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Define



Boston Scientific manufactures and markets medical and surgical devices from its 26 manufacturing, distribution and technology centers.

Within the product portfolio at Boston Scientific are: IS-1, Fineline and Heart Failure.

Fineline is the most in-demand product in room B.

As part of the search for manufacturing room space at Boston Scientific, the Fineline manufacturing line is evaluated.

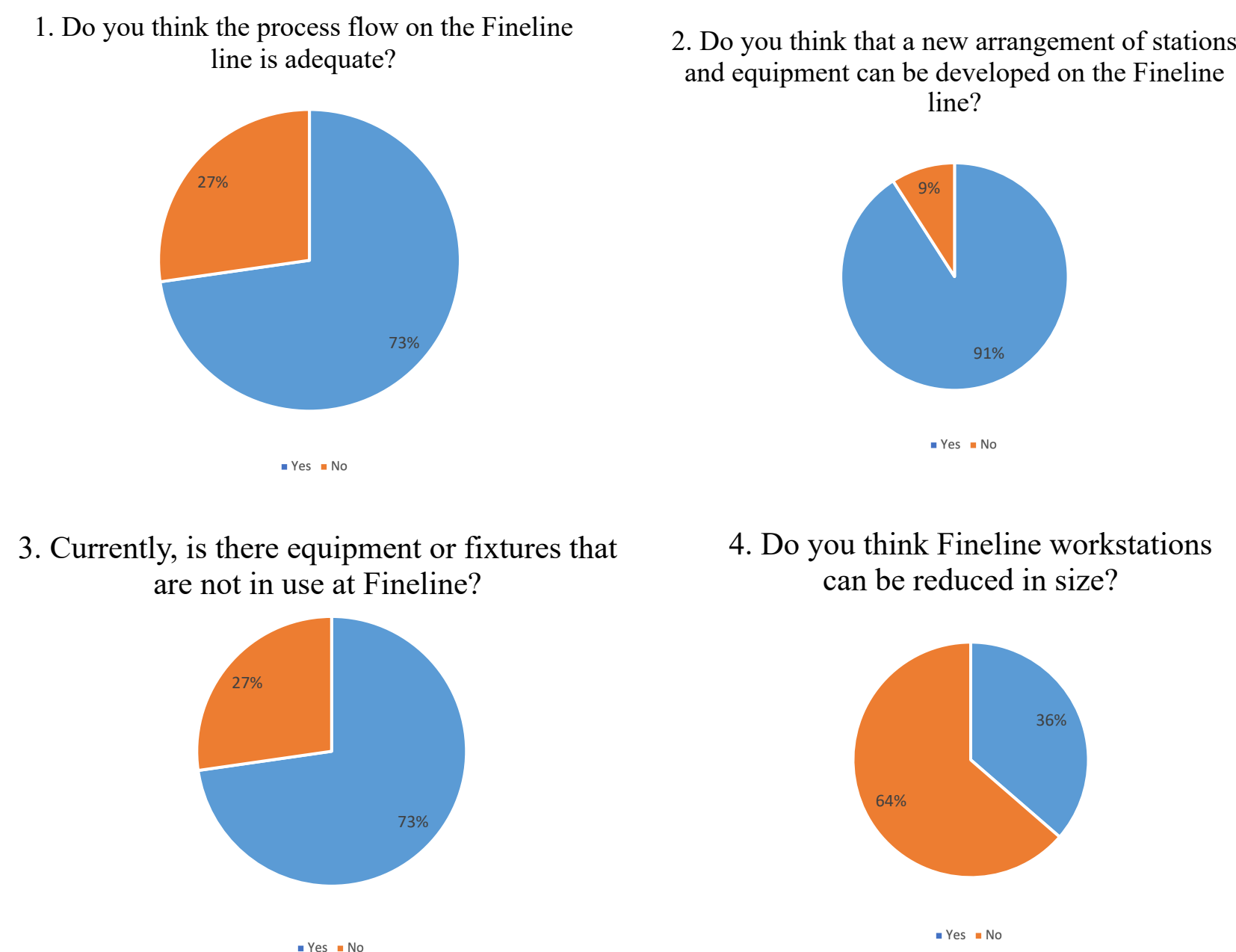
For this, a facility evaluation was required, in terms of equipment, workstations and process flow.

Problem

Problem Statement
The process structure for the Legacy Product are independent manufacturing lines that has similar workstations, equipment, processes, and product builders. The space in Room B is limited and a visual evaluation was performed to identify processes that can be done on the same workstation or equipment. This situation leads into a high cost per feet square (\$300.00).

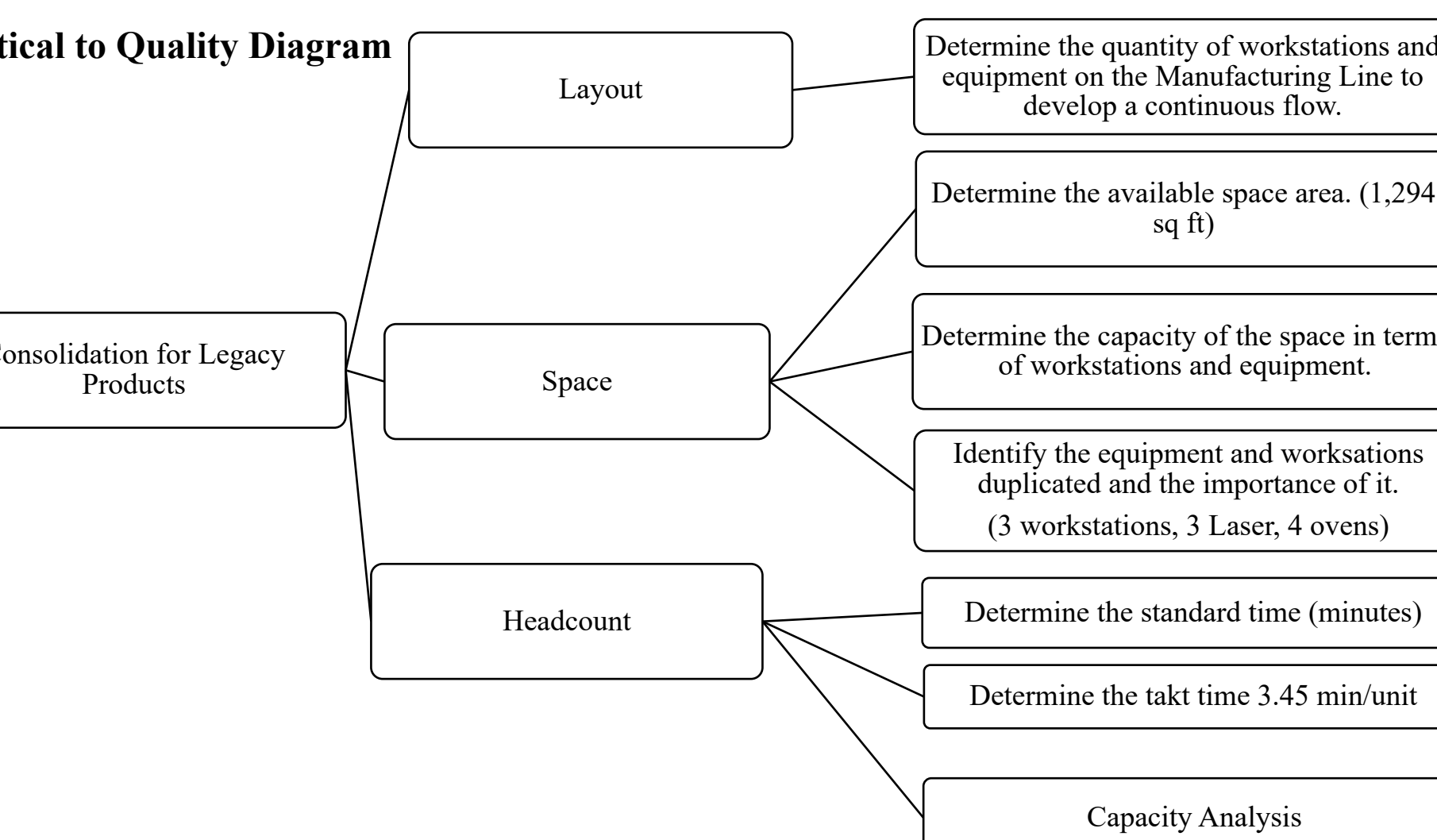
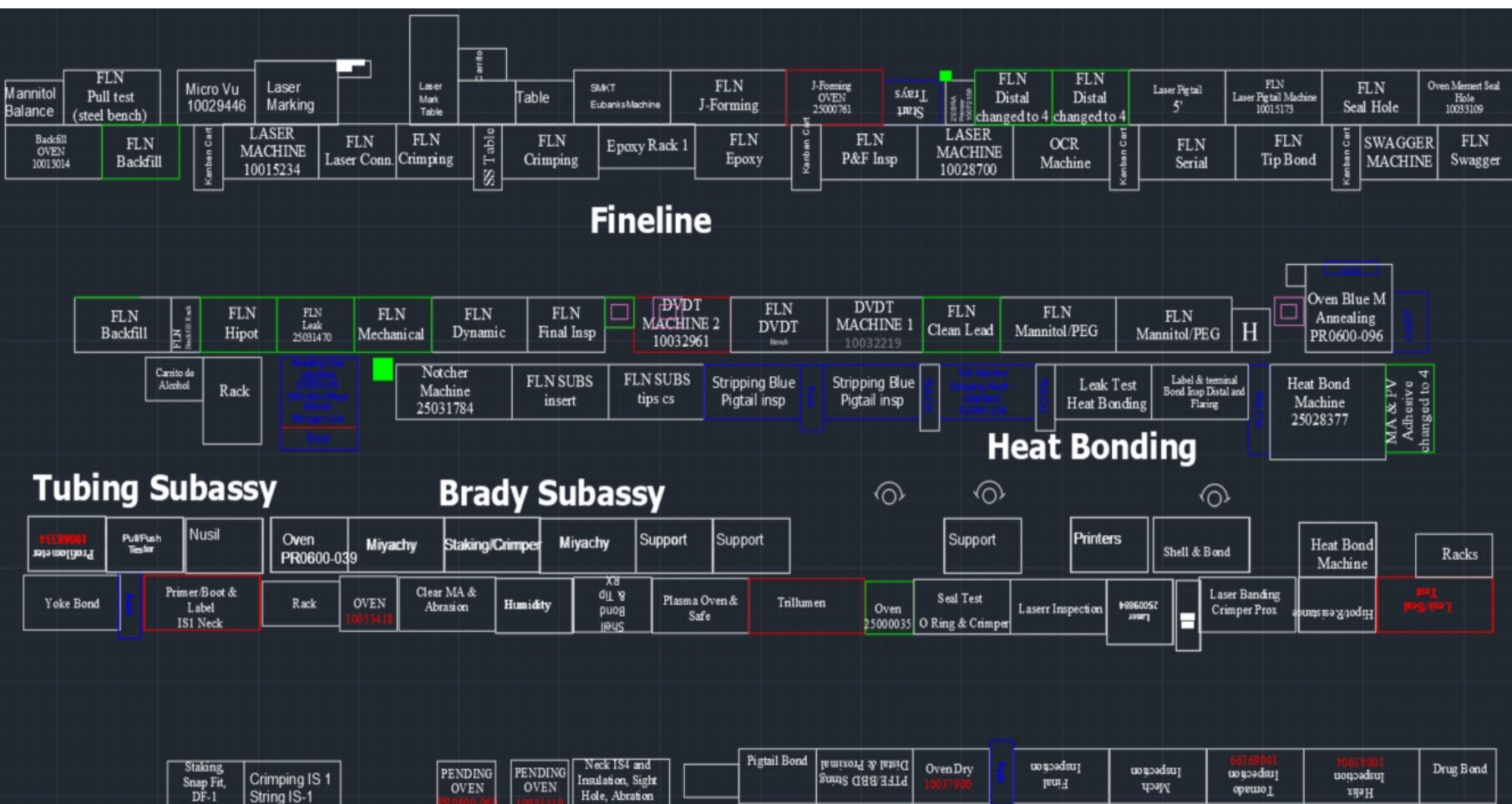
The project scope is to evaluate the Legacy Product Fineline based on the process, product assembly, equipment, overhead, and waste. Consolidating the Manufacturing Line will improve the manufacturing process and the space on Room B, which would represent a 30% reduction of the total cost incurred by Boston Scientific.

Voice of the Customer (VOC)



Actual Layout

The image is a representation of the Room B space using the AutoCAD software. As presented in the image there are multiple workstations that are necessary for the Fineline lead assembly.

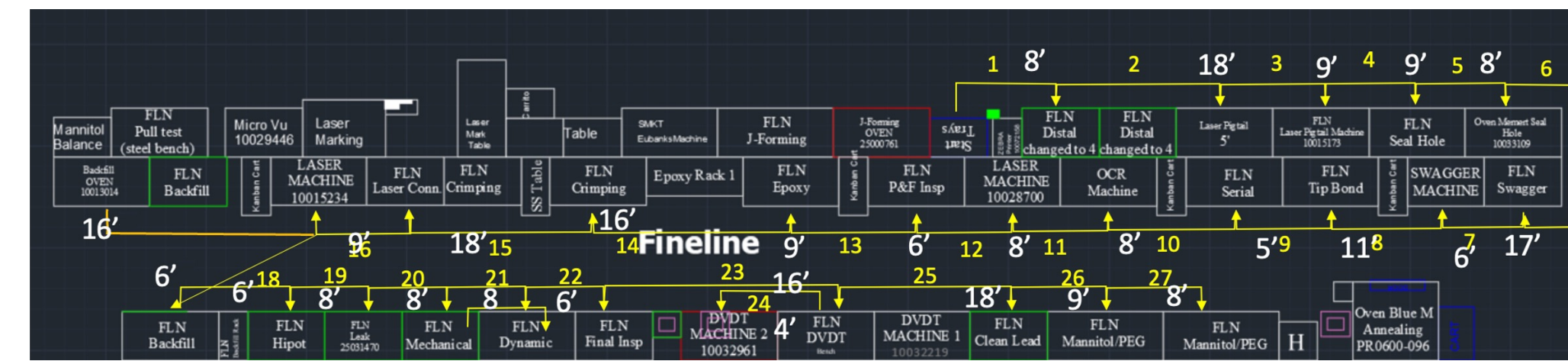


The Critical to Quality Diagram demonstrates that the Consolidation for Legacy Products can be achieved if and evaluation of the Layout, Space and Headcount are analyzed to perform a proposal for the continuous flow in terms of process and equipment use for the manufacturing line.

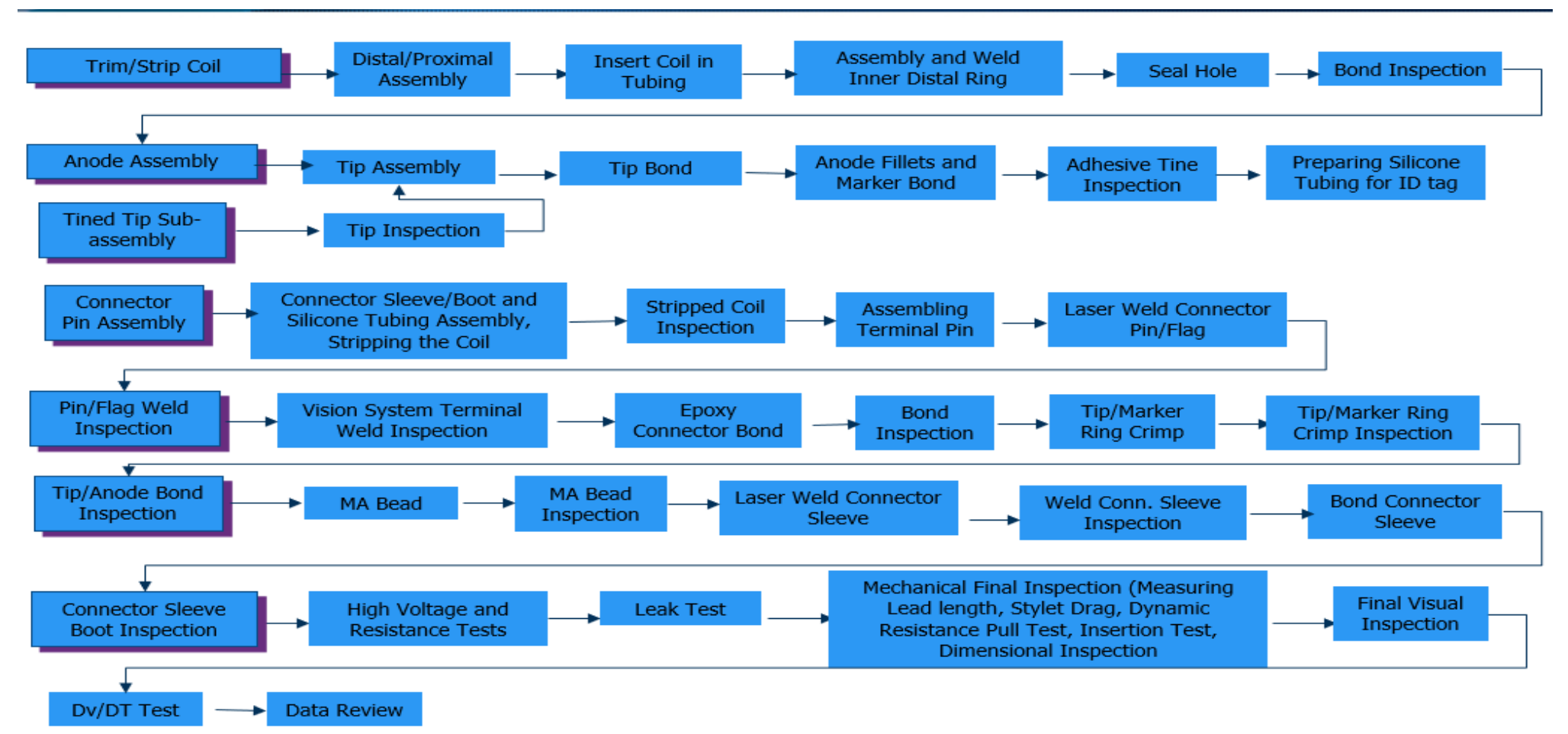
Measure

Measure, is the second phase of the DMAIC. The Fineline daily demand is 110 units, and the Headcount is 17 Product Builders. In this phase an evaluation of the process flow, time study, quantity of workstations and equipment is performed. As part of the Measure phase, a spaghetti diagram was conducted as a tool to measure the quantity of steps and the flow of the product builder through the line.

Spaghetti Diagram



Process Flow



The process flow was conducted to have a better understanding of the required processes for the Fineline Product Assembly. The Fineline Manufacturing Line has 28 workstations and 8 equipment as Laser Equipment, Oven Equipment and Pull Tester Equipment. The Room Space of Fineline is 1,294 square feet. The total steps of walking for and operator at the manufacturing line is: 227 feet. Some of these workstations are duplicated and equipment as well. Some of the duplicated workstations are FLN Distal, FLN Crimping, FLN Backfill. The duplicated equipment is FLN Laser Pigtail Machine, Laser Machine 10015234, Laser Machine 10028700 and Pull Tester.

Equipment

Product Line	Equipment	Oven Temperature
Fineline	Oven Memert Seal Hole	50-130 °C + 5
Fineline	Oven Memert J Form	50-130 °C + 5
Fineline	Oven Memert Backfill	50-130 °C + 5
Fineline	Oven Blue M Annealing	50-130 °C + 5

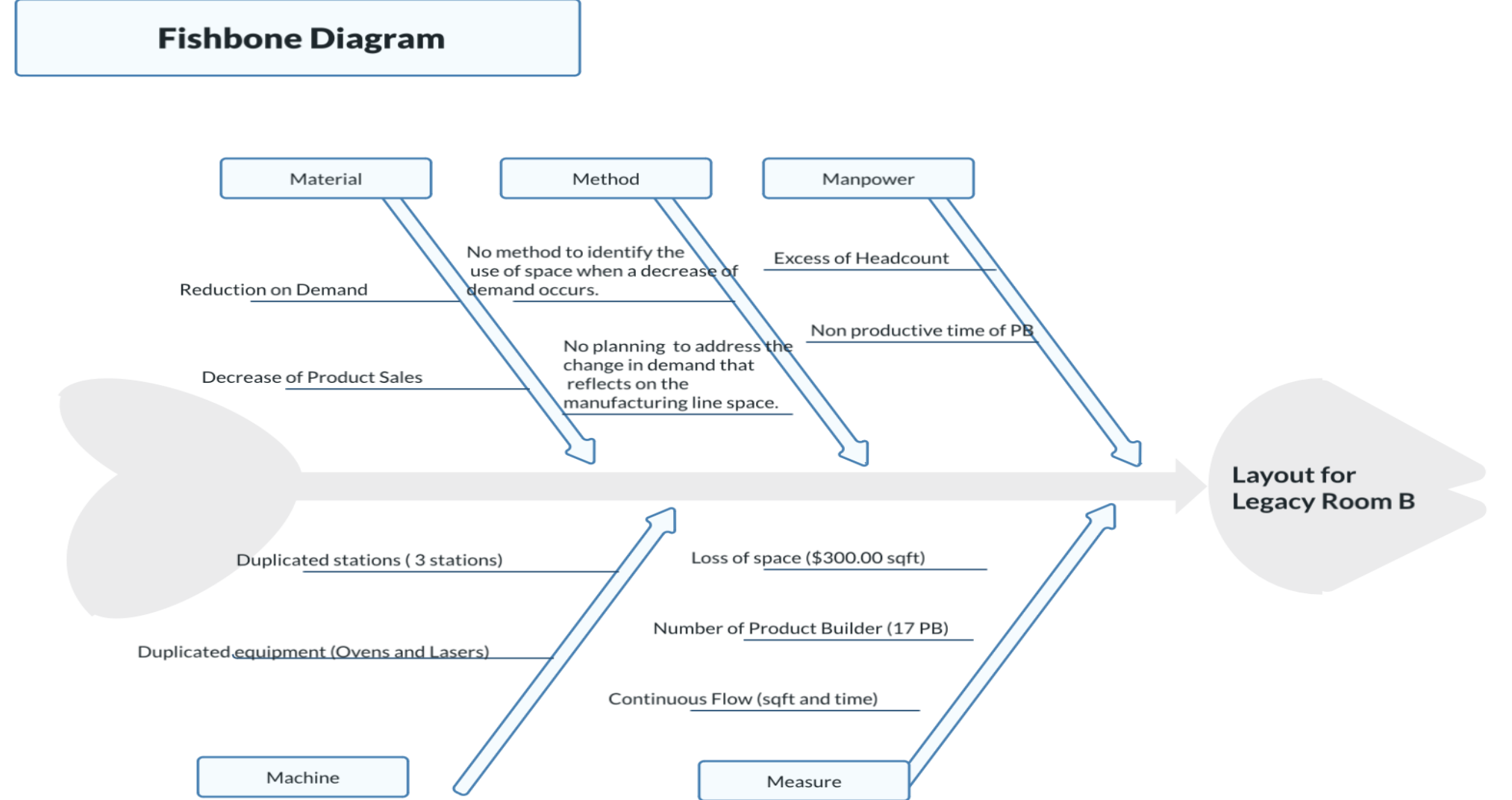
Time Study

Process	Time (min)	Westinghouse (Normal Time minutes)	Comman (Std. Time minutes)
Start	4.36	5.89	5.25
Assembly and Weld Distal Ring	7.18	9.69	8.65
Swaging	6.05	8.17	7.29
Tip Assembly, Tip Bond	12.38	16.71	14.92
Preparing Silicone Tubing for ID tag	9.38	12.66	11.30
Connector Pin Assembly	7.68	10.37	9.25
Laser Weld Connector	4.39	5.93	5.29
Pin/Flag Weld Inspection	2.56	3.46	3.08
Epoxy	5.2	7.02	6.27
Laser Weld	0.76	1.03	0.92
Mechanical Test and Dynamic	6.57	8.87	7.92
DV/DT	3.6	4.86	4.34
Data Review	2.15	2.90	2.59
Crimping and Tip Bond Inspection	14	18.90	16.87
Clean	7.87	10.62	9.48
Inspection Backfill	4.75	6.41	5.72
Sub Assembly	7.82	10.56	9.42
Hipot	2.95	3.98	3.55
Leak Test	5.33	7.20	6.42
Backfill	6.56	8.86	7.90
PEG	11.47	15.48	13.82
Final Inspection	7.72	10.42	9.30

With the Westinghouse method, the skill method was determined considering the four (4) factors when evaluating the operator's performance. The factors were: ability, effort, conditions, and consistency, from which we were able to determine the performance factor (1.35%).

The Comman Method is used to determine the compensations of the process performed by the product builders in terms of temperature, humidity, noise, position, visual demand, and other factors needed to calculate the Standard Time.

Analyze



The fishbone diagram reflects different causes for the Layout at Room B. The Material Cause reflects that due to the demand reduction, less material will be required to produce the leads, therefore less inventory of material at the storage and supermarket area. Also, the decrease of product sales demonstrates that the capacity in terms of space, is not required. The Method cause reflects that there is no method used to identify how an impact on the demand can affect the space (workstations, equipment, labor). The Manpower cause, deliver the question about the nonproductive time if there is a reduction on the product demand. In terms of Machine, during the Measure phase it was identified same equipment and workstations. Related to the Measure cause, this reflects the daily loss of money related to space consumption, number of PB that may be relocated on other manufacturing line and the continuous flow of the process with a re-layout.

Value of the Area per Workstation

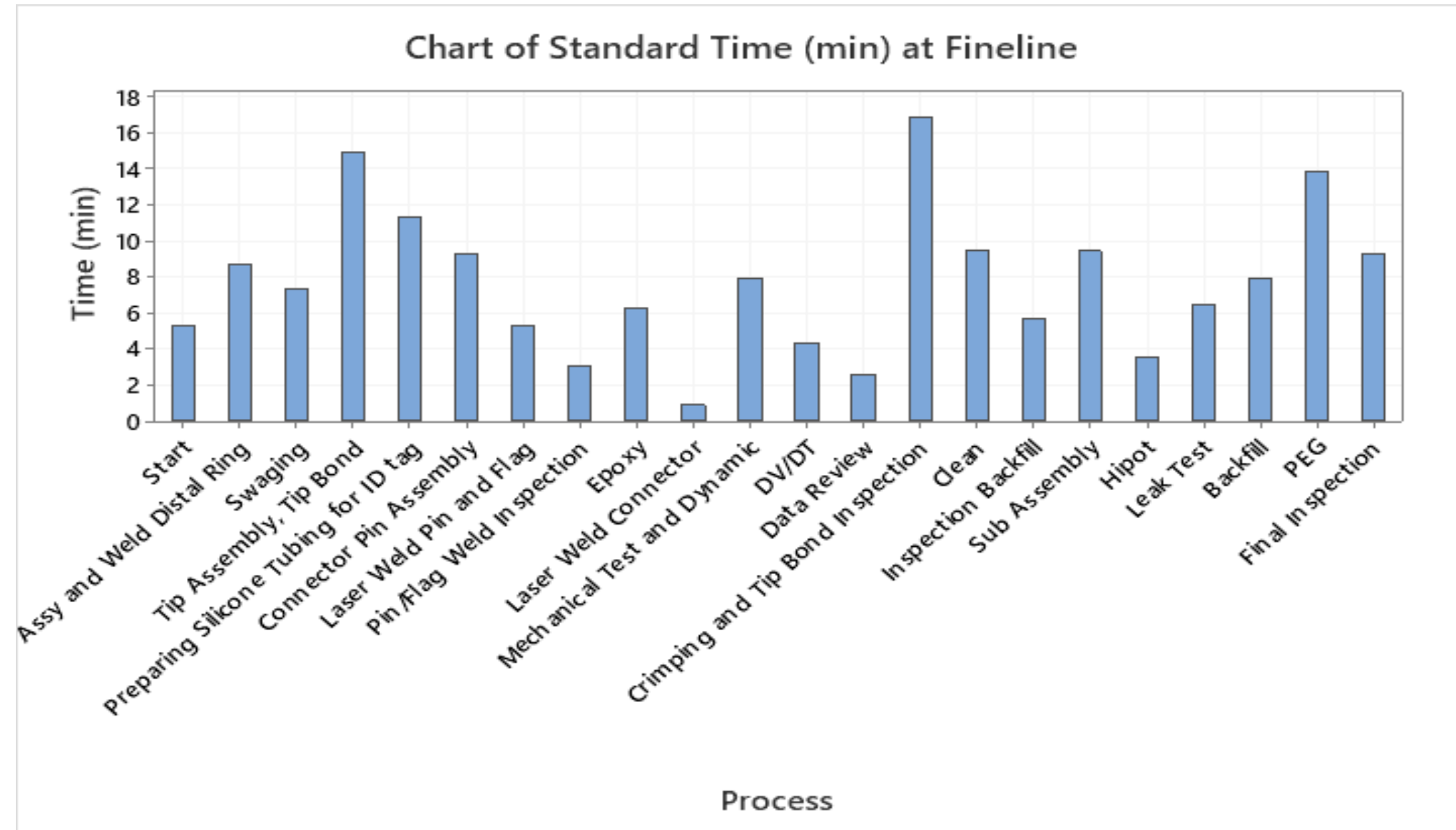
Workstation	Area (square feet)	Value of the Space(\$300.00 sqft)
J-shape	14.92	\$4,477.47
FLN DISTAL	10.00	\$3,000.00
Epoxy Rack	9.91	\$2971.83
FLN Crimping	12.45	\$3,735.93
FLN Backfill	12.50	\$3,750.00

At the Fineline manufacturing line the FLN Distal, FLN Crimping and FLN Backfill workstations are duplicated. As the demand data demonstrated these stations were considered when a high volume of Fineline was required. Therefore, a proposal with an elimination of this workstations in order to maximize space. If the previous workstations were eliminated the available area will be 59.7841 square feet and the saving in space will be \$17,935.

Value of the Area per Equipment

Equipment	Area (square feet)	Value of the Space (\$300.00 sqft)
LASER Pigtail	12.50	\$3,750.00
LASER Pin and Flag	12.50	\$3,750.00
LASER Connector	12.50	\$3,750.00
DV/DT	12.50	\$3,750.00
Blue Oven Anneal	17.00	\$5,100.00
Blue Oven Anneal	18.00	\$5,400.00
Blue Oven Anneal	18.00	\$5,400.00
Seal Hole Oven	12.50	\$3,750.00
J-shape Oven	12.48	\$3,745.32
Backfill Oven	12.50	\$3,750.00

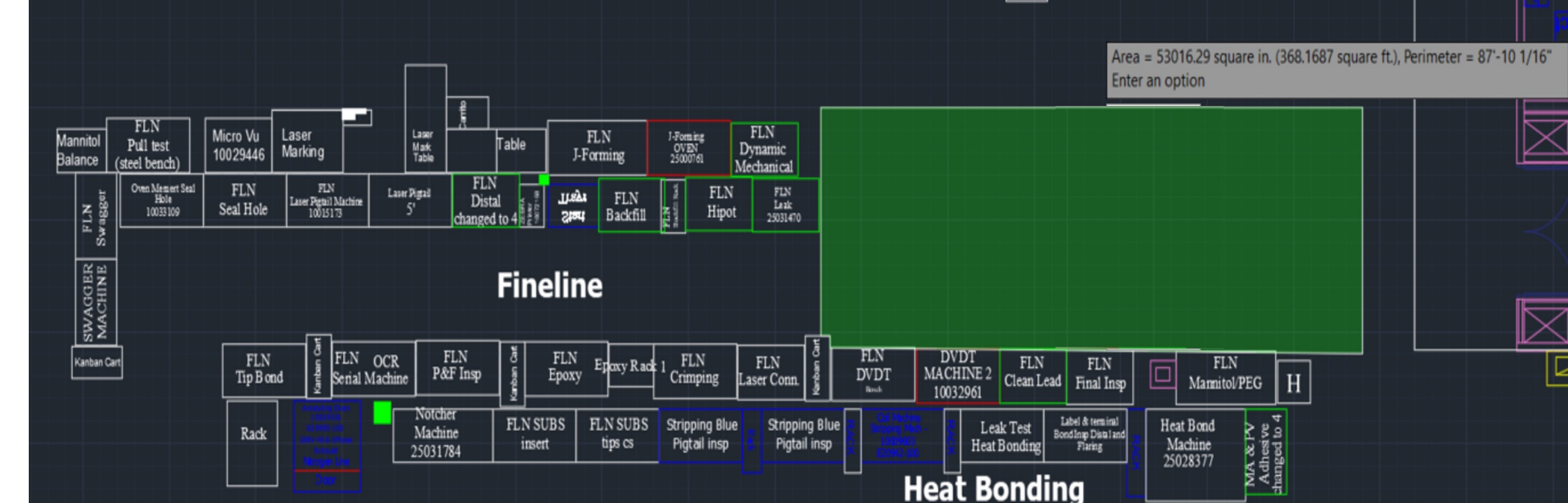
If the Laser Pigtail and Laser Pin and Flag processes were consolidated the reduction on space will be 12.50 square feet. As per the assessment, the dV/dT Equipment is not operating due to malfunction and the manufacturing line works with another dV/dT equipment. If the dV/dT is removed from the controlled room, the available space will be 12.50 square feet. If a consolidation of the Blue Oven Anneal occurs, the available space will be 36.0 square feet and the saving will be \$10,800. On the other hand, if the Seal Hole Oven and Backfill Oven are consolidated, the available space will be 24.00 square feet and the saving \$7,500. The total value in terms of space that the workstation and equipment occupy, is \$54,680.32.



The graph demonstrate the standard time for the processes at Fineline Manufacturing Line. The process with the higher standard time is the crimping and tip bond inspection. Also, the process with the lowest standard time is the Laser Weld Connector.

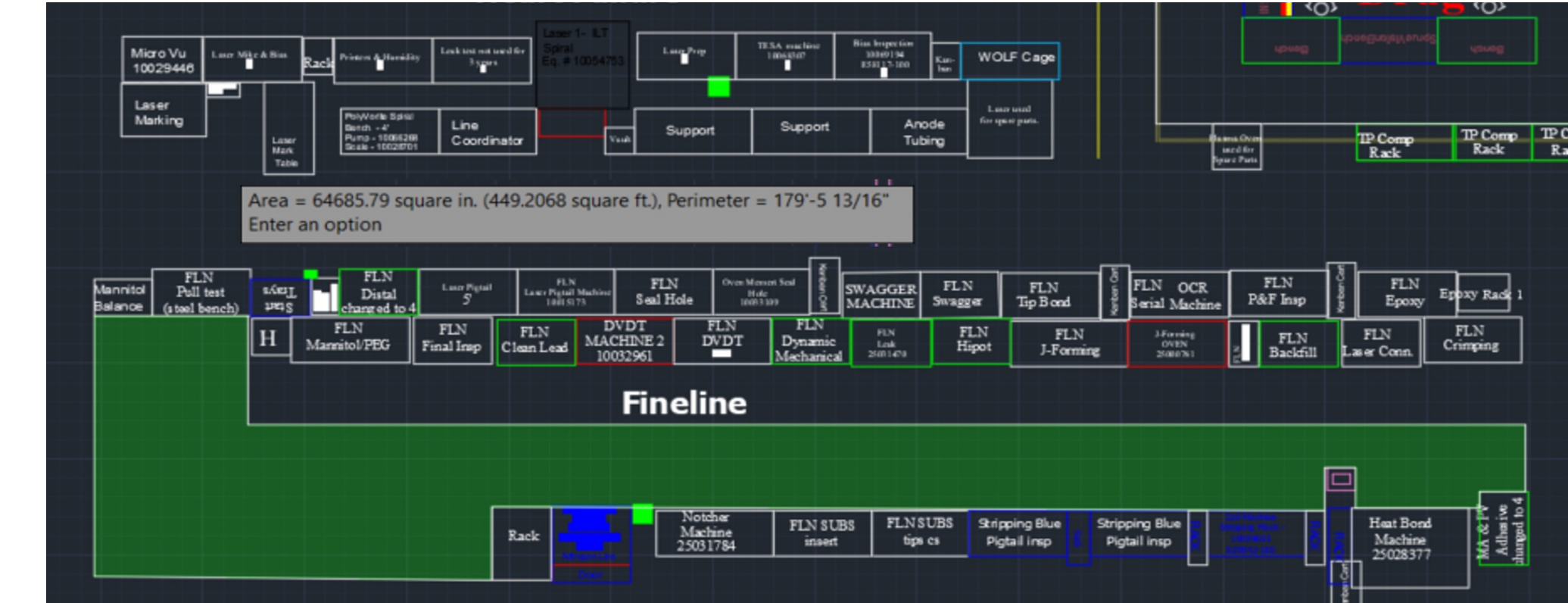
Improve

Layout 1



After the assessment of the workstations and equipment it was determine that a consolidation can be proposed. The available space resulting from the first layout is approximately 369 square ft. The total area multiplied by \$300.00 results in \$110,700 on savings. This re layout contemplates the relocation of workstations and the consolidation for the Laser Process, and the backfill oven with the seal hole oven. In Room B, there are 3 blue Ovens, and the proposal is to operate with one (1) Blue Oven. Also, the FLN distal, FLN Crimping, FLN Backfill, FLN Mannitol PEG and FLN dV/dT are proposed to be eliminated of the area due to duplication of workstations. The FLN Serial, OCR, FLN Dynamic and Mechanical are proposed to be consolidated because the same PB perform the two processes and there is available space on the workstation to merge the tools used to perform these processes.

Layout 2



On the above figure the proposed layout will be 449.21 square ft of free space. This layout needs additional resources since the layout contemplates the movement of equipment from Heart Failure Manufacturing Line.

Payback Period

	Layout 1	Layout 2
Implementation (Management Resources)	\$10,000	\$30,000
Equipment	\$10,000	\$15,000
Construction Resources	\$15,000	\$20,000
Savings	\$110,700	\$134,700
Total Cost	\$35,000	\$65,000
Payback Period	3.79 months	5.79 months

The first layout has a lower Payback period (3.79 months) than the second layout. This is since the first layout is focused on the arrangement and consolidation of workstation on the Fineline manufacturing line. The second layout, involve two products Heart Failure and Fineline, therefore the effort in terms of human resources and expenses on materials as workstations and new equipment makes the payback period higher (5.79 months). It is recommended that the second layout will be considered due to the 449 square feet of available space. The time implementation will be longer, and a higher investment (65,000) is required, nevertheless this layout brings a space to introduce a new assembly on the manufacturing line.

Control

As part of the Control phase for the project, a form for assessment after a decrease on demand is seen, will be developed. In this way, when the decrease on demand is noted, the management will have the tool to evaluate and determine if a reduction of workstations or equipment is necessary. As per the evaluation, it will provide information to continue the improvement and the development to transfer or build new products.

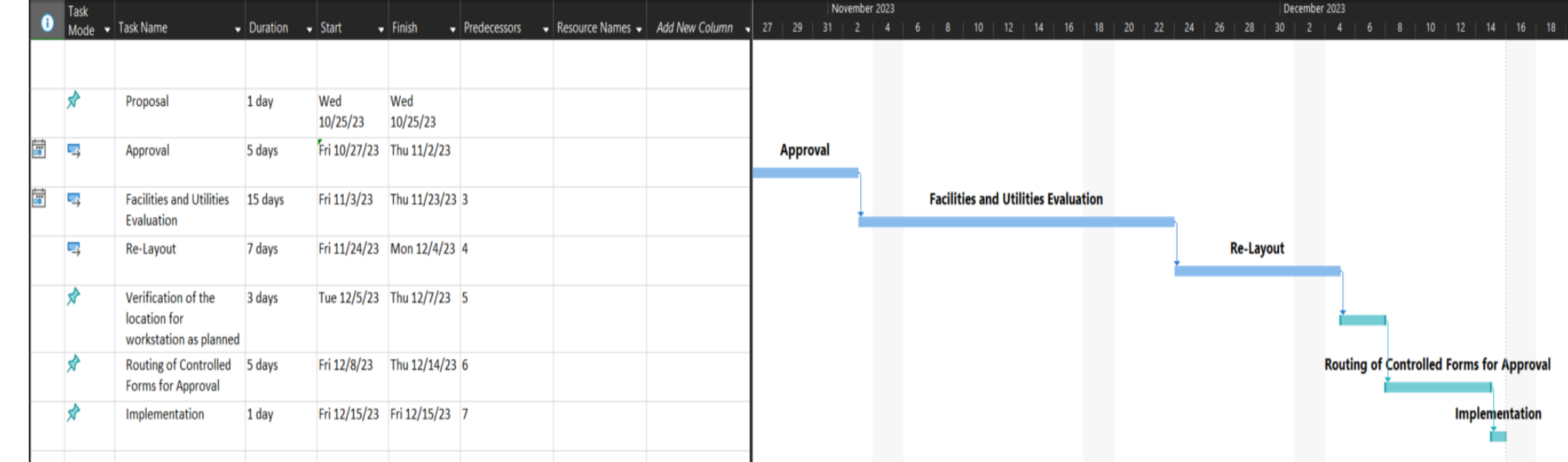
Evaluation Form for Projects based on Annual Demand (Form XXXXX)

The purpose of this form is to evaluate the space on a Controlled Room based on the space occupied by the workstations and equipments.

Requirement	Data
1. Actual Demand	
2. Projected Demand	
3. Actual Number of workstations	
4. Actual number of Equipment	
5. The projected demand is less than de 30% of the actual demand?	
6. If the answer for question 5 is yes, please conduct an assessment and identify is the workstations and equipments can be consolidated.	

Performed by: (Industrial Engineer):
Verified by: (Industrial Engineer):
Approved by (Industrial Engineer Manager and Manufacturing Manager):

Gantt Chart



As per the Gantt Chart, the duration of the approval and implementation of the Re-Layout is approximately six (6) weeks.