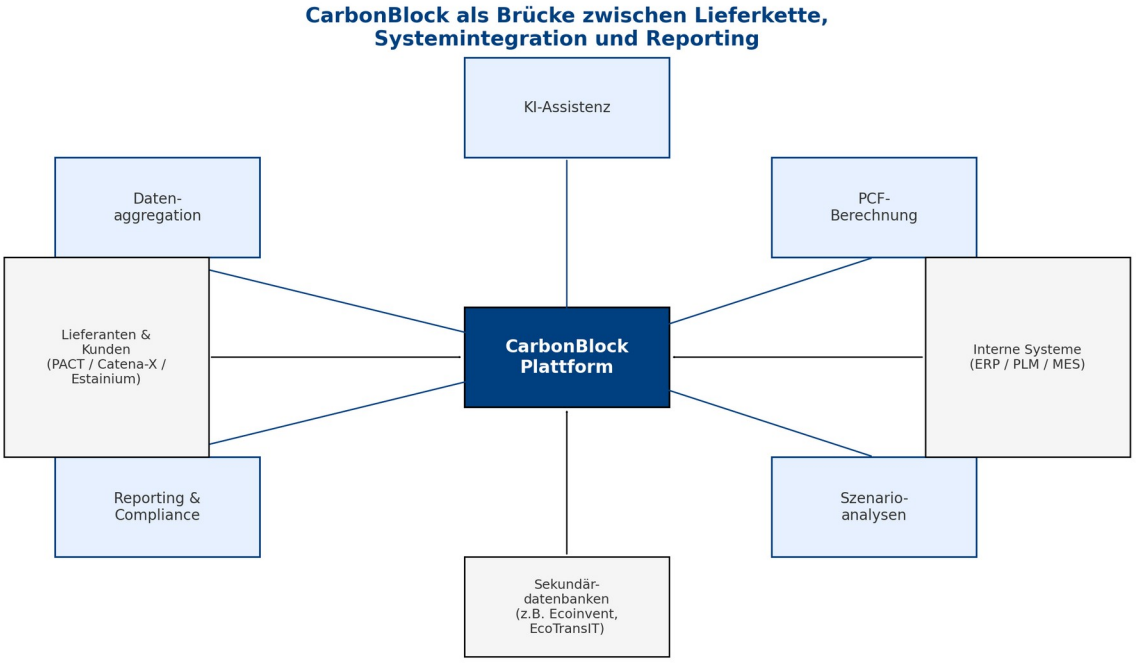
Result: Companies can focus on **analyzing and optimizing** their carbon footprint rather than struggling with data chaos and Excel sheets.

The Five Core Functions of CarbonBlock

1. **Data Aggregation & Management**
    - Central platform for PCF data from the Pathfinder Network, internal systems, and other sources.
    - Automatic **validation, versioning, and consistency checks**.
    - Supplier onboarding with clear guardrails for PACT-compliant data.
2. **Calculation & Allocation**
    - PACT-compliant **calculation module** for in-house products.
    - Inclusion of supplier data and internal energy/process data.
    - Flexible allocation rules for complex machines and assemblies.
3. **Reporting & Compliance**
    - Automated reports for **CSRD, EU Taxonomy, and customer requests**.
    - Export into auditable formats.
    - Rapid responses to RFQs and sustainability queries.
4. **Eco-Design & Scenario Analysis**
    - Simulation tools for engineering and procurement:
      “What happens to the PCF of my machine if I choose this supplier or that material?”
    - Support for **Design-to-Sustainability** decisions.
    - Use of the data foundation for **strategic innovation projects**.

5. **AI-Supported Assistance**
    - **Ensuring data quality**: AI flags missing or implausible supplier entries.
    - **Accelerating workflows**: Automated help texts and standard replies guide suppliers through onboarding.
    - **Simplifying reporting**: AI generates text modules for CSRD reports or customer inquiries from structured data.
    - **Highlighting priorities**: AI identifies hotspots and provides simple “what-if” hints.

Visualization of the Architecture



The architecture diagram shows:

- On one side, the **internal systems** of the machinery manufacturer (ERP, PLM, MES).
- On the other, the **Pathfinder Network** and external stakeholders.
- In between: **CarbonBlock as the bridge**, orchestrating and validating data flows, and making them usable for reporting and analysis – with **AI as an additional efficiency booster**.

Conclusion: With CarbonBlock, PACT shifts from a regulatory obligation to a **strategic tool**. Companies gain not only transparency but also **competitive advantages through speed, cost savings, and innovation capacity**.

7. The Roadmap to Implementation – Step by Step with CarbonBlock

Introducing PACT does not have to be a massive undertaking. With a clearly structured roadmap and the **CarbonBlock SaaS platform**, companies can move from assessment to full-scale implementation within just a few months.

Phase 1: Assess & Prepare

- **Kick-off workshop** with all relevant stakeholders (sustainability, procurement, IT, controlling, engineering).
- Analysis of the **current data situation**: Which data are already available, where are the gaps?
- Definition of **goals**: Which product lines, reporting obligations, or customer expectations take priority?

Outcome: A clear project plan with priorities and realistic timelines.

Phase 2: Connect & Onboard

- Technical integration of **ERP, PLM, and MES systems** with CarbonBlock.
- Connection to the **Pathfinder Network** via standardized interfaces.
- **Onboarding of key suppliers** (e.g., the top 50 representing 80% of purchasing volume).
- Provision of **training and support resources** to bring suppliers up to PACT standards.

Outcome: The first standardized PCF data begin to flow into the platform.

Phase 3: Calculate & Report

- First **PACT-compliant PCF calculations** for selected products or assemblies.
- Creation of **pilot reports** for CSRD, EU Taxonomy, or specific customer requirements.
- Internal **review loop** with sustainability, controlling, and management.

Outcome: The company can provide **reliable CO_2 data** for the first time, both for regulatory compliance and market needs.

Phase 4: Optimize & Scale

- Expansion to the **entire supply chain** and additional product lines.
- Use of **scenario analysis tools** for procurement and engineering (“Design-to-Sustainability”).
- Integration into **strategic reporting** and embedding into company processes.

Outcome: Sustainability evolves from a one-off project into a **core organizational competence – and a competitive advantage**.

Practical Implementation

Thanks to CarbonBlock’s modular architecture, companies can follow this roadmap **step by step** – with no need for large upfront investments and with tangible results at every stage.

The goal: Within **6–12 months**, move from the first workshop to a fully implemented, PACT-compliant data and reporting system.

8. The Return on Investment (ROI) of PACT + SaaS

At first glance, implementing PACT may appear to be primarily a **regulatory obligation**. Yet with the right execution – and especially with a SaaS platform like **CarbonBlock** – it becomes a **clear and measurable business case**.

1. Cost Savings

- **Automation instead of Excel:** Companies cut manual effort for data collection, consolidation, and reporting by up to **80%**.
- **Reduced consulting expenses:** Standardized processes and automated workflows eliminate costly ad-hoc projects.
- **Company-wide synergies:** Once collected, data can be reused – for sustainability reports, tenders, and product development.

2. Risk Mitigation

- **Compliance certainty:** PACT-compliant data are auditable and reduce the risk of errors or inconsistencies in CSRD reporting.
- **Protection against greenwashing claims:** Transparency through clear standards enhances the credibility of carbon footprints.
- **Supplier risk management:** Better visibility of critical emission hotspots in the supply chain.

3. Revenue Opportunities

- **Sustainability as a sales argument:** Machinery companies that can provide reliable PCFs meet the growing requirements of global customers – and win business.
- **Eligibility for tenders:** Many large customers already demand transparent CO_2 data as a prerequisite for submitting bids.
- **Premium positioning:** Sustainability becomes a differentiator against competitors.

4. Future-Proofing

- **Regulatory robustness:** By investing in PACT, companies align with the standard that will increasingly be mandatory across Europe and beyond.
- **Scalability:** CarbonBlock scales with the company – from a single product line to the entire supply chain.
- **Strategic foundation:** CO_2 transparency becomes the basis for innovation, eco-design, and partnerships.

ROI Example (Fictional but Realistic)

A mid-sized machinery manufacturer with 500 suppliers:

- **Before:** >1,000 hours of manual data collection and consolidation annually, costing over €100,000.
- **After with CarbonBlock:** 80% less effort, savings of approx. €80,000 per year.
- **Additional benefit:** Winning a major new contract because PACT-compliant data could be provided at short notice.

Conclusion: PACT plus CarbonBlock is not a burden – it is an **investment with a clear return**. Companies save costs, secure contracts, and position themselves as leaders in a market where CO_2 transparency is rapidly becoming the norm.

9. Case Study: How MusterMaschinen GmbH Achieved Scope 3 Transparency in Just 6 Months

Initial Situation

MusterMaschinen GmbH, a mid-sized manufacturer of highly specialized packaging machines, faced significant pressure to act:

- **Regulation:** The upcoming **CSRD reporting obligation** made the measurement of Scope 3 emissions (Category 1: “Purchased goods and services”) a top management priority.
- **Customer demand:** A **key account** in the consumer goods sector requested reliable CO_2 data for a tender.
- **Inefficiency:** The sustainability team had previously attempted to collect data from over 500 suppliers via email and Excel – a process that was chaotic, error-prone, and unauditable.

The Search for a Solution

Management realized: Without standardization, reliable reporting would be impossible.
The company decided to adopt the **WBCSD PACT Standard**, with **CarbonBlock by CircularTree** as the technical platform.

Objectives:

- Standardized PCF data from the supply chain.
- Seamless connection to the Pathfinder Network.
- Relief for internal teams through automation.

Implementation with CircularTree – A Three-Phase Plan

Phase 1: Data Onboarding (Months 1–2)

- Identification of the **top 50 suppliers** (representing 80% of purchasing volume).
- Automated invitations and connection to the Pathfinder Network.
- Provision of **guidelines and training** for suppliers unfamiliar with PACT.

Phase 2: Automated Data Collection & Calculation (Months 3–4)

- Standardized import of PCF data via CarbonBlock.

- Integration of internal data (own production, energy consumption).
- First PACT-compliant PCF calculations for the **top five machine models**.

Phase 3: Reporting & Value Realization (Months 5–6)

- Generation of the first **CSRD-compliant Scope 3 report**.
- Delivery of transparent PCFs for the tender of the key account.
- Execution of a **scenario analysis**: Substituting a steel component with a lightweight alternative reduced the machine's PCF by 8%.

Results

- **80% less time spent** on data collection and preparation.
- **Reliable PCFs** for the most important product lines – audit-proof and accepted by customers.
- **Competitive advantage:** Winning a major contract thanks to transparent CO_2 data.
- **Future security:** A solid foundation for continuous optimization and compliance with future regulations.

Voices from the Company

> "Thanks to the combination of the PACT standard and the CarbonBlock platform, we turned a compliance obligation into a **strategic strength**. We now speak the language of sustainability – and our customers are listening."
> – Leonard Maier, Head of Sustainability, MusterMaschinen GmbH

10. Conclusion and Next Steps (CTA)

Conclusion

The decarbonization of the machinery industry will not be decided in the factories themselves, but in the **supply chains**. Scope 3 emissions are the largest lever – and the greatest hurdle.

With the **WBCSD PACT Standard**, there is now, for the first time, a globally coordinated framework that ensures transparency, comparability, and auditability. But only with the right **technological implementation** does PACT move from theoretical concept to **practical success factor**.

CarbonBlock by CircularTree makes this possible:

- **Integration** into existing systems.
- **Automation** of data management and reporting.
- **Utilization** of the data for competitive advantage.

The result: A regulatory obligation is transformed into a **strategic opportunity**.

Next Steps

👉 **Book Your Appointment Now**
Through our central form, you can request both the **ROI Calculation Toolbox** and a **product demo**.

- In the first session, we will walk you through the ROI toolbox together and demonstrate the concrete value PACT + CarbonBlock can deliver to your company.
- We will then schedule a follow-up appointment for the **individual product demo**, tailored to your specific requirements.

This way, you receive **both in one streamlined process** – practical insights into ROI potential and a customized platform demo.

In short: Companies that act today not only secure regulatory compliance but also ensure **future competitiveness** in the global machinery industry.

11. Outlook: PACT + DCM – Sustainability Meets Resilience

The standardization of CO_2 data through **PACT** is a decisive step toward decarbonizing the machinery industry. But sustainability alone is not enough to safeguard long-term competitiveness. Companies must also make their supply chains **resilient and predictable**.

This is where the concept of **Demand & Capacity Management (DCM)** comes into play, as currently being developed within **Catena-X**:

- **Goal:** Identify supply chain bottlenecks and overcapacity early and prevent them through standardized processes.
- **Benefit:** Greater transparency, better coordination between customers and suppliers, and a more stable supply base in volatile markets.

The Link Between PACT and DCM

Both approaches complement each other to create a holistic picture:

- **PACT** ensures **transparency and standardization of climate data** across the value chain.
- **DCM** ensures **resilience and efficiency** through coordinated capacity and demand management.
- Together, they enable a **sustainable and robust supply chain** that meets regulatory requirements while adapting to market fluctuations.

The Role of CarbonBlock

CarbonBlock by CircularTree can act as the **bridging platform**:

- The same infrastructure used today for PCF data can in the future also be extended to **capacity and demand data**.

- Companies benefit from a **unified data logic and system integration**, avoiding fragmented solutions.

Conclusion: While PACT sets the standard for CO_2 transparency, the outlook toward DCM illustrates the next step: combining **sustainability and resilience**. For machinery manufacturers, this opens the opportunity to position themselves as **pioneers of a future-proof European industry**.

12. Glossary & Appendix

Glossary of Key Terms

- **Scope 1 / 2 / 3**
  - *Scope 1:* Direct emissions from owned sources (e.g., boilers, company vehicles).
  - *Scope 2:* Indirect emissions from purchased energy (e.g., electricity, heating, cooling).
  - *Scope 3:* Indirect emissions across the value chain (e.g., purchased goods, logistics, product use).
- **PCF (Product Carbon Footprint)**
  The total CO_2 footprint of a product across its life cycle – from raw material extraction to manufacturing, use, and disposal.
- **LCA (Life Cycle Assessment)**
  Standardized methodology for assessing environmental impacts across a product's entire life cycle.
- **CSRD (Corporate Sustainability Reporting Directive)**
  EU directive requiring companies to disclose detailed sustainability information, including CO_2 emissions.
- **WBCSD (World Business Council for Sustainable Development)**
  Global business council uniting companies to advance sustainability and competitiveness.
- **PACT (Partnership for Carbon Transparency)**
  Global WBCSD initiative to standardize PCF calculation and enable interoperable data exchange.
- **Pathfinder Network**
  Technical infrastructure within PACT for secure, standardized, and auditable PCF data exchange.

Further Reading

- WBCSD PACT Initiative: https://www.wbcsd.org(PACT)
- GHG Protocol: https://ghgprotocol.org
- European Commission – CSRD: https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

About CircularTree

CircularTree GmbH is a pioneer in digital solutions for supply chain decarbonization. With its SaaS platform **CarbonBlock**, CircularTree helps industrial companies seamlessly integrate the **PACT Standard** into their operations:

- Automated data collection and validation.
- PACT-compliant PCF calculations.
- CSRD and EU Taxonomy reporting.
- Scenario analyses for procurement and engineering.

Mission: To transform a regulatory obligation into a **strategic strength** – for greater transparency, resilience, and competitiveness in the global machinery industry.

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