Team Project: Report 2

Lean Project Proposal for Megatech Engineers Company

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Team number: 7

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Company Overview

Megatech Engineers [1] is a mid-sized manufacturer of industrial pumps and valves, serving critical sectors such as oil and gas, water treatment, and chemical processing. With a global clientele, the company has positioned itself as a provider of corrosion-resistant, energy-efficient products in line with contemporary sustainability goals. Generating annual revenues of $120 million, Megatech currently utilizes basic lean practices such as Just-In-Time (JIT) inventory and selective process automation.

. Rise in adoption of industrial pumps in petrochemicals, chemicals, medical, and pharmaceutical industry fuels the growth of the global industrial pumps market [2][3]. However, several operational challenges restrict its performance and scalability. These include a dispersed supplier network across Asia and Europe, high product customization with over 200 active SKUs, aging equipment, and disconnected data systems that inhibit real-time visibility and accurate forecasting. Raw material procurement and inventory management constitute 30% of Megatech's total expenses.

Problem

Through interviews and direct observation during our site visit, we identified several bottlenecks affecting Megatech's operational flow:

1. **Inefficient Inventory Management**

- Overstock of polymers and stainless steel consumes 18% of warehouse space, leading to holding costs of approximately ₹10 crore/month.
- Stockouts of essential parts like seals and bearings delay production by 10–15 days due to manual inventory tracking.

2. **Supply Chain Fragmentation**

- Poor coordination with 12 key international suppliers has led to an increase in lead times from 35 days in 2023 to 45 days in 2024.
- 8% of incoming parts exhibit quality issues, causing rework expenses of approximately ₹2.1 crore/year.

3. **Unplanned Equipment Downtime**

- Average machinery age is nine years, resulting in 15% unplanned downtime and an annual loss of approximately 3,500 units.
- Reactive maintenance costs total ₹1.5 crore annually (parts + overtime labor).

4. **Data Silos**

- Disconnected ERP, MES, and supplier systems limit visibility and forecast accuracy, with 40% of production schedules needing last-minute changes.

Project Goals

- Reduce inventory-related holding costs by 30% over the next 6 months through improved flow and replenishment control.
- Eliminate overstocking and reduce stockouts of critical components like bearings and seals by implementing visual inventory control systems.
- Improve overall equipment uptime by 25% through better workplace organization and tool management.
- Strengthen supplier communication and reduce lead time volatility by integrating visual pull signals and material tracking.
- Cultivate a culture of lean discipline and operator ownership through sustained 5S audits and training.

Proposal

To address the root causes identified, the project proposes a targeted implementation of Kanban for inventory control and 5S for workplace organization. These lean tools will enable better material flow, reduce excess inventory, improve visual control, and enhance equipment reliability.

1. **Kanban Implementation**

Kanban is a visual pull system that signals the need for replenishment and ensures that inventory levels remain optimized.

Step 1: Conduct a data analysis to identify 15-20 high-frequency SKUs such as seals, gaskets, and polymers that are prone to stockouts or overstock.

Step 2: Establish appropriate minimum and maximum inventory levels for each SKU based on historical usage and supplier lead times.

Step 3: Develop and deploy Kanban cards for each SKU - color-coded for procurement, storage, and shop floor usage. Each card will include part number, supplier name, reorder quantity, and bin location.

Step 4: Install manual Kanban boards in the warehouse and production areas and, where feasible, implement a digital tracking tool to improve cross-team visibility.

Step 5: Train procurement and operations staff on Kanban usage, monitor card cycling weekly, and refine card quantities based on real-time demand trends.

2. **5S Workplace Organization**

5S creates a clean, safe, and efficient environment, enabling faster access to tools, reduced search time, and fewer breakdowns.

Step 1: Perform a 5S baseline audit of key areas - CNC section, valve assembly benches, and the maintenance zone. Identify excess materials, poorly stored tools, and safety hazards.

Step 2: Apply "Sort" to eliminate unnecessary tools and components. Tag items for relocation or disposal using red tag zones.

Step 3: Implement "Set in Order" by organizing essential tools with foam cutouts in drawers, wall-mounted shadow boards, and floor-marked material zones.

Step 4: Execute "Shine" through weekly cleaning routines, machine lubrication schedules, and visual cleaning checklists for all stations.

Step 5: Establish "Standardize" practices by documenting layout blueprints, labeling rules, and daily 5S task ownership per operator.

Step 6: "Sustain" improvements through monthly 5S audits scored on cleanliness, organization, and tool availability. Use reward systems to motivate team adherence.

Project (Measurable) Benefits

- **Inventory Holding Cost Reduction**: Eliminate overstock of raw materials, especially polymers and stainless steel, to save up to 4 - 5 lakh per month in holding costs by freeing up 18% of warehouse space.
- **Stockout Frequency Reduction**: Reduce instances of critical component stockouts (e.g., bearings, seals) by at least 50% through the introduction of Kanban visual triggers and reorder points.
- **Lead Time Stability**: Improve supplier communication using Kanban signals to decrease lead time variability by approximately 20%, improving forecast accuracy and reducing rescheduling.
- **Equipment Uptime Improvement**: Apply 5S to reorganize maintenance tools and implement scheduled cleaning and lubrication, leading to 25% less unplanned downtime and recovery of up to 3,500 lost units annually.
- **Workplace Safety and Efficiency**: Clean, clearly marked workspaces and organized tools will lower motion waste and reduce operator fatigue, indirectly enhancing output quality and speed.
- **Cultural Shift Toward Lean**: By integrating routine 5S audits and visual management, the project fosters a lean culture where continuous improvement becomes part of the daily routine.

Project Budget

The Kanban and 5S project are budgeted to deliver tangible ROI in under 6 months. Budget allocation covers both tangible materials and skill development. Approximately 20,000 is dedicated to creating physical Kanban cards and visual trackers. If digital Kanban is added later, 30,000 will go toward software tools. Reorganizing workstations, tool walls, racks, and cleaning kits will require 35,000. Training workshops conducted by lean consultants will cost 40,000. For ongoing audits and visual checklists, 15,000 is set aside. Total cost is 1,40,000.

COMPONENT	DESCRIPTION	ESTIMATED COST (INR)
Kanban Cards & Visual Boards	Design and printing of physical Kanban cards and boards	20,000

Software Tools	Kanban tracking software licenses (if digital)	30,000
Storage and Tooling Reorganization	Shelving, labeling systems, bins, shadow boards	35,000
Training Workshops (Kanban + 5S)	External lean trainer for 2 sessions	40,000
Audit Materials and Maintenance Kits	5S audit templates, color coding tags, cleaning tools	40,000

Total Estimated Budget: INR 1,40,000

Required Resources

The project will require coordination among key internal roles and access to material tools. The Lean Coordinator will manage implementation. The Production Supervisor will manage layout changes. Procurement will support reorder point calculations and supplier coordination. The Maintenance Lead will oversee tool organization. Operators and interns will support 5S audits and card cycling.

Materials required include laminated Kanban cards, visual boards, shadow boards, audit clipboards, barcodes (if applicable), color-coded cleaning buckets, and training documentation. Staff time for daily 5S and Kanban practices is expected to be under 15 minutes per shift.

Follow up (Continuous Improvement)

A structured feedback loop will sustain progress. Monthly 5S and Kanban audits will measure compliance and generate improvement tasks. Metrics tracked include inventory accuracy, 5S audit scores, lead time adherence, and reduction in downtime hours.

A cross-functional lean council will meet every two months to review data, discuss team feedback, and update SOPs. Kaizen events will be held quarterly, and best practices will be documented and rolled out to other work areas. An internal lean champion program will identify and train high-performing operators as peer mentors.

Appendix A: Notes from your interviews

Interviewee 1: CNC Operator (6+ years experience)

Q1: What challenges do you face during your daily operations?

Ans: "Locating the right tools often takes 10–15 minutes. They're sometimes on the wrong cart or mixed up with others."

Q2: How do you currently manage inventory or material shortages?

Ans: "Sometimes we only know we're missing something when we're about to start a job. We then wait for procurement or borrow from another line."

Interviewee 2: Assembly Supervisor

Q1: How would you describe your team's work area and setup process?

Ans: "Everyone has their own setup method. Some use diagrams; others don't. We lack consistency, and that causes delays when someone is absent."

Q2: How do you track part availability?

Ans: "Mostly manually or by calling stores. There's no automatic update or Kanban-style visual alert."

Interviewee 3: Procurement Manager

Q1: What is your biggest procurement challenge currently?

Ans: "Lead times are increasing because we aren't forecasting well. We also don't have buffer alerts to know when something's running low until it's too late."

Interviewee 4: Maintenance Technician

Q1: How organized are maintenance tools and spares?

Ans: "We spend too much time locating spares or specialty tools. There's no fixed location, and rarely are things labeled. It slows us down a lot."

Interviewee 5: New Operator (under training)

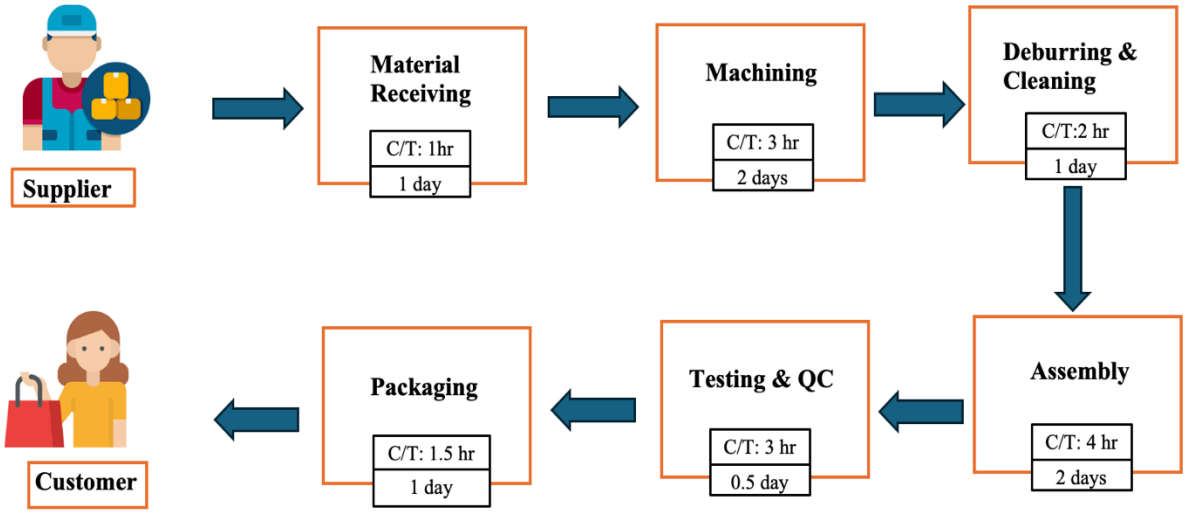
Q1: How easy is it to follow the workflow on the shop floor?

Ans: "I'm learning mostly by watching others. There aren't enough visual guides, so I rely on memory or verbal instructions."

Appendix B: Pictures from your tour (if applicable)

Picture 1: *Picture of the manufacturing site at Megatech Engineers*

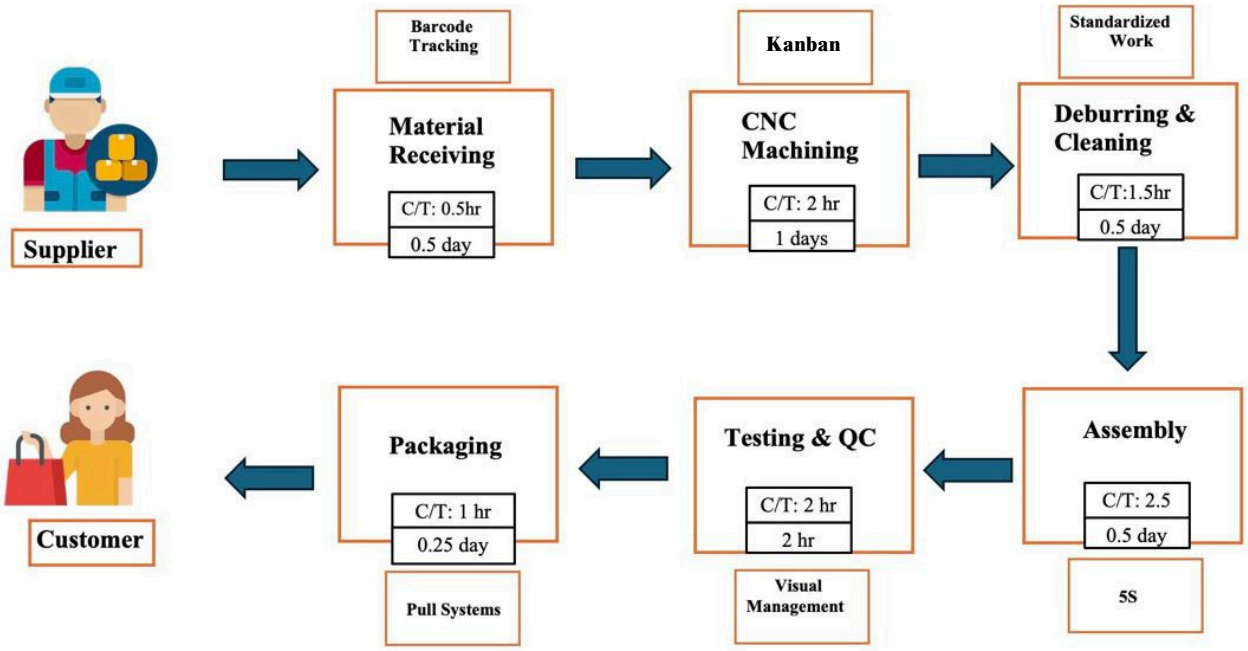
Appendix C: VSM (current)



Areas for Improvement:

1. **Lack of real time Tracking in between stations**: Megatech is unable to see the precise location of certain parts between machining, assembly, and testing.
2. **Manual Verifications of Inventory and Status**: Currently, workers perform manual inspections to ascertain WIP progress or inventory levels. This leads to inefficient labor use and significant motion waste.
3. **High Rework Rates in Assembly**: Inconsistent processes and a deficiency of standard operating procedures (SOPs) lead to assembly problems. Cycle time and throughput are decreased by frequent faults and quality failures.
4. **Between-Process Idle Time**: Significant downtime between assembly → QC testing and deburring → assembly. Batch-based scheduling and the absence of a pull system are the main causes.
5. **Overstock in the Packaging Section**: Because there is no JIT dispatch mechanism and the downstream flow is irregular, final products build up.
6. **Process of Non-Standard Testing**: Operators use different informal testing methods: Traceability and auditability are diminished by manual data logging.

Appendix D: VSM (proposed)



Process Improvements:

1. **Material Receiving**: Cycle time reduced to 30 minutes (down from 1 hour), with barcode tracking for faster logging and less overstock
2. **CNC Machining**: Set-up automation with Kanban system to signal material flow and reduce waiting time in CNC area
3. **Deburring & Cleaning**: Visual instructions with visual signals (FIFO), maintaining 1.5-hour cycle time but with better flow
4. **Assembly**: Layout enhanced with guided SOPs and 5S, 2.5-hour cycle time with reduced rework
5. **Testing & QC**: Visual testing process with digital records, standard work, and implementation of 5S, and maintaining cycle time of 2 hours but with faster quality assurance
6. **Packaging & Dispatch**: Packaged only at the last minute with pull-based flow, reducing cycle time to 1 hour and lead time to 0.25 day

Lean Tools Implemented:

- Barcode-based Skid Tracking using mobile scanning app
- Kanban techniques to reduce waiting time in CNC area
- Standardized Work Instructions in all processes
- 5S System in Assembly and QC areas
- Visual Management through electronic logs

- Pull-based Flow throughout the value stream
- Kanban System connecting Machining to Assembly

Key Improvements:

- 50% cut in lead time
- 60% reduction in work-in-process inventory
- Rework rate to reduce from ~15% to <5%
- Fewer misunderstandings and backlog with smoother flow

Appendix E: A3 Chart

1. Background / Context

Megatech Engineers is a ₹120 crore ($120M) mid-sized manufacturer of industrial pumps and valves, serving global clients across oil & gas, water treatment, and chemical processing. The company is known for energy-efficient, corrosion-resistant products aligned with sustainability goals. Despite implementing basic lean methods like JIT and partial automation, several inefficiencies limit growth, such as high SKU diversity, aging equipment, fragmented supplier networks, and disconnected data systems. Inventory and procurement alone account for 30% of total expenses.

2. Current State

- Inventory Issues: Overstock of polymers and steel takes up 18% of warehouse space, costing ₹1.2 crore/month; frequent stockouts (bearings, seals) delay jobs 10–15 days.
- Supply Chain Gaps: Poor supplier coordination raised lead times from 35 to 45 days; 8% of inbound parts are defective, costing ₹20 lakh/year in rework.
- Downtime: Equipment averages 9 years of age, leading to 15% unplanned downtime (3,500 units lost annually); maintenance is reactive.
- Data Silos: ERP, MES, and supplier tools don't communicate, causing 40% of schedules to be last-minute changes.

3. Root Cause Analysis

Insights from Interviews + Observations:

- No visual alerts for low inventory; restocking is reactive.
- Tools and spares are disorganized, causing 10–15 mins of daily delays.
- Inconsistent setup practices between operators due to lack of visual SOPs.
- Procurement struggles with poor forecasting and lack of buffer alerts.

Root Causes Identified:

- Absence of visual inventory triggers (no Kanban).
- Poor workplace organization; no 5S discipline.
- Lack of standardized workflows and training.
- Disconnected digital systems limiting transparency.

4. Target State / Goal

- Cut inventory holding costs by 30% in 6 months.
- Reduce stockouts of key parts (seals, bearings) by 50% using Kanban signals.
- Increase equipment uptime by 25% via organized tools and preventive cleaning.
- Improve supplier responsiveness and cut lead time volatility by 20%.
- Build a lean-first culture through 5S ownership and audits.

5. Proposed Solutions

Kanban System for Inventory Control

- Identify 15–20 high-frequency SKUs to monitor (e.g., seals, gaskets, polymers).
- Set min-max levels using usage and lead time data.
- Deploy color-coded Kanban cards with SKU, reorder qty, bin location.
- Set up manual Kanban boards in production and warehouse; explore digital tools.
- Train teams, monitor weekly, and refine based on demand patterns.

5S Workplace Organization

- Sort: Red-tag unnecessary tools and clear clutter in CNC, assembly, maintenance areas.
- Set in Order: Install foam tool cutouts, shadow boards, and clear floor zones.
- Shine: Weekly cleaning routines + lubrication schedules.
- Standardize: Visual SOPs for layout, labeling, daily roles.
- Sustain: Monthly audits with scoring and rewards to embed discipline.

6. Plan

STEP	OWNER	TIMELINE	STATUS
Identify key SKUs and analyze data	Lean + Procurement	1 Week	Pending
Design and print Kanban cards	Lean Team	1 Week	Pending
Deploy visual boards (manual/digital)	Ops + IT	2 Weeks	Pending
Conduct 5S baseline audit	Lean + Floor Supervisors	1 Week	Pending
Train teams on Kanban + 5S	Lean + HR	2 Weeks	Pending
Implement 5S tools + layout changes	Maintenance + Ops	3 Weeks	Pending
Monitor and audit systems	Lean + Cross-functional Team	Ongoing	Pending

7. Follow-Up Actions

- Conduct monthly audits on 5S scorecards and Kanban compliance.
- Track metrics: inventory accuracy, uptime, lead time stability, rework rates.
- Run Kaizen events quarterly to refine practices.
- Create a Lean Council to monitor impact and standardize improvements across lines.
- Launch an internal Lean Champion Program to empower peer mentors.

Appendix F, etc.

References

[1] https://www.megatechengineers.com/

[2] Allied Market Research. (2023). Industrial Pumps Market Size, Share & Forecast 2023–2032. https://www.alliedmarketresearch.com/industrial-pumps-market

[3] IBISWorld. (2024). Valve Manufacturing in the US – Market Research Report. https://www.ibisworld.com/manufacturing-sector/