AUTOMATED PARCEL SORTER PROCESS EVALUATION

EWR – FIRST TO PILOT

Mehmet Gur

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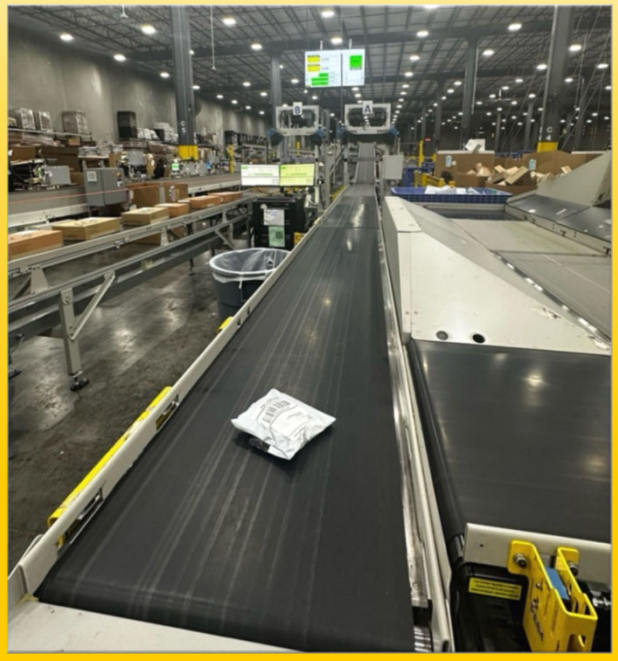
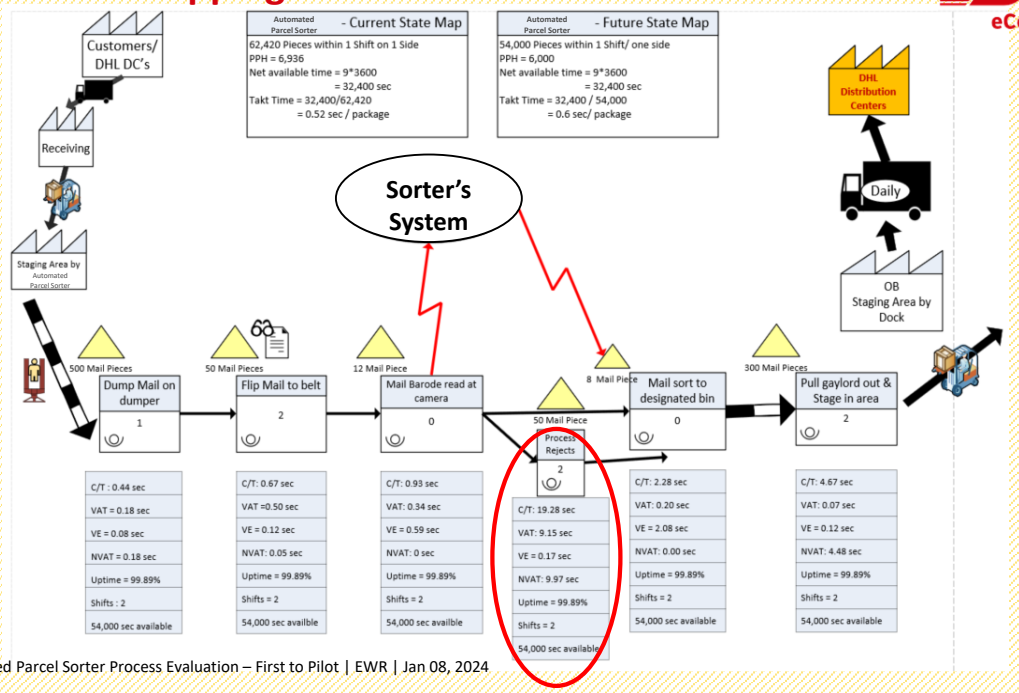


Agenda

DHL eCommerce

1	**Value Stream Mapping – OB Automated Parcel Sorter**
2	**Problems Identified** • Reject Rates – June/July 2023
3	**Focused Process** • Root Cause Analysis • Process Observations
4	**Current vs Future States** • Times and Headcounts
5	**Benefits**
6	**Visual for Instructions Example**
7	**Action Plan**

Value Stream Mapping – OB Automated Parcel Sorter



Problems Identified

Higher Rejects
~Up to 14%

More HC to Process Rejects
Impact PIM

~16 additional hours each day
Impacts PIM

~ 7,000 pieces/ 50,000k
Double Handling

Reject Rate: June/July 23

Average of % Sort Reject	Column Labels						
Row Labels	7/6/23	7/7/23	7/8/23	7/9/23	7/10/23	7/11/23	Grand Total
XSTRM - EWR - A	7.99%	6.57%	9.89%	1.19%	5.35%	8.62%	6.60%
XSTRM - EWR - B	6.29%	9.27%	17.49%		2.76%	3.85%	7.93%

Average of % Sort Reject	Column Labels						
Row Labels	6/30/23	07/01/23	07/02/23	07/03/23	07/04/23	07/05/23	Grand Total
XSTRM - EWR - A	5.91%	13.17%		5.29%	8.92%	8.04%	8.26%
XSTRM - EWR - B	3.99%	9.70%		2.85%	3.98%	8.55%	5.82%

Average of % Sort Reject	Column Labels						
Row Labels	6/6/23	6/7/23	6/8/23	6/9/23	6/10/23	6/11/23	Grand Total
XSTRM - EWR - A	10.03%	8.18%	9.30%	6.25%	4.52%	5.08%	7.23%
XSTRM - EWR - B	4.14%	4.55%	3.88%	5.67%	2.59%		4.17%

Average of % Sort Reject	Column Labels						
Row Labels	6/2/23	6/3/23	6/4/23	6/5/23	6/6/23	6/7/23	Grand Total
XSTRM - EWR - A	8.54%	12.14%	8.62%	11.82%	10.04%	8.29%	9.91%
XSTRM - EWR - B	5.03%	4.24%		2.61%	4.15%	4.57%	4.12%

FOR INTERNAL USE

Focus

Conducted Design of Experiments

- Different Speeds of Conveyor
- Different Headcounts

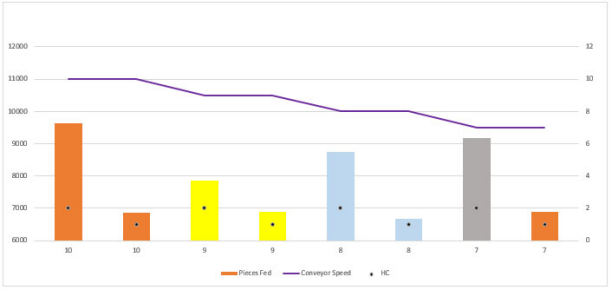
Evaluated For:

- Rejects
- Read Rates
- Throughput
- Pieces Rehandled

Root Cause Analysis – Design of Experiment

Design of Experiment

Constants			Variables											Rejects	
Duration of Study (2 hours)	Conveyor Speed	HC	Pieces Fed	Sorted	Rehandled			Actual Rejects (Bin 1) **Hospital Belt**	Mechanical Rejects (Bin 22)	Read Rate	Disposition No Container	Disposition Missing	Misc	Collect Sample Pieces from Hospital	Track after marking (without encoding), how many came back)
5/23/2023 (1000-1200) | B	10	2	9644	9389	2809	6835	29%	2556	253	97.38%	11	240	4	20	17
5/30/2023 (2100-2300) | B	10	1	6870	6722	930	5940	14%	792	138	96.91%	15	122	11	15	14
5/24/2023 (1900-2100) | B	9	2	7853	7678	862	6991	11%	687	175	98.40%	38	135	2	8	7
5/24/2023 (2200-0000) | B	9	1	6886	6791	567	6319	8%	472	95	98.43%	24	71	0	4	0, 2 packages came back, were reinducted and then got sorted.
5/24/2023 (1900-2100) | A	8	2	8746	8632	1204	7542	14%	1090	114	96.27%	87	22	5	10	8
5/31/2023 (0000-0200) | B	8	1	6676	6527	913	5763	14%	762	151	95.55%	6	123	20	16	15
5/26/2023 (0945-1145) | B	7	2	9170	8977	1605	7565	18%	1411	194	96.65%	16	176	1	14	14
5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		



Observations

Higher Speed with 2 HC

- Increases **Throughput** by 30% but also increase pieces **rehandled** by 8% (22% theoretical increase)
- More Mechanical Rejects
- More Rejects

Minimum Pieces Rehandled for Two Combination

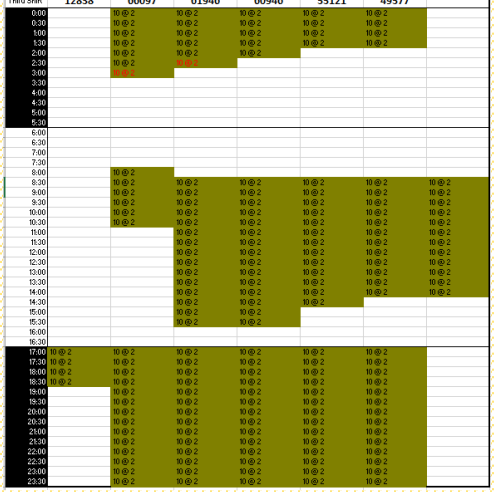
- Speed 9 – HC 2
- Speed 7 – HC 1

States Comparison

Current State – 2 HC/ Shift

Input

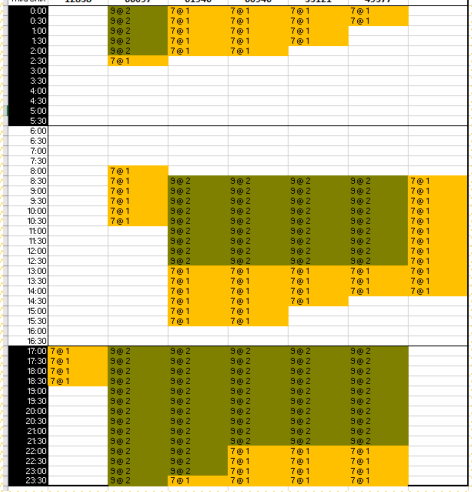
	Sun	Mon	Tue	Wed	Thu	Fri	Sat
First Shift		18034	49771	49398	44214	40469	39047
Third Shift	12838	66097	61946	60946	55121	49577	



Future Sate – Mix of 2 & 1 HC / Shift

Input

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
First Shift		18034	49771	49398	44214	40469	39047
Third Shift	12838	66097	61946	60946	55121	49577	



FOR INTERNAL USE

States Comparison

Current State – 2 HC/ Shift

Input

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
0:00			1	1	1	1	
0:30			1	1	1	1	
1:00			1	1	1		
1:30			1	1	1		
2:00			1	1			
2:30		1					
3:00							
3:30							
4:00							
4:30							
5:00							
5:30							
6:00							
6:30							
7:00							
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9:00		1					1
9:30		1					1
10:00		1					1
10:30		1					1
11:00							1
11:30							1
12:00							1
12:30							1
13:00			1	1	1	1	1
13:30			1	1	1	1	1
14:00			1	1	1	1	1
14:30			1	1	1		
15:00			1	1			
15:30			1	1			
16:00							
16:30							
17:00	1						
17:30	1						
18:00	1						
18:30	1						
19:00							
19:30							
20:00							
20:30							
21:00							
21:30							
22:00				1	1	1	
22:30				1	1	1	
23:00				1	1	1	
23:30			1	1	1	1	

Future Sate – Mix of 2 & 1 HC / Shift

Output

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
0:00			10	10	10	10	
0:30			10	10	10	10	
1:00			10	10	10		
1:30			10	10	10		
2:00			10	10			
2:30		10					
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13:00			10	10	10	10	10
13:30			10	10	10	10	10
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17:30	10						
18:00	10						
18:30	10						
19:00							
19:30							
20:00							
20:30							
21:00							
21:30							
22:00				10	10	10	
22:30				10	10	10	
23:00				10	10	10	
23:30			10	10	10	10	

Benefits

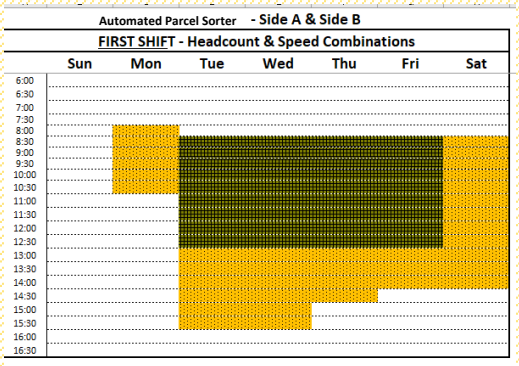
Cost Savings

Improved PIM

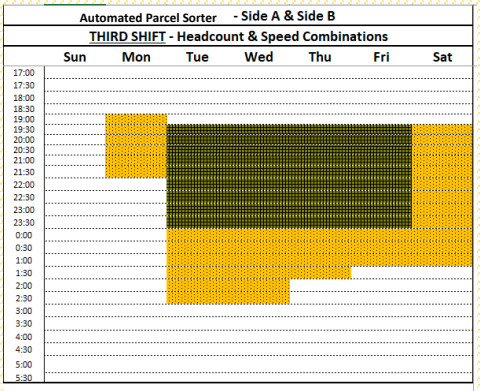
Flexibility of Staffing for OMs

Wages		Savings		
Hourly	Half Hourly	Weekly	Monthly	Yearly
$ 20	$ 10	$ 710	$ 2,840	$ 34,080

Visuals for Instructions Example



Speed	Headcount	Instructions
9.0		Run @ Speed 9 with 2 Headcounts
7.0		Run & Speed 7 with 1 Headcount



Speed	Headcount	Instructions
9.0		Run @ Speed 9 with 2 Headcounts
7.0		Run & Speed 7 with 1 Headcount

Action Plan

Run as Pilot
- Manual with Visuals
- Duration – 2 weeks
- Start Date – 7/16/23
- End Date - 7/29/23

Evaluate Results
- Shift End Times
- PIM Impact
- Follow up meeting

Expand to Network
- Share the results

Key takeaways

- **Understand the purpose and constructure of VSM**
  - Material flow
  - Information flow
- **Be able to identify the problems from VSM**
- **Be able to focus on the potential root cause/factors**
  - Independent Variables
  - Evaluation for output
- **Know how to conduct and interpret from Design of experiment**
  - Create various potential scenarios
  - Address the potential combination for test validation
- **Conclude and provide solution**
- **Scale up and implement for future standard process**

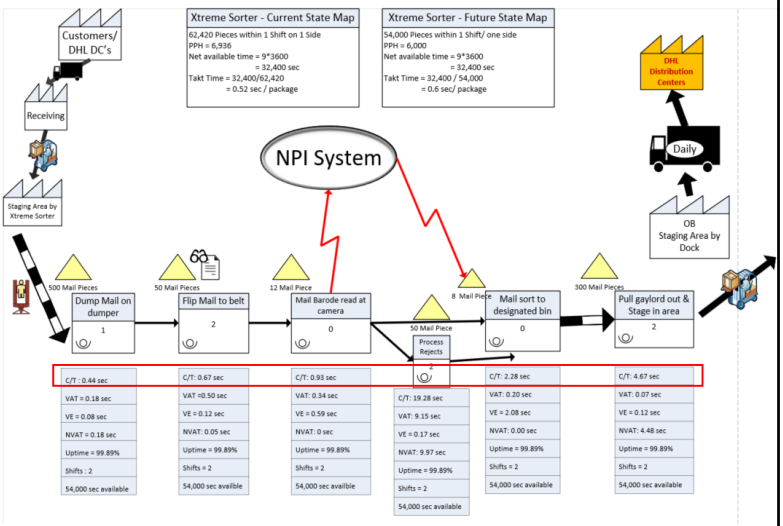
Quiz time

Question 1

What's the cycle time of the whole process

Answer: 28.27s

0.44+0.67+0.93+19.28+2.28+4.67



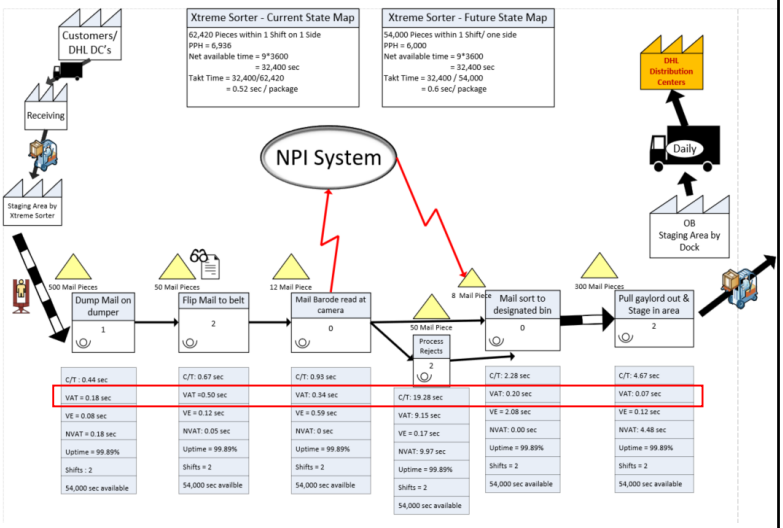
Refer to slide 3

Question 2

What's the value-added time of the whole process

Answer: 10.44s

0.18+0.5+0.34+9.15+0.2+0.07



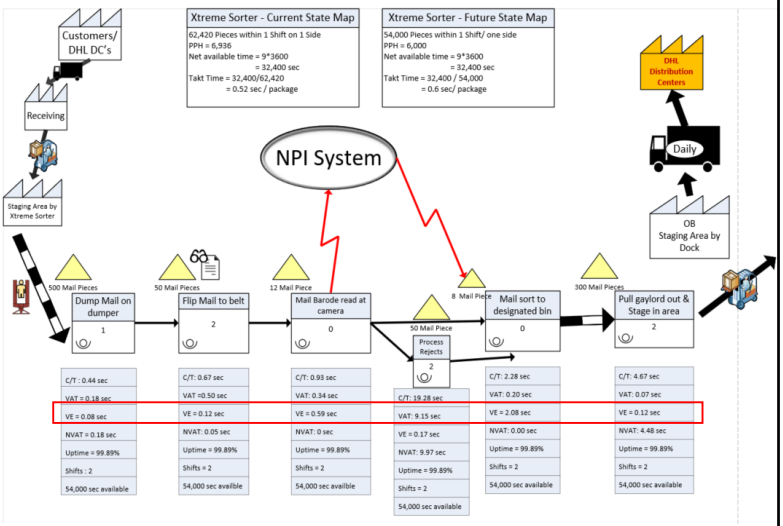
Refer to slide 3

Question 3

What's the non-value enabled time of the whole process

Answer: 3.16s

0.08+0.12+0.59+0.17+2.08+0.12



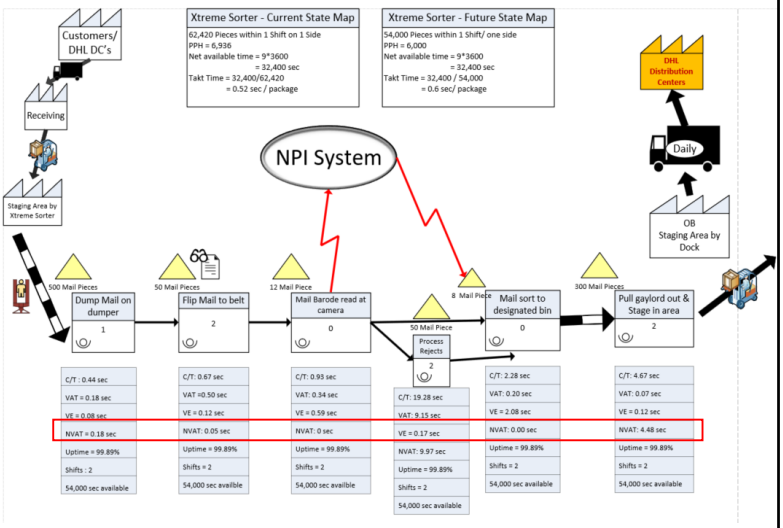
Refer to slide 3

Question 4

What's the non-value enabled time of the whole process

Answer: 14.68s

0.18+0.05+0+9.97+0+4.48

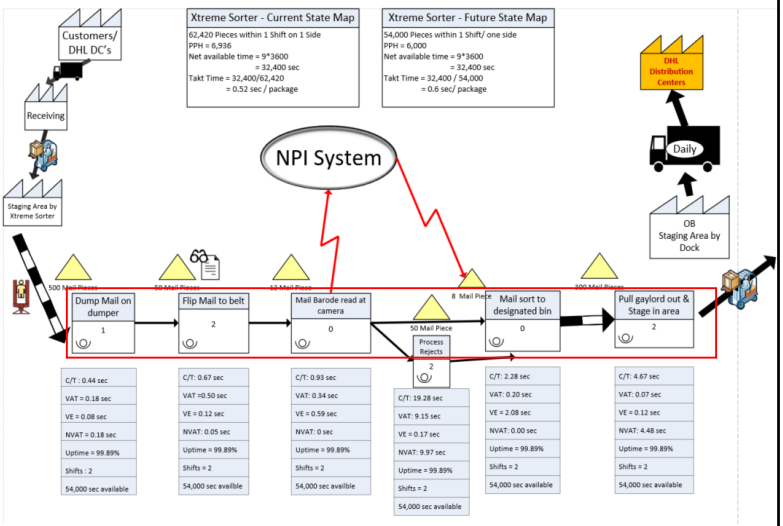


Refer to slide 3

Question 5

What's the number in the small boxes?

Answer:
The headcount needed in that step



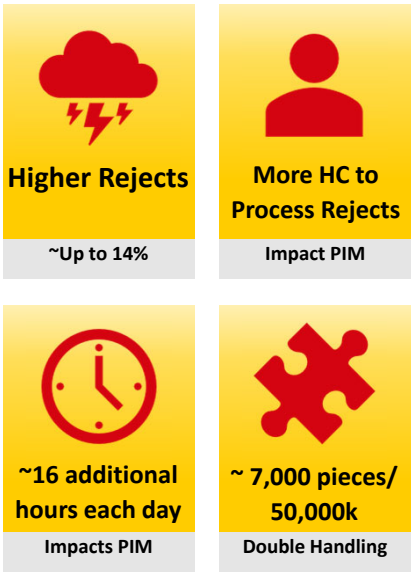
Refer to slide 3

Question 6

What's the problem identified from this process?

Answer:

- High rejects
- More headcount needed
- More sorting time needed
- Double handling



Refer to slide 4

Question 7

Which side has more room to improved based on June/July record?

Answer:
Side A, with more low read rates records.

Average of % Sort Reject	Column Labels						
Row Labels	7/6/23	7/7/23	7/8/23	7/9/23	7/10/23	7/11/23	Grand Total
XSTRM - EWR - A	7.99%	6.57%	9.89%	7.19%	5.35%	8.62%	6.60%
XSTRM - EWR - B	6.29%	9.27%	17.49%		2.76%	3.85%	7.93%

Average of % Sort Reject	Column Labels						
Row Labels	6/30/23	07/01/23	07/02/23	07/03/23	07/04/23	07/05/23	Grand Total
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Average of % Sort Reject	Column Labels						
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XSTRM - EWR - B	4.14%	4.55%	3.88%	5.67%	2.59%		4.17%

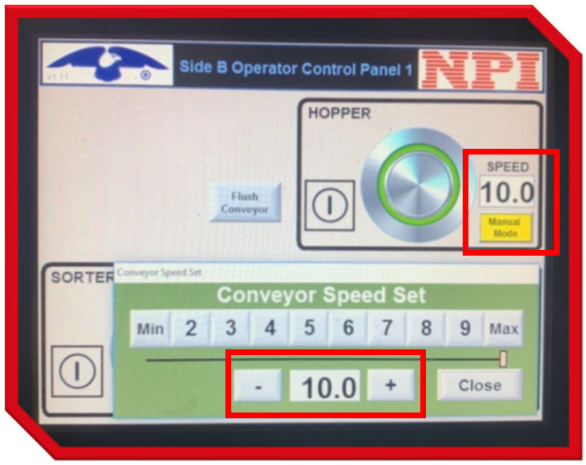
Average of % Sort Reject	Column Labels						
Row Labels	6/2/23	6/3/23	6/4/23	6/5/23	6/6/23	6/7/23	Grand Total
XSTRM - EWR - A	8.54%	12.14%	8.62%	11.82%	10.04%	8.29%	9.91%
XSTRM - EWR - B	5.03%	4.24%		2.61%	4.15%	4.57%	4.12%

Refer to slide 5

Question 8

How does engineering team conduct DOE with this control panel?

Answer: Set different speeds of conveyors

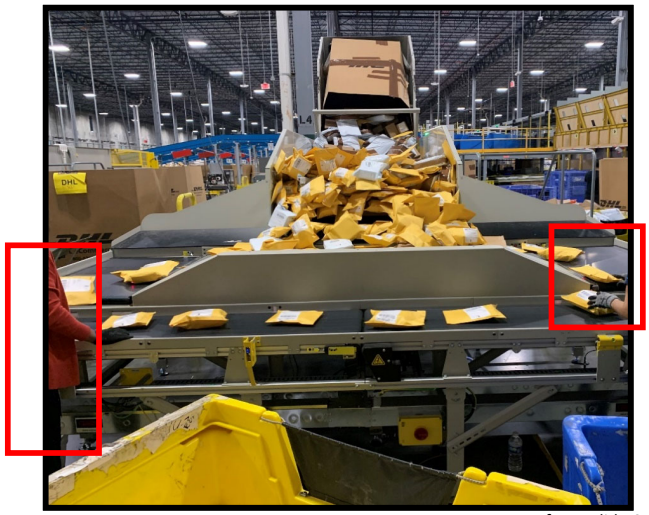


Refer to slide 6

Question 9

What's the other independent variables besides the speeds of conveyors?

Answer: Different operators at the conveyors



Refer to slide 6

Question 10

What's the 4 indices evaluated from this DOE?

Answer:

- Throughput
- Piece rehandled
- Read rates
- Reject counts

Design of Experiment

Constants			Variables											Rejects	
Duration of Study (2 hours)	Conveyor Speed	HC	Pieces Fed	Sorted	Rehandled			Actual Rejects (Bin 1) Hospital Belt	Mechanical Rejects (Bin 22)	Read Rate	Disposition No Container	Disposition Missing	Misc	Collect Sample Pieces from Hospital	Track after marking (without encoding), how many came back)
5/23/2023 (1000-1200) | B	10	2	9644	9389	2809	6835	29%	2556	253	97.38%	11	240	4	20	17
5/30/2023 (2100-2300) | B	10	1	6870	6722	930	5940	14%	792	138	96.91%	15	122	11	15	14
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5/24/2023 (2200-0000) | B	9	1	6886	6791	567	6319	8%	472	95	98.43%	24	71	0	4	2 packages came back, were reinducted nd then got sorted.
5/24/2023 (1900-2100) | A	8	2	8746	8632	1204	7542	14%	1090	114	96.27%	87	22	5	10	8
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5/26/2023 (0945-1145) | B	7	2	9170	8977	1605	7565	18%	1411	194	96.65%	16	176	1	14	14
5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		

Refer to slide 6

FOR INTERNAL USE

Question 11

How many different scenarios in this DOE?

Answer:

8 scenarios

Design of Experiment

Constants			Variables											Rejects	
Duration of Study (2 hours)	Conveyor Speed	HC	Pieces Fed	Sorted	Rehandled			Actual Rejects (Bin 1) Hospital Belt	Mechanical Rejects (Bin 22)	Read Rate	Disposition No Container	Disposition Missing	Misc	Collect Sample Pieces from Hospital	Track after marking (without encoding), how many came back)
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5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		

Refer to slide 7

Question 12

And what are these independent variables?

Answer:

- Conveyor speed
- Headcount

Design of Experiment

Constants			Variables											Rejects	
Duration of Study (2 hours)	Conveyor Speed	HC	Pieces Fed	Sorted	Rehandled			Actual Rejects (Bin 1) Hospital Belt	Mechanical Rejects (Bin 22)	Read Rate	Disposition No Container	Disposition Missing	Misc	Collect Sample Pieces from Hospital	Track after marking (without encoding), how many came back)
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5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		

Refer to slide 7

Question 13

Provide two findings that you can find out from this DOE.

Answer:

Different level of rehandle parcels and read rate from different combinations.

Design of Experiment

Constants			Variables											Rejects	
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5/24/2023 (2200-0000) | B	9	1	6886	6791	567	6319	8%	472	95	98.43%	24	71	0	4	0, 2 packages came back, were reinducted and then got sorted.
5/24/2023 (1900-2100) | A	8	2	8746	8632	1204	7542	14%	1090	114	96.27%	87	22	5	10	8
5/31/2023 (0000-0200) | B	8	1	6676	6527	913	5763	14%	762	151	95.55%	6	123	20	16	15
5/26/2023 (0945-1145) | B	7	2	9170	8977	1605	7565	18%	1411	194	96.65%	16	176	1	14	14
5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		

Refer to slide 7

Question 14

What's the impact if we have 2 operator with higher speed to flip the mails?

Answer:

- Increases Throughput by 30% but also increases pieces rehandled by 8%(22% theoretical increase)
- More rejects

Design of Experiment

Constants			Variables											Rejects	
Duration of Study (2 hours)	Conveyor Speed	HC	Pieces Fed	Sorted	Rehandled			Actual Rejects (Bin 1) Hospital Belt	Mechanical Rejects (Bin 22)	Read Rate	Disposition No Container	Disposition Missing	Misc	Collect Sample Pieces from Hospital	Track after marking (without encoding), how many came back)
5/23/2023 (1000-1200) | B	10	2	9644	9389	2809	6835	29%	2556	253	97.38%	11	240	4	20	17
5/30/2023 (2100-2300) | B	10	1	6870	6722	930	5940	14%	792	138	96.91%	15	122	11	15	14
5/24/2023 (1900-2100) | B	9	2	7853	7678	862	6991	11%	687	175	98.40%	38	135	2	8	7
5/24/2023 (2200-0000) | B	9	1	6886	6791	567	6319	8%	472	95	98.43%	24	71	0	4	0, 2 packages came back, were reinducted and then got sorted.
5/24/2023 (1900-2100) | A	8	2	8746	8632	1204	7542	14%	1090	114	96.27%	87	22	5	10	8
5/31/2023 (0000-0200) | B	8	1	6676	6527	913	5763	14%	762	151	95.55%	6	123	20	16	15
5/26/2023 (0945-1145) | B	7	2	9170	8977	1605	7565	18%	1411	194	96.65%	16	176	1	14	14
5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		

Refer to slide 8

Question 15

What are the 2 combinations with the minimum pieces rehandled from this DOE?

Answer:

- Speed 9 – HC 2
- Speed 7 – HC 1

Design of Experiment

Constants			Variables											Rejects	
Duration of Study (2 hours)	Conveyor Speed	HC	Pieces Fed	Sorted	Rehandled			Actual Rejects (Bin 1) Hospital Belt	Mechanical Rejects (Bin 22)	Read Rate	Disposition No Container	Disposition Missing	Misc	Collect Sample Pieces from Hospital	Track after marking (without encoding), how many came back)
5/23/2023 (1000-1200) | B	10	2	9644	9389	2809	6835	29%	2556	253	97.38%	11	240	4	20	17
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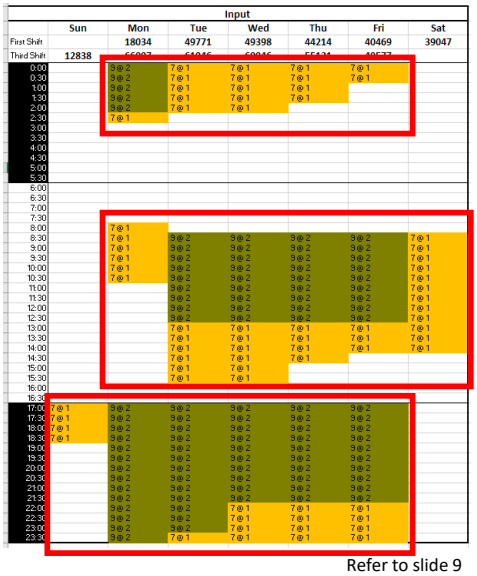
5/31/2023 (0000-0200) | B	8	1	6676	6527	913	5763	14%	762	151	95.55%	6	123	20	16	15
5/26/2023 (0945-1145) | B	7	2	9170	8977	1605	7565	18%	1411	194	96.65%	16	176	1	14	14
5/31/2023 (1700-1800) | A	7	1	6902	6868	274	6628	4%	120	17	96.87%	16	1	17		

Refer to slide 8

Question 16

What difference do you observe between current and future state?

Answer:
Mix speed and headcount are used (in non busy hours)

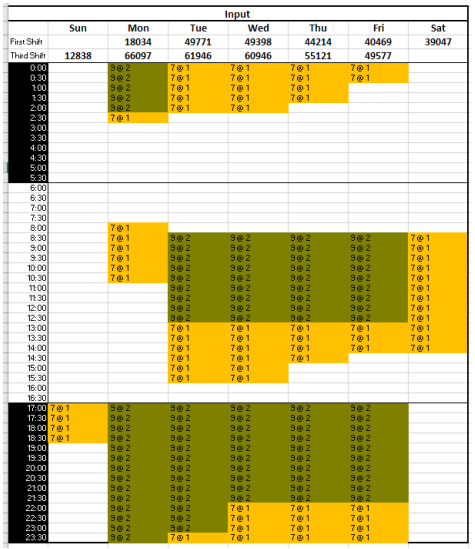


Refer to slide 9

Question 17

What impact do you think will be observed with the future state?

Answer:
- Less double handled
- Less headcount with less cost



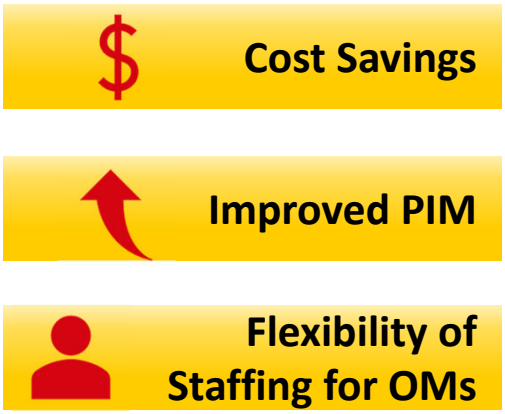
Refer to slide 9

Question 18

What benefits are expected from this overall analysis?

Answer:

- Cost saving from less hours with hourly wages
- Improved PIM
- Flexibility of Staffing for OMs

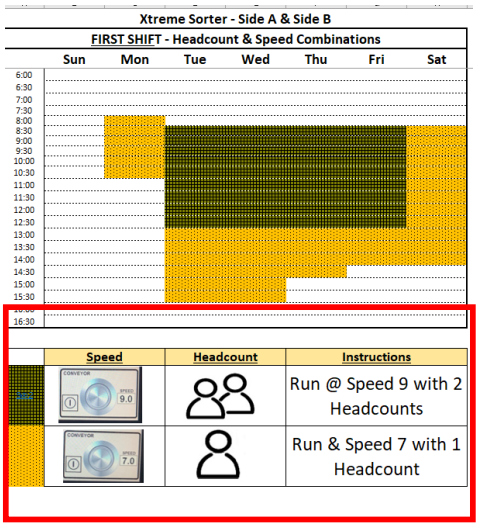


Question 19

What benefits do you think this visual instruction can provide?

Answer:

This visual instruction will provide operation team with a clear schedule to allocate different combination (speed and headcount) from the study.



Question 20

How do you set up an action plan with steps in this example?

Answer:

- Run pilot with a short period of time
- Evaluate results
- Expand to network

Refer to slide 13

THANK YOU

Contact

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