

3.0 Bulk Fork Free Parameters

3.1 Introduction

This section details some of the general methodologies and input parameters behind the movement of parts to the mainline.

3.2 Methodology

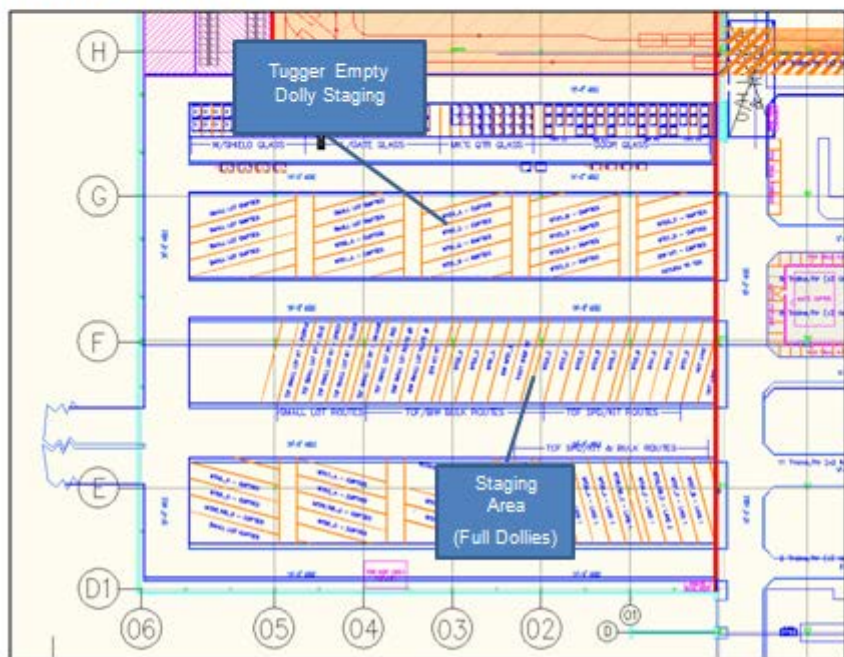
The simulation model uses line rate, parts per vehicle and parts usage per vehicle information for each part number to determine a rate at which each part is used on the mainline. As containers are depleted on the mainline, orders are placed for additional containers to be brought to the mainline. Before an order is placed, the number of parts at the line must fall below a threshold value.

Once the number of parts fall below the threshold value, a signal is sent where the part is delayed until one of the following conditions are met.

- Kanban Wait Status Dwell expires (starting once 1st order is placed)
- Maximum dollies per trip is met

The dollies will be assembled into a train and transported from Synchronon to the staging area located at the West Dock. The dollies will wait for pick-up via tugger. The tugger then transports the parts to lineside where they are unload and the empty container retrieved.

Upon delivery of all containers, the tugger will return to the West Dock area where the empty container(s) are unloaded at the empty dolly staging. The vehicle then proceeds to the staging area to await for the next parts to be delivered to the mainline.



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3.3 Vehicle Parameters

The table below shows the vehicle parameters utilized in the model.

Description	Assumption
# of Vehicles	4
# of Dollies	4 maximum (1 part per dolly)
Velocity Straight & Curve	5.0 mph (440.0 rpm)
Acceleration	1.5 ft/sec*
Deceleration	1.5 ft/sec*

3.4 Miscellaneous Parameters

The table below shows the miscellaneous parameters.

Description	Assumption	Comments
Staging Time	15.0 min	This is the time required from the time the replenish signal is received until the time the part is available to be delivered by the tugger driver. Product is assumed to be always available to load to tugger.
Tugger - Pickup Full Time	3.0 sec	Time required to pickup loaded/full dollies in West Dock Staging Area
Tugger - Unload Container Time	74.0 sec (1.2 min)	Time required to unload container at lineside. This includes tugger operator leaving the vehicle, unloading the container and returning to the vehicle.
Tugger - Empty Hook Time	35.0 sec (0.6 min)	Time required to hook empty to tugger at lineside.
Tugger - Set-down Empty Time	52.0 sec (0.9 min)	Time required to detach empty dollies in Empty Dolly Staging area.



4.3 Phosphate System #2 Sequence of Operation

Below is a summary of the Sequence of Operations for the Phosphate System #2.

4.3.1 Phosphate Load

Units are loaded from an g0 Shell carrier onto an Elpp carrier via a fork transfer. Units proceed to the Phosphate while the empty Shell carrier proceeds to the Phosphate Unload process.

4.3.2 Phosphate

The Phosphate process consists of a production conveyor where the unit is dipped several times in the Phosphate solution.

Before a unit can enter to the Phosphate process, the unit must make sure the strip protection counter is not at capacity. This is to ensure units are not left in the Phosphate/Elpp systems. A common strip protection is utilized for both Phosphate System #1 and Phosphate System #2.

Units count into the counter prior to the entrance of the Phosphate process and count out of the counter at the stop prior to the LASD Sealer Cell. The counter has a capacity of 220 units.

Units then are routed to the Elpp process.

4.3.3 Elpp

The Elpp process consists of a production conveyor where the unit is dipped several times in the Elpp solution. Units then are routed to the Elpp Transfer process.

4.3.4 Elpp Transfer

Units are unloaded from the Elpp carrier onto the BIW Shell carrier via a fork transfer. Units proceed to the Elpp Oven.

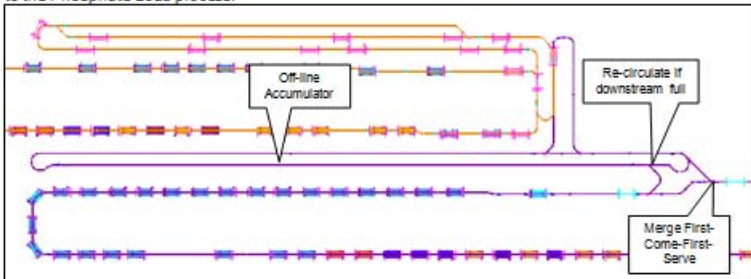
The empty Elpp carrier then proceeds to the empty return process.

4.3.5 Empty Return

The Empty Return consists of an accumulator prior to the Phosphate Load process or an off-line accumulator.

The off-line accumulator consists of in-line accumulator and a carrier cleaner. The carrier cleaner will not be part of the simulation model at this point in time due to the low frequency of use. The empty carriers will continue to be re-circulated in the off-line accumulator until room is available downtime prior to the Phosphate Load process.

The empty carriers merge from the off-line accumulator in a First-Come-First-Serve method and proceed to the Phosphate Load process.



4.4 Conveyor Data

Below is a summary of the conveyor data utilized in the simulation model.

Carrier Data Table		
Type	# of Carriers	In-line/Bias Accum c/c
Phosphate System #1		
Phosphate Overhead P&F	57	21' - 0" (inline)
Phosphate System #2		
Phosphate Overhead P&F	72	21' - 0" (inline)

Conveyor Data						
Chain I.D.	Description	Speed (fpm)	Gap/ No Gap	Dog Spacing	Prod. Centers	Prod. Rate
Production Conveyors						
P-202	Phosphate #1	13.9	Gap	7' - 0", 17' - 0"	24' - 0"	34.7
P-204	Elop #1	13.9	Gap	7' - 0", 17' - 0"	24' - 0"	34.9
P-206	Phosphate #2	13.9	Gap	7' - 0", 17' - 0"	24' - 0"	34.9
P-208	Elop #2	13.9	Gap	7' - 0", 17' - 0"	24' - 0"	34.9
Delivery Conveyors						
P-201	Delivery	60.0	N/A	5' - 0"	N/A	N/A
P-203	Delivery	60.0	N/A	5' - 0"	N/A	N/A
P-207	Delivery	60.0	N/A	5' - 0"	N/A	N/A
P-209	Delivery	60.0	N/A	5' - 0"	N/A	N/A

Notes: **No-Gap** - Gap will not be allowed, therefore the conveyor will stop and wait for a job to enter the conveyor.

Gap - Gaps of increments of the dog spacing are permitted.

P-202 & P-206 will be simulated as an average dog spacing (7' - 0" & 17' - 0" dog pattern = 12' - 0" average)