**Project description:** With the launch of pure loads (fluid load trailers that are loaded with only totes or only cases) our robot utilization has taken a hit. Your project will be to maintain pure load percentage of fluid load doors while increasing diverts to our OB diverts

Flow decided by costs

Percentage of fluid loads that are pure loads is about 70%

Fluid loads 70-75% of all loads

How does sending more totes to rwc increase costs?

Nick says rwcs only have one less person working than manual palletize

* Not much more cost effective than manual palletize

What are the deciding factors when deciding where to send inbound loads

* Why send to fluid, rwc , mp

FL CPLH want at least 140

RWC want 12,000 per shift

Manual palletize rate want 155

Buffer want less than 200

* Buffers: number of pallets on the dock

Lane full under 15%

Because of location of robots and expansion doors, when robots/expansion doors get backed up, bypasses get much more backed up as well. Robots and expansion doors are both only pure loads.

**New Project**

MP lines with two vs three scanners. Which is more efficient, cost effective?

MP Lines 2 and 3 have three scanners

Questions

Two vs three scanners

Should the number of workers change as the number of scanners change?

Metrics

[MP Diverts by Line](https://tinyurl.com/MPDiverts)

[PPR](https://fclm-portal.amazon.com/reports/functionRollup?warehouseId=IND9&spanType=Intraday&startDate=2025-06-19T06%3A00%3A00.000&endDate=2025-06-19T18%3A00%3A00.000&reportFormat=HTML&processId=01003021)

[Dock Flow MP](https://prod-na.dockflow.robotics.a2z.com/IND9/fleet/DirectedPalletize?tagConfig=%7B%7D&fleetSummaryConfig=%7B%7D)

**Cost**

When CPLH is lower, we are understaffed. When CPLH is over, we are overstaffed or running efficiently. When CPLH is low, cost is negative (i.e. losing money).

**Ideas and Thoughts**

Track the rates and diverts for each line

Track morning and afternoon separately

* Associates work harder in the morning: they are less tired, and they try harder to hit their rates in the morning so that they do not have to work as hard in the afternoon (according to Angel)

Follow individual associates

* There are differences in rates across associates

Check what the lane full percentage is

* Use MP Diverts by Line
  + It tracks how many cartons go down the line, not how many are scanned (proxy for workload)
* Lanes are getting different levels of work day to day
* Or check how many cartons the lane is receiving each day (morning/afternoon)

MP 10 is irrelevant because it’s a downstack line

Check how experienced the AAs are in MP through Tamper Monkey

When uploading data from PPR, see the last time data was checked

Save everyday when leaving

**Shift Colors**

FHD: orange

BHD: blue

Wraparound: yellow

Pizza: Salmon/Pink

Green: Donut

Gold: Flex

Purple: Saturday & Sunday

**Positioning of Scanners**

On MP lines two and three, three sides have two scanners on the outside and one in the middle. Scanner 3-1-B has two scanners on the inside and one scanner on the far side; there is no scanner closest to the walking lanes.

MP 1: both close side and middle

MP 2: both close side, middle, and far side

MP 3:

* A: close side, middle, and far side (A)
* B: middle, middle, and far side (B)

MP 4:

* Right: close side and middle (A)
* Left: close side and far side (B)

MP 5:

* Right: close side and middle (A)
* Left: middle and far side (B)

MP 6: both middle and far side

MP 7:

* Right: close side and far side (A)
* Left: middle and far side (B)

MP 8:

* Right: middle and far side (A)
* Left: close side and far side (B)

MP 9:

* Right: close side and far side (A)
* Left: middle and far side (B)

Close side and middle (4)

* MP1A, MP1B, MP4A, MP5A

Close side and far side (4)

* MP4B, MP7A, MP8B, MP9A

Middle and far side (6)

* MP5B, MP6A, MP6B, MP7B, MP8A, MP9B

Close side, middle, and far side (3)

* MP2A, MP2B, MP3A

Middle, middle, and far side (1)

* MP3B

**Data Analysis**

Days don’t matter: create two new spreadsheets without days

* Make one morning and one the entire day
* Sort by MP line or A/B
* Clean Paid Hours columns: just need one column (will cause difficulties)
* Do weighted JPH by number of hours worked

Change date to timestamp

Streamlit

* Create a slider that chooses the minimum and maximize number of diverts to a lane in order to qualify (have it roughly be diverts per hour; could also filter by jobs)
* Create minimum hours worked widget

Weighted JPH

Create function that goes through each individual and finds their weighted JPH. Create ranking at different scanner counts

Create graphs showing two vs three scanners for everybody (morning and whole day)

Create graphs of top associates

* Two vs three scanners

Create graphs of average associates

* Two vs three scanners

Graphs filtered for number of diverts

* Everyone
* Top associates
* Average associates

**Line 72: Need Charly’s LC Level**

**Data Analysis (Alone)**

* Make a graph of all scanner configurations for only people that are alone
  + Same for 2 vs 3
* Make a graph of all scanner configurations for only people that are not alone
  + Same for 2 vs 3
* Standardized Productivity might actually matter here
  + Include “Sometimes” in standardized productivity

**Statistical Significance of Positioning**

* Compare each configuration to Middle and Far Side
  + There are six sides that are Middle and Far Side, which is the most
  + It is the control group

Top Performers on BHD (last updated 7/9)

* Clark, Tatiana
  + On her third day she was on 2B but didn’t go that fast
  + Second time on 2B she had JPH of 233: slightly above average for her after first week
  + Total: 2B twice
* Mang, Sui (Level 5)
  + Hasn’t been on 2 or 3
* Jangmaw, Roi Ji (Level 5)
  + Hasn’t been on 2 or 3
* Amouzoun, Jean-Baptiste
  + On both 2 & 3 for first time on 7/3

Decent and/or Frequent MP Workers

* Ngen, Sui
  + Hasn’t been on 2 or 3
* Dominique, Donald
  + Has been on 2 & 3, but they were his first few days
* Ulysse, Sabinior
  + Has been on 2 & 3
* Tluang, Robert (Level 5)
  + Hasn’t been on 2 or 3
* Tappan, Breyanna
  + Been on 2 and 3 once each: not much of a difference
* Par, Zung Tin (Level 5)
  + Has been on 3A and 3B: some of her best days
* Ma, Phat
  + Hasn’t been on 2 or 3
* Kaur, Amardeep (Level 5)
  + Been on 3A once: not much of a difference

**Asking people if three scanners makes it easier/faster**

domdona: big difference

tappan: big difference; always tries to get either MP2 or MP3

ljeanbam: big difference

crnkoche: big difference

**Scanner Positioning and positioning of pallets (buttons?)**

1A vs 1B (1B should be better)

5B vs 5A (5A should be better)

7A vs 6A,8A (6A & 8A should be better)?

8B vs 6B,7B (6B & 7B should be better)

9A vs 9B (pallets are same formation but have different scanner configuration)

MP1

* 1A: move to middle and far side; it has a close side scanner that is only getting one pallet; it also has a middle scanner but the pallets go farther back than most
* 1B good
* Check distance between pallets and buttons
* Move 1A pallets to match 1B pallets. This makes each scanner service two pallets. Also condenses pallets so that the farthest one does not go as far back

MP2

MP3

MP4

* Go close side scanner on both; is middle or far side scanner better? Pallet positioning is similar enough on the two of them. Both about as condensed as they’re going to get

MP5

* 5A distance between buttons: 13’8”
* 5B distance between buttons: 20’1”
* 5A distance between pallets: 24’4”
* 5B distance between pallets: 25’1”
* 5A seems better
* Switch 5B to match 5A

MP6

* Make 6B pallets like 6A
* 6B pallets are too spread out

MP7

* 7A pallet positioning matches 6A, but have different scanner configs; switch 7A to middle and far side, matching 6A
* 7B good (\*\*\*\*)

MP8

* 8A good; same as 6A

MP6 – MP8

* 6A, 7A, 8A have the same pallet positioning but 7A has different scanner configuration
* 6B, 7B, 8B have the same pallet positioning but 8B has different scanner configuration

Can the U-Boat be moved at all? On the B side, the U-Boat keeps the closest pallet from being closer to the walkway. As a result, the farthest pallet on the B side is too far away from the closest scanner. On the A side, there is no U-Boat, allowing the closest pallet to be closer to the walkway. This allows for three pallets before the support column. Only one pallet is on the other side of the column, making all of the pallets more condensed and closer to the scanners.

6A, 8A: middle and far side

7A: close side and far side

For the B sides, if the U-Boats can’t be moved, middle and far side scanner positioning is probably better. A close side scanner only serves one pallet. Since there are two pallets on either side of the support column, the close/middle scanner services the first two and the far side services the second two.

6B, 7B: middle and far side

8B: close side and far side

MP 9

* Support column isn’t in the way of pallets, but if you put a pallet in front of the column then a jack could not get it
* The pallets are formatted the same, but the scanners on 9A are close side and far side, while the scanner on 9B are middle and far side
* Should rearrange pallets to match MP6 – MP8

Explaining difference between 2 vs 3 scanners when alone versus all data

Check:

Compared to: (

Check: 28.57%

Compared to: 28.36%

**Find Average Number of Diverts to each lane**

**Find Total Number of Diverts to each lane**

* Count just MP1, MP2, MP3 (not MP1A, MP1B, MP2A, MP2B, MP3A, MP3B)
* See if MP2 & MP3 are getting more diverts than other lanes

Diverts Per Hour to JPH

0-50; 50-100; 150-200; 250-300; 350-400 (5 bins)

Average JPH at each bin

100-150; 150-200; 200-225; 225-250; 250-275; 275-300; 300-325; 325-350; 350-375; 375-400 (10 bins)

Create own arrays in order to plot

For DPH, might have to have arrays: [1, 2, 3, …] and then label them

JPH when working alone is higher because there is a constant stream of work; whereas when AAs are working on a team, they can go through all the work and then have breaks? More likely explanation is that there is simply more possible work to be done when working alone than when working with a partner.

On bins tab and looking at diverts to JPH, have two columns below the graphs that shows the number of each instance. DPH is typically higher for teams because they are capable of more work. It is possible for them to do more.

Teams are getting disproportionately higher diverts, not lanes with three scanners.

Is the difference in diverts per hour statistically significant between two scanners and three scanners? Check alone and as a team. Do bin graph like in other one. On x-axis, have bins of DPH ranges. On y-axis, have number of occurrences. Have two graphs, one for alone and one for team. Find average DPH. Test if average DPH is statistically significant.

Make a Whole Day? Column and look at the observations from only that

7/19: stats summary

When DPH is at least 200 and one hour has been worked (team):

LCs 1- 5: JPH difference between 2 & 3 scanners is 7.725 (not statistically significant)

* JPH difference of 15.45 for lane
* Should do 139.05 more jobs over the day

LCs 2-5: JPH difference between 2 & 3 scanners is 16.276 (statistically significant)

* JPH difference of 32.552 for lane
* Should do 292.968 more jobs over the day

LCs 3-5: JPH difference between 2 & 3 scanners is 23.650 (statistically significant)

* JPH difference of 47.3 for lane
* Should do 425.7 more jobs over the day

LCs 4-5: JPH difference between 2 & 3 scanners is 28.186 (statistically significant)

* JPH difference of 56.372 for lane
* Should do 507.348 more jobs over the day

LC 5: JPH difference between 2 & 3 scanners is 27.873 (statistically significant)

* JPH difference of 55.746 for lane
* Should do 501.714 more jobs over the day

DPH to JPH

Teams always get more diverts regardless of whether or not they’re on a lane with two or three scanners

Difference in Diverts Per Hour Between Lanes with Three Scanners vs. Lanes with Two Scanners (teams)

LCs 1-5: Difference in DPH is 19.823 (not statistically significant)

* DPH difference of 39.646 for lane
* Should have 356.814 more diverts over the day

LCs 2-5: Difference in DPH is 32.583 (statistically significant)

* DPH difference of 65.166 for lane
* Should have 586.494 more diverts over the day

LCs 3-5: Difference in DPH is 38.397 (statistically significant)

* DPH difference of 76.794 for lane
* Should have 691.146 more diverts over the day

LCs 4-5: Difference in DPH is 42.886 (statistically significant)

* DPH difference of 85.772 for lane
* Should have 771.948 more diverts over the day

LC 5: Difference in DPH is 44.112 (statistically significant)

* DPH difference of 88.224 for lane
* Should have 794.016 more diverts over the day

MP2 was down for five of the days I worked

**Results part of White Paper**

Whole dataset:

There is no statistically significant difference without filtering the data whatsoever. Upon removing LC 1s, there is a statistically significant different without changing any of the other filters.

Alone:

There are fewer observations when associates are working alone, which may be one of the reasons for the swaying differences and statistical significance

Team:

Total Diverts:

Change minimum to 1700

Total Diverts and Diverts Per Hour Comparison:

3 scanners result in 218.69 more diverts for LC 4s/5s over an entire day, which is equivalent to 23.02 more diverts per hour

This is less than the 33.77 found in the diverts per hour section because this only includes LC 4s and 5s

How is profit for MP calculated?

How much money does the extra 200 jobs/diverts make?

How often are 10, 11 associates needed?

Cost of associates?

Discrepancy between difference in DPH and difference in total diverts for solo associates is because people rarely work alone on MP2 and MP3. Many of the hours for solo associates is for people that were only alone in the morning.

Make argument that diverts per hour info is better because it more closely tracked individuals. Whether or not a team worked on a lane changes throughout the day, making the team vs solo numbers less reliable.