Hi! My name is Aananthan Mariappan

Technical Portfolio

Scan the above QR code to get redirected to my LinkedIn profile.

Portfolio Content table

General overview of my engineering excellence

I specialize in various engineering as shown below in the diagram ranging from manufacturing, Process engineering and Design Engineer. I love problem solving and thinking from ground up to solve any engineering problem. This portfolio covers various topics/domains that I have contributed and have experience working with through my last 6 years of work experience.

I currently work as Sr. Engineer at Amazon, and I am actively looking for an opportunity to start at the earliest possible. I am open roles related about my overall experience.

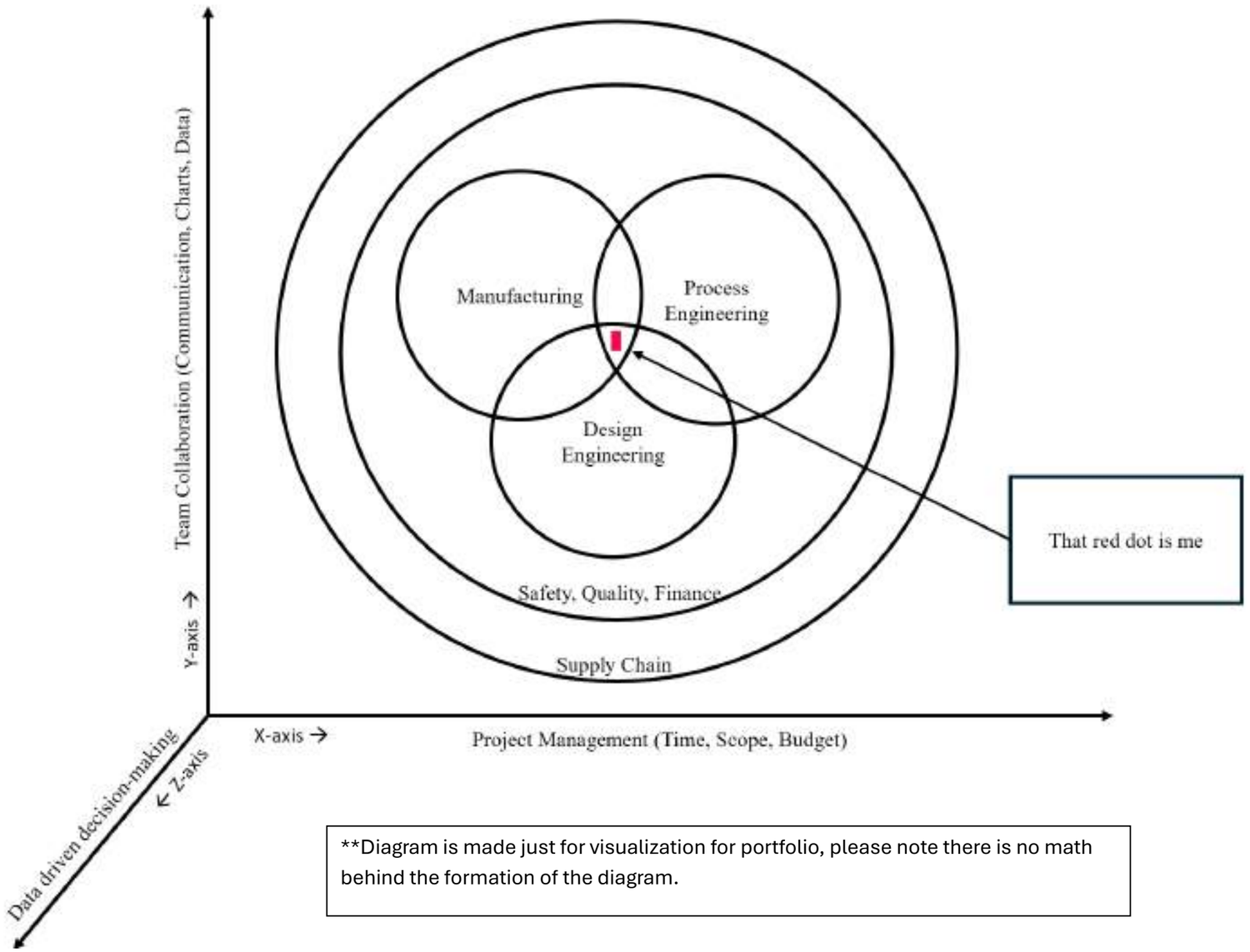


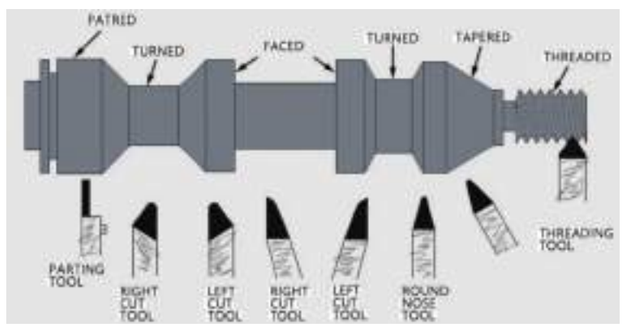
**Diagram is made just for visualization for portfolio, please note there is no math behind the formation of the diagram.

My target roles are as below:

1) Manufacturing Engineer
2) Process Engineer
3) Design Engineer
4) Industrial Engineer
5) Technical Program Manager
6) Project Engineer
7) Mechanical Engineer
8) Equipment Engineer
9) Automation and Optimization Engineer
10) Robotics Engineer

Basic Mechanical Engineering skills and tools I have used at my work

- **Lathe Operation:** I have worked on 10 machining operations using lathe: 1) **Turning** - Step turning, Taper turning, Chamfer turning, Contour turning 2) **Facing** 3) **Grooving** 4) **Parting** 5) **Threading** 6) **Knurling** 7) **Drilling** **Reaming** 9) **Boring** 10) **Tapping.**



8)

Process followed: Get the design measurements -> Obtain the part block -> Use lathe tool -> Start machining -> Measure dimensions using digital vernier caliper -> Obtained the final part design -> Verify dimensions -> Document and Record process time, chipped metal scrap weight, clean work area.

- **Drilling Operation:** Various drilling operations I have worked are – Reaming, counterboring, countersinking, spot drilling.

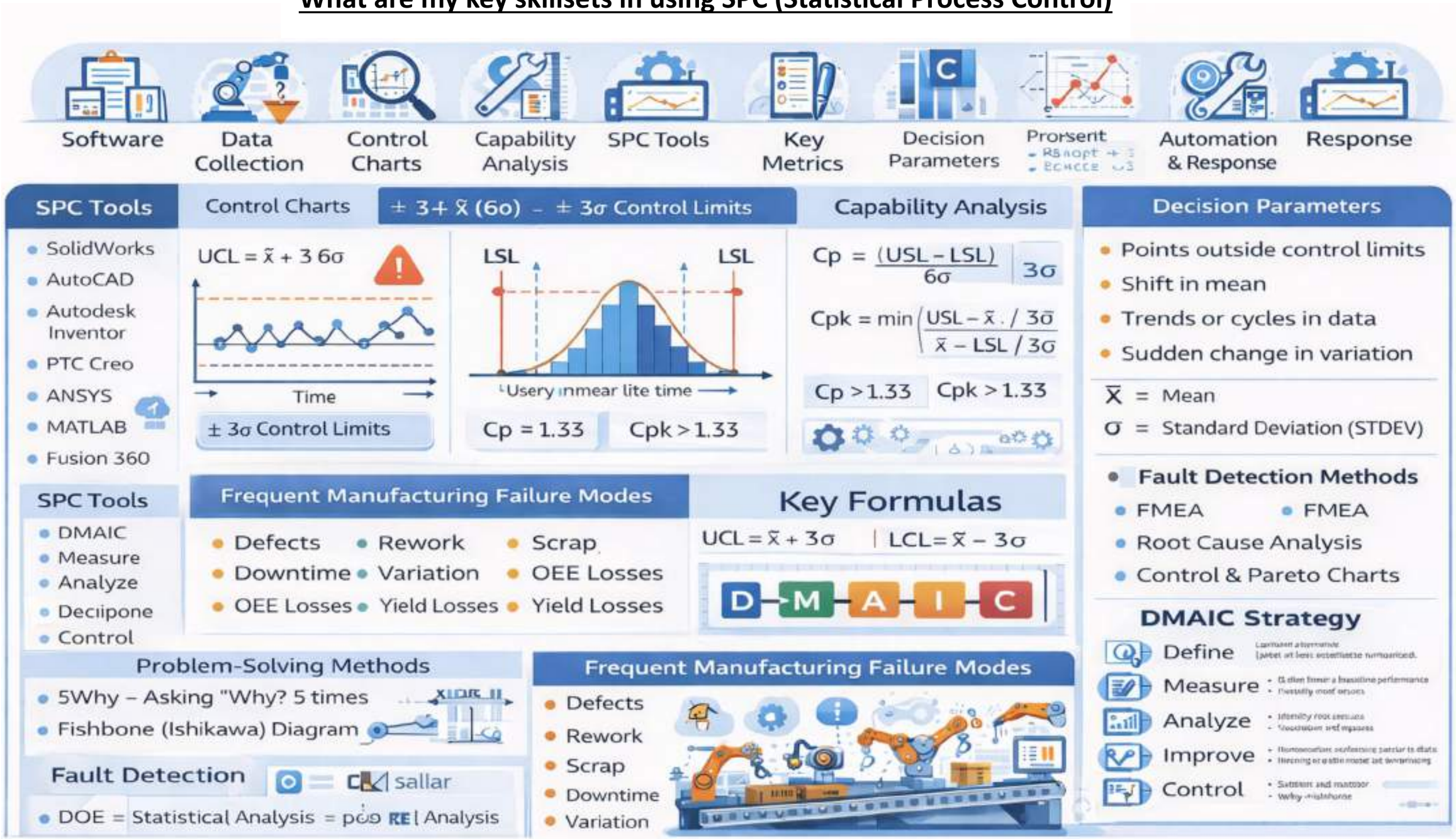
Selection process of the drill bit: Aluminum material -> HSS drill bit; Mild steel -> HSS; Stainless steel -> Cobalt; Hardened steel -> Carbide; Titanium -> Carbide.

- **Grinding Operation:** I have worked on surface grinding, cylindrical grinding, centerless grinding, and tool grinding.
- **Shaping and Planing**: Tool is moved back and forth for shaping, whereas for planing -> workpiece moves.
- **Broaching**: Multiple teeth cutting tool is used to remove the materials from the parts. This process is commonly used in automotive industries for gear manufacturing.
- **Soldering**: I have used in assembly of PCB boards. This process is usually used for low temperature filler metal (<450C).
- **Fastening:** Have used Screws, bolts, anchors, and Rivet
- **Measuring Tools:** I have used various measuring tools for Gage R&r study, assembly verification, design verification, and dimensional analysis.
  - Linear dimensions - Vernier caliper, Micrometer, Steel ruler.
  - Angle – Protractor, sine bar, angle gauge.
  - Surface flatness and hole measurement – Surface plate, Bore gauge.
  - Alignment and Geometric measurement – Coordinate Measurement Machine (CMM’s).
  - RPM measurement – Dynamometer
  - Temperature – Thermocouple, infrared thermometer
  - Pressure – Pressure gauge
  - Speed – Tachometer
  - Rotational motion – Stroboscope
  - Position – Encoder

What are the key engineering skills I poses?

Software	Design & Drafting	Manufacturing & Processes	Testing & Analysis	Soft Skills
• SolidWorks • AutoCAD • Autodesk Inventor • PTC Creo • ANSYS • MATLAB • Fusion 360 • KeyShot • Microsoft Office	• 2D & 3D CAD • GD&T • Tolerance Analysis • Design for Manufacturability (DFM) • Design for Assembly (DFA) • FMEA	• CNC Machining • Injection Molding • 3D Printing • Sheet Metal Fabrication • Rapid Prototyping • Process Optimization • DFM / DFA • Lean Manufacturing • Six Sigma	• Mechanical Testing • GD&T Inspection • Tolerance Stack-Up • Root Cause Analysis • Design of Experiments (DOE) • Thermal / FEA Analysis	• Problem Solving • Team Collaboration • Communication • Project Management • Time Management • Time Management • Time Management • Continuous Improvement

What are my key skillsets in using SPC (Statistical Process Control)

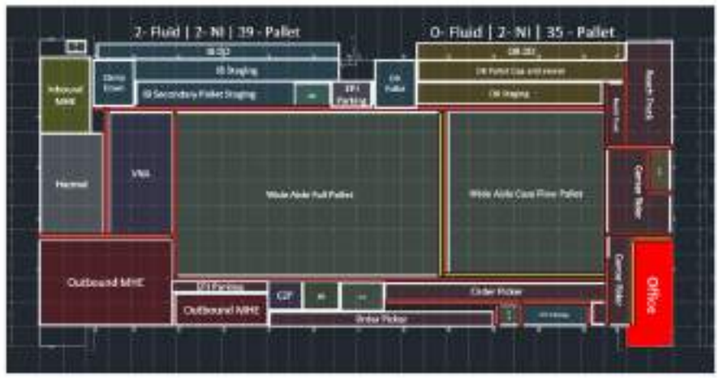


What is the Industrial Engineering experience I have worked on?

One-sided Building Process Flow

What was the problem to solve?

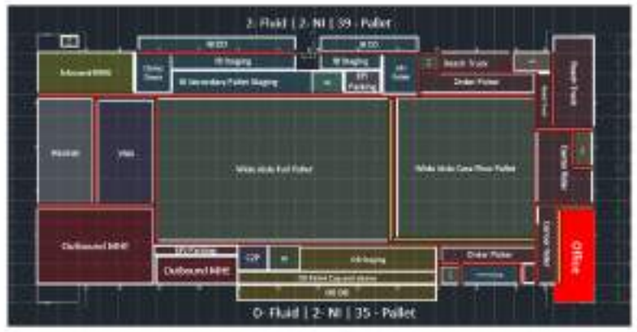
1. 20% increased Traffic at IB & OB Junction.
2. 10% increased associate safety hazard/incidents (3 incidents -> 4 per day)
3. 20% reduced PIT process rate. (22Pph -> 17Pph)
4. Increased downtime -> Reduced throughput (6MM -> 5.4MM)
5. High density labor distribution (Total AA: 464, 165AAs at the dock area -> risk for egress)



Two-sided Building Process Flow

What it solved?

1. Change to flow through building -> streamlined traffic flow -> eliminated 1-sided traffic issue.
2. Installed lift gates, and swing gates at every PIT vs Ped interaction zone -> Reduced incident to 5% (4 incident -> 1 per day)
3. Increased PIT process rates (17Pph -> 22/25Pph)
4. Decreased downtime -> Increased throughput (5.4MM -> 5.7/6MM).
5. Reduced labor distribution -> No risk to egress (165 AA -> 85AA at each dock area).



What was the problem to solve?

1. All sites are 100% hydrogen fuel PITs
   1. Because of this each PIT requires dedicated time to go for refueling process.
   2. Based on safety, hydrogen dispenser should be away from active zones during operation time.
   3. This caused downtime at all zone across building.
   4. This required 1.5x PITs at the dock -> 1.5x PIT operator as well (0.5x increase).

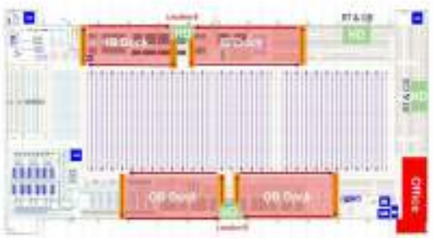
What I focused to solve here?

1. Maximize building throughput capacity by focusing on IB and OB dock area.
   1. Based on analysis – Each PIT at the dock takes 17 min per refueling cycle (back and forth)
   2. Each PIT to travel 1.5-3k ft round trip leading to potential 5.03% reduced building capacity.
2. **To remove this inefficiency -> Proposed to convert dock PITs to Li-ion.**
   1. What it solved? – eliminated downtime at the dock
   2. Eliminated the requirement of additional PITs and Labor at the Dock.
   3. Introduced opportunity charging -> leading to 0% downtime of Dock PITs.
   4. Easy training procedure for dock PIT AAs.
   5. Overall streamlining of the Dock operation -> eliminating the 5.03% reduced building capacity.

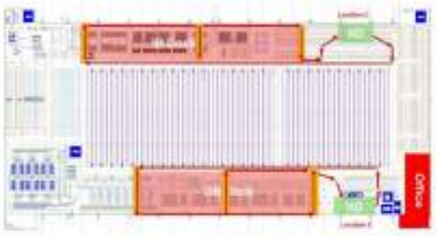
Hydrogen fuel Concept Design cases

Option 1

Option 2

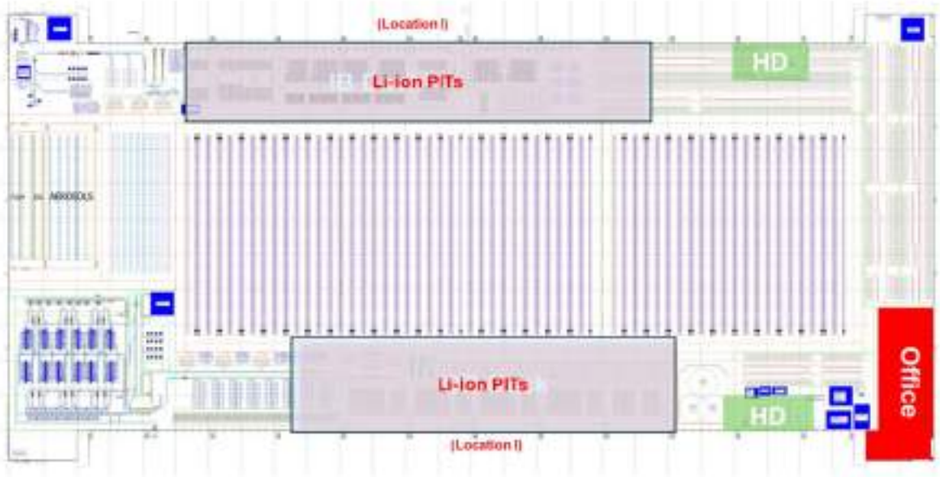


Option 3



Option 4

Mixed Power Concept Design



- Took ownership on CapEx vs OpEx and NPV for this proposal

Vendor 1 Dock PIT					
PIT Details			Cash Flow		
Supplier	Model	Quantity	3 Year NPV per Site	5 Year NPV per Site	7 Year NPV per Site
Vendor 1	Clamp Truck	14	$1,391,433	$2,226,066	$2,891,430
Vendor 1	Forklift	34			

- Worked on validating vendor data to have higher accuracy in the calculation, established vendor data verification process

Battery Ah	100	200	300	400	500	600	700	800	900
% at end of 4 hr run	11.88%	53.44%	67.29%	74.22%	78.38%	81.15%	83.13%	84.61%	85.76%
% to charge to 100%	88.13%	46.56%	32.71%	25.78%	21.63%	18.85%	16.88%	15.39%	14.24%

- Took ownership to figure out which spec setup needed for maximizing the dock efficiency. Established a centralized run-time data capturing system.

Battery capacity vs charger Amperage									
Ah vs Adc	100	200	300	400	500	600	700	800	900
100	50.00%	25.00%	16.67%	12.50%	10.00%	8.33%	7.14%	6.25%	5.56%
200	100.00%	50.00%	33.33%	25.00%	20.00%	16.67%	14.29%	12.50%	11.11%
300	150.00%	75.00%	50.00%	37.50%	30.00%	25.00%	21.43%	18.75%	16.67%
400	200.00%	100.00%	66.67%	50.00%	40.00%	33.33%	28.57%	25.00%	22.22%
500	250.00%	125.00%	83.33%	62.50%	50.00%	41.67%	35.71%	31.25%	27.78%
600	300.00%	150.00%	100.00%	75.00%	60.00%	50.00%	42.86%	37.50%	33.33%

What was the problem?

- Since this process path of having mixed power zones in the building, each process paths followed were new.
- This required validation of process rates using real-time “process time-study”.
  - Collaborated with operations team to execute the time study by process path using test space/pilot test site space to run the study.
- The data gathered was then used in the design simulation using Flexsim.
  - Collaborated with Simulation team to run the simulation of the current design.
- Based on Flexsim output data, the site designs where continuously improved.

Overall process flow

Problem Statement: Current building has Throughput constraint due to mechanical failure & system design. Key decision equation "Safety + Design + Process (manual/auto) + Quality (defect/scrap) + Finance".

Case 1– The First Bucket:

Machine vs Throughput: Capacity planning predicted increase in demand by 20% by 2027 (5MM -> 6MM units/461k cases per week).

- Current 2025 system designed to handle 5MM units (385k cases) with defects to fix.
- Demand delta 1MM units -> Need Semi/auto MHE

Key factors to look into:
Process -> Capacity -> Quality -> Cost -> Risk

Fig 1: safety hazard

Fig 2: Package conveyance

Case 2 – The Second Bucket:

Site reports issues related to **Labor**, **Safety, Process** and **Ergonomics.**

- Existing safety systems failed -> Unsafe working zone
- High labor traffic in unsafe working zone -> Reduced process rate
- Reduced process rate led to process deviation -> Process deviation
- Process deviation caused high labor churn rate -> Unsafe process execution
- Unsafe process execution -> ergonomic issue -> Overall ripple effect

-> Leading to building throughput reduction by 22%

High visibility, High criticality, $32M value end-to-end problem-solving project

How do I solve it? What is my thought process to approach these two cases?

General strategy: DMAIC – Define, Measure, Analyze, Improve and Control

- **Steps 1 & 2 (Define & Measure):** You start by identifying the process and quantifying the defects. This is critical because it ensures you are analyzing real data rather than just guessing.
- **Step 3 (Analyze):** This is where you use the Fishbone Diagram (Ishikawa). Its purpose is to brainstorm potential causes across different categories (like People, Machine, and Method) to find the Root Cause.
- **Steps 4 & 5 (Improve & Control):** Once you know the "Why," you propose and implement solutions. The final step – Control -> is essential to make sure the problem doesn't return.

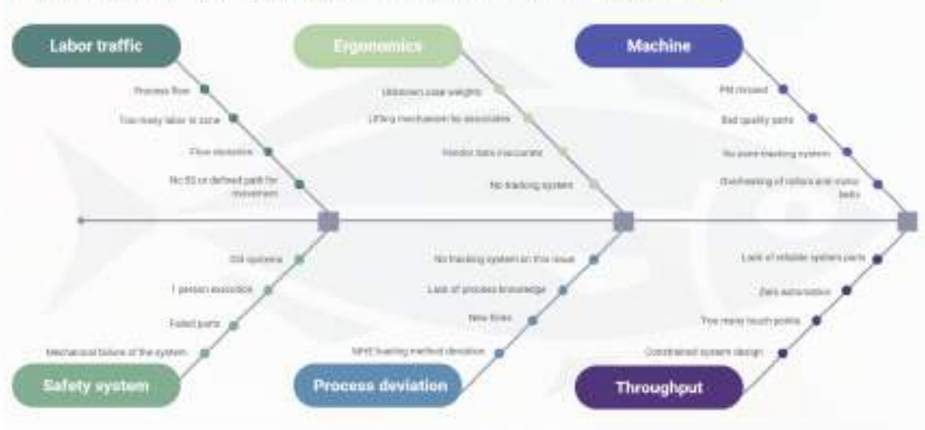
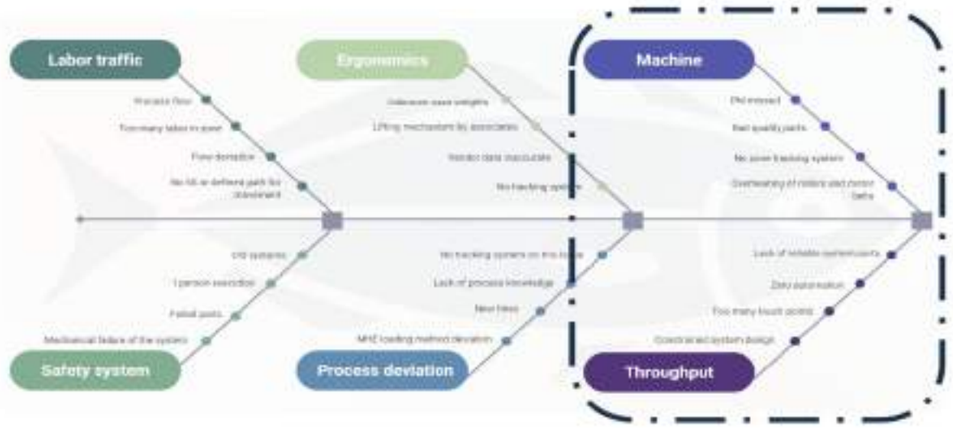


Fig 3: Fishbone Mapping

The First Bucket

Machine & Throughput

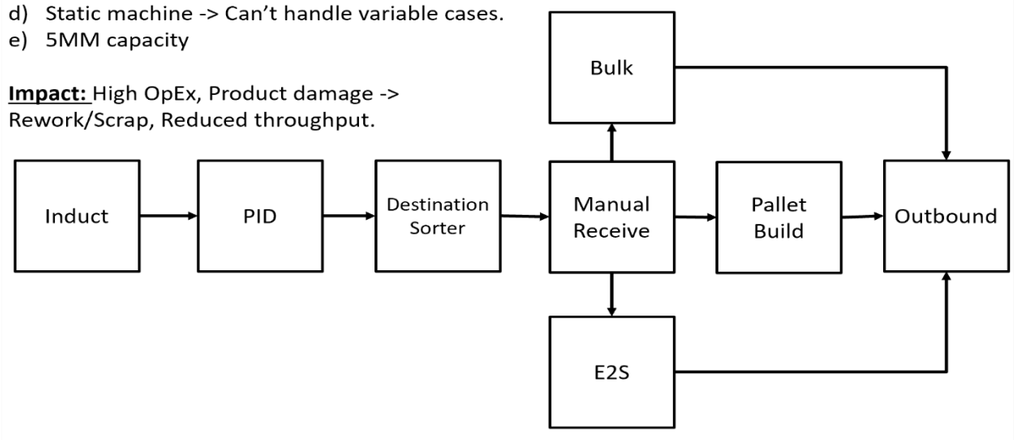


Machine & Throughput

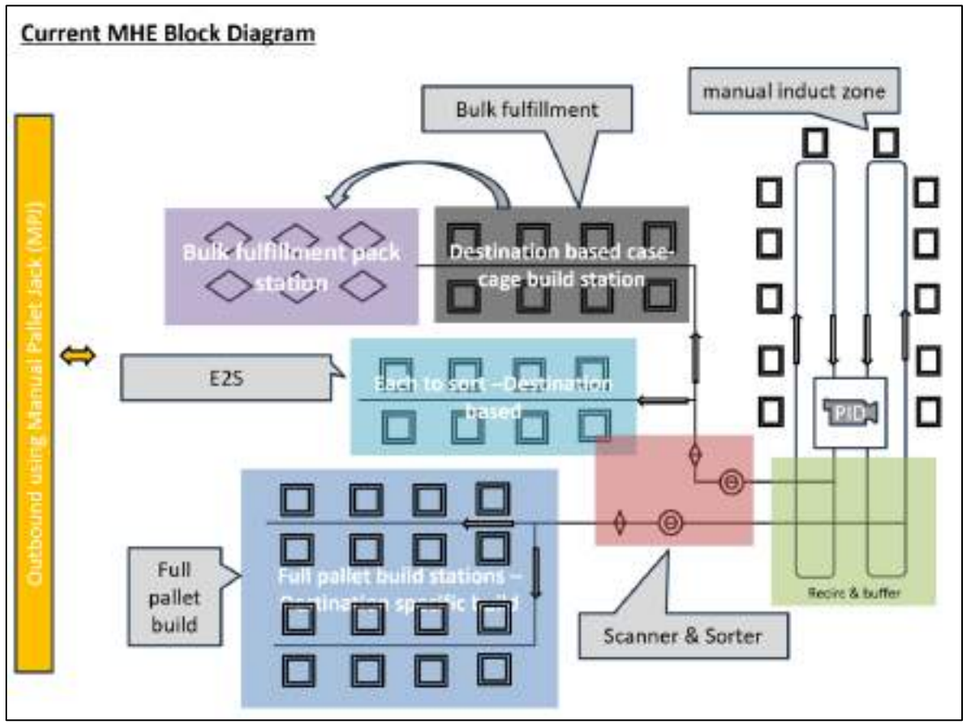
Issue:

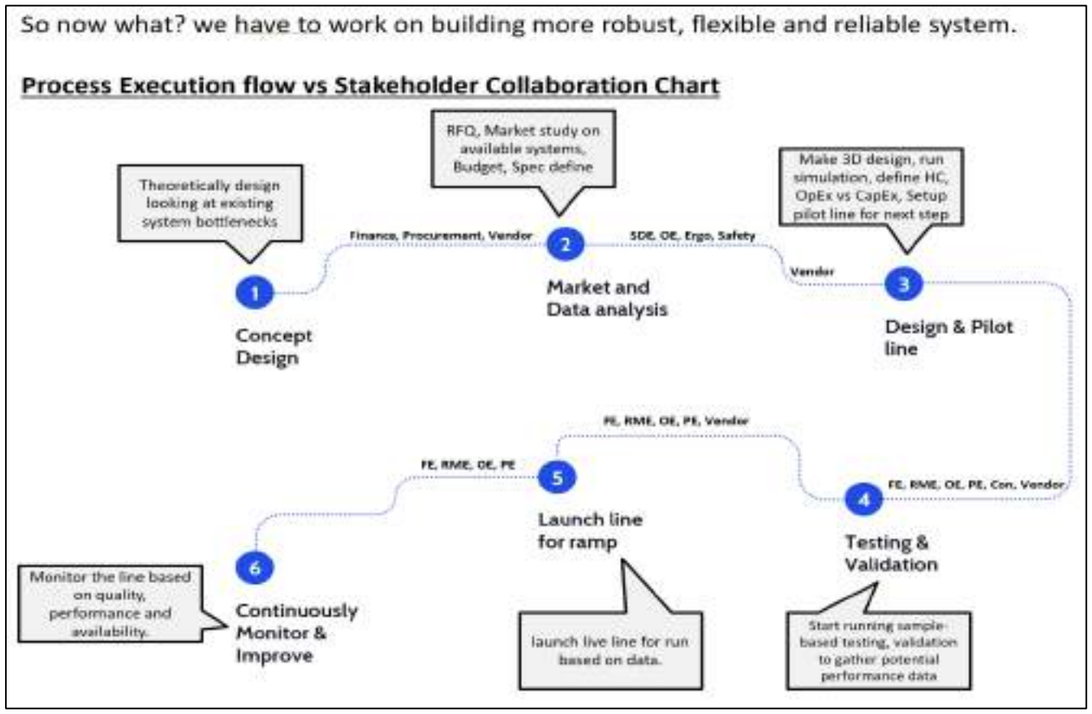
a) Increased downtime -> Missed PM, Roller defect, Part Quality, Lack of tracking system
b) Increased walk distance over MHE
c) High OpEx (50 labors/shift) @ $30/hr.
d) Static machine -> Can't handle variable cases.
e) 5MM capacity

Impact: High OpEx, Product damage -> Rework/Scrap, Reduced throughput.



Current MHE Process flow diagram (PFD)



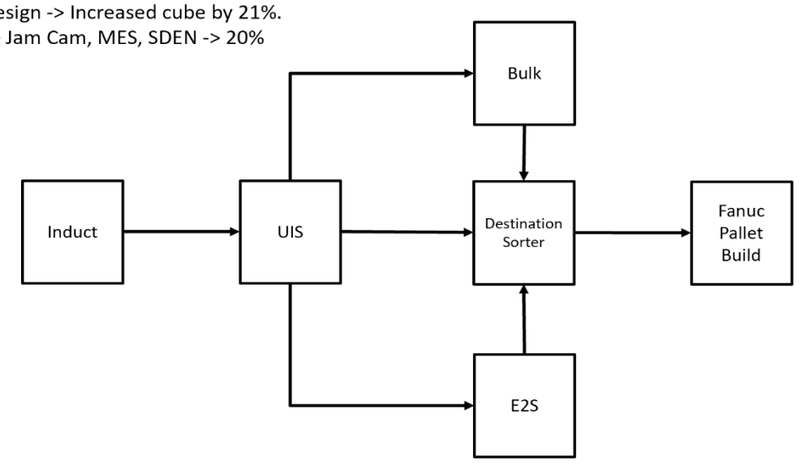


Updated MHE design PFD

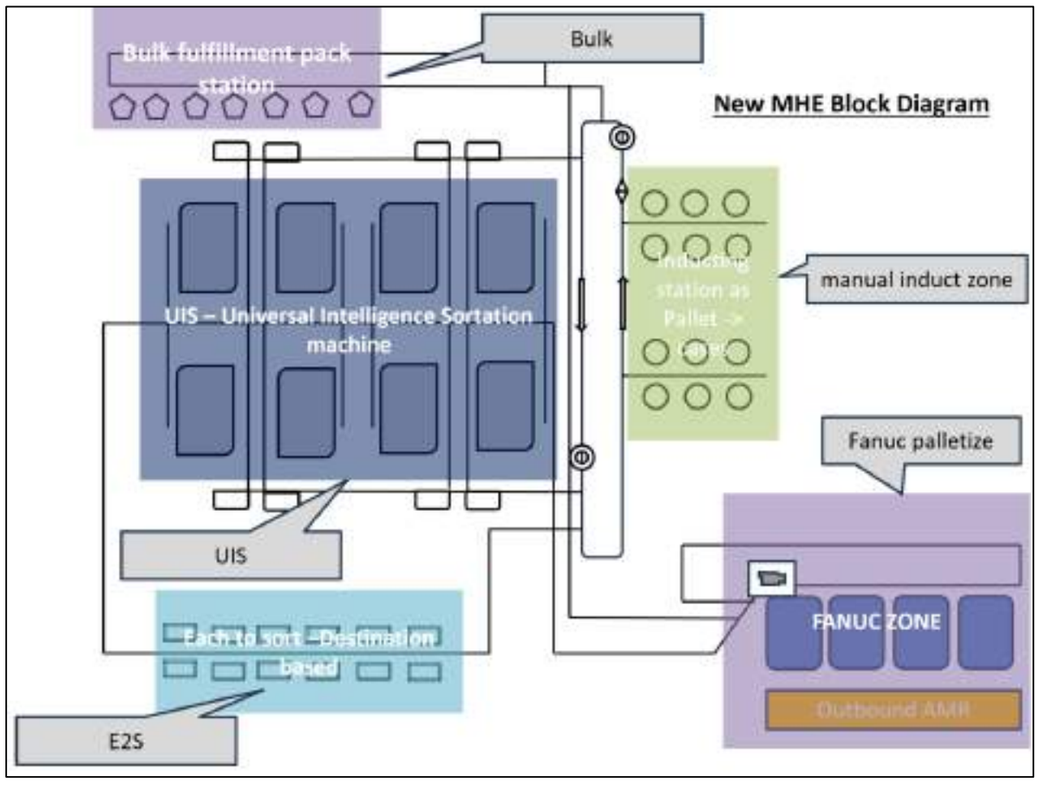
Solve: Optimize MHE design, RCA defects, Optimize HC – save OpEx, Increased storage cube – Make more money, Implement flexible MHE – Semi/Auto, Hire experienced labors.

Result:

a) Process optimization -> 3 touch points vs 5-7 touch points -> Increased process rate/cycle time.
b) Saving $6.8M/yr -> 68% HC reduction -> Streamlined flow.
c) Flexible MHE -> Can handle cases up to 50lb weight.
d) Optimized MHE design -> Increased cube by 21%.
e) Tracking system -> Jam Cam, MES, SDEN -> 20% reduced downtime.



New MHE Process flow diagram (PDF)



What was the issue? What was the solve? What was the result?

Issue:

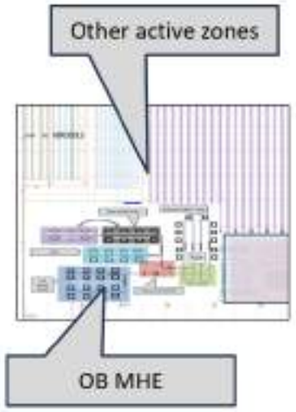
a) Increased downtime -> Missed PM, Roller defect, Part Quality, Lack of tracking system
b) Increased walk distance over MHE
c) High OpEx (50 labors/shift) @ $30/hr.
d) 5MM capacity

Impact: High OpEx, Product damage -> Rework/Scrap, Reduced throughput.

Solve: Optimize MHE design, RCA defects, Optimize HC – save OpEx, Increased storage cube – Make more money, Implement flexible MHE – Semi/Auto, Hire experienced labors.

Result:

a) Process optimization -> 3 touch points vs 5-7 touch points -> Increased process rate/cycle time.
b) Achieved 7.2MM potential capacity to handle
c) Saving $6.8M/yr -> 68% HC reduction -> Streamlined flow.
d) Flexible MHE -> Can handle cases up to 50lb weight.
e) Optimized MHE design -> Increased cube by 21%.
f) Tracking system -> Jam Cam, MES, SDEN -> 20% reduced downtime.



Other improvement on MHE process

Case packing process

- Created product vs packing size decision making tool -> Eliminates waste of cube space.
- Designed and prototypes angled high volume final case holding fixture considering ergo requirements for fast label process -> Increased rate.

Fig 10: Package sizing tool

Fig 11: Trailer storage cube

Process followed: Historical data on package size -> Frequency curve -> fixture definition based on max, min and avg package size.

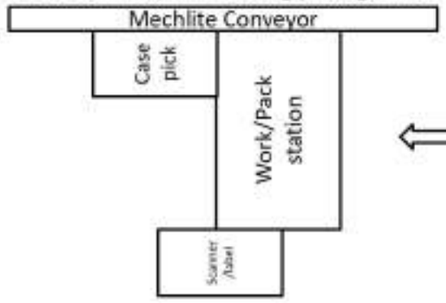


Fig 12: Ergo packing holding fixture

***Storage cube is king (More cube > Save money)*

Quick overview on method followed:

Define size -> Concept design (2D/3D CAD) -> Defining material -> Prototype -> Test -> Validate -> Finalize

Define phase:

- What is the measurement range?
- What is the tolerance?
- What are the case size to handle?

Concept design:

- What slider design mechanism?
- How should it function?
- Is it easy to manufacture?

Material selection:

- What material to use?
- What is the cost comparison?
- How easy is to get this material?

Prototype:

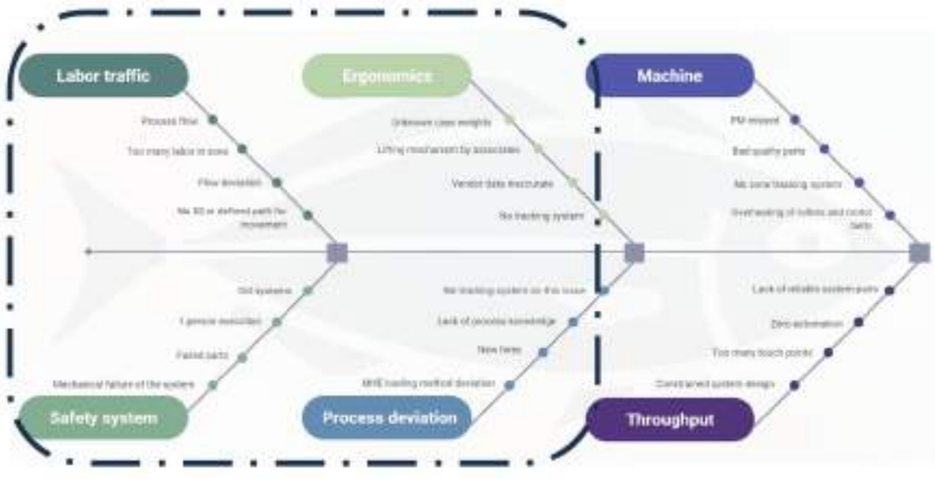
- How is the first pass unit?
- Any defects?
- Can we make it easy to manufacture?

Test, Validate & Finalize:

- Are all unit made measuring within the range?
- Is the process to make is accurate and giving high quality product?

The Second Bucket

Labor, Safety, Process, Ergo



Let's dive deep?

Labor:
Issue: Process deviation, Traffic, Lack of defined movement.
Impact: Causing reduced process rates.
Solve: Implement training and monitor system, 5S the zone, Optimized labor count by process.
Result: Reduction in 85% process deviation, 0% traffic zones, 100% increase in process rate.

Safety system:
Issue: Existing safety systems failed, Insufficient labor, Bad quality product
Impact: Unsafe workspace, Bad employee moral, Zone downtime, Reduced process rate.
Solve: Increased HC (2/zone), Vendor quality improvement, Upgraded safety system.
Result: 0% safety incident, 100% increase in process rate, 100% increase in employee moral.

***Industrial safety is fundamentally a psychological factor - when workers feel psychologically safe - safe to operate, get heard on callouts - it reduces risk, boost productivity by up to 50%.*

Fig 5: Dock guardian

Fig 4: Lift gate

Process Deviation & Ergonomics:
Issue: Process deviation – New hire, Vendor data mismatch
Impact: New hires -> 1% capacity reduced, case weights varied -> ergo and process issue.
Solve: Implemented continuous monitoring system, Vendor process calibration, Training
Result: Increased throughput potential by 10%, Higher process/data visibility.

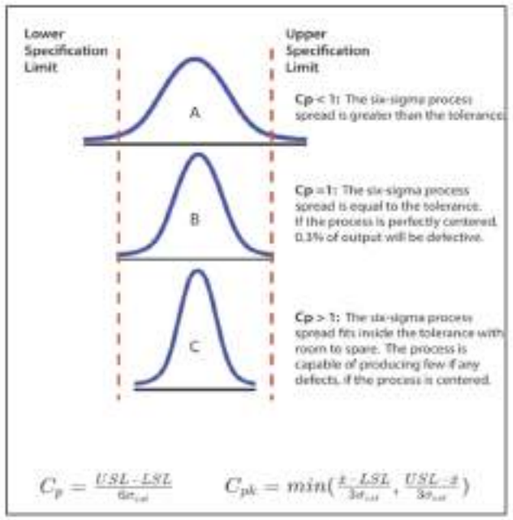


Fig 7: SPC method for reference

Fig 6: Ergo Pallet lift table

What I contributed, What was the output and Who I collaborated with?

a) Machine & Throughput: Owned resolving failure modes -> designed alternate MHE layout targeted to reduce headcounts, cost effective and flexible line.

- ➔ **Result:** Increased throughput by 20%, Saved ~$6.8M, Increased cube space by 21%.
- ➔ **Collaborated with:** Vendor, Data Eng., Process Eng., Operations, Safety, Module design, Training, Finance, Procurement, and Ergonomics.

b) Labor: Owned the problem -> dive deep into data and safety policies -> proposed solutions to reduce labor safety issues, traffic, congestion.

- ➔ **Result:** 15% reduction in labor traffic incident, 95% increased SOP adherence.
- ➔ **Collaborated with:** Safety, Module design team, Operations, Operators, Training, site HR, Finance.

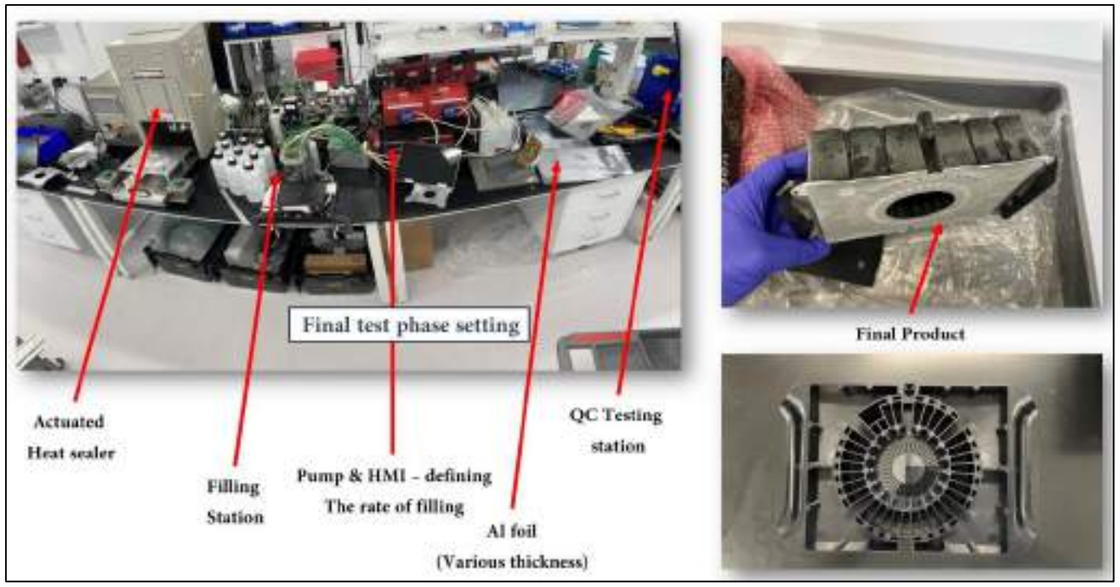
c) Safety: Led end-to-end dive deep on existing safety systems -> performed doing root cause analysis -> proposed a new safety methods -> Worked with Vendor and stakeholders.

- ➔ **Result:** 100% elimination of safety hazard, 20% increase in process rate, Saved $125k on cost.
- ➔ **Collaborated with:** Vendor, Procurement, Finance, Operations, Operators.

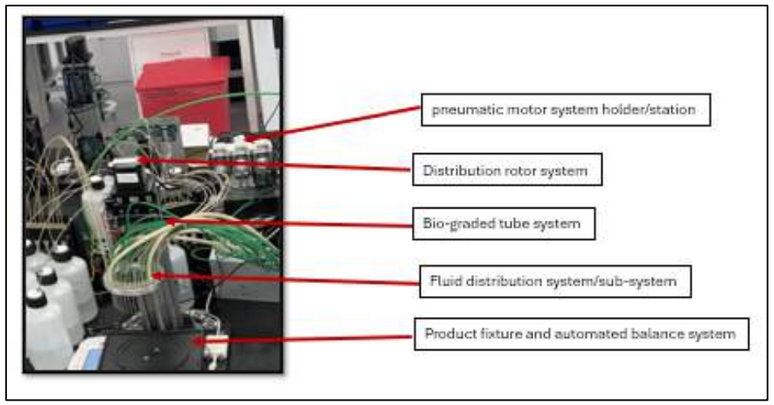
d) Process & Ergonomics: Led end-to-end process flow analysis -> authored detailed report on why, what and how -> Drafted SOP for new hires -> Implemented new process path with pallet table.

- ➔ **Result:** Saved 15% labor hour, Increased process rates by 22%
- ➔ **Collaborated with:** Process Eng., Operator, Training and Ergonomics.

System root cause analysis and development

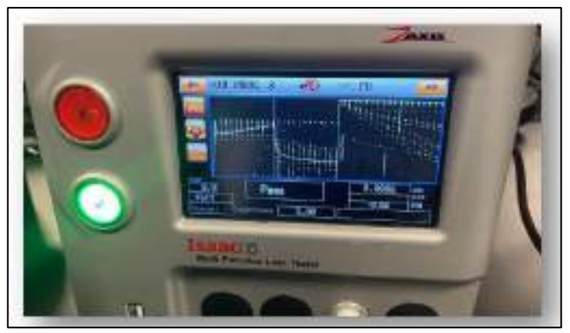


1) **Manual to Semi-automated production line set-up:** I worked in designing the entire assembly/production line from phase 0 to 1 to eliminate high scrap rate.
   - Designed the automated fluid distribution system using SolidWorks (picture below).
   - Designed, Tested, Validated, Qualified, Documented SOP, and Trained operators.
   - Image on right shows complete test line setup with product induct > QC testing station



The semi-automated filling station (introduced to reduce manual scrap errors by 22%)

2) **Root Cause Analysis on manual process with high scrap rate**
   - Various failure modes were identified using FMEA method.
   - Ranked the failure modes using RPN -> the high severity failure was tool deformation, pressure value rupture, tube length leading to pressure deviation, temperature variation.
   - Worked in designing and developing the above semi-automated production line leading to reduction in scrap to 5%.



Above images are dissembled parts of machine and testing machine used

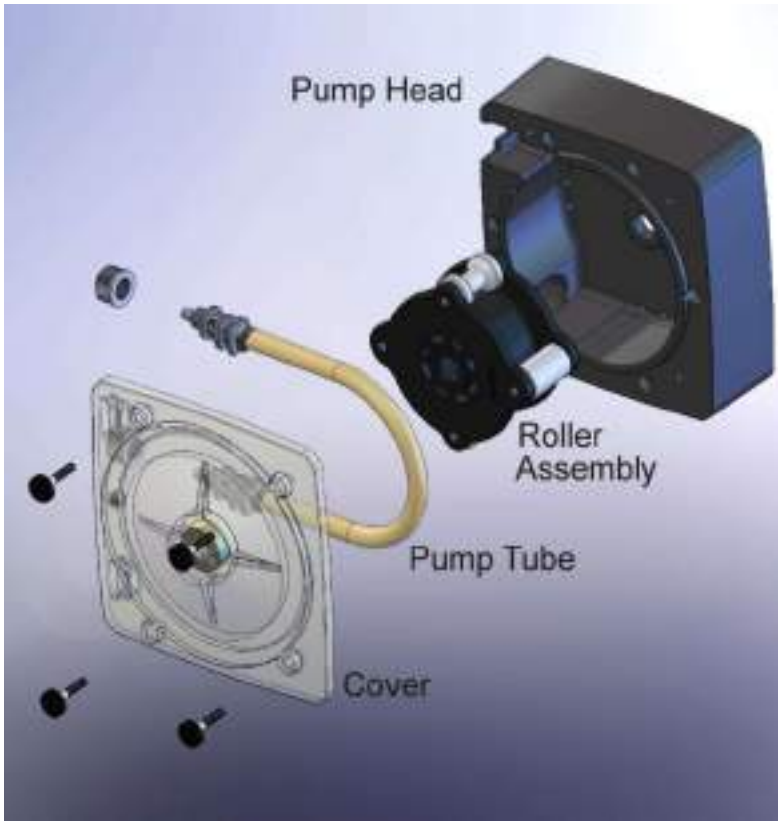
My experience working on product manufacturing assembly & Design

Hair dryer NPI manufacturing line from Concept design -> Launch

Hair dryer iteration design assembly for manufacturing

- I led the design of sub-assemblies of parts used in the final part assembly.
- Considered various prototypes (PV1, PV2,… PVx).
- Worked on DFA, DFM to simplify assembly and manufacturing processes finalized on product design for manufacturing.
- Spearheaded testing, validation (EVT, DVT, PVT) and qualification of process and design.
- Performed RFQ of parts for assembly line with various vendors.
- Finalized on finance of the overall line considering CapEx, OpEx, and NPV.
- Documented and wrote leadership review paper for alignment and approval.
- Executed the launch of the NPI line by cross functional collaboration.
- Continuously monitored to improve and stabilize the process and system.

Peristaltic pump NPI manufacturing line from Concept design -> Launch



Peristaltic pump iteration design assembly for manufacturing

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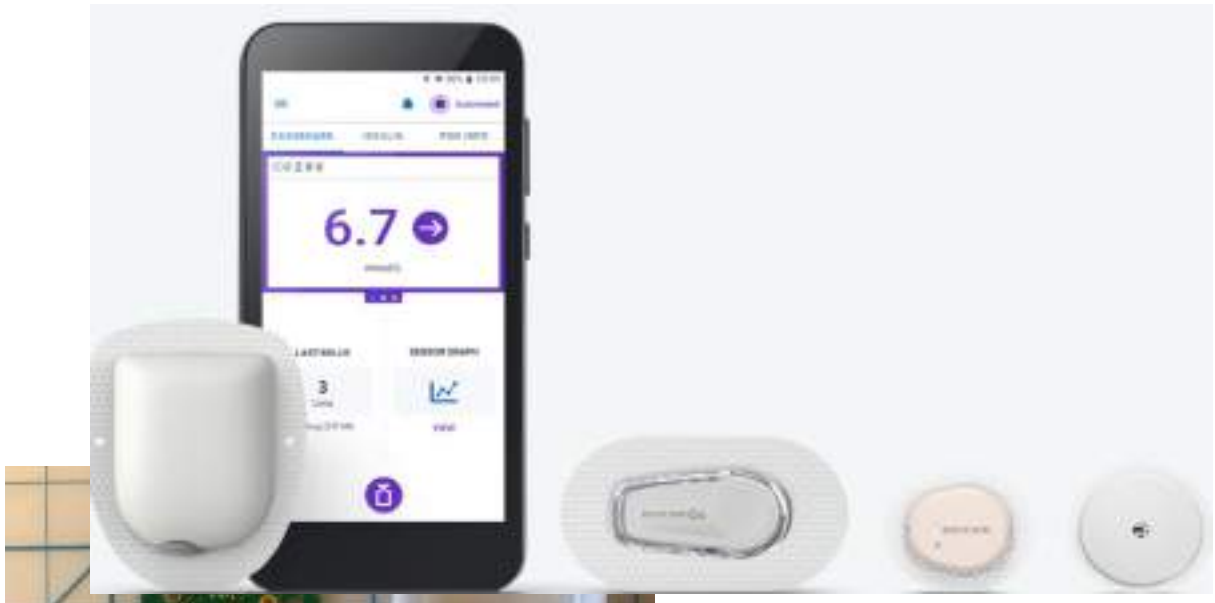
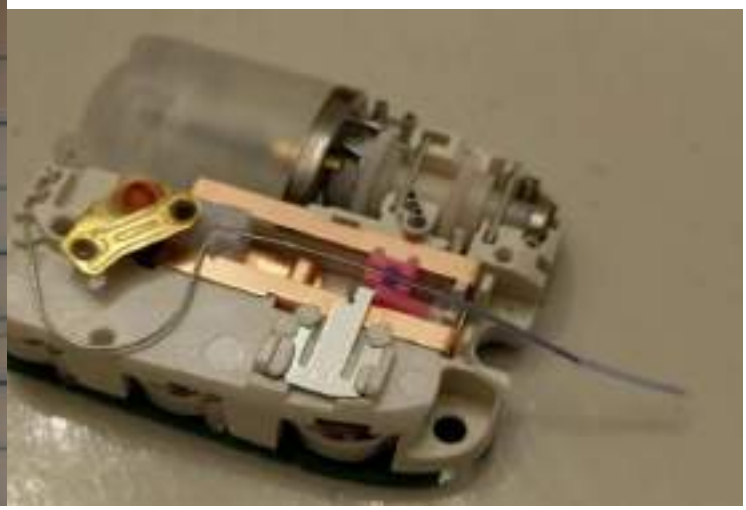
- Executed the launch of the NPI line by cross functional collaboration.
- Continuously monitored to improve and stabilize the process and system.

Omnipod – Process, design and Manufacturing failure analysis

- I worked on Omnipod – a medical device used to pump insulin into patients body based on how much glucose they have at any point of time. This device is mainly used for diabetic patients.
- Below image will show mobile -> Glucose monitor -> Insulin pump.
    - I worked at Insulet to solve long-term manufacturing failures.





Ventilator - manufacturing process improvement and root cause analysis

- I worked on assembly process of ventilators during peak covid time.
- My task was to figure out solutions to semi-automate the manual manufacturing line due to worker shortage because of covid'19
- I used VSM -> Process rate analysis -> Product design -> Control failure modes -> Find out bottlenecks to target -> Implement automated tools by streamlining the data flow and process flow to continuously monitor the manufacturing line.

What are the common SQL queries I use at work?

SQL Operation	Example Query	Purpose
SELECT	SELECT * FROM production_orders;	Extract raw data from source systems
Filter Data	SELECT * FROM sensors WHERE timestamp > '2025-01-01';	Extract incremental data
Join Tables	SELECT a.order_id, b.machine_id FROM orders a JOIN machines b ON a.machine_id=b.id;	Combine multiple source tables
Data Cleaning	SELECT TRIM(machine_name) FROM machines;	Remove spaces or unwanted characters
Handle Nulls	SELECT COALESCE(defect_count,0) FROM quality;	Replace NULL values
Type Conversion	SELECT CAST(production_time AS FLOAT) FROM production;	Convert data types
Data Standardization	SELECT UPPER(product_code) FROM products;	Normalize text values
Derived Columns	SELECT quantity*price AS total_value FROM sales;	Create calculated fields
Conditional Logic	SELECT CASE WHEN defect_rate > 5 THEN 'High' ELSE 'Normal' END FROM quality;	Classification
Aggregation	SELECT machine_id, AVG(cycle_time) FROM production GROUP BY machine_id;	Process performance metrics
Window Functions	SELECT machine_id, ROW_NUMBER() OVER(PARTITION BY machine_id ORDER BY timestamp DESC) FROM logs;	Ranking / latest records
Deduplication	SELECT DISTINCT part_id FROM inventory;	Remove duplicates
Data Validation	SELECT COUNT(*) FROM production WHERE cycle_time < 0;	Identify bad records
Insert Data	INSERT INTO warehouse_orders SELECT * FROM staging_orders;	Load transformed data
Upsert	MERGE INTO target t USING source s ON t.id=s.id WHEN MATCHED THEN UPDATE SET t.qty=s.qty WHEN NOT MATCHED THEN INSERT VALUES(s.id,s.qty);	Insert or update records
Update	UPDATE production SET status='COMPLETE' WHERE end_time IS NOT NULL;	Update existing records
Delete	DELETE FROM staging_orders WHERE load_date < CURRENT_DATE - 30;	Remove old staging data
Production KPI	SELECT machine_id, AVG(cycle_time) FROM production GROUP BY machine_id;	Monitor efficiency
OEE Calculation	SELECT runtime/planned_time FROM machine_logs;	Equipment performance
Defect Rate	SELECT SUM(defects)/SUM(total_units) FROM quality;	Quality analytics
Downtime Analysis	SELECT machine_id, SUM(downtime_minutes) FROM downtime_logs GROUP BY machine_id;	Reliability analysis
Sensor Data ETL	SELECT machine_id, MAX(temperature) FROM sensors GROUP BY machine_id;	Predictive maintenance

NPI (New product introduction)

I have worked on various NPI products from 0 -> 1. I enjoy working as it requires a lot of effort, team collaboration and diving deep into problems to figure out the solution using design, data, process, safety, ergonomics, supply chain and quality.

Typical NPI Gateway

Gate 0 → Concept Approval
Gate 1 → Design Review
Gate 2 → Prototype Approval
Gate 3 → Validation Approval
Gate 4 → Pilot Build Approval
Gate 5 → Production Launch

*EVT- Engineering Validation Test
*DVT- Design Validation Test
*PVT- Production Validation Test
*MP- Mass Production

My 3D SolidWorks Part/Product Design Experience

Link to the file: Click here

THANK YOU!!!!

Scan the above QR code to get redirected to my LinkedIn profile.

Thank you for going through my detailed technical portfolio. If you have any questions or would like to talk to me, please reach out to me at the number below or the email address provided in my resume. Looking forward to talking with you!

Phone: (617-708-5378).