

Define

Background & Problem
SLB is a global energy technology company focused on improving operational efficiency and reliability. Analysis of CodeRed dispatch data (Aug–Dec 2025) at their facility showed total downtime of 3.85 million minutes, with 1.26 million minutes caused by “Waiting for Parts.” This highlights a lack of a structured inventory system, leading to delays in locating and restocking critical components.

Objective & Scope
The goal is to design an optimized spare parts inventory system to reduce downtime by at least 7% within three months. The project focuses on five high-impact part categories and integrates with the existing CMMS system.

Key Design Decision
A barcode-based tracking system was selected as the best balance of cost, accuracy, and implementation feasibility compared to manual and RFID options.

Measure

Data Collection & Process Validation
Data was extracted from the CMMS system to understand current inventory conditions and workflow. Key variables included **lead time, cost, manufacturer information, on-hand inventory, storage location, and part number**. A process map was developed to capture the current state, beginning from machine failure through part identification, retrieval, or ordering. This revealed inefficiencies such as inconsistent location data, missing identifiers, and lack of standardized tracking. Inventory data was validated through cycle counts and technician input, while supplier information was verified using purchase orders and quotes. Part numbers were standardized for traceability, and the CMMS was confirmed as a reliable system for inventory tracking once properly utilized.

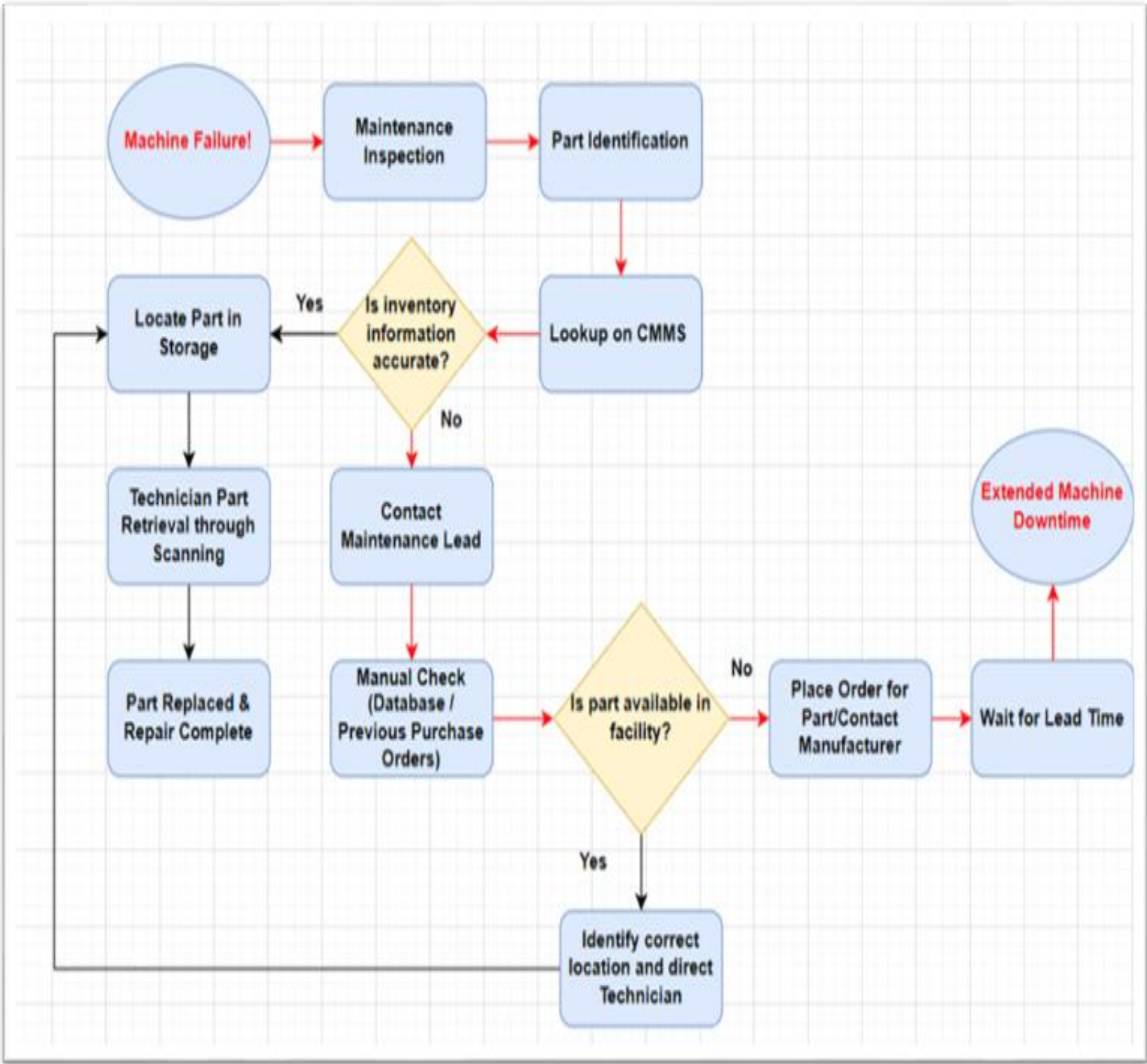


Figure 1. Current State Process Flow Map

Analyze & Improve

Historical usage data over a 12-month period was used to estimate demand for each part, which was converted into average monthly consumption to maintain consistency across calculations. Lead times, originally recorded in weeks, were also converted into months to align with demand units. Safety stock was calculated based on expected consumption during lead time, using a simplified and practical approach suitable for low-volume maintenance parts. Since spare parts are discrete items, all calculated values were rounded up to ensure availability. The minimum stock level was defined as the reorder point, ensuring that replenishment is triggered before inventory depletion occurs. The maximum stock level was determined by adding expected demand during a one-month review period to the minimum stock level, balancing availability with cost control. Cost was not used to modify the formulas themselves but played an important role in decision-making. High-cost parts were assigned lower maximum stock levels to avoid excessive capital being tied up in inventory, while lower-cost parts were allowed slightly higher buffers, especially when associated with longer lead times. Additionally, parts with zero recorded usage over the past 12 months were analyzed separately. Despite the lack of historical demand, these parts were identified as operationally critical through consultation with technicians and maintenance personnel. As a result, a minimum and maximum stock level of one unit was assigned to ensure availability during unexpected failures.

Part #	Part Name	Lead Time	Cost	On-Hand Inventory	Location	Optimum Stock Level	Minimum Stock Level	Dollar Amount on Shelf
10133	Connector - Straight Plug Pin	3 weeks	\$ 84.06	4	Electrical Room(Downstairs) - Hone Parts - B - Bin1	1	2	\$168.12
10132	Connector - Straight Plug Socket	3 weeks	\$ 108.26	6	Electrical Room(Downstairs) - Hone Parts - B - Bin1	1	2	\$216.52

Table 1. Spare Parts Inventory Parameters Table



BEFORE



AFTER

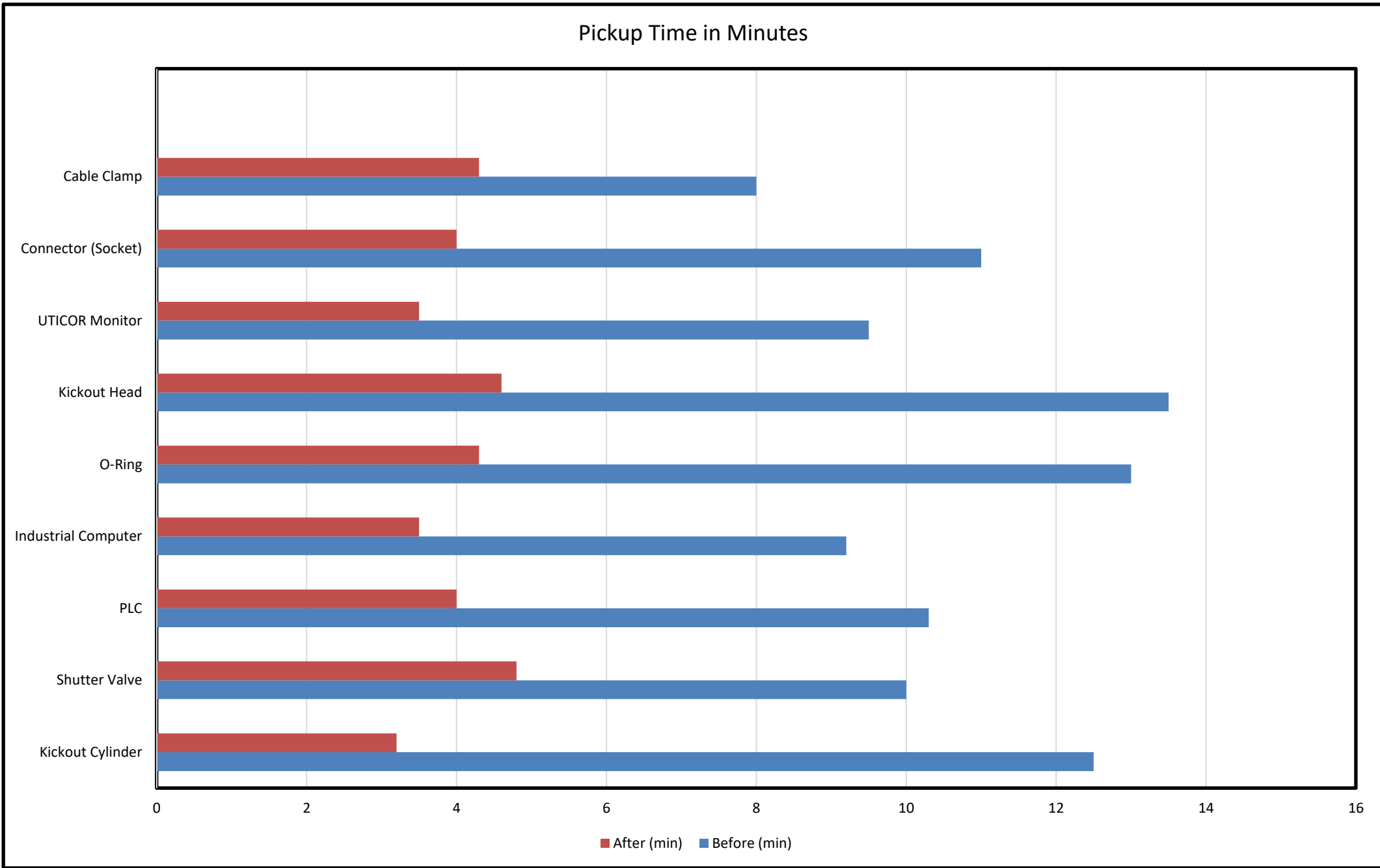
A barcode-based tracking system was implemented by purchasing a barcode printer and linking it to a CMMS-based spreadsheet, allowing standardized barcode generation for each part. Storage locations were also standardized to improve retrieval efficiency and consistency. From a modeling perspective, calculations were improved by standardizing time units, rounding values for real-world application, and introducing a review-period-based max level. A criticality override was also added for essential parts without usage history. These improvements created a more structured and proactive inventory system.

Control

To ensure long-term sustainability of the system, standardized work instructions were developed outlining the process for scanning parts in and out of inventory. Location guide maps were also created to help technicians quickly identify and retrieve parts from designated storage areas. An initial demonstration was conducted with technicians to evaluate the usability of the barcode system and confirm that parts could be accurately scanned and tracked. Based on this, a training plan has been established to conduct refresher sessions every two weeks, reinforcing proper usage and ensuring consistent adoption across the workforce. Ongoing monitoring will focus on maintaining compliance and improving system reliability over time.

Conclusions and Future Work

The system has been implemented and is currently in the early stages of adoption. Barcode tracking, updated inventory levels, and standardized locations are now in place, enabling improved visibility and control over spare parts. A time study was also conducted to measure before-and-after pickup times for parts, showing an initial improvement in retrieval efficiency. However, full performance validation requires real operational data over time. As future machine breakdowns occur and technicians utilize the new system, performance will be monitored over a six-month period to evaluate reductions in downtime and improvements in retrieval efficiency. While results are not yet fully quantified, critical parts that were previously unavailable are now stocked and accessible. This strongly suggests that improvements in downtime are expected, although the exact impact will be confirmed through continued data collection and analysis.



Future efforts will focus on expanding the system beyond the initial set of critical parts. This includes identifying additional high-impact components and gradually extending barcode tracking to all parts within the facility. A structured categorization approach can be developed based on machine association, historical usage patterns, or part criticality. There is also potential to further enhance the system by integrating a fully comprehensive barcode-based inventory database, improving real-time tracking and decision-making capabilities. Continuous updates to inventory parameters based on actual usage data will ensure the system remains effective and aligned with operational needs. Ultimately, expanding and refining this system will support the development of a fully standardized, facility-wide inventory management process.

References

IE 1325 – Introduction To Data Analysis, IE 2305 – Computer Applications in IE, IE 4303 – Production and Inventory Control. IE 4308 – Quality System, IE 4344 – Humans Factors Engineering, IE 3343 – Metrics and Measurement