

Tripling BMS Testing Throughput Without Buying New Machines

A targeted case study in process decoupling and massive CapEx avoidance for EV component manufacturing.

The Executive Summary

+200%

Throughput Surge

Output increased
from a hard cap of
4 UPH to 12 UPH.

ZERO

Headcount Added

Achieved using the
exact same
single-operator
footprint.

₹50 Lacs

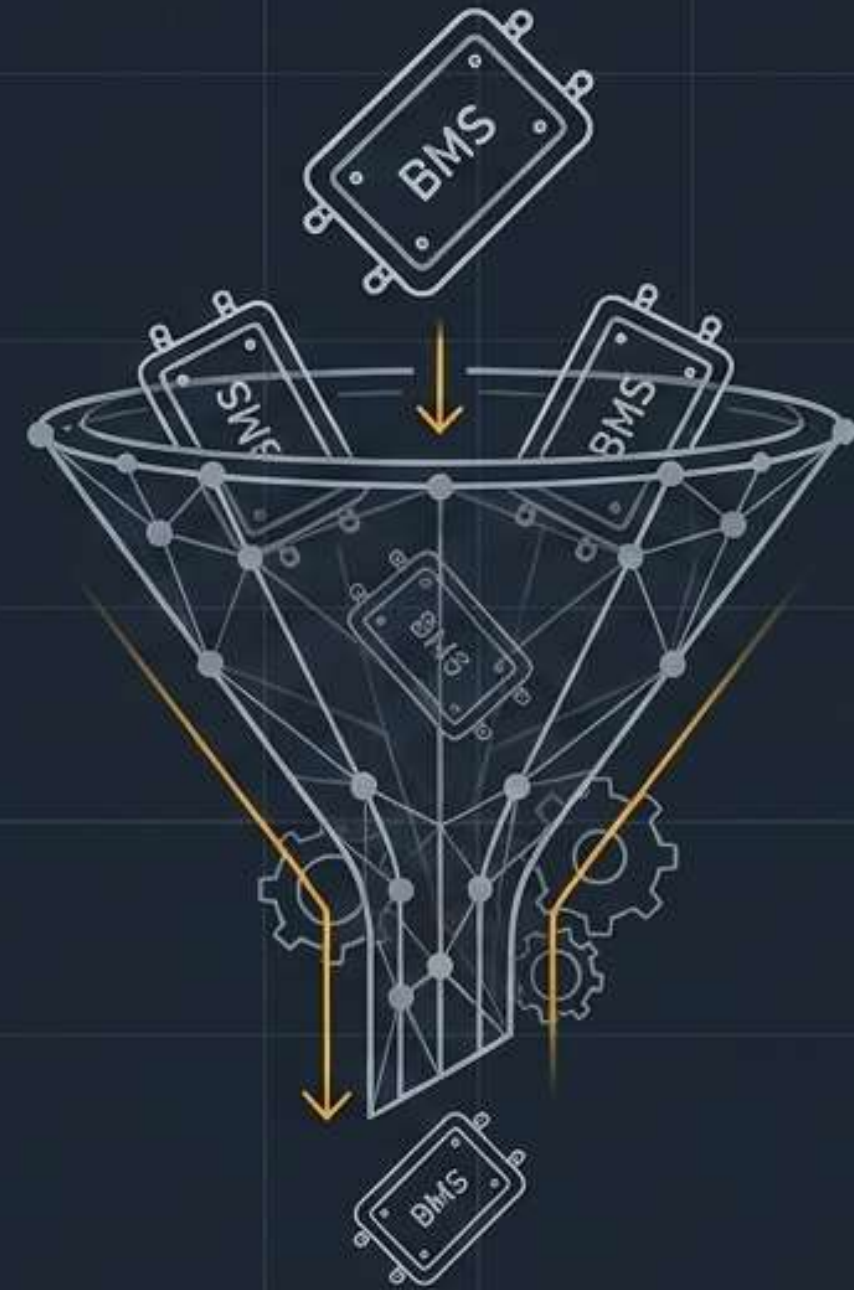
CapEx Avoided

Eliminated the need
to purchase
duplicate testing
equipment.

The Challenge

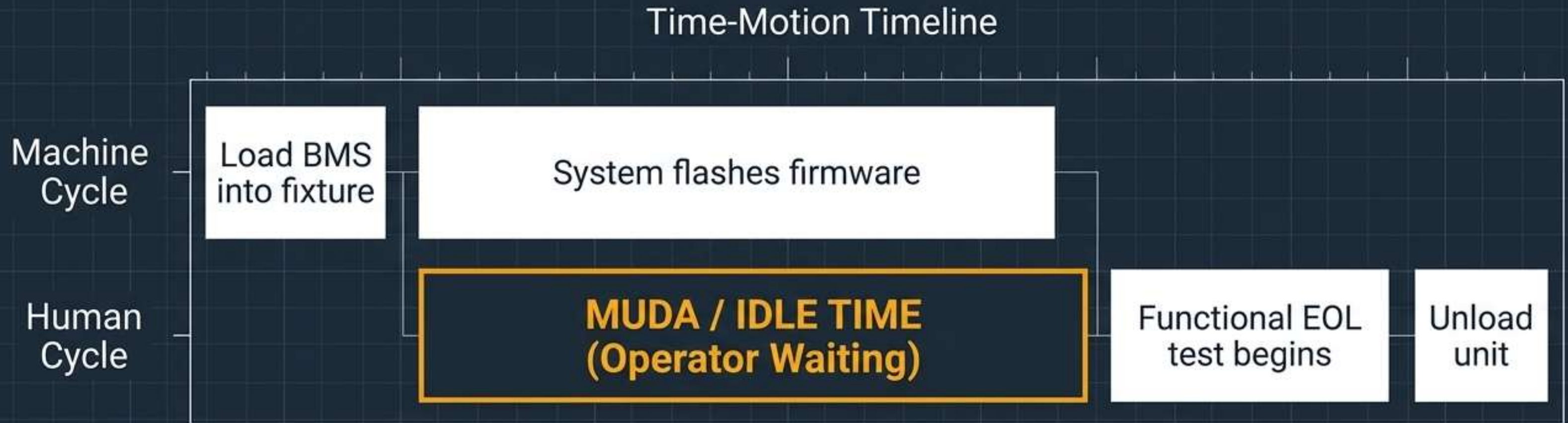
In EV and Battery Management System (BMS) manufacturing, End-of-Line (EOL) testing frequently emerges as a severe bottleneck.

As customer demand grew, the production line was restricted by a highly sequential EOL testing protocol.



**System Capacity Capped:
4 Units Per Hour (UPH)**

The Anatomy of a Bottleneck: Flawed Baseline Architecture



The root cause of the limitation was not operator speed. Flashing and testing were structurally tied to the same fixture in a sequential cycle. The machine cycle time was dictating the human cycle time, paying operators to watch a machine load firmware.

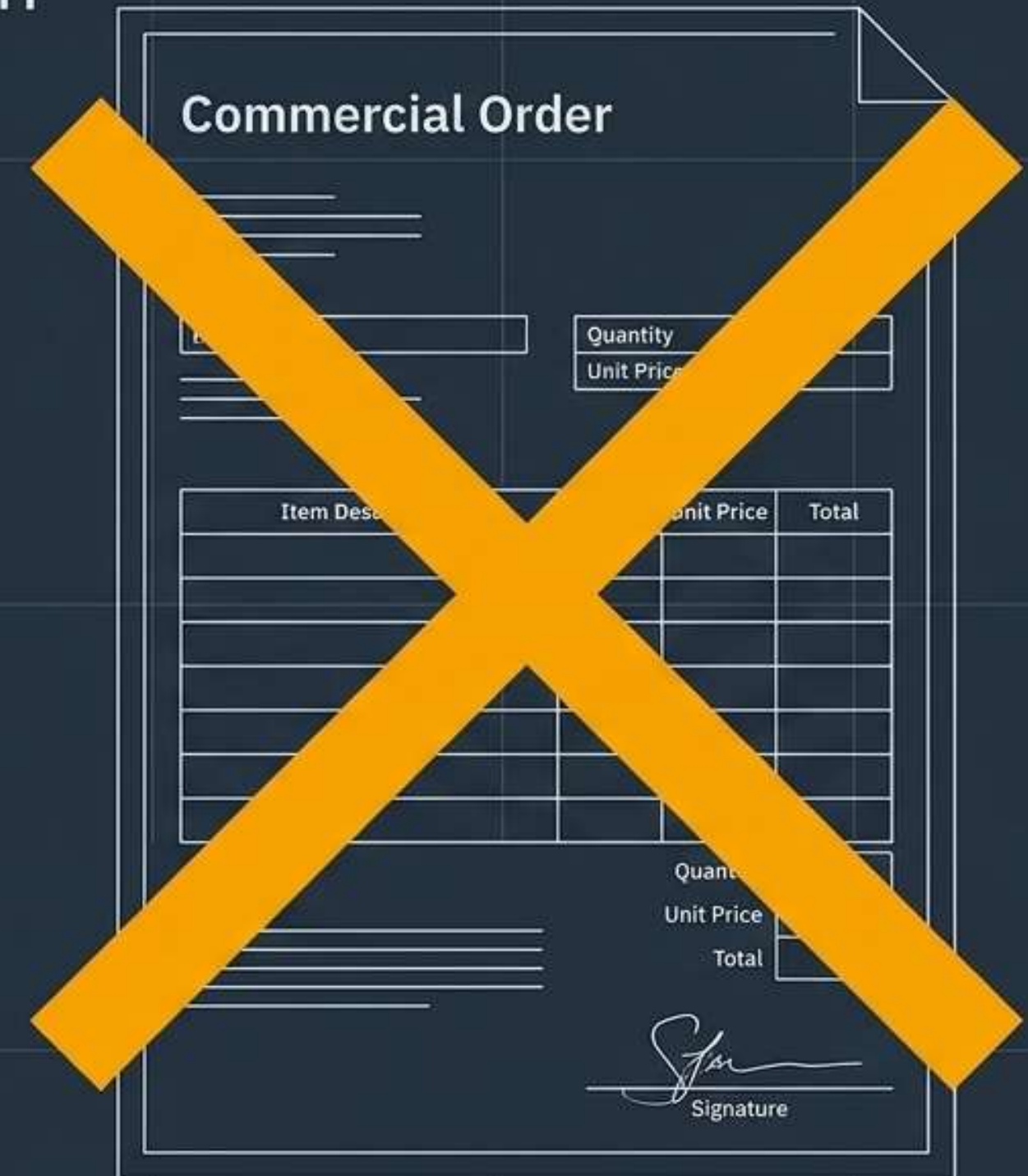
The Expensive Default Assumption

The Default Reaction:

To meet growing customer demand and hit 12 UPH, the initial plant assumption was to scale the flawed process through brute force.

The Projected Cost:

This required a heavy **CapEx** investment to duplicate the entire testing cell (purchasing two new EOL testers at **₹25 Lacs** each) and taking on premium **OpEx** by hiring additional EOL operators.



Commercial Order

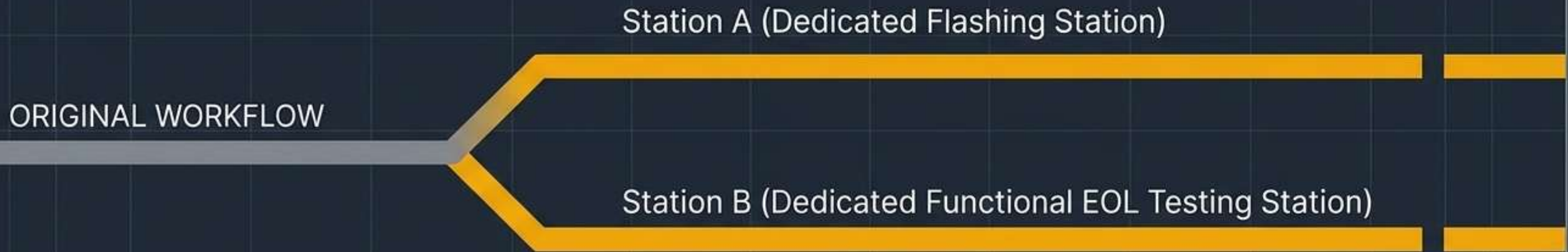
Quantity
Unit Price

Item Description	Unit Price	Total

Quantity
Unit Price
Total

Signature
Signature

The Solution: Process Splitting & Parallel Execution



Instead of scaling a flawed process, Mhadeshwar Advisory advocated for process discipline and bottleneck elimination. A highly targeted ₹60,000 investment in secondary fixtures, wiring, and handling mechanisms decoupled the sequential workflow.

The Mechanical Reveal: Parallel Workflow

Overlapping Time-Motion Timeline

Track 1
(Station A)

[Operator
Loads Unit 1]

[Machine handles Autonomous Flashing]

Track 2
(Station B)

[Operator
Moves Unit 2]

[Machine handles EOL Test]

[Operator
Unloads]

The operator now manages **parallel processes**. Machine idle time and operator waiting time are effectively **eliminated**. **Throughput surges from 4 UPH to 12 UPH** utilizing the exact same single testing operator.

Scaling 3x: The Analytical Comparison

	The Brute Force Approach	The Lean Approach
Target Throughput	12 UPH	12 UPH
New Testers Required	2 Integrated Cells	0 New Cells (Secondary Fixtures Only)
New Operators/Shift	2 Additional Operators	0 Additional Operators
Upfront Investment	₹50,00,000	₹60,000

Cost Avoidance & P&L Impact

CapEx Avoided

₹50,00,000

Achieved by avoiding the purchase of 2 full integrated EOL testing machines at ₹25 Lacs each.

Labor Savings Model

₹6,00,000
/ year / shift

Achieved by keeping the process to 1 operator, avoiding 2 additional hires (assuming a burdened cost of ₹3,00,000/year).

**If the plant runs 2 shifts, annual labor savings jump to ₹12 Lacs/year.*

The Ultimate ROI Calculation



Initial Investment:
₹60,000

Payback Period:
1.2 Months (0.10 Years)

Year 1 ROI:
900%

$$F = \left[\frac{(\text{₹6,00,000} - \text{₹60,000})}{\text{₹60,000}} \right] \times 100 = 900\%$$

This model calculates ROI purely on labor savings. When factoring in the **₹50 Lacs** of avoided capital expenditure, the return is effectively **instantaneous and infinite**—freeing up **critical cash flow** for the business.

“Technology and capital expenditure do not fix bad behavior or poor process design; process discipline does.”

When facing capacity constraints in high-stakes environments, the default response is to buy more machines and hire more people. This case study proves that applying Lean manufacturing principles—specifically maximizing operator utilization—protects operating margins while tripling output.

Stop buying machines to fix process leaks.
Protect your operating margins by
holding labor costs flat.

Let's identify the operational leaks hurting your margins. If your plant is preparing for an incoming Tier-1/OEM audit, or if scale is exposing quality vulnerabilities, let's schedule a brief introductory call.



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