Blueprint Update and Assembly Redesign

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Presenting... MSP MANUFACTURING

…a manufacturing company producing precision machined parts for aerospace and defense for customers including Boeing, Gulfstream, L3, and more.

Problem Statement:

Case, duct, clamp, and switch guard production experiences sporadic, daily delays due to unorganized and inconvenient organization of assembly parts, resulting in high opportunity costs. The floor plan of the assembly department is outdated, employee workstations are inadequate for the current production volume, and there is a lack of SOPs for case assembly.

Methods

1. Department Layout:

- Accurately measured current assembly floor layout
- Drafted current and new layout design options in AutoCAD

2. 5S Organizational Methodologies:

- Currently 30% or more of nearly every workstation is occupied by clutter (WIP items, misc. tools and parts)
- Tools float around the desks with no centralized location

3. Workstation Redesign:

- New workstation design developed in 3DS Max
- Includes more in/on-station storage and organizational bins

4. Standard Operating Procedure(SOP)for cases

- Analyzed build times using production logs
- Crafting detailed work instructions to put into ERP system

Results

1. Layout update

New Layout Development:

- Aims to reduce overall inter-workstation travel distances, evaluated with the following equations

Using Actual Walking Distances:

$$\Sigma_{i=1}^{n}\Sigma_{j=1}^{n} f_{ij} d_{ij}$$

Using Centroidal Rectilinear Distances

$$\Sigma_{i=1}^{n}\Sigma_{j=1}^{n} f_{ij}\left(\sqrt{(x_i - x_j)^2} + \sqrt{(y_i - y_j)^2}\right)$$

where f_{ij}: the flow between workstations i & j, x and y values represent (x,y) coordinate locations of workstations, d_{ij}: the actual walking distances between rough centroidal locations of workstations, and n is the number of workstations. Smaller scores are better.

Scoring Matrix for Original Layout Design for 2024

	Case 1	Case 2	Case 3	Case 4	Partmark (PM)	Switch Guard	Misc 1	Misc 2	Duct 1	Duct 2	Clamp 1	Clamp 2	Extra Misc Table	Paint Booth	Storage	Total:
Case 1	0	386448	701184	0	0	0	0	0	0	0	0	0	0	948192	986040	3021864
Case 2		0	382464	0	0	0	0	0	0	0	0	0	0	0	0	382464
Case 3			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Case 4				0	0	0	0	0	0	0	0	0	0	0	0	0
Partmark (PM)					0	0	0	0	0	11172	840720	0	0	0	0	851892
Switch Guard						0	0	0	0	0	0	0	0	0	2181000	2181000
Misc 1							0	0	0	0	0	0	0	0	0	0
Misc 2								0	0	0	0	0	0	0	0	0
Duct 1									0	5656	0	0	0	0	0	5656
Duct 2										0	0	0	0	0	0	0
Clamp 1											0	0	0	0	0	0
Clamp 2												0	0	0	0	0
Extra Misc Table													0	0	0	0
Paint Booth														0	0	0
Storage															0	0
															Grand Sum:	6442876

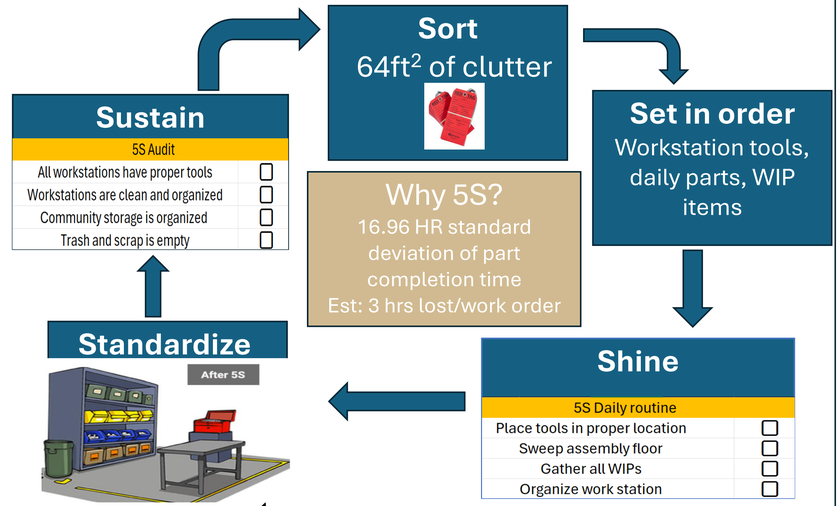
Resulting Score: 6442.88 ← ~4.63% Higher than optimal layout score

Expressed Proportionally:

For the current design,
52.84% of overall time → **case** assembly
13.04% of overall time → **clamp** assembly
0.212% of overall time → **duct** assembly
33.85% of overall time → **switch guard** assembly

ROI of optimal layout: reduce assembly time by approximately 4.63%

2. 5S Methodology



ROI for 2 & 3: 51% avg increase in performance in a production facility with 5S implementation

**From "The Impact of 5S Implementation on Industrial Organizations' Performance by Arash Ghodrati and Norzima Zulkifli

3. Workstation redesign

An updated workstation made in 3dsMAX, with dimensions based on a US Ergo standard reach diagram, that accommodates suggested 5s implementation

Challenges:

1. 5-week case assembly cycle time → could not get multiple independent time studies
Assembly department limited to 35.5" x 52 " with no room to expand
Potential forecasting issues that leads to a delay in material arrival

Discussion:

Multiple design layouts offered to client (not pictured due to NDA)
Suggested 5S methodology is paired with education and implementation suggestions
Workstations have wooden tops to accommodate alterations needed for large tools