1. Description of process:

1.1. Shipping totes can arrive at the Sequencer installation from three locations:

1.1.1. AMD3 - a picking miniload connected to the sequencer by conveyors. It is a continuation of the process started in the miniload;

1.1.2. Manual entry point (physically several points) – totes coming from different manual areas;

1.1.3. Destacker (considered as an optional valuation in the tender specification)- dolly arriving from other DCs operated by a robot to automatically destack stacks of shipping totes and direct them according to destination (without employee participation – only safety belts are removed manually before the dolly is put on the destacker).

1.2. In order to manage the flow of totes on an automated installation, at least this data is required in the MFS:

- route ID;
- route type;
- drugstore number;
- order number;
- date and time of loading;
- destination;
- picking totes plan;
- volume/filling ratio of the tote;
- type of articles in the tote.

1.3. According to point 2 various types of routes are currently planned to be handled at the installation:

- regular (routes sent directly to drugstores);
- pendulum (routes sent to other warehouses);
- hub (routes sent to transshipment warehouses);
- investment (routes sent to new drugstore openings, commissioned and held in the sequencer for an extended period of time);
- other.

1.4. Parameterizable in MFS by route type must include for example:

- minimum dolly sealed (dolly6/doll8/dolly10)
  If number of totes is above defined parameter then sealing is mandatory ;

Commented [AM1]: This is not a base process according to tender specification, therefore I suggest we add a note saying that this is for the case that the supplier finds the relevant space and it can be implemented at this stage of the process.
The specification treats automatic destacking as an optional price.

Commented [RK2R1]: What about infomation that we expect that Logistics Contractor present his solution within the scope of the offer (as optional price) and if sees possibility of optimising the layout and indicating this position, then this needs to be calculated and shown on the layout

Commented [AM3R1]: That is exactly what I am saying. We shoould clearly indicate, this is an optional valuation, as we have to be consistent in the documentation. I am not sayng to remove it, but to add to description.

Commented [AM4R1]: See my proposal

- method of handling last totes for store-route (mix with totes labeling / mix with stack labeling / manual stacking etc.) ;
- destination of last totes for store-route (how we plan process looking on stacker/manual sorting area destination);
- minimum dolly stacked automatically;
- freezing time
- start of stacking before loading time
- start of outbound last totes for route-store combination before loading time

Additionally to above, route types might change in the future, so we need to be able to change route types in the context of adding, removing, modifying route types.

1.5. Totes entering the sequencer/manual sorting area need to be controlled prior to storage in terms of weight, contour, barcode/rfid, WMS data. For totes directed to manual sorting area we also expect contour check but with possibility to turn it off from MFS application.

1.5.1. If there is an error on the shipping tote, it will be directed to the NOK station for correction, and then the operator should be able to bring the tote back to the installation for storage in the sequencer. The tote must be re-verified for errors.

1.5.2. Scanning of NOK containers and visualization of errors in the MFS system should be done automatically without requiring manual scanning by the NOK operator. When the tote is pushed out of the NOK station, the error is automatically cleared in the MFS system.

1.5.3. If several errors have been detected on the shipping tote on its way to the sequencer, the NOK station should display all errors simultaneously.

1.6. Processes of inbound and outbound in sequencer are according to point Logic of inbound and outbound and Investment route keeping in mind Last tote for the shop-route combination and Consolidation functionalities.

1.7. Processes of directing totes in the installation is according to point according to Logic of directing totes in the installation, Mix of totes and Multifunctional fingers.

1.8. Processes of automatic stacking and WMS-workstation are according to tender documentation/subsequent (Tender document Logistics Contractor Subsequent Delivery 20.08.24), taking in mind we don't consider clips on dollies anymore.

2. Sequencer functionalities

2.1. Tote consolidation:

Commented [AM5]: Please review this sentence

Commented [RK6R5]: yea, should be used according to once

2.1.1. The purpose of consolidation is to reduce the number of totes created in the picking process in different picking areas, different warehouses. For consolidation functionality data will be sent by WMS (such as totes filling rate, type of articles in tote). The main idea is to consolidate two or more totes whose volume is lower than the parameter specified in the MFS.

2.1.2. It is necessary to classify totes for consolidation so as not to withhold too many totes from automatic stacking of full dolly. The MFS creating the appropriate totes sequence (pair, three, etc.) will have boundary conditions that it will have to meet, such as total tote weight, total volume in tote, types of articles in totes that cannot be combined (e.g. food must not consolidate with non-food totes), etc.

2.1.3. In addition, there will be rules to be followed in consolidation such as: consolidation is stopped for a certain period of time before loading, totes directed to the consolidation must enter the consolidation station together (sequence haven't been broken), etc.

2.1.4. In MFS application there needs to be visualization of totes that are currently on consolidation conveyor, possibility to mark tote as tote full (as not to consolidate), switch off/on consolidation.

2.1.5. Consolidation can be done in one/few multifunctional fingers on manual sorting area.

2.2.Sequencer inventory

2.2.1. Sequencer inventory is needed to verify the sequencer physically in the installation and determine if they match what is visible from the WMS/MFS system. Inventory must be triggered manually by employee from MFS application level. During verification there will be various cases, after which the installation will have to perform various actions such as sending the tote to the NOK station, blocking the location, etc.. In the MFS application, it must be possible to cancel the inventory and it is necessary to have a history of performed inventories with information on whether the inventory was successful (was completed automatically). MFS must have dashboard, in which there will be current information about each tote in the installation (locations in sequencer, conveyors around sequencer etc.).

2.2.2. If the MFS recognizes that for some reason, any place is occupied (even though it shouldn't be), e.g. when attempting to store a tote in a location it finds

that for some reason it cannot store a tote in that location, then it blocks that place in MFS until verification. Place has to be unlocked from the MFS application. In addition, it performs an attempt to outbound the tote from the place to the NOK station with an appropriate message (then it is not needed to block location). If the MFS attempts to retrieve a tote from a location and cannot do so for some reason, e.g. the tote is not in the location, then the location should be blocked for verification and marked in the system. Places have to be unlocked from the MFS application level. Above behavior must also take place in the case of a normal continuous process.

2.3. Automatic tote labeling

2.3.1. At decision point/points, which allows us to complete the open commission and print a label for the totes based on MFS configuration/WMS data. Already marked in tender documentation and mainly in previous subsequent delivery.

2.4. Investment route

2.4.1. Storing (keeping) totes in shuttle for longer period of time. One option is to mark the route (route type marked as investment) as investment (the MFS will obtain this data and keep it updated from other system). As long as the totes are assigned to the investment route they are stored in the sequencer (there might be other terms and conditions to be discussed in later stage). Second option to keep totes in sequencer for longer period of time is to define time before loading after which stacking of totes to dolly will begin. Option described in more details later in this document (Logic of inbound and outbound).

2.5. Last tote for the shop-route combination

2.5.1. Needed for logic of sending out totes from one store. Information marked by MFS with the last shipping tote from a given shop-route combination or after the other requirements are met- this will be a trigger for the MFS system to require containers to be directed to place of the destination (with the exception of investment routes, routes with longer loading period).

2.5.2. WMS will send information about all totes that need to be delivered to sequencer from different areas (picking totes plan). MFS for each tote will be continuously updated by the WMS system. This marker will be then handled by MFS according to the picking totes plan and consolidation described above (this is just mark/check from MFS that all the required totes already arrived to the sequencer/not waiting for any other totes according to picking totes plan).

2.6. Logic of inbound and outbound

2.6.1. The logic of inbound and outbound will be defined at a later stage - at the stage of discussions with the Logistics Contractor. The solution must be optimal and meet our throughput requirements. MFS is responsible for all the flow inside the installation.

2.6.2. Routes with the exception of investment route/loaded in long term must be stored in optimal locations, other totes must be stored in the least optimal installation locations or locations defined by user on MFS dashboard. The number of "non-standard" totes must not exceed the defined parameter in MFS and the MFS must handle it.

2.6.3. Long term loading date defined by a parameter in MFS as number of hours before loading, after which stacking of full sequences will be started (excluding last totes for route-shop combination). Let's define it as Start_stacking.

2.6.4. There will be also additional parameter needed - Last_totes_hold. It is number of hours before loading, after which last totes for route-shop combination for drugstores that already have the last flag in the system will start to roll off the shuttle installation. When the specified hour is reached in the first place, we should send a question to the WMS again, in order to verify that there are no more totes for which the MFS should wait.

2.6.5. For above parameters (2.6.4 and 2.6.3) there must be possibility to define in MFS per day of the week (Monday, Tuesday etc.).

2.6.6. Such totes can be stored for example without id route (parameterization from the MFS level) and in the future it will be assigned to target route id.

2.6.7. Creating sequence to stackers must be done in such way to maintain the queue of the aisle independently. Ready sequences must be send out from sequencers outbound zone(prezone) as fast as possible - sequence already prepared goes to stacker, however queue for stackers from sequencer must be created in such a way as not to block the flow (stacker is chosen after it is enough place to send all totes from one sequence to the conveyor that is connecting sequencer with stackers). It must be able to redirect the destinations of individual full stacks sent to stackers or sorting area. In case of failure of one stacker or one conveyor to stacker, the destination of the next shipping totes can be easily changed on MFS level (automatically).

2.6.8. Outbound totes to the stacker for the shop-route combination can be triggered automatically when

- If the flag "Last tote" is not marked, the condition with the parameter Start_stacking has been reached, then we can create only full stacks;

- If the flag “Last Tote” is marked, the condition with the parameter Start_stacking and Last_totes_hold has been reached, then we can create a sequence of containers below the maximum number of totes in the stack. Start_stacking and Last_totes_hold are described in previous points.

2.6.9. If a route freeze time is reached, then the MFS sends the stacking totes with a high priority, disregarding whether the “Last Tote” flag is marked, and skips consolidation.

2.7.Logic of directing totes in the installation

2.7.1. At the beginning, it's worth mentioning that the MFS will obtain the picking totes plan for each route with its current update, will have information about the totes in the miniload and will be able to manage them from the transmission level. We further assume that the MFS will manage the entire flow within the sequencer. Thus, we expect optimal movements on the area for standard flow as well as for emergency situations. To be discussed at later stages of the project.

2.7.2. Each tote arriving to the sequencer area is directed accordingly to target destination sent by WMS at the beginning of the process. The target can be updated by the MFS if one of the emergency strategies is used: e.g., after a certain occupancy (assume X%) of the sequencer is exceeded, direct to the stores for which there are no totes in the sequencer to a manual sorting area until the counter goes down, or after a certain occupancy (assume Y%) of the sequencer is exceeded, direct all totes to stackers to create mix of totes. Emergency strategies must be discussed in detail at a later stage of the project.

2.7.3. The main goal of the sequencer's process in terms of choosing destination is to maximize the number of totes handled on stackers relative to manually operated totes on manual sorting area. In the section below (mix of totes) the logic of creating automatic stacks in the sequencer is described. In addition, for regular routes, stacks must be implemented in such a way as to minimize the number of totes created in mixes, while creating the maximum number of dolly not requiring further handling (not necessarily always dolly 10) - this is for a detailed discussion at a later stage.

2.7.4. From the MFS application it has to be possible to direct the totes in the appropriate direction manually. Additionally, it must be an ergonomic solution for the employee - the employee has to, for example, send a specific route/store/single tote to the appropriate sort with the appropriate mode, to stackers to create mixes with/without labels, to the NOK station, etc.

2.7.5. It must be possible to proceed dollies contains only 2 layers of totes using stackers (minimum number of totes handled by installation must be 3 full with 1 empty tote).

2.8.Mix of totes

2.8.1. If a sufficient number of shipping containers is not reached for a given route-store combination according to the min_amount_dolly parameter, these containers must still be shipped to stackers however, they must be stacked in mix-totes dolly (accordingly to route type parametrization).

2.8.2. MFS will be able to create 3 different automatic stacks from shipping totes (excluding emergency strategies):

2.8.2.1. Automatic stack - consisting of 4-10 (defined by parameters) shipping totes, such stacks will be transported directly to the loading yard.

2.8.2.2. Automatic mix-stacks of regular routes orders created on the stacker - consisting of 3-8 (defined by parameters) shipping containers, MFS will create such stacks from different stores in order to optimize number of carriers created and transported to the repacking yard. This type of stacking will be for shipping totes that do not meet the criteria for the creation of “Automatic stack”. It is important to create a mix of complete orders (all remaining totes for route-shop combination must be send in one stack) - it can’t be possible to create mix-stacks of regular orders by splitting the order into two different dolly units. Mix-stacks must be realized within a similar loading hours. In the absence of other orders with which it can be mixed after the freeze time, is sent to the manual sort (if the parameter indicates it).

There will be general rules to provide, such as (setting on the route type level):

- whole route-store combination in 1 stack;
- label printed on each tote (on longer side);
- maximum 8 totes in stack
- it is required that the drugstores are stacked next to each other;
- the center of gravity must be maintained;
- lid is required (possibility to disactivate this requirement from MFS level).

2.8.2.3. Automatic mix-stacks of pendulum routes orders - created on the stacker - consisting of 3-10 (defined by parameters) shipping containers,

MFS will create such stacks from different stores in order to optimize the created and shipped dolly to other warehouses. For this type of stacking will be shipping containers that do not meet the criteria for the creation of "Automatic stack". Unlike the creation of "regular order mix-stack" in this case, we can create stacks from incomplete orders. In this case, the MFS can create a stack of shipping containers by dividing one of the orders into two different dolly stacks. This will apply to stores to be inserted on the sequencer in other warehouse, so it doesn't matter much to us if we have an order in one dolly stack. In the WMS it is enough to create one package (printing one label for whole stack). Assigning a base/lid to a label analogous to a full dolly stack (first variant). Sealing in this situation is not required (further handling of the unit in another warehouse). Stacks must be done within 1 route.

There will be general rules to provide such as (setting on the route type level):

- route-store combination in 1 stack not required;
- 1 label printed per dolly (on longer side at highest level);
- max 10 totes in stack
- it is not required that the drugstores are stacked next to each other;
- the center of gravity must be maintained;
- lid is required.

2.8.2.4. Automatic mix-stacks in emergency strategy - created on the stacker from totes from different areas. We expect stacking them to dolly with / without printing labels on it.

Commented [AM7]: Ahould it be „we accept stacking them to dolly…"?

Commented [RK8R7]: it should be expect, Czech mistake

2.9. Multifunctional fingers

2.9.1. The possibility to change functions of each of the sorting finger (multifunctional modes of operation). Already mentioned in tender documentation / subsequent delivery. Possible modes:

2.9.2. "standard sorting area mode": as standard handling of specific stores on the sort (1 store = 1 place / base of dolly at the sort (buffer)). We except maximum of 10 stores handled on one sort. If more than one sort is activated in this mode then stores must be assigned in optimal way to maximize efficiency on sorts and minimalize carrying totes for longer distances by employee (for example it is better to have 2 sorts with 4 stores each then 8 on one sort);

2.9.3. “mix open”: in order to stack the totes as a dolly mix of random totes coming of the Picking Gallery / inbound existing building, and then further handling it (reinsertion into the sequencer after a breakdown will be repaired / handling with the appropriate area (container buffers same as in sorts) defined in the MFS);

2.9.4. “mix pendulum”: with label printing. To create dolly composed of mixes of several stores, cover with shipping label for every stack not for single tote;

2.9.5. “mix regular”: with the option to print labels for each tote for further handling in the manual repacking area;

2.9.6. “consolidation”: totes directed from sequencer to consolidation (need check between exit and entry – if the employee did not make a mistake).

2.9.7. “empty totes”: drop in of empty totes in case of failure to feed stackers from order start (empty totes needed for odd stacks). Weight, contour and WMS data verification in this case necessary so that a full tote is not mistakenly sent to the buffer;

2.9.8. “NOK”: Possibility to activate additional NOK station on multifunctional fingers in which there is ability to handle errors and re-inject into the installation after correcting them (check needed between exit and entry to verify that the error has been corrected);

2.9.9. “manual repacking area”: The totes come down to the sort with a printed label on an automatic labeling machine, placed in the appropriate place on the installation. Defining instead of the store the target buffer to which the totes will be directed. Selection of stores connected with manual repacking area directed to the sort editable from the MFS level. The totes are directed randomly from the Picking Gallery / inbound of the existing building (ordered mixes of totes that are left for each store are not created);

2.9.10. “control station”: in this mode previously selected totes will be directed to the station for physical and system verification. The totes will be reinserted into the installations after inspection. The MFS, when sending out totes from sequencer, makes sure to direct totes only for a certain period of time before loading. If there is not enough time, then authorized person should accept this transport before sending it to control station.

2.9.11. “manual stacking”: stores (orders) for which an insufficient number of totes are create for a dolly, directed in this mode to the sort in order to sort them with roll cages and print a label on roll cages (handling only the totes for 1 store in

each roll cage, not few stores in 1 roll cage – without mixing totes from different stores);

2.9.12. "inbound": potentially use of the sort for emergency insert totes from Lodz, other areas (for example in case there is a destacker failure).

2.9.13. Of the above modes: consolidation, NOK, empty totes, inbound, control station require a return conveyor.

2.9.14. Other modes of operation: standard sorting area mode, mix open, mix regular, mix pendulum, manual repacking area possible on any sort.

2.9.15. Modes with exception of consolidation must be fully done in MFS application. Looking on consolidation, process will be done in WMS (only some data or small functionalities must be on MFS side).

2.9.16. It must be possible to activate few modes in one sorting finger (for example mix open + mix regular + mix pendulum + manual stacking).

2.10. Counters such as:

a) Number of locations in sequencer dedicated for "non-standard" totes
   - Non-standard = totes from investment route + totes with longer loading date
   - Number must be parametrizable within every single aisle

b) Start_stacking - Number of hours after which stacking process will begin
   - Parametrizable per day of week

c) Last_totes_hold - Number of hours after which stacking process will begin for last totes for route-store combination
   - Parametrizable per day of week

d) Freezing time
   - Number of hours before loading date after which totes are directed outside sequencer without waiting longer for last tote for route-store combination
   - At the freezing time it is still possible to create mix of totes in dolly (if there is enough tote to build stack like this)

e) Maximum number of totes in dolly (per route type)

f) Minimum number of totes for automatic stack (per route type)

g) Minimum number of totes after which the empty totes must be inserted for uneven automatic stacks

h) Minimum weight of automatic stack

i) Maximum weight of single tote on the highest level (5)
j) Number of stores in a single manual sorting area (parametrizable per sort)
k) Emergency counters such as number of occupancy after which strategies will be started

3. MFS

According to Logic of directing totes in the installation we expect that the MFS will manage the entire flow within the sequencer. Thus, we expect optimal movements on the area for standard flow as well as for emergency situations. WMS system will only give required information and let MFS do the job of managing all the flow in this area.