Re-Layout of Shipping and Pre-Inspect Departments

OWNER:
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PROJECT LEADER:
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TEAM MEMBERS:
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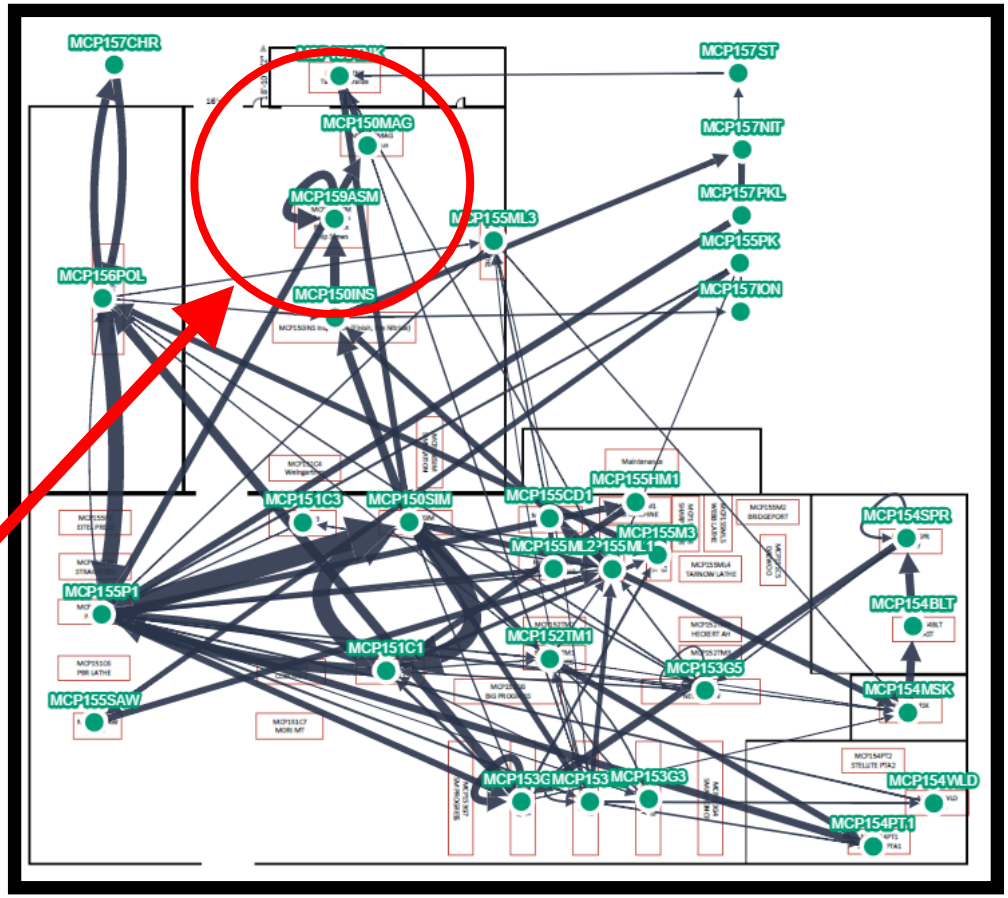
Overview of the Project

Karen's project ***Re-Layout of Shipping and Pre-Inspect Departments*** will initiate the implementation of the future factory layout because it will:

1. Move Pre-Inspect into the warehouse.
2. Locate the Yellow Straightener opposite the Weingartner to form a partial cell.

The floor space that will be freed up in this department could be used to (1) accommodate at least two Grinders (to complement Polishing and Welding) and (2) (in the future) hold WIP carts for the Polishing department when Welding is located next to Polishing.



Project - OGSM

Objective	Goals	Strategies	Measures
Re-layout the Shipping department (including Re-location of Pre-Inspection department)	**Improve the Pre-Inspection process by reducing steps** **Reduce Lead Times for Pre-Inspection by ≈ 1 week** **Implement a series of near-term layout improvements throughout the factory that are contingent on freeing up floor space in the Shipping and Final Inspection departments**	Re-locate Pre-Inspection to the warehouse Implement a new layout for Pre-Inspection to include a dedicated Simulation table, Neutralizing tank and Magnaflux station Execute 5S zoning projects in the Shipping and Final Inspection departments to consolidate or free up floor space needed to initiate the near-term layout improvements throughout the factory Move Shipping to location of current Pre-inspection department Move Finish Inspection to location of current Shipping department	Lead time reduction for Pre-Inspection process > 5 days. Potential number of additional quoted Rebuilds > 18 FTE freed up for factory wide support activities = 1 Potential labor hours from non Pre-Inspection operators that can be repurposed > 1000 hours

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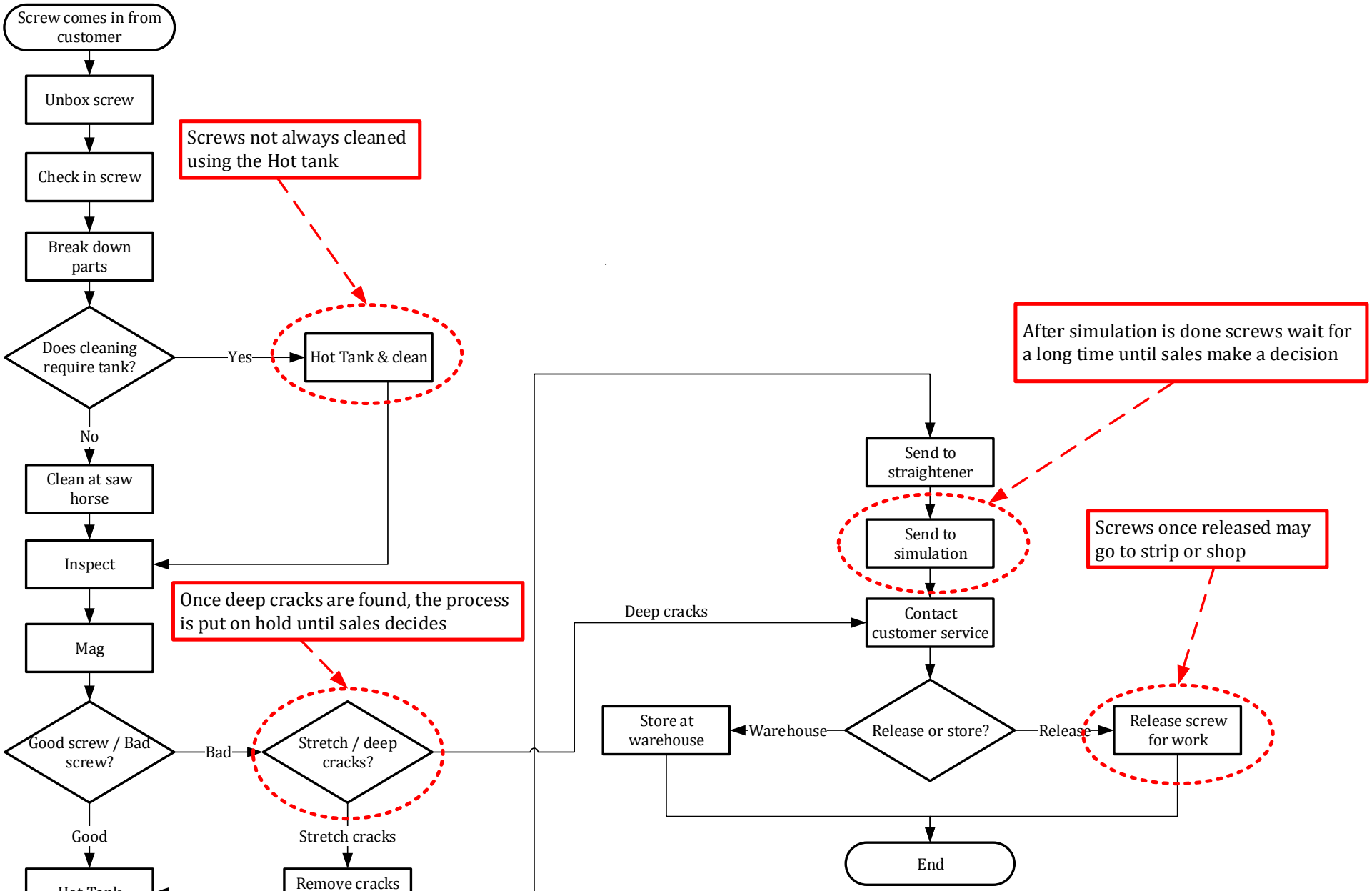
Process Flow Chart: Pre-Inspection



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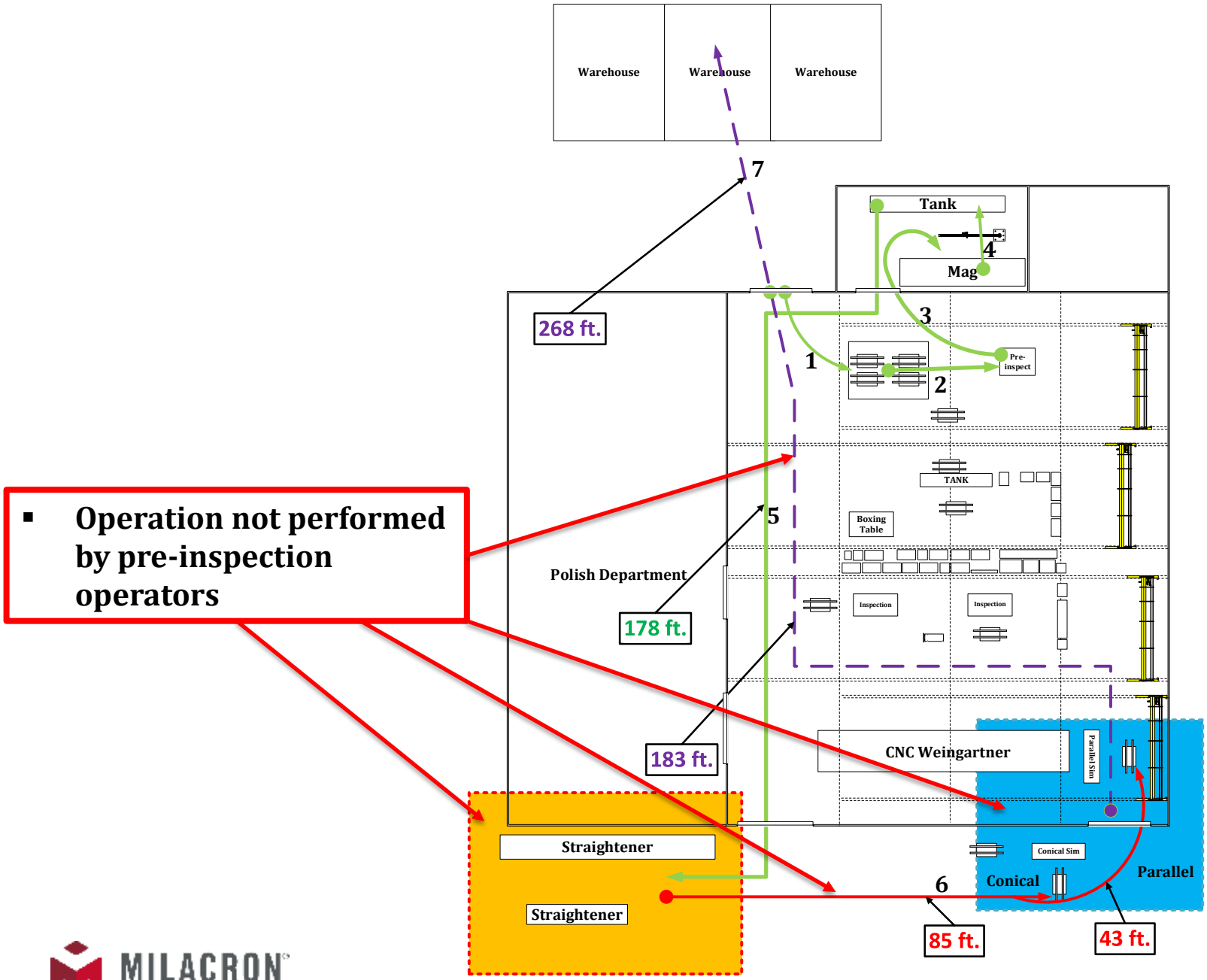
Current State – Operator Usage

- **Operation not performed by pre-inspection operators**



Current State (contd.)

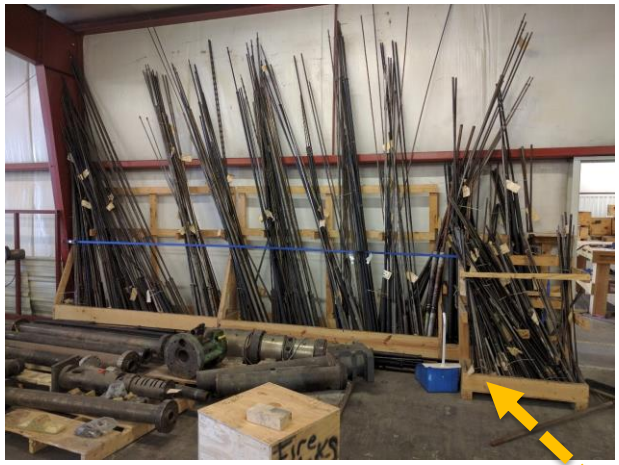
- 3 operators from pre-inspect, 1 operator from straightener & 1 operator from simulation utilized to complete the process

Large number of screws & barrels wait at the WIP saw horses next to pre-inspection; consumes huge floor space (approx. 18*13 sq.ft.)

Barrels checked in 1/9/2016 still in WIP

Current State (contd.)

- Pre-inspected screws wait at the saw horses next to simulation stations & Weingartner until sales department gets a quote on it
- Screws waiting on quote consumes space & obstructs the flow of other products through the simulation station
- Scrapped screws will be taken out of the main facility to the dumpster; of the screws quoted for release, a portion goes to “Strip (an outside operation)”, hence preferable to place pre-inspected screws at the warehouse until quoted
- Stripped oil tubes & parts are currently placed in the warehouse



Pre-inspected screws waiting at Simulation saw horse

Oil tubes of stripped pre-inspect screws stored at warehouse

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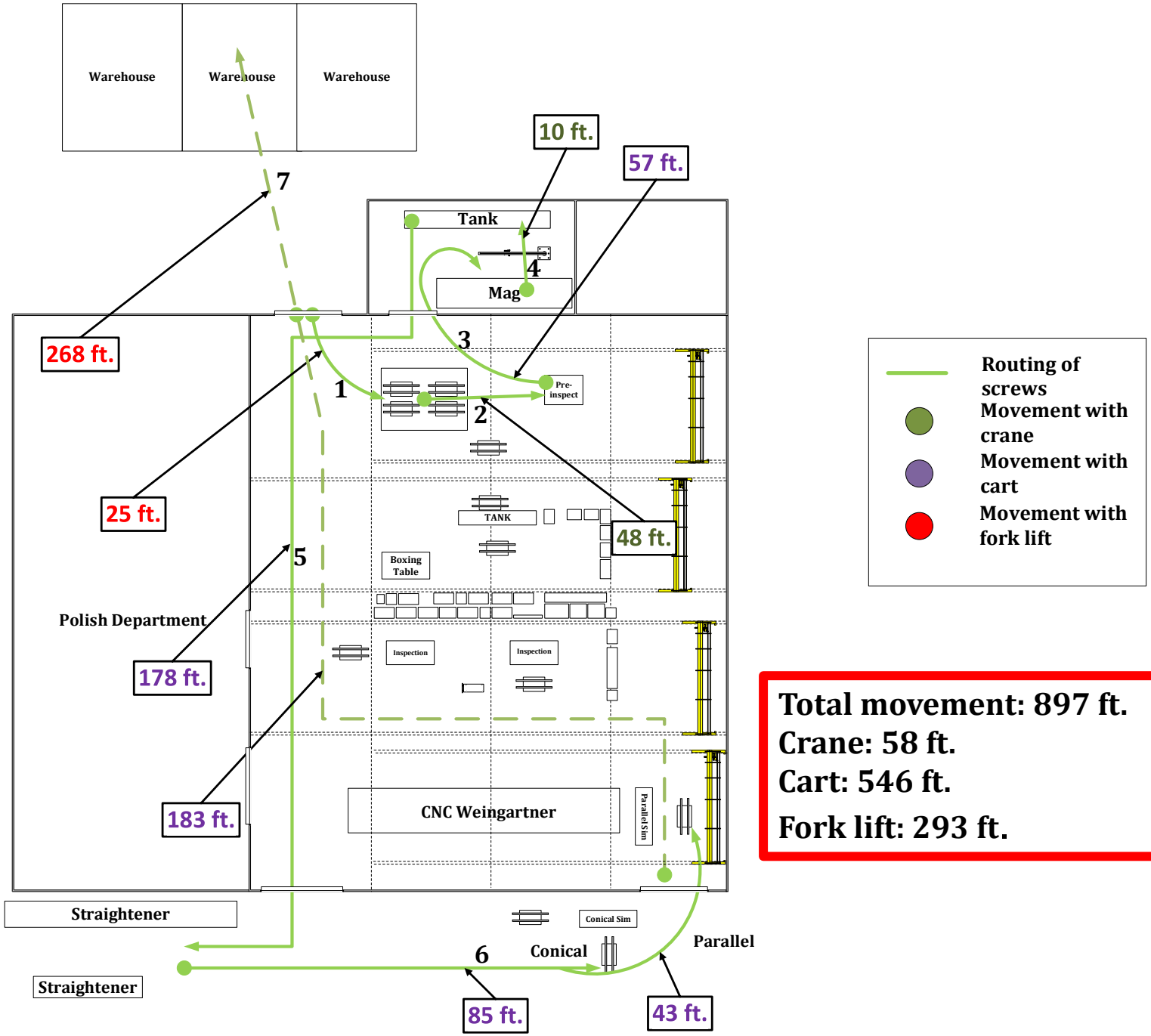
Current State (contd.)



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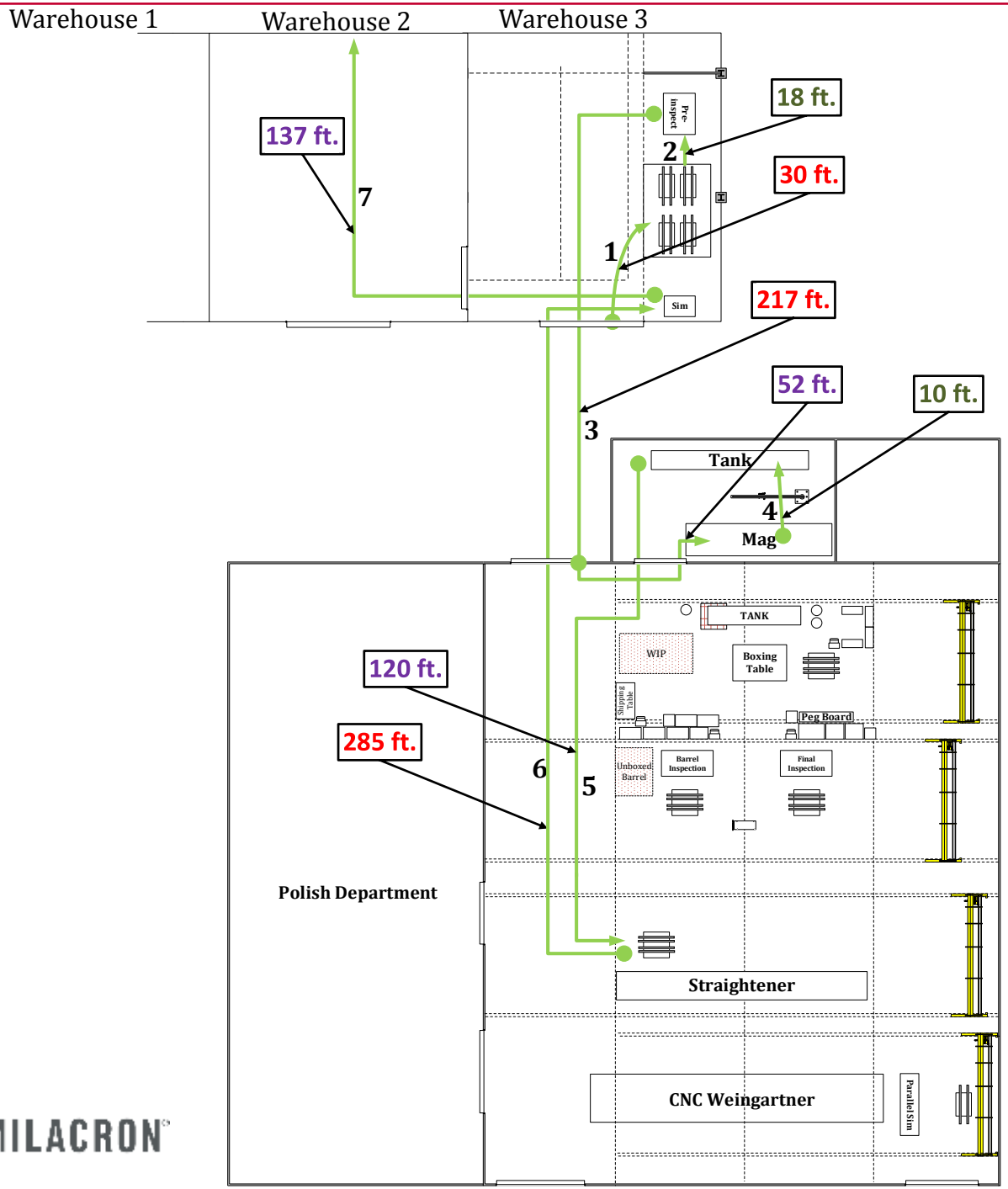
Intermediate State

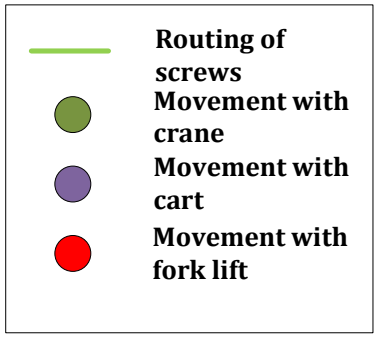
- Pre-inspection table & work-in-process saw horses will be moved to the warehouse
- Pre-inspection operators can be crossed trained for performing simulation
- A-frame hoist available can be used temporarily for lifting screws

Warehouse space available for Pre-inspection

Temporary A-frame hoist

Intermediate State (contd.)





Total movement: 869 ft.
Crane: 28 ft.
Cart: 309 ft.
Fork lift: 532 ft.

Savings from
current state: 28 ft. per screw set
% savings: 3.12% per screw set

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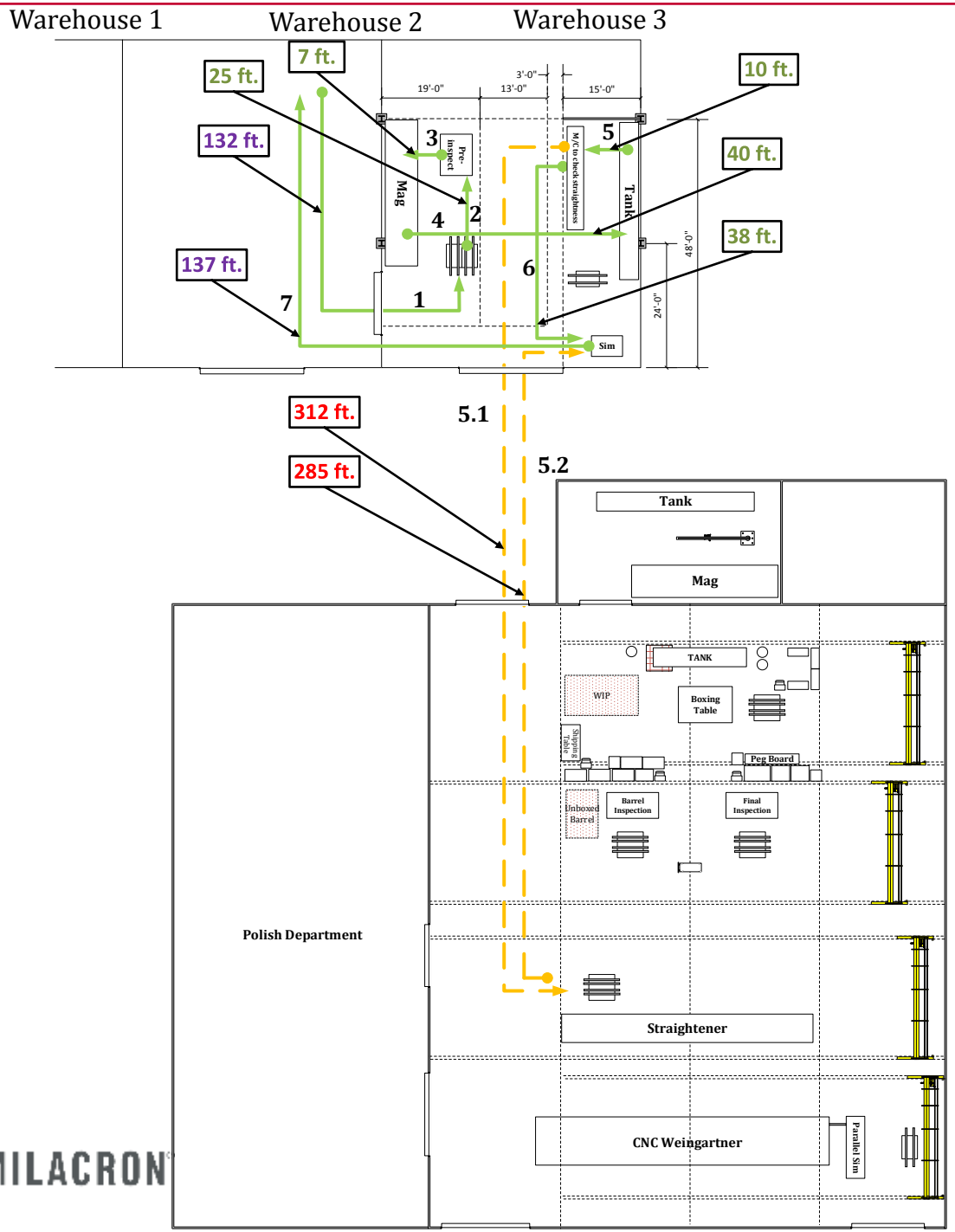
Future State

- Pre-inspection & all its components will be shifted to the warehouse
- Requires duplicating or moving the Magnaflux & tank
- Based on operators, 70% of pre-inspect screws are straight & is not necessary to be pressed
- The available polishing machine at warehouse can be repurposed to check the straightness of the pre-inspected screws at the warehouse
- Only the screws that need to be pressed will be required to enter the main facility (30%)
- Screws coming in from customers & waiting on sales can be stored at the warehouse
- Office space available at warehouse can be used to bring sales close to pre-inspection
- Pre-inspect value stream will be restricted to the warehouse until rework / rebuild quote is issued
- Moving pre-inspection opens up floor space in the main facility for machine movements & layout improvements

Future State (contd.)



Routing of screws
Movement with crane
Movement with cart
Movement with fork lift

Total movement: 557 ft.
Crane: 109 ft.
Cart: 269 ft.
Fork lift: 179 ft.

Savings from
current state: 340 ft. per screw set
% savings: 38% per screw set

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Why the Re-location is Beneficial

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Cost – Benefit Analysis

Month	Number of sets received for Pre-inspection
March	57
April	64
May	45

3 sets per day

- Average number of sets of screws checked in per day for Pre-inspection: 3 sets

- Average time taken for Straightening operation : 20 mins per set
- Time taken for moving a set from Straightener to Simulation : 5 mins

  Total time invested by Straightener operator
  = 20*3 + 5*3
  = 75 mins per day
  = 1.25 hours a day

  Total time invested by Straightener operator for a year = 313 hours a year

- Average time taken for Simulation operation : 60 mins per set

  Total time invested by Simulation operator
  = 60*3
  = 180 mins per day
  = 3 hours

  Total time invested by Simulation operator for a year = 750 hours a year

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Cost – Benefit Analysis (contd.)

- Based on Theory of Constraints we will use the time savings on Simulation to calculate the potential increase in throughput for New, Rebuild and Coatings

Time taken by Sim per new set	Sim hours per set (Assuming 6 steps per set)	Additional sets that could be processed by Sim in a year
Min-CT: 1 hour	1*6 = 6	125
Max-CT: 2.5 hour	2.5*6 = 15	50

- Assuming that polishing can only complete a percentage of the extra screws that Simulation completes (10-50%), then the potential number of additional screws that can be shipped in a year are shown below:

	10%	20%	30%	40%	50%
With Min-CT for Sim	13	25	38	50	63
With Max-CT for Sim	5	10	15	20	25

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Potential Revenue Earnings from New, Rebuild, Coating

- Hours that Straightener and Simulation operators done on Pre-inspect work could be re-allocated to work on New, Rebuilds and Coatings screws.

	Average price	Percentage of Simulation output that can be processed by Polishing									
		10%		20%		30%		40%		50%	
		Min-CT	Max-CT	Min-CT	Max-CT	Min-CT	Max-CT	Min-CT	Max-CT	Min-CT	Max-CT
New	**$ 30K**	$ 375K	$ 150K	$ 750K	$ 300K	$ 1125K	$ 450K	$ 1500K	$ 600K	$ 1875K	$ 750K
Rebuild	**$ 20K**	$ 250K	$ 100K	$ 500K	$ 200K	$ 750 K	$ 300K	$ 1000K	$ 400K	$ 1250K	$ 500K
Coating	**$ 10K**	$ 125K	$ 50K	$ 250K	$ 100K	$ 375K	$ 150K	$ 500K	$ 200K	$ 625K	$ 250K

Potential Revenue Earnings from Rebuild

Considering Pre-inspection moved to warehouse:

- Reduction in material handling distance from current state = 340 ft per set
- Assuming time consumed for loaded travel = *0.06 min/ft
- Time saved by material handling distance = 20 mins per set
- Average number of sets done in a day = 3 sets per day
- Average number of sets done in a year = 3*250 = 750 sets
- Total material handling time saved per year = 750*20

= 15,000 mins

= 250 hours

* 0.06 min/ft was calculated based on time study

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Potential Revenue Earnings from Rebuild (contd.)

- Time taken for Pre-inspection operation:

Activity	Process Time without grinding at Mag	Process Time with grinding at Mag
Break down	30	30
Inspection	75	75
Mag	**20**	**60**
Tank	10	10
Straightener	20	20
Simulate	60	60
Material Handling	33 (557ft*0.06 min/ft)	33 (557ft*0.06 min/ft)
Total	**250 min**	**290 min**

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Potential Revenue Earnings from Rebuild (contd.)

- Number of additional Rebuilds that can be done by the operators using the **15,000 mins** of material handling time saved:

	Process Time without grinding at Mag	Process Time with grinding at Mag
Additional Pre-inspect sets	60 (15000/250)	52 (15000/290)
Ratio of Rebuilds Quoted	1/3	1/3
Quoted Rebuilds	20 (60/3)	18 (52/3)
Potential revenue from additional Rebuilds	**$ 400,000 (20*20000)**	**$ 360,000 (18*20000)**

Lead Time Reduction for Pre-inspect Process

	S.No of screw	Check-in at Pre-inspection	Straightener operation	Number of days between Check-in & Straightening
1	12102	5/10/2016	5/16/2016	6
2	12581	5/27/2016	6/2/2016	6
3	12394	5/18/2016	5/23/2016	5
4	WT-4849	6/1/2016	6/6/2016	5
5	12746	6/4/2016	6/6/2016	2
6	W-0260	5/19/2016	5/27/2016	8
7	WT-3313	5/27/2016	6/2/2016	6
8	12605	6/4/2016	6/9/2016	5
9	12458	6/4/2016	6/8/2016	4
10	WT-4038	6/4/2016	6/8/2016	4
11	WT-4925	6/4/2016	6/10/2016	6
12	WT-4948	6/4/2016	6/9/2016	5
13	WT-3810	6/6/2016	6/10/2016	4
14	3698	5/27/2016	6/10/2016	14
15	WT-4628	6/3/2016	6/10/2016	7
			AVERAGE:	**5.8**

- Based on the current state, a checked-in Pre-inspected screw takes on average **6 days** to complete up to the Straightening operation

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Lead Time Reduction for Pre-inspect Process (contd.)

Number of sets that can be processed per day based on future layout:

Assuming 2 full time operators:

- Available time per day = 2*8 = 16 hours = 960 mins
- Maximum time taken to process a Pre-inspect screw = 290 mins
- Number of Pre-inspected sets that can be completed per day = 960/290
  = **3 sets per day**

Assuming 3 full time operators:

- Number of Pre-inspected sets that can be completed per day = 1440/290
  = **4 sets per day**

In the current state, a checked-in Pre-inspect screw takes at least 6 days to complete up to Straightening operation (without considering the time taken to complete Simulation**).**

Hence moving Pre-inspection to warehouse would bring about a minimum Lead Time reduction for Pre-inspect process by 5 days.

Potential Crew Reduction for Pre-Inspection

- Two dedicated full time operators can process 3 sets of Pre-inspect screws per day
- Assuming 3 sets per day is sufficient throughput, the third operator can be potentially re-assigned as a floater between Pre-inspection and other operations (logistics & shipping)

Shift hours for 1 operator = 8 hours per day

= 2000 hours per year

Floater work hours that could be re-purposed for a variety of manufacturing support activities

Other Potential Benefits from Factory Layout Changes

If Pre-Inspection is moved

Floor space consumed by Pre-inspection will be freed up, which will help to make major factory layout improvements without significant investment

- Boxing can be moved to current Pre-inspection location
- Final & Barrel inspection can be moved to Boxing location
- Yellow Straightener can be moved across from Weingartner
- Move Daewoo, Webb lathe & Bridgeport next to Boxing
- Move Sharp mill, Sharp lathe & Tarnow to Straightener location
- Move Eitel press to West TOS Lathe location
- Move West TOS Lathe to Daewoo location

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Summary of Benefits

Potential revenue earnings from making additional 5 – 13 New, Rebuild or Coating sets is $ 50,000 - $ 375,000

Potential earnings from 18 additional quoted Rebuilds is $ 360,000

Minimum 5 days of lead time reduction for Pre-inspect process

1 FTE could be freed up for factory wide support activities while maintaining a Pre-inspect throughput of 3 sets per day

Major factory layout improvements will be made possible if the floor space currently occupied by Pre-inspection is freed up

Improvements to Final inspection & Boxing

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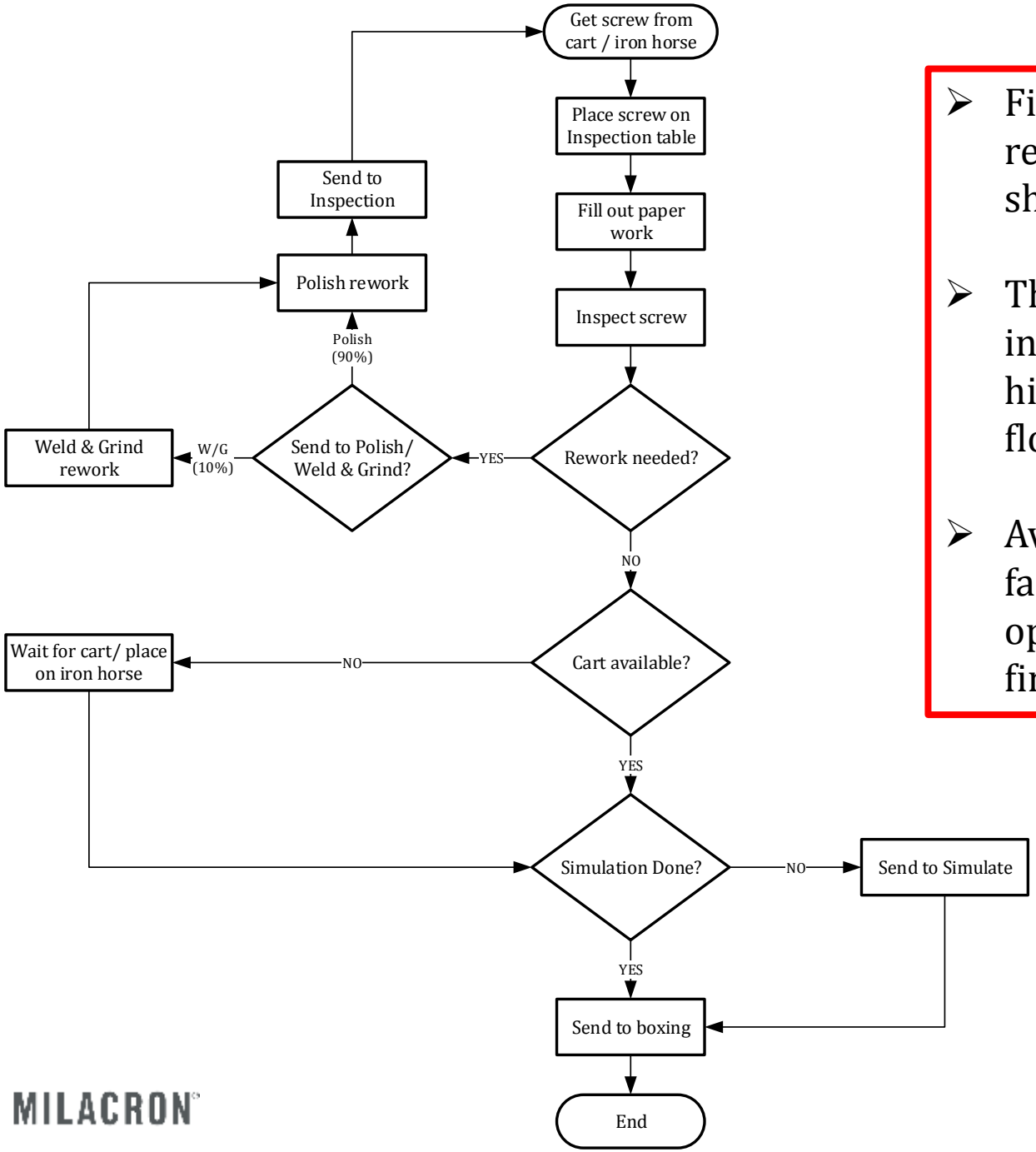
Process Flow Chart: Final Inspection



- Final Inspection & boxing are required for all screws that are shipped from the facility
- The flow between final inspection & boxing is much higher than the pre-inspection flow
- Availability of floor space will facilitate improvement opportunities for the shipping & final inspection department

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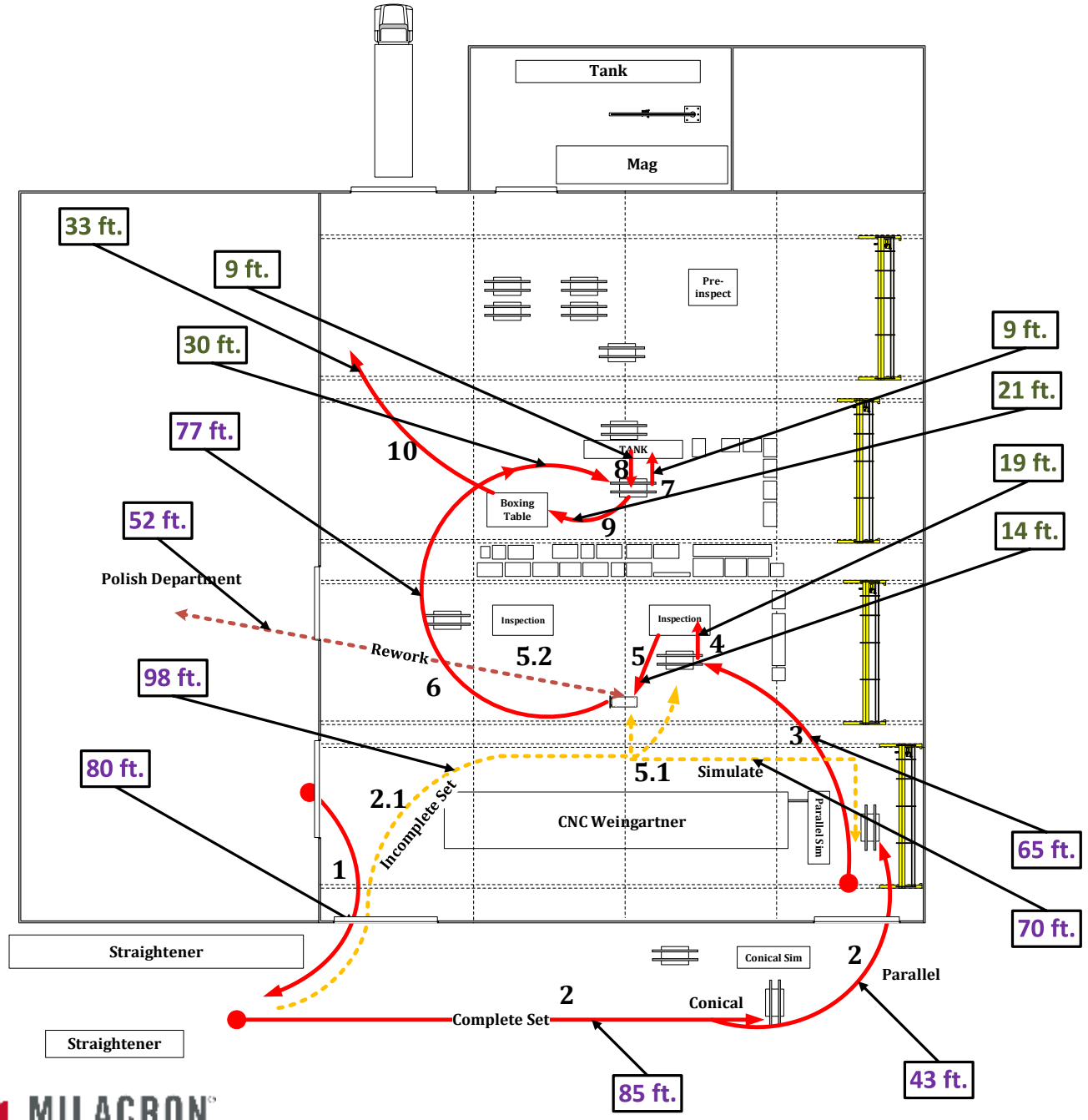
Current State: Final Inspect & Shipping



Routing when screws are complete set

Routing when screws are an incomplete set

Movement with crane

Movement with cart

Total movement: 485 ft.
Crane: 135 ft.
Cart: 350 ft.

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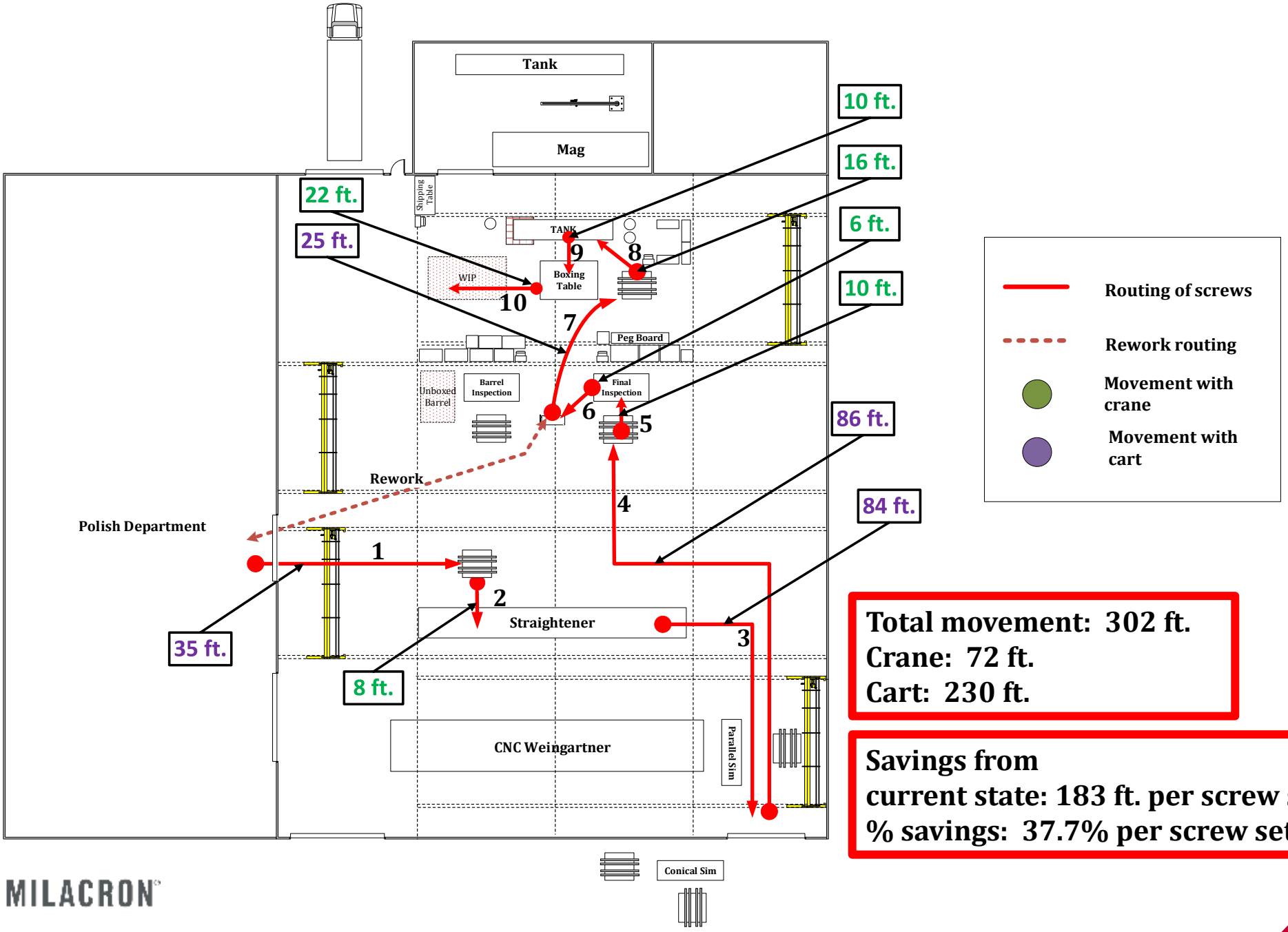
Future State: Final Inspect & Shipping



Total movement: 302 ft.
Crane: 72 ft.
Cart: 230 ft.

Savings from
current state: 183 ft. per screw set
% savings: 37.7% per screw set

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Warehouse

Pre-inspected screws stored at the warehouse that are waiting for a decision from the customers

Project Status

S.No	Activities	In Charge	Status	Notes
1	Prepare space for Pre-inspection at Warehouse	Karen	100%	
2	Move Pre-inspection to Warehouse	Karen, Brian	100%	
3	Over head crane at Warehouse	Karen, Chris	50%	Currently using A-frame. Quotes obtained for new crane, AFE submitted.
4	New Mangnaflux for Pre-inspection	Karen, Chris	50%	Used Magnaflux found. AFE written & submitted. Conversion/New setup quoted & ready to proceed pending approval.
5	Dedicated Simulation table for Pre-inspection	Gary, David	25%	Simulation table currently being designed and developed.
6	New dip tank for main facility	Karen	25%	Out for quote.
7	Move existing hot tank to Warehouse	Karen, Brian	0%	On hold untill Magnaflux completed.
8	Consolidate & move Boxing to current Pre-inspect location	Karen, Brian	100%	
9	Consolidate & move Finish & Barrel inspection to current boxing location	Karen	75%	Inspection tables are moved & wired. Racks and cabinets are being consolidated & arranged.
10	Move yellow Straightener across from the Weingartner	Karen, Brian	0%	Will begin once Final & Barrel Inspection move is completed.