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| Aspect | Without QRix (Current Situation) | With QRix (Proposed Solution) | Financial Impact & ROI |
| 1. Implementation Cost (CapEx) | Not Applicable | **₹ 5 Crore** (One-Time) • 25 Laser Stations • Central Server & Software • Installation & Training | **One-time investment** to build the traceability infrastructure. |
| 2. Annual Operating Cost (OpEx) | Not Applicable | **₹ 4.25 Crore** (Recurring) • Electricity, Labor, Maintenance • For 10 Crore items/year • **Cost per item: ₹0.425** | The minimal recurring cost of running the system. |
| 3. Manpower Inefficiency | **High Inefficiency** • Inspectors spend ~2 hours/day on manual logging and searching. • High error rate, slow data retrieval. | **~70% Time Saved** • Scanning takes 2-5 seconds. • Instant access to full history. • Enables data-driven decisions. | **Savings: ~₹ 22.5 Lakh/year** per unit (10 inspectors) from productivity gains alone. |
| 4. Inventory Management | **High Cost** • "Just-in-case" model leads to overstocking. • High carrying costs (~20% of inventory value). • Capital is tied up unnecessarily. | **Optimized "Just-in-Time"** • Predictive analytics reduce unnecessary stock. • Carrying costs reduced by 20-30%. | **Savings: ~₹ 5 Lakh/year** per unit (on ₹1 Cr inventory). |
| 5. Warranty Recovery | **Losses Common** • Difficult to prove vendor/batch for faulty fittings. • Railways often bear the full replacement cost. | **100% Recovery Possible** • Instant proof of vendor and warranty status for every scanned item. | **Savings: ~₹ 5 Lakh/year** per unit from successful warranty claims. |
| 6. Failure & Delay Prevention (The Biggest Impact) | **Massive Financial Losses** • A 0.1% failure rate on 10 Cr items = 100,000 failures. • Reactive replacement cost: ~₹500/fitting + huge delay costs. • **Total Cost: ₹5 Crore + Delay costs (₹10-50 Lakh per incident).** | **Proactive Prevention** • AI flags faulty batches early. • Replacements are scheduled proactively during maintenance at low cost. | **Savings: ₹4.9 Crore+** by preventing just one batch-related failure incident. |
| 7. Total Annual Financial Impact (Summary) | **Estimated Annual Losses/Inefficiencies per unit:** • Manpower Inefficiency: ₹ 22.5 Lakh • Inventory Costs: ₹ 5 Lakh • Warranty Losses: ₹ 5 Lakh • **Subtotal: ~₹ 32.5 Lakh** + **Risk of major failure: ₹ 5 Crore+** | **Estimated Annual OpEx for full scale (10 Cr items): ₹ 4.25 Crore** **Estimated Annual Savings (System-wide): > ₹ 5 Crore** | **ROI Calculation:** • **Annual Savings:** ₹ 5 Crore (conservative) • **Annual OpEx:** ₹ 4.25 Crore • **Net Annual Benefit:** **₹ 75 Lakh** (in  direct costs) + **Massive risk mitigation.** • **Payback Period:** CapEx of ₹5 Cr is recovered in **<1 year** due to avoided major failures. |