



PREDICTIVE FEASIBILITY

PFA

Real-World Validation Case 03

Similar Systems. Different Predictive Feasibility.

Question

Do similar physical systems necessarily support the same predictive strategy?

To investigate this question, multiple cells from the NASA Battery Aging dataset were evaluated using the Predictive Feasibility Assessment framework.

At first glance, the cells appear highly similar:

- Same dataset family
- Similar degradation behavior
- Similar operating conditions

However, the underlying predictive structure proved significantly different.

What Was Evaluated?

The analysis focused on:

- structural behavior
- cross-run consistency
- prediction stability
- predictive feasibility

Each cell was evaluated independently.

Result

Different cells occupied different predictive regimes.

B0053

High consistency.

Classification: LIMITED

B0054

Low consistency.

Classification: NO-GO

B0055

Moderate consistency.

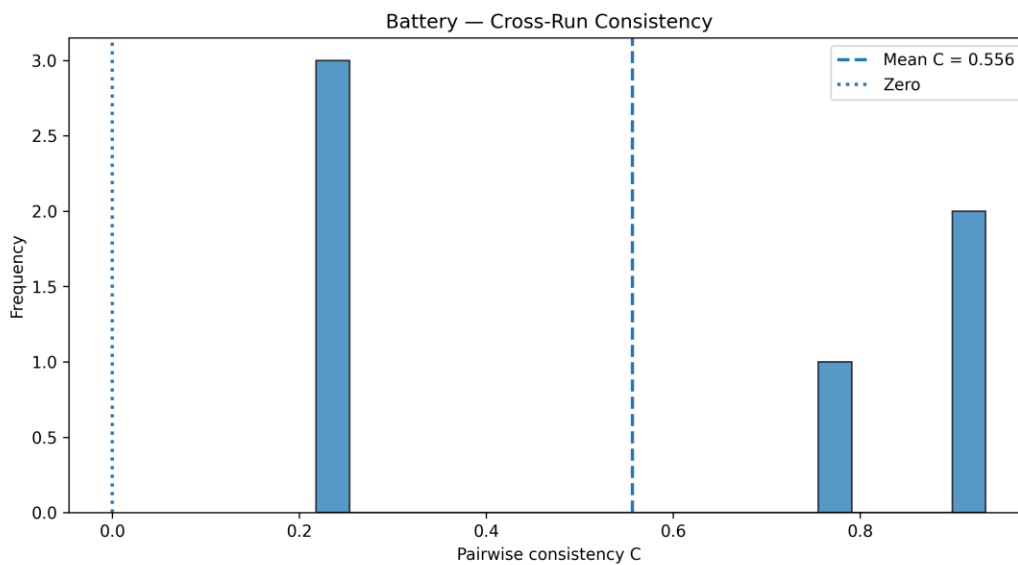
Classification: LIMITED

B0056

Borderline consistency.

Classification: LIMITED

Figure 1 — Predictive Feasibility Across Battery Cells



Caption

Predictive feasibility across multiple NASA battery aging trajectories.

Although all cells belong to the same physical system class, substantial differences emerge in structural consistency and predictive behavior.

The figure illustrates that predictive feasibility is not uniform even within a single dataset family. Similar systems can produce fundamentally different predictive outcomes.

Why This Matters

Many predictive maintenance projects assume that similar assets support identical predictive workflows.

This case demonstrates that predictive feasibility must be evaluated individually.

Industrial Implication





Although all four cells belong to the same dataset family and exhibit similar degradation behavior, their predictive feasibility differs significantly.


The infographic below summarizes the practical implications of asset-level predictive feasibility assessment.

INDUSTRIAL IMPLICATION













Asset Similarity Does Not Guarantee Predictive Similarity


WHY THIS MATTERS


- 
FOUR BATTERY CELLS
 B0053, B0054, B0055, B0056
- ↓
- 
SAME DATASET
 NASA Battery Aging Dataset
- ↓
- 
SIMILAR DEGRADATION BEHAVIOR
 Comparable operating conditions and degradation trajectories
- ↓
- 
DIFFERENT PREDICTIVE FEASIBILITY
 Each cell exhibits a different level of structural consistency and predictability



KEY OBSERVATION
 Asset similarity does not guarantee predictive similarity.

BATTERY CELL COMPARISON

	B0053			LIMITED
	B0054			NO-GO
	B0055			LIMITED
	B0056			LIMITED


WHAT THIS MEANS
 Although all four cells originate from the same dataset and exhibit similar degradation behavior, their predictive feasibility differs significantly.


PRACTICAL IMPACT
 Evaluating predictive feasibility at the asset level helps identify which systems support stable prediction and which require a different analytical approach.


EVALUATE EACH ASSET INDIVIDUALLY. Apply the right predictive strategy to the right system.

Key Takeaway

Physical similarity does not guarantee predictive similarity.

Different assets may require different predictive strategies, even when they appear nearly identical.