KNAPP

K1513 JLP Sorter

Functional Specification

DRAFT Version

1.2.2-002
PH-FU
V0-40
03/2013
en

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Language variant

English (Original)

Translation from English

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Contents

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Index of Figures

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About this Document

Informatione

In this document you find all necessary information about the defined functionalities for KiSoft systems.

Signal words

In KNAPP documents the following signal words are used for hazards and links:

Signal word	Signification
DANGER!	Imminently hazardous situation which may result in death
CAUTION!	Risk of personal injury and potentially also risk of material damages
CAUTION!	Risk of damage to property and potentially also slight risk of injury
IMPORTANT!	Risk of malfunctions (without personal injury and damage to property)
Note	Important information and useful advice for smoother operation

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Notations

Following mentioned notations are used in this document:

Unit	Format	Example
Button, switch	Angle brackets	<On>
Button	Square brackets	[Exit]
Menu command	Small caps	language
Menu text, dialogue text	Quotation marks	"Orders"
Cross-reference	Italic	See *documentation*

Terms and abbreviations

All important terms are explained within this document. The abbreviations are listed and explained in the list of abbreviations at the end of the document.

Figures

The figures contained in this document are standard illustrations. Minor differences may occur for custom installations.

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Informations about the Document

Document history

Vers.	Date	First version	Examination	Release	Annotations
0-01	2012-11-20	FIA			Initial Version (including Sorter description from 2012-12-03)
0-10	2012-12-07	FIA			Send to customer for the first review
0-20	2012-12-18	FIA			Changes in section 3.5 and 4.4 due to informations Hollen-steiner (error chute and contain-er routing to inducts) Minor changes in various sec-tions Send to customer the very day.
0-30	2013-01-11	FIA			Changes due to conference call with Rob Cooper (2011-01-09) and question sheet from JLP (12_12_14 Sorter Specification JLP Comments.xlsx) Send to customer the very day
0-40	2013-01-16	FIA			Changes according to feedback DEV for error handling and ac-cording to HOLM for fallback handling Send to customer the very day
0-50	2013-02-11	FIA			Changes due to • New design of the sorter • WS in Leoben (John Waugh, Robert Cooper) Important: due to outstanding FAT of the ramps – changes on the ramp handling / layout of the ramps may be necessary. Send to customer 2013-03-05

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Document directory

No.	Date	File name	Annotations
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1 General

1.1 Information about the logistics parties

1.1.1 General Provider

General Provider	**Knapp Logistics & Automation GmbH**
Locations	Guenther Knapp Straße 5 - 7 A – 8075 Hart bei Graz phone: +43 (0)316 495 0 Fax: +43 (0)316 495 99 0
Project Manager	Gabriel Winkler

1.1.2 Information on the logistic supplier

General Provider	Knapp System Integration GmbH
Locations	Waltenbachstraße 9 A - 8700 Leoben phone: +43 (0)3842 805 0 Fax: +43 (0)3842 805 500
Project Manager	Harald Hausbauer
Technical Project Manager	Marko Brenner

1.1.3 Customer

Customer	John Lewis Partnership
Locations	Milton Keynes (Magna Park)
Implementation team manager	Steve Waugh

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1.1.4 3rd party

Supplier	BEUMER
Locations	Beckum / Germany
Project Manager	Kevin Schmid

1.2 The project

1.2.1 Initial state and ambition

The existing ware house of John Lewis Partneship (JLP) will be extended with a sorter solution for the conatiners to be despatched to customers. This solution is based on two main processes:

- Automated sorting
- Manual cage build up

Software components to achieve this goal are

- KiSoft WMS and WCS
  To assigning sorter lanes to despatch tours
  To feed the sorter with despatch containers
  To make the dolly build up for containers used in thi ssortng process
- BEUMER Sorter Software
  For automated sorting of the infeeded containers to assigned lanes of the sorter chutes
- BEUMER Visulalisation
  Please see (see section 7.1 Standalone Visualisation of the Sorter System (BeOS))
- Visualisation ZenON
  Please see document “VISU612-0231-x.xls”. This Excel sheets enumerates the provided data points which are used in the ZenOn visulation.

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1.2.2 Scope of the document and further documentation

This document and its appendices describe the functionality and the entire KNAPP scope of supply of this sorter solution within this ware house. This contains:

All logistical functionalities referring to

- Functionalities of the sorter (inclusive infeed of the containers onto the sorter and the maintenance of the sorter chutes) – inclusive error handling
- Functionalities after the containers are on the sorter chutes (cage build up) – inclusive error handling

The follow up process of the build cages is not changed and is not described in this document.

Only functionality described in this document will be implemented and will be part of the functional acceptance of the system.

Communication between KiSoft and 3rd party systems (like the BEUMER) is described in separate internal specifications.

Functionalities of other partner systems are only described briefly to support the readability and the understanding of the user process if necessary. These functionalities are neither scope of this document, nor scope of supply of KNAPP.

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2 System Overview

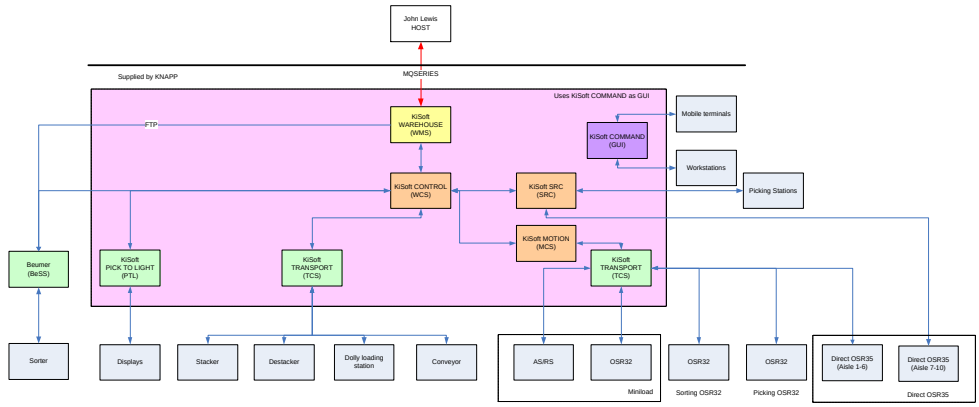

Figure 1: System overview

System	Description	In scope of KNAPP
BEUMER BeSS	Software of the BEUMER Sorter	Yes
Sorter	PLC and HW of the BEUMER sorter	Yes
All other systems	Please see main spec “PH_FU-K1233_V2-2.en”_	

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3 Logistic Elements of this Extension

3.1 Layout

The following figures display

- an overview of the ware house inclusive the infeed conveying system.
- And the layout of the sorter in detail

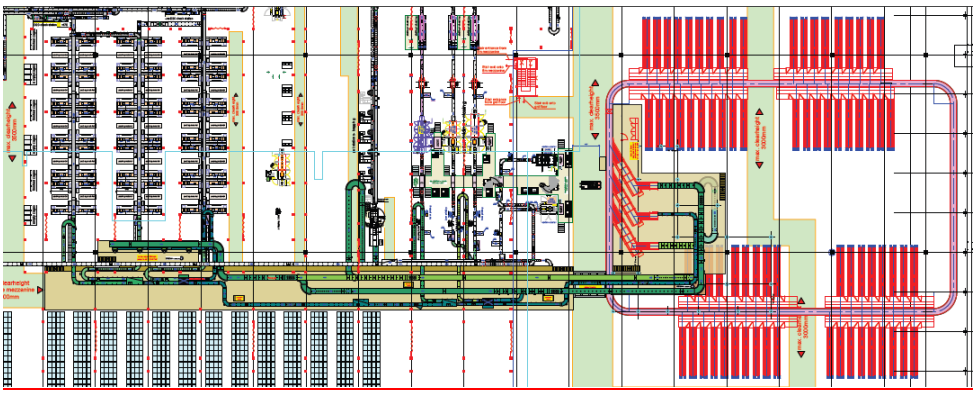

Figure 2: Overview layout / (1) … sorter area (with the final 2020 layout of the sorter)

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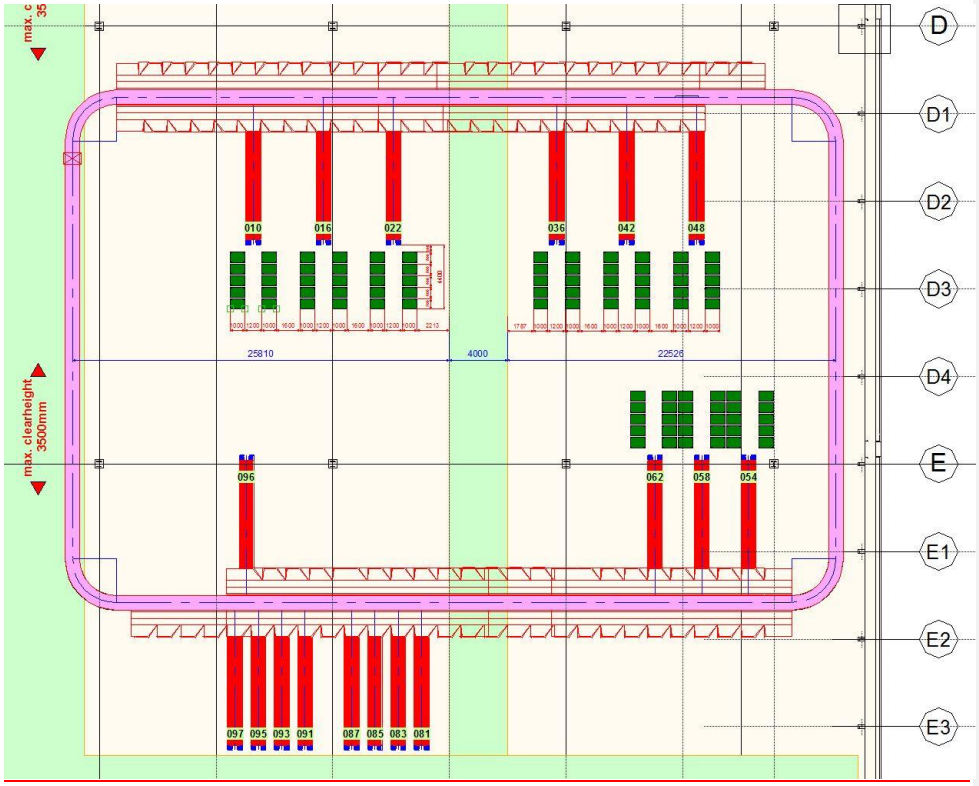

Figure 3: Sorter configuration for 2013 (already with ramp numeration)

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3.2 Container and Container Types

Two container types are used

- Bags
  Which are resulting of the bagging process
- Despatch – Cartons
  Which are resulting from automated closure-lines (ACL) and manual pack-benches

Due to additional sorting restrictions (see assignment of tours to chutes) a container subtype is defined as following

- Manual box
- Bag
- Medium Carton
- Large carton

Restriction:
These subcontainer types are fixed and can't be changed by JLP.

The sorting system is based on the following dimensions and weights:

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Container dimensions					
Container	**class**	**Length [mm]**	**Width [mm]**	**Height [mm]**	**Ratio**
Carton	Min.	200	140	40	15%
	Medium	400	300	150	40%
	Large	530	350	300	35%
	Max.	900	500	420	10%
Bags	Min.	210	150	5	
	Medium	600	400	200	90%
	Max.	900	630	300	10%

Container weight			
Container	**class**	**Weight [kg]**	**Ratio**
Carton	Min.	0,1	0%

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	Ø	10	95%
	Max.	25	5%
Bags	Min.	0,1	0%
	Ø	5	95%
	Max.	7 bzw. 25 *	5%

*Remark:

- Bags with a length of more than 600 mm will be inducted via the “Bag induct” using the additional steel plate. The weight of those bags is limited to 7 kg.
- Bags with a length of more than 600 mm and a weight above 7 kg will be inducted via the “Carton induct”. A 100% correct induction process is not guarented in this case.

Non conveyable containers

Any shipment that cannot be transported on conventional belt conveyors or automatic sorting system without the risk of being damaged or damaging the sorting system is designated non conveyable.

Non conveyable products		
Description	**Unit**	**Specification**
Weight	[kg]	x < 0,1 / x > 25
Lenghts	[mm]	x < 200 / x > 900
Widths	[mm]	x < 140 / x > 500
Height	[mm]	x < 5 / x > 300
- Liquid or fragile material, to avoid breaking, spillage or leakage, such as wine bottles, metal cans of paint - Package of outside material such as styrofoam, metal straps, wood, hard plastic, pallets, items with feet and nails - Unstable material with a risk to roll back or tumble on the sorting system, such as cylindered items or spherical items - Items classified as Dangerous Goods - Wet items - Items with anti-slip treatment.		

Note: product = container

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Container specification for connection conveyors

The container specification for the connection conveyors from the different packing areas to the sorter inducts will vary from the above stated specifications for the sorter. This relates to the foreseen conveyor elements depending on the container transported on the various routes.

3.3 Barcodes

3.3.1 Shipment barcodes

The shipment barcode (routing barcode) is on the despatch label / shipping label of the containers which are dispatched. The definition is as following

Type:	CODE 39 (CODE C)
Number of Digits:	10 including (no check digit)
Quiet Zone:	5 mm
Colour of carrier:	White
Colour of barcode:	Black
Print Quality:	ANSI A
Format:	Alphanumeric (10)
Bar-coded Characters:	Numeric
Narrow Bar Width:	0.3 mm
Height of bars:	10 mm
Barcode width:	70 mm incl. 5 mm quiet zones on both sides of the code

(please see Appendix H)

3.3.2 Barcode on Cages / Pallets

This barcode is used for identification of the

- Cages /pallets build at the end of the sorter chutes

Type	2 / 5 Interleaved
Module width	0.5 mm

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Ratio	3 : 1
No. of digits:	8 incl. check digit
Calculation of check digit	Modulo 10
Bar length	30mm (minimum)
Adjustment	ladder form (horizontal bars)
Plain text field	numbers (includes check digit)
Quiet zone	minimum 6 mm (on all sides)
Colour of carrier	White
Colour of barcode	Black
Print quality	ANSI A
Format	N(8)
Bar-coded characters	Numeric

The LPN Barcode will be used on pallets and cages. Therefore KNAPP has defined the following ranges for the LPN.

Cage units:	0100000X – 0999999X
Pallets:	1000000X – 9999999X

Where X is the check digit.

3.3.3 Location / ~~Chute~~ Ramp Barcodes

This barcode is used for identification of the

- Ramp ~~Logical chutes (lane)~~ of the sorter
  So each ramp ~~logical chute (lane)~~ is identified by it's own barcode
- The cage / pallet build up locations at the sorter

Type	Code 39
No. of digits:	12 incl. check digit
Calculation of check digit	Modulo 43
Plain text field	alphanumeric (including check digit)
Colour of carrier	White
Colour of barcode	Black

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Print quality	ANSI A
Format	C(12)
Bar-coded characters	Alphanumeric

(please see Appendix H section 2.10.2)

Basically: (area-prefix [3 digits] plus logically chute number [8 digits] plus checkdigit [1 digit])

The area prefix is defined as STR

Example: STR00000014~~1~~y would mean ~~chute~~ ramp 14~~, lane 1~~

Numbers ascending in direction of the material flow. On the outside of the sorter the ~~chutes~~ ramps with the odd numbers are located, on the inside of the sorter, the ~~chutes~~ ramps with the even numbers.

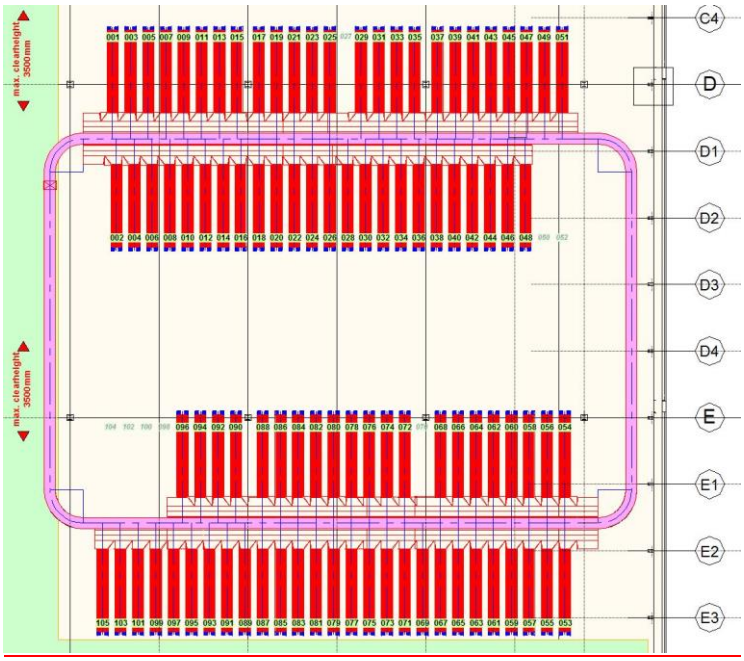

Figure 4~~3~~: Naming convention sorter ~~lanes~~ ramps (already for the final layout of 2020)

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Due to this numeration schema, it can be that there are “missing” numbers/gaps in the names of the ramps.

Note.
Since already all ~~chutes~~ ramps are named from the beginning (with the correct location number), the figure above shows the final ~~chutes~~ ramps of 2020 in addition

Since BEUMER uses a maximum of 4 digits to indentify the ~~chute~~ramp, the download th BEUMER is masked in the according way (just the substring 8 – 11 is downloaded; in the example above, just 0014 is downloaded to BEUMER.

3.4 Label

3.4.1 Shipping Label

See Appendix H, section 2.17.

The shipping barcode on the cross belt sorter can be read if th eorientation of the barcode is within the following ranges:

- Horizontally (parallel to the surface of the cross belt tray):
  The barcode can be rotated within 360°
- The other two axis allow a rotation till +/- 10°.

3.4.2 Label of Cages / Pallets

The labels for cages/pallets are taken from a pre-printed role (please see Appendix H).

3.4.3 Label of Location / ~~Chutes~~Ramps

These labels are not printed by any KiSoft system. Definition, please see see Appendix H.

3.5 Induction to the Sorter

Out of the following **source-areas** containers are routed to the sorter system

- Manual picking
- Auto bagging (bagging machines)

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- Carton closing (I-pack machines)
- Conveyor “error chute back to sorter”

The sorter itself has the following **inducts**:

- Standard induct used only for cartons (sorter induct number 3 in the figures below)
- Standard induct used for cartons and bags (sorter induct number 2 in the figures below)
- Advanced induct used only for bags (sorter induct number 1 in the figures below)

Each induction is equipped with a green/red tower light:

- green induction is running in auto mode
- red solid E-Stop has been pressed
- red flashing fault

The **material flows** from these source-areas to the according inducts of the sorter are illustrated in the figures below whereas the highlighted path describes the according material flow (and the red number in the upper right corner represenst the material flwo number):

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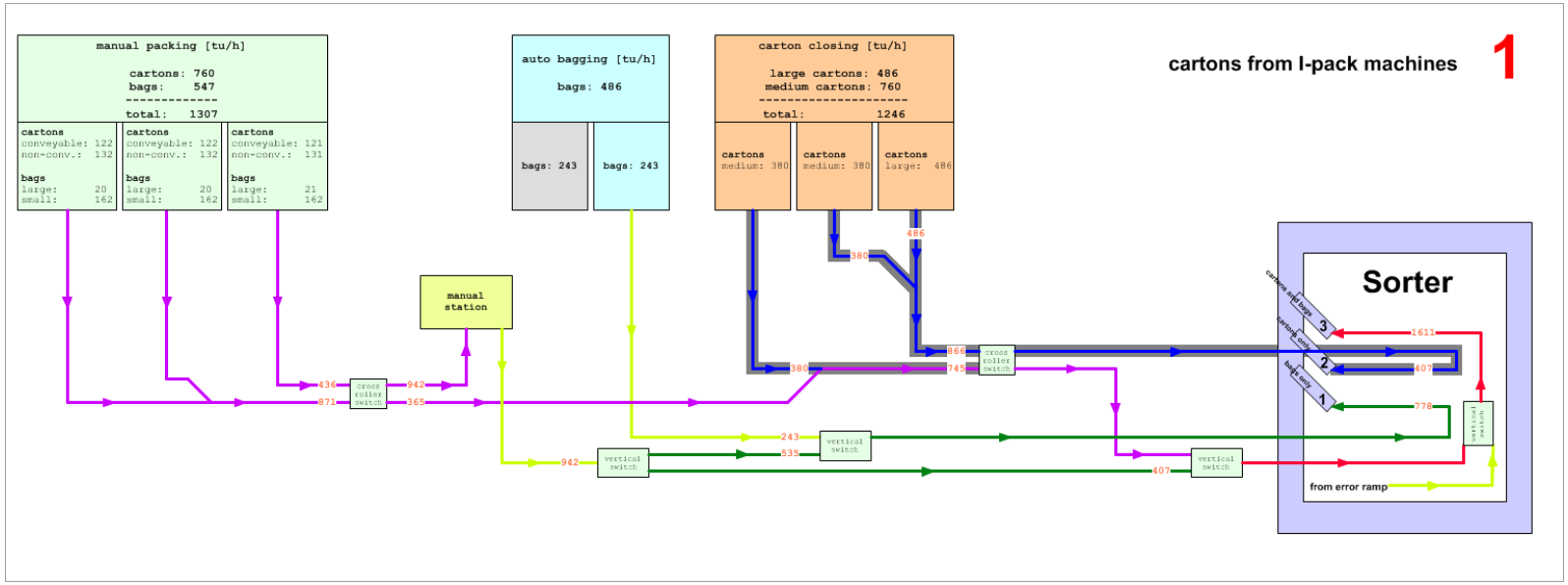

Figure 54: material flow from the carton closing to the sorter

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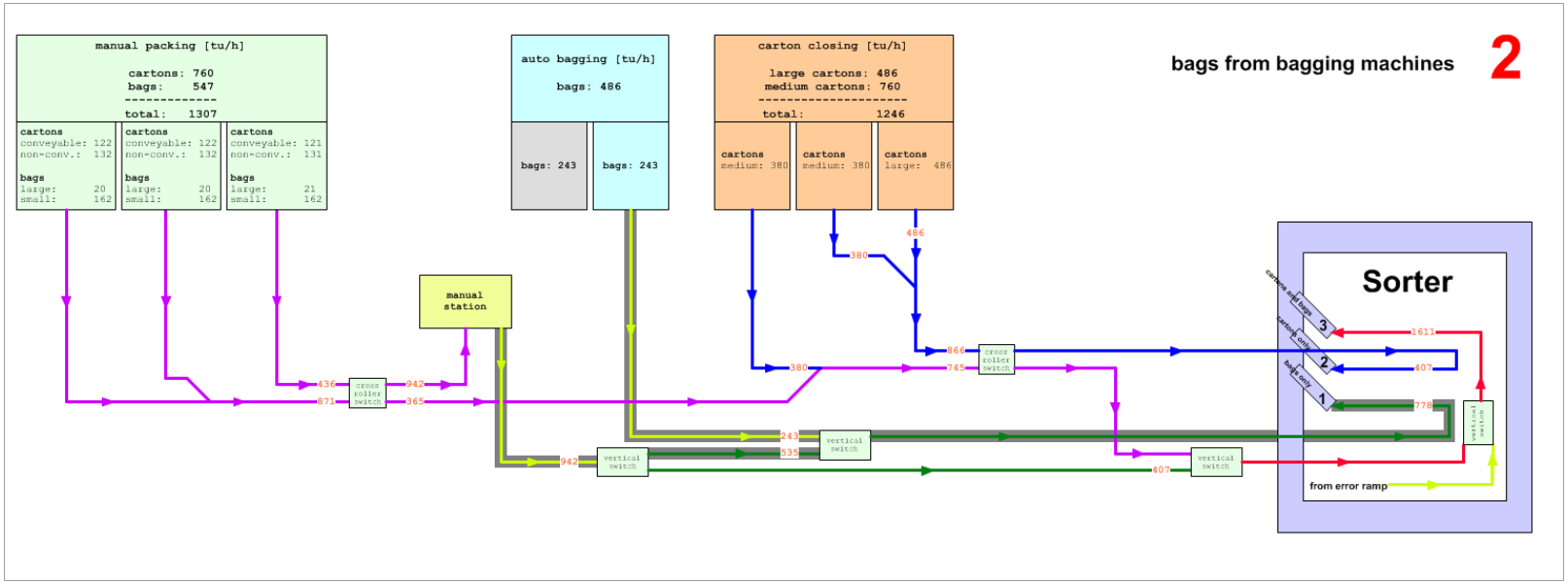

Figure 65: material flow from the auto bagging to the sorter

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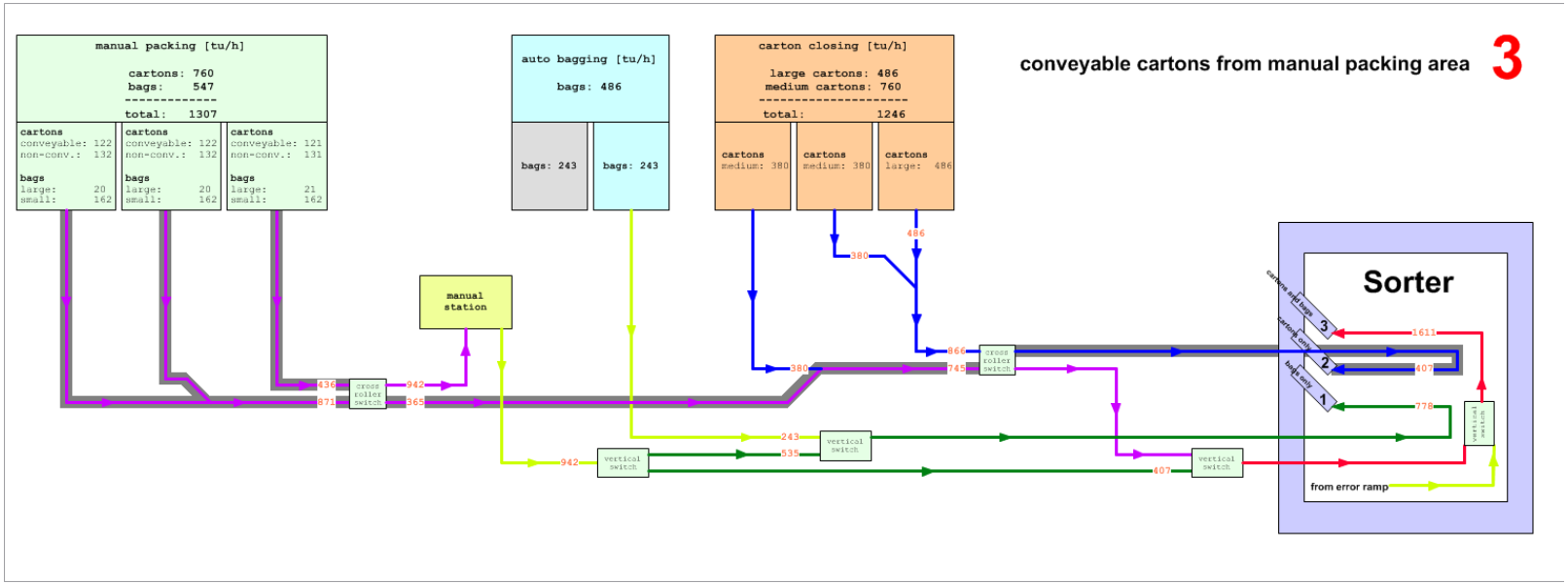

Figure 76: material flow from manual packing (conveyable cartons) to the sorter

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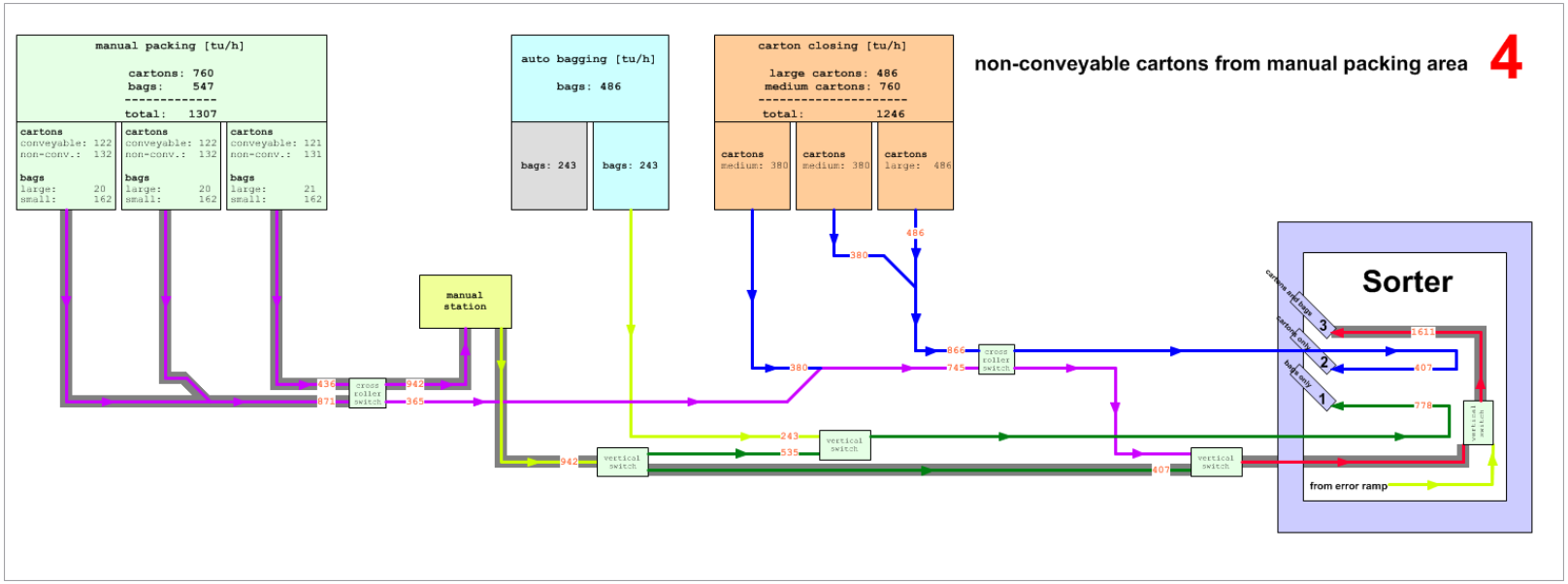

Figure 87: material flow from from manual packing (non-conveyable cartons) to the sorter via the manual station

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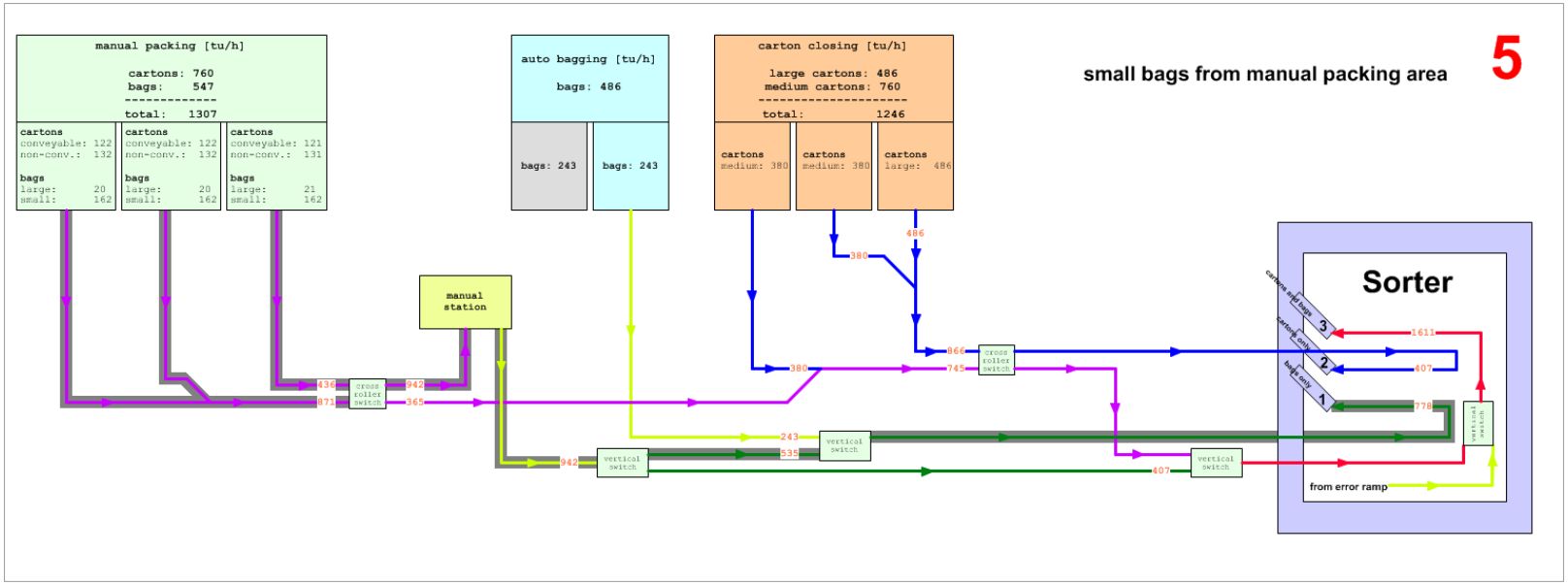

Figure 98: material flow from from manual packing (small bags) to the sorter via the manual station

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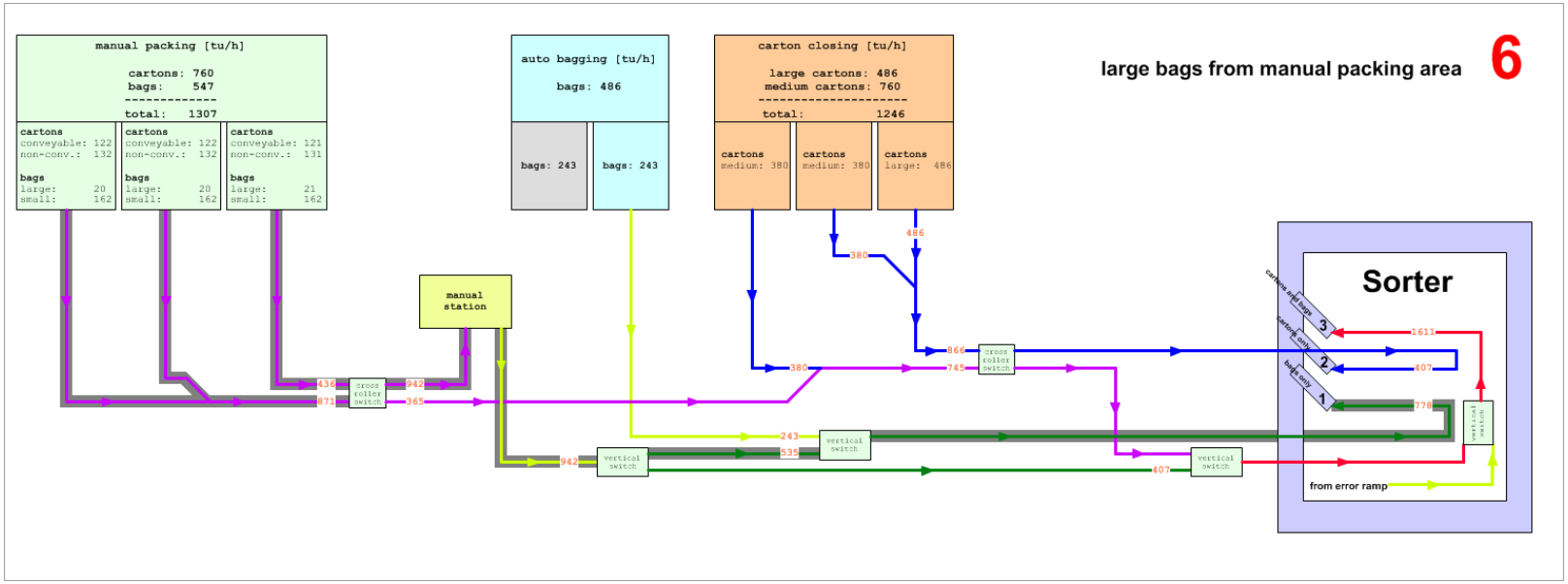

Figure 109: material flow from from manual packing (large bags) to the sorter via the manual station

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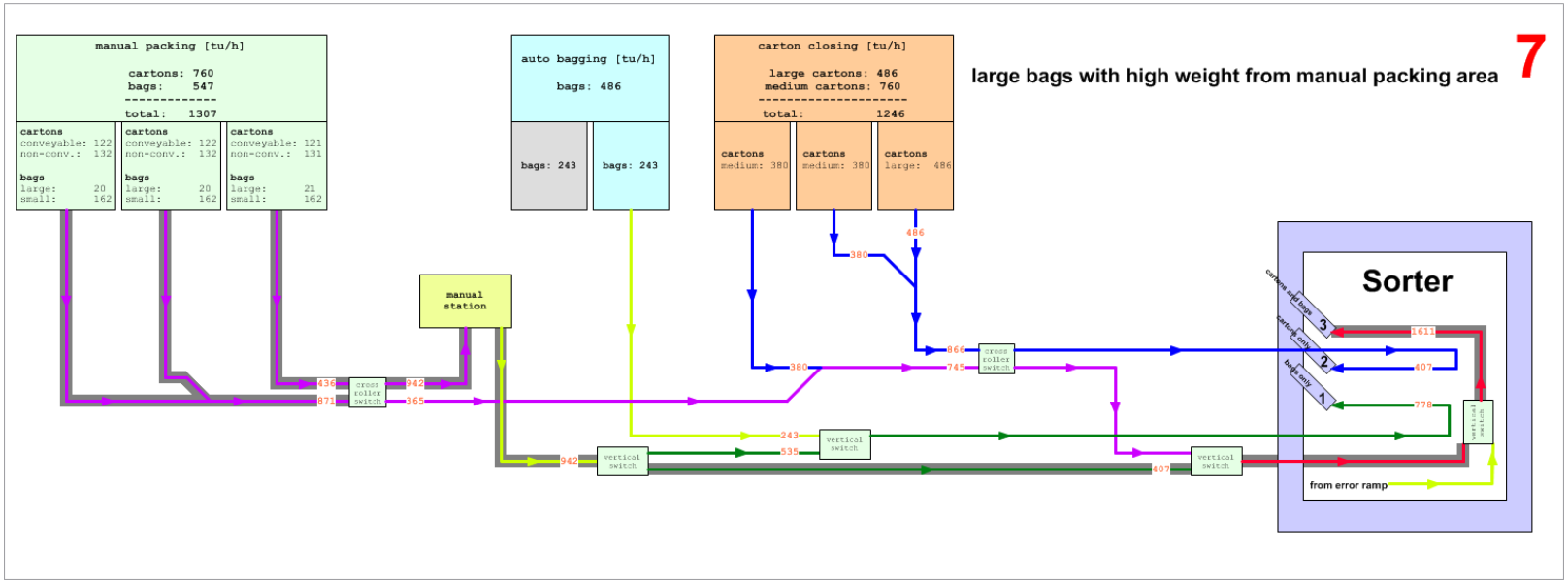

Figure 1110: material flow from from manual packing (bags with weight above 7kg and lower than 25kg) to the sorter via the manual station

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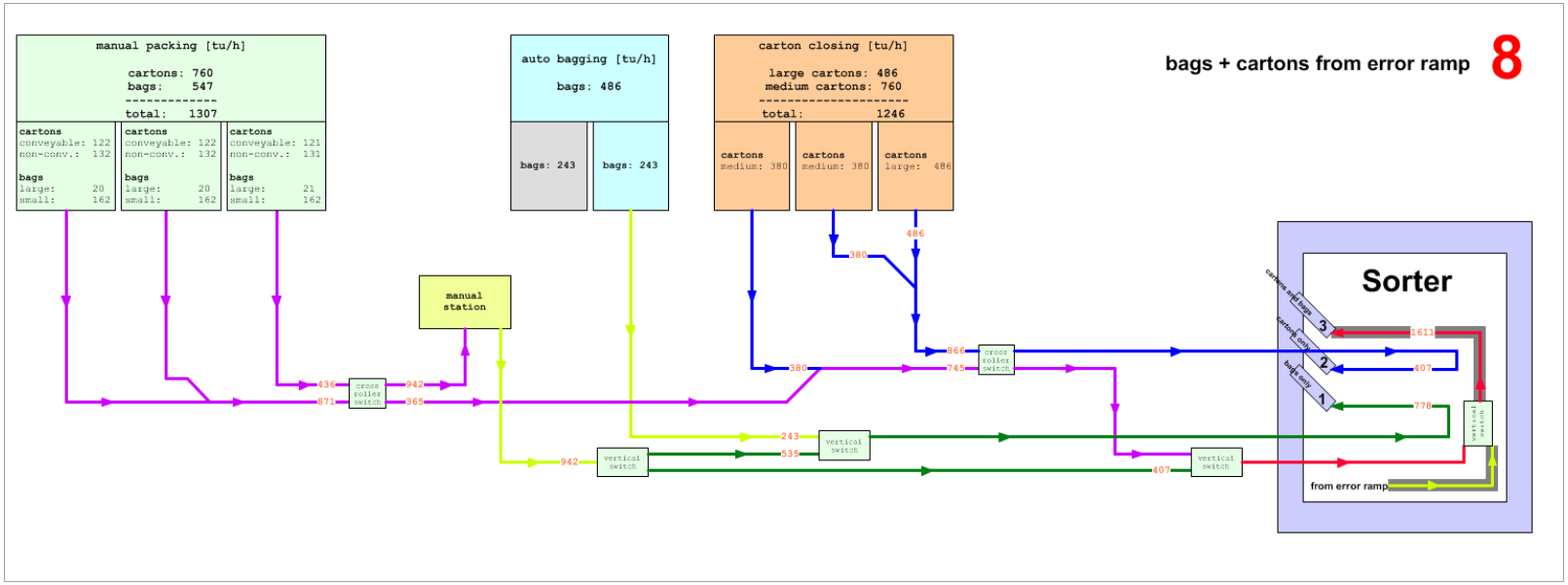

Figure 1211: material flow from the error chute (ramp) to the sorter

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The two tables below describe the details of the technical possible material flows with respect to the different containers used.

current packaging products

No		Container type	Length [mm]	Width [mm]	max. Height [mm]	min Weight [kg]	max. Weight [kg]
1	Large Carton	Carton	600	400	420	0,1	25
2	Med Wine Carton	Carton	400	300	300	0,1	25
3	A4 Carton	Carton	300	220	150	0,1	25
4	A5 Carton	Carton	220	150	150	0,1	25
5	Small Bag (A3)	Bag	440	330		0,1	25
6	Bags from autobagging	Bag	600 max	400 max	250 max	0,1	25
7	Folded Small Bag (A4)	Bag	220	330		0,1	25
8	Medium Bag (A2)	Bag	620	460		0,1	7
						7	25
9	Large Bag (A1)	Bag	840	600		0,1	7
						7	25
10	A5 Jiffy	Bag	210	150		0,1	25
11	A4 Jiffy	Bag	300	210		0,1	25
12	Large I-Pack Carton	Carton	530	350	280	0,1	25
13	Medium I-Pack Carton	Carton	400	300	150	0,1	25

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feasiblity

No	standard induct	advanced induct	Roller conveyable	from which area	to which infeed
1	ok	no	y	manual packing	3
2	ok	no	y	manual packing	3
3	ok	no	to be tested (**)	manual packing	3 (standard) 2 (fallback)
4	ok	no	n	manual packing	2
5	possible (*)	ok	n	manual packing	1
6	possible (*)	ok	n	auto bagging	1
7	possible (*)	ok	n	manual packing	1
8	for NoReads to be defined/tested (***)	ok	n	manual packing	1
	possible (*)	no	n	manual packing	2
9	for NoReads to be defined/tested (***)	ok	n	manual packing	1
	possible (*)	no	n	manual packing	2
10	possible (*)	ok	n	manual packing	1
11	possible (*)	ok	n	manual packing	1
12	ok	no	y	carton closing	3
13	ok	no	y	carton closing	3

Definitions:

- (*) means: the standard induct can be used as a fallback for the advanced induct

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- means: test with according roller conveyour are still open - till these tests are finsihed, no statement is possible
- (***) means: test with according induct are still open - till these tests are finsihed, no statement is possible

Decission points

The following figure shows the 3 decission points (A, B and C) where the incoming material flow is routed via different exits.

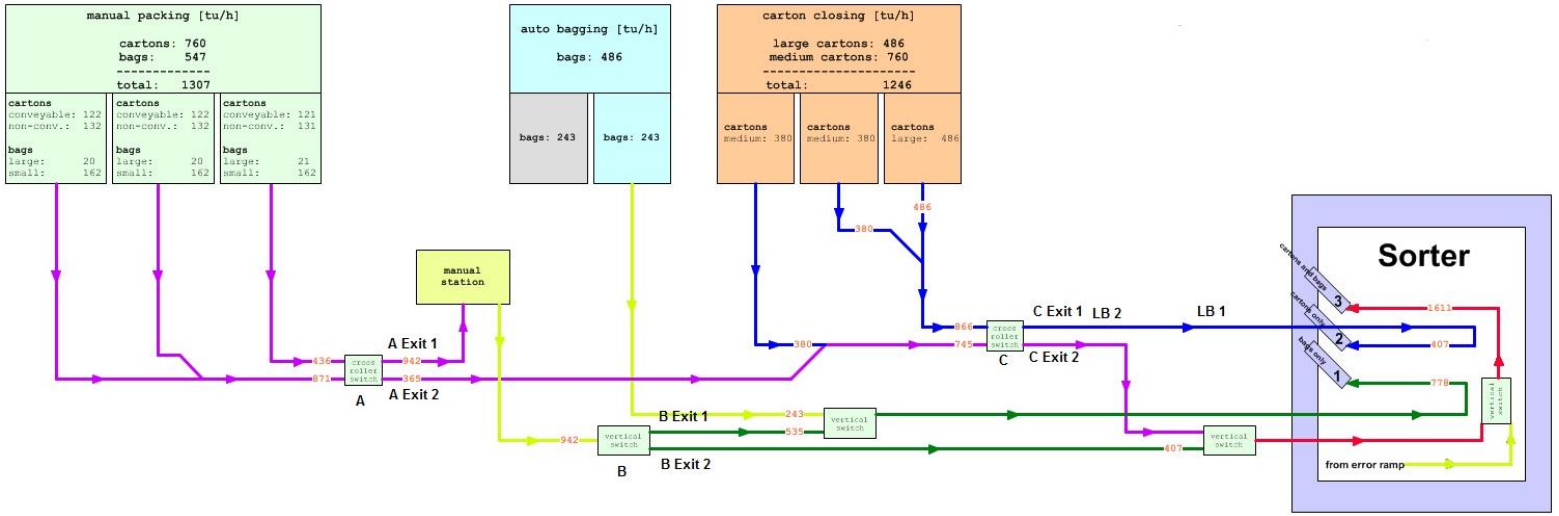

Figure 1312: decision points within the material flow

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Rules for these decision points:

- Decission point A:
  Used in material flow number 3, 4, 5, 6 and 7
  A Exit 1 is taken: all bags and cartons
  A Exit 2 is taken: all totes

  Decision based on on sensors

- Decission point B:
  Used in material flow number 2, 4, 5, 6 and 7
  B Exit 1 is taken: all bags till a weight of 7 kg (inclusive)
  all no reads
  B Exit 2 is taken: all cartons (till maximum weight)
  and bags with a weight above 7 kg
  These decissions are made in the following sequence
  1.) scale
  weight above / below 7 kg
  2.) overhead scanner
  thus identification bags or cartons
  3.) no read
  Since cartons are most probably read and the cance for a no read is definitly higher for bags, alls no reads are treaded like bags till a weight of 7 kg)
  Decision based on weight and container type
  Note:
  It is not possible to provide a decisiohoughput in decision point B (like in decission point C).

- Decission point C:
  Used in material flow number 1 and 3
  C Exit 1 is taken: there are two light barriers installed (LB 1, LB 2)
  still basically all incoming container are routed to this exit
  C Exit 2 is taken: but if LB 1 is blocked, every 5th container is routed via “C Exit 2”
  and if LB 2 is blocked, each container is routed via “C Exit 2”

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Decision based on light barriers.

Important (Modification in existing system is necessary)

To make these flows achievable, the dialogue on the packing tables must be modified in the following way: The operator must tell the system which container type he has used (bag or carton). To do so a pop up window will be installed, where the container type has to b estated by the operator (at the packing tables).

3.6 Sorter ~~Chutes~~ Ramps ~~/ Lanes~~

3.6.1 Layout of the ~~chutes~~ Ramps

The sorter has 18 chutes including an error chute.

[tbd]: open: exact layout of the ramps is still missing (will be fixed after the FAT with BEUMER). This has no impact to the functionality itself.

~~Each physical chute is divided into 2 logical chutes (one on the left and one right side). This logical chutes are called lanes. The lanes of one chute are separated by a metal beam which can be removed.~~

Each lane is equipped with the following elements:

- Two photo eyes at two different heights (full and half full)
- Orange Indicator light
    - Flashing if half full
    - Solid if full

3.6.2 Logical Point of View of the ~~Chutes~~Ramps

Each ramp is defined as one target to which containers are diverted. The logical target is equal to a physical target (no subdivision or such like).

Each ramp is treated equally (just the error ramp is treated differently). Error ramps may be used as well as an target for a tour and as a target due to an error.

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Each lane of a (physical) chute is addressed as an individual logical chute. These logical chutes/lanes can be addressed separately by KiSoft.

Thus the system grants the following possibilities (sorting method):

a.) **Sorting method 1**

physical chute
logical chute 1 | logical chute 2
bag and carton | bag and carton

b.) **Sorting method 2**

physical chute
logical chute 1 | logical chute 2
carton | carton

c.) Sorting method 3

physical chute
logical chute 1 | logical chute 2
bag | bag

d.) **Sorting method 4**

physical chute
logical chute 1 | logical chute 2
carton | bag

3.6.3 Sorting Methods

The sorting method described which types of the defined subcontainers are allowed to be diverted to an assigned ramp.

For these assignements of the containers to ramps, not the container types are used, but the sub containertypes as defined in section 3.2.

Out of these subcontainer types the sorting method is created by an operator.

The following sorting methods are already build in from the beginning

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- Sorting method 1
  Just containers of the subtype “manual carton” (Type A) are allowed on the according ramp
- Sorting method 2
  Just containers of the subtype “bag” (Type B) are allowed on the according ramp
- Sorting method 3
  Just containers of the subtype “medium carton” (Type C) are allowed on the according ramp
- Sorting method 4
  Just containers of the subtype “large carton” (Type D) are allowed on the according ramp
- Sorting method 5
  Just containers of all carton-subtypes (so type A, or C, or D) are allowed on the according ramp
- Sorting method 6
  Containers of all subtypes (so type A, or B, or C, or D) are allowed on the according ramp

Preconditions

- The subcontainer types are defined (see according section).

Functionality

An operator may add or delete additional sorting methods. This is done by using a KiSoft screen.

Points in time, when an operator may add a new or delete an existing sorting method:

- Adding a new method: any point in time
- Delete an existing method: an existing method can only be deleted, when the sorting method
  is not used in any active tour
  or
  is not used in any sorting plan (sorting plan – please see later in the following section)

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Important (mixture of bags and cartons on the same chute)
This mixture may damage the bags used in the ramps. Neither the quantity nor the severity of this damage can be said.

[tbd] open – this paragraph may be changed du ethe the final results of the FAT for the new ramps. This has no impact to the functionality itself.

Important for all sorting methods
As well due to the different sizes/weight of cartons and bags it can not be guaranteed that the sequence of the diverted containers at the bottom of the ~~lane~~ ramp is the same sequence in which the containers are diverted into the ~~lane~~ramp.

~~3.6.3~~3.6.4 Assignement of the Ramps / Creation of the Sorting Plan~~lanes)~~

Preconditions

Following order criteria which are necessary for the sorting and cage build up are downloaded to KiSoft:

- Dispatch tour (mandatory)
- logical drop point group (LDPG) – optional
  If an order has a LDPG, this criterion is used for the ~~chute~~ ramp assignement and not the dispatch tour.

Following additional preconditions are given:

- Subcontainer types are known to the system (please see section 3.2 Container and Container Types~~Container and Container Types~~)
- Each container refers to one subcontainer type
- Sorting method is defined
- Each ramp has 10 locations assigned (except error ramp, there a pool location is defined)

Based on this a sorting plan is created. This **sorting plan** defines

- several dispatch tours (or LDPGs)
- and for each dispatch tour (or LDPG) at least one sorting method

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- and for the combination of each dispatch tour (or LDPG) and defined sorting method, the ramps where the according containers are allowed to be sorted by the sorter

Restriction for choosing different sorting methods for one dispatch tour (LDPG):

Each sub-containertype is just allowed in one sorting method.

Example 1:

Tour: 4711

Chosen sorting methods are method 2 and method 5

Since methods 2 is used for sub container type “bag” and sorting method 5 is used for sub-containertype “manual carton”, “medium carton” and “large carton” this combination is possible (and allowe by the system)

Example 2:

Tour: 4712

Chosen sorting methods are method 2 and method 6

Since methods 2 is used for sub container type “bag” and sorting method 6 is used for sub-containertype “manual carton”, “bag”, “medium carton” and “large carton” this combination is NOT possible (and NOT allowe by the system) – reason: the subcontainertype bag is used in both sorting methods.

~~Based on this each container has assigned either a dispatch tour (carrierID) or the logical drop point group (LDPG).~~

Functionality

The operator assignes as well

- sorting method to a ramp
- TourID or LDPG to a location associated to the ramp

This is done in a maintainace screen which looks basically as in the figure below (changes during implementation are possible):

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Sorting plan Workingday-afternoon

	Ramp	Sorting method	Error ramp	Location	TourID/LDPG
+	01	6	N		
+	02	6	N		
-	03	5	N		
				0301	Hermes
				0302	Hermes
				0303	Hermes
				0304	London
				0305	London
				0306	Chester
				0307	York
				0308	Graz
				0309	Leoben
				0310	Paris
-	04	2	N		
				0401	Hermes
				0402	London
				0403	Chester
				0404	York
				0405	Graz
				0406	Leoben
				0407	Paris
				0408	...
				0409	...
				0410	...
+	05	1	N		
+	06	2	Y		
	07	3	N		

In this screen the operator assignes

1. A sorting method to a ramp
2. A tourID or LDPG to locations of this ramp
3. And gives this sortig plan a name
4. And wether a ramp is used as a error ramp or not

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One TourID or LDPG can be assigned to more than one location of a ramp and can be assigned to locations of different ramps (see restriction about different sorting methods for the same TourID or LDPG).

The following relations are possible:

- (sorting method) : ramp = 1 : 1
- (location of a ramp) : TourID/LDPG = n : 1
- ramp : TourID/LDPG = m : n

Locations or ramps can be left empty (without assignement).

The operator may store such a sorting plan by using a name for it. Such a stored sorting plan can be loaded again and modified and can be stored again (using the same or a different name).

After assigning the ramps to sorting methods and TourIDs/LDPGs the operator has to assign each ramp to one sorting algorithm. This is done in a separate screen. The sorter uses three methods how to choose the definite ramp (**sorting algorithm**) :

- Round Robin
- Waterfall with priority
- Fastest (as fast as possible)

If the opreator doesn't assign a sorting algorithm to a ramp, the system uses as a default the round robin method.

Waterfall

Whenever a tray arrives at a lane from the sorting plan, the PLC verifies whether there is a lane with a higher priority (first lane in the sorting plan has the highest priority). If the lane with the higher priority is ready for the discharge the container will be directed to that lane otherwise the container will be discharged at this current lane.

Waterfall algorithm will always be used for special destinations such as No Read, sorter reject/jackpot/dump.

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RR (round robin)

The goal is to distribute the container amongst the different destinations without creating recirculations. Therefore the sorter system internally changes the priority of the destinations and combines it with the Waterfall-algorithm:

Example:

Destinations configured in the plan: 11,12, 13, 14

1st Item gets the destinations: 11,12, 13, 14

2nd item gets the destinations: 12, 13, 14, 11

3rd item gets the destinations: 13, 14, 11, 12

4th item gets the destinations: 122,111,112,121

5th item gets the destinations: 111,112,121,122

…

Fastest

The sorting system tries to discharge the containre at the first possible lane from the sorting plan independent of the order in the sorting plan.

Result

As a result all assignements are done, the so called **sorting plan** is created. This sorting plan described the possible targets out of which the sorter chooses to eject a container on a ramp.

This sorting plan is saved and may be activated later by downloading to the sorter system.

3.6.5 Activation of the Sorting Plan

Precondition:

For a change from one sorting plan to an other sorting plan:

All cages/pallets which are used (containers are booked on) in the active sorting plan have to be closed. If this precondition is not fulfilled the sorting plan can not be changed / a new sorting plan can not be activated.

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Functionality

The operator chooses one of the saved sorting plans and activates this plan. Thus the sorting plan is downloaded to the sorter system. No separate activation of this sorting plan in the sorter system is necessary, the download automatically activates the sorting plan on the sorter system (the previous (old) sorting plan is overwritten).

To achieve an easy way of maintaining the assignments, it is possible to define several sorting plans for assignments in KiSoft. The changing between these sorting plans would be basically just activating the new sorting plan for assignments (and thus deactivating the old plan)

Note: changing in operation leads to a mix of containers with different dispatch tours on the same ramp (containers for “old” and “new” dispatch tours are on the same ramp). This changing in operation has to be avoided organisationally.

Important:

There is a restriction of maximum 6 targets in the sorter software.

Thus a combination of

- sorting method
- TourID/LDPG

is downloaded to the sorter. By using the system in this way for each combination of sorting method and TourID/LDPG up to 6 targets (ramps) are possible.

This combination works as following:

- The sorting method is downloaded as an additional criterion to the original tourID/LDPG
- This additiponal criterion is 8 digits long (the first 4 digits are used from the beginning, the second 4 digits are used as a place holder if additional sub container types are necessary.

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This additional criteion is defined as

- A0000000 for sorting method 1
- 0B000000 for sorting method 2
- 00C00000 for sorting method 3
- 000D000 for sorting method 4
- A0CD000 for sorting method 5
- ABCD0000 for sorting method 6

Example:

A TourID like “Hermes1212” can now be split in 2 different “logical” tours (as an example):

- A0CD000 in combination with Hermes1212
- 0B000000 in combination with Hermes1212

This would be possible.

Not possible is (due to the restrictions in the sorting method)

- A**B**CD000 in combination with Hermes1212
- 0**B**000000 in combination with Hermes1212

In the container data the sub-container type is downloaded to the sorter system (so either A, or B or C or D is downloaded) and the original TourID/LDPG (in the example abobve this would be “Hermes1212”).

So the sorter system checks to which ramp the combination of sub-container type and the original TourID/LDPG is assigned according to the sorting plan.

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OPEN:

BEUMER has to confirm

- **this concept of concatination of sorting method and TourID/LDPG**
- **and the user maintainable sorting methods**

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otherwice the whole concept described here is not possible (neither the user changeable sorting methods, nor the more than 6 possible targets for the combination sorting method and dispatch tour).

Result

The chosen sorting plan is activated and downloaded to the sorter system. From that very moment on all containers are sorted according to this sorting plan.

3.6.43.6.6 Sorter – Error chuteramp

For the implemented errors: please see section 4.2.7 Sorting Exceptions~~Sorting Exceptions~~~~Sorting Exceptions~~

It is possible to assign different error ~~chutes~~ ramps to different errors.

It is also possible to assign a “normal” destination to the error ~~chute~~ramp.

Important: The maintenance of the error ~~chutes/lanes~~ramps is not done in KiSoft, but locally in the sorter system. In KiSoft the operator has just to define which ramp is used as an error ramp (this is done in a KiSoft screen)

Note: (sub-)container type and error ~~chute~~ramp:
The sub-container type is not used for the ejection on the error ramp (due to an error).

~~The error chute is build same as all normal chutes – like also separated into two lanes. Thus the sorting method must be set up also for the error lanes. And if the container type is known, this is considered at ejection. If the container type is not known, the side for cartons is used as default.~~

3.7 Error ~~Chute~~ Ramp back to Sorter Infeed

An additional conveyor is installed which routes containers from the error ramp back to the sorter. For details, please see the according sections.

Note: there are no restrictions with respect to container type or weight for the containers used in this material flow.

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3.8 Mobile Terminals

At the end of the lanes a cage build up is done using mobile terminals (connected to KiSoft WMS). The detailed description is in the according function section.

3.9 Parameters of the Sorting System

The following parameters can be maintained locally in the sorter system (not in KiSoft).

Index	Parameter	Description
0	Max. recirculations	Max. allowed recirculation's, an item is redirected to an exception destination (error lane)
1	Read retry	Nbr of times that a no read is scanned before it is assigned to a special destination (error lane)
2	Discharge retries	Max. allowed discharge faults before sending the container to the "discharge fault"-lane
3	Keep data for x days	Container data, older than x days will be deleted. The delete process will start at the 'Purge Time'
4	Deletion time	The actual time the purge of the database is to be initiated on a daily basis. e.g. 09:00 p.m.

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4 Functional Section

4.1 Overview

This section describes the functionalities starting from infeeding containers to the sorter system till the cage / pallet build up is done and is based on two main processes:

- Automated sorting
- Manual cage build up

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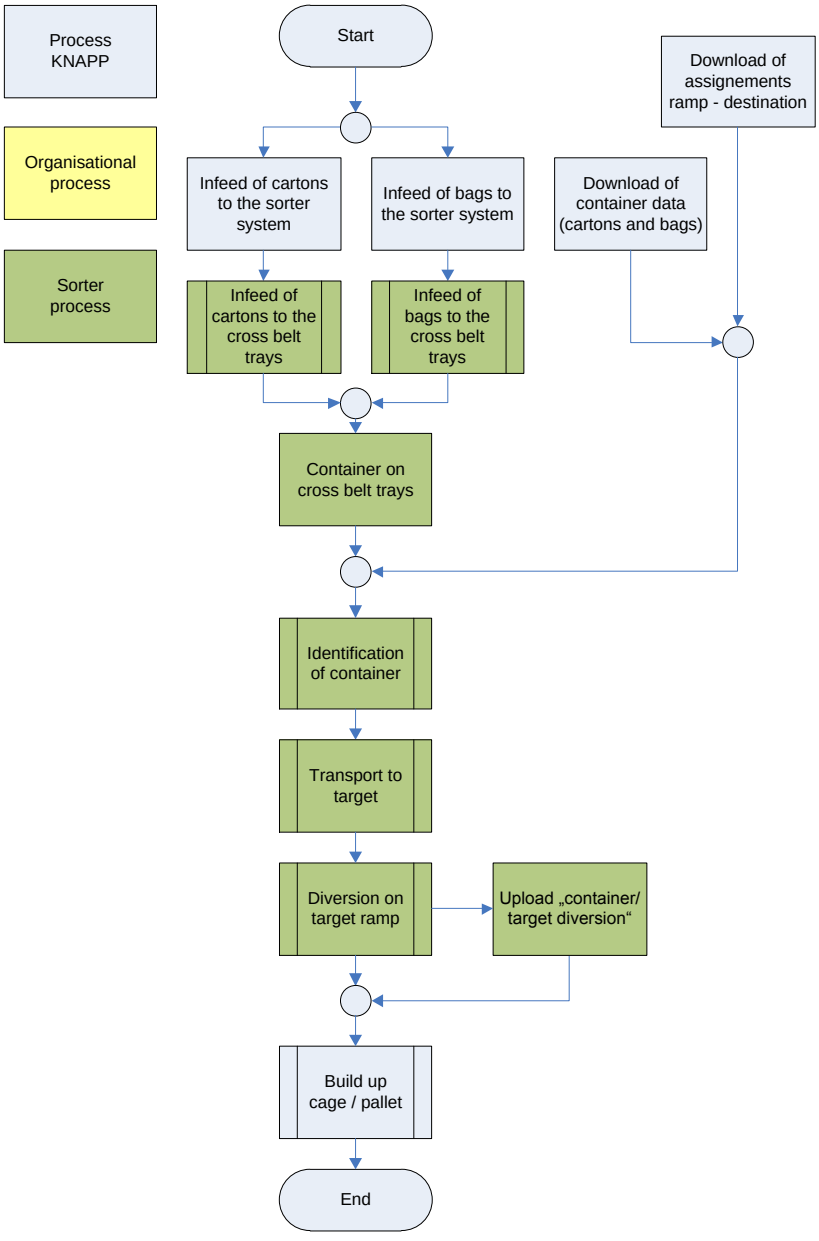

Figure 14134: Overview process

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4.2 Automated Sorting

4.2.1 Overview

The following item list describes the events in chronological order.

1. Sorting plan has been downloaded (assignement dispatch tours/LDPG to ramps)
2. Container data has been received by the sorter system
3. The container is inducted onto an empty tray on the sorter
4. The sorter system (part BSC) triggers the camera system to read the barcode
5. The the camera system sends the barcode to the sorter system (part BSC)
6. Sorter system (part BSC) sends a request message with tray number and barcode information to sorting system (part BeSS).
7. The sorter system (part BeSS) determines the dispatch tour / LDPG and container type from container data with the barcode
8. The sorter system (part BeSS) determines the list of ~~lanes~~ ramps for the corresponding container ~~(bag or carton)~~ from the sorting plan and send them to the sorting system (part BSC)
9. The sorting system (part BSC) discharges the container into the designated ~~lane~~ramp.
10. At the discharge check position, the sorting system (part BSC) checks if the tray is empty.
11. The sorting system (part BSC) sends a discharge confirmation to the sorting system (part BeSS).
12. The sorting system (part BeSS) sends an acknowledgement to the sorting system (part BSC).
13. The sorting system (part BSC) deletes the data associated with the tray.
14. The discharge confirmation will be send from the sorting system (part BeSS) to the host (the KiSoft system).

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4.2.2 Infeed of the Containers

Preconditions

- Each container is labelled; the defined shippment barcode is on the label.
- The container has the according container type.
- There are 3 infeed conveyors
    - One line just for cartons
    - One line just for bags
    - One line which can handle as well cartons and bags
- A cross belt tray which is already in use, will not be adressed for a new container
- Each cross belt tray can be used for both kind of container types.

Functionality

The containers are handed over by the KNAPP system to the infeed conveyor of the sorter system. After this hand over, the sorter system takes the container and feeds the container to the cross belt trays of the sorter.

For material flow details and routing decisions – please see section 3.5 Induction to the SorterInduction to the Sorter

Result

- Container in the sorter system
- Max. one container on each cross belt element (cross belt tray)
- Container ready for identification ofteh barcode

Errorcases

1. Container is not within the defined dimensions:
   There is an overlenght detection at the infeed / on the induction. In case of overlength the sorter system will stop the induction line. An error is displayed on the sorter visu (not in ZenOn)

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2. Infeed on an already used cross belt try:
   At the end of the destination area a discharged tray will be checked whether it is phsyically empty by an photo eye. Furthermore the software checks whether the belt has been started or not (by communication between belt tray element and PLC). Thus no infeed onto an occupied tray in a controlled way takes place.
   Nevertheless, if a container sticks somewhere between induction and sorter it could go to one of the trays behind. But this can just resolved in an organisational way (depends also on the method of the pallet/cage build up).
3. Infeed on between two belt cross belt trays:
   No infeed onto an occupied tray in a controlled way takes place. Nevertheless, if a container sticks somewhere between induction and sorter it could go to between two trays. But this can just resolved in an organisational way
4. Induction fault:
   Induction will be stopped and the induction must be cleared manually. (for example reason due to 2 containers aretoo close to each other on the infeed, …)
5. Broken or not existing cross belt trays:
   Broken or not existing elements can be blocked with the local visualization system and are not used as an infeed position.

4.2.3 Identification of the Container

Preconditions

- The container is placed on the cross belt element
- The container is labelled and the label is placed on top oft he container
- The barcode on the label is fully visible and according to specification
- The download of the container data took already place (container, target)

Functionality

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The barcode on the container will be read and identified by an over head camera system. The identified barcode will be assigned to the downloaded order information and a transport order to the destination(s) (chute and lane ramp) will be generated.

Result

- The container is uniquely identified (due to the barcode)
- The cross belt tray is set to occupied with the identified container
- The Transport order is created, married to the cross belt tray and is ready to ready to b eexecuted.

Errorcases

1. No container data downloaded to the sorter system BeSS:
   The container will be ejected at the error chute. Latest point in time to downlaod this data: 1 minute previous to container passes the reading system.
   Same error occurs if the connection between the sorter system BeSS and KiSoft is down.
2. Other errors, please see section 4.2.7 Sorting ExceptionsSorting ExceptionsSorting Exceptions

Note "recirculation"

Each time a container passes the identification (makes a re-circulation) the destination is newly calculated. Therefore it can happen that, due to a change in the assignement table ("destination – chuteramp"), the destination for a container is no longer valid, thus the container will be ejected on the error chuteramp.

4.2.4 Caclulation of the Target

The calculation of the target chute / laneramp is done according to the downloaded sorting plan and the downloaded container data. If the sorter receives a container data twice the data in the database will be overwritten.

One request point behind the camera system, has been setup. Each occupied tray will be requested at that point. At every request the sorting system

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runs through the sorting plan to calculate the target (please see section 3.6.43.6.3 Assignement of the Assignement of the Chutes).

4.2.5 Transport to the Target Destination

Preconditions

- Identification of the container was sucessfully
  or at errors (like nor read): the default target destination is defined
- „Marriage“ container data to target destination (laneramp) is done

Functionality

The container will be transported to the calculated target destination (laneramp).

Result

- The container arrives at the target destination (laneramp).

Errorcases

1. The container gets „dumped“ into the net around the sorter
   These containrers are brought manually to the error chute ramp and are treated like discribed there.
2. Other errors, please see section 4.2.7 Sorting ExceptionsSorting ExceptionsSorting Exceptions

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4.2.6 Ejection at the Target Destination

Preconditions

- The transprort to the target is finished
- The target lane ramp is free / can take the container

Functionality

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When the container (on his tray) has reached the target position, the container is ejected into the target ramplane

Result

- The container is physically and logically in the assigend laneramp.
- Upload to KiSoft that the container is ejected

Errorcases

1. Ejection on target lane ramp is not possible:
   please see in the following section: recirculation and disabled lane ramp
2. Ejection on the wrong laneramp
   Is not notified by the sorter system - can only be treated during the cage build up process (just in the 100% check).
3. Ejection on the wrong chute
   Is not notified by the sorter system - can only be treated during the cage build up process (just in the 100% check).

4.2.7 Sorting Exceptions

Recirculation handling

One request point behind the scanning camera system, has been setup. Each occupied tray will be requested at that point even the recirculating ones. At every request the sorter system runs through the sorting. That means if an items was assigned according plan A and meanwhile the plan changes to B the item will be sorted according the plan B after a recirculations (note: as said valid just for container which are recirculating).

If an container turns (independent of the reasons) on the sorter more than x times (parameter at the sorting system), the sorting system will sort the container to the corresponding exception destination (error laneramp).

No Read handling

If the barcode of a container could not be identified by the identification system, this item is handled as a No Read item.

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There is one parameter in the sorting system to determine the number of read retries of the system. If this value equals zero, the container will be re-directed directly to the corresponding exception destination (error laneramp). If the value is higher the system will first try to read the barcode again after a re-circulation.

The value for the retry parameter counts the number of re-circulations of the container. In this installation with two identification systems, the system can retry to read twice per re-circulation.

Handling of discharge faults

A discharge fault is detected by a divert verification sensor. There is one sensor per induction area. Even though the 2nd induction and discharge area is optional the 2nd detection sensor will be implemented directly.

If one of these sensors detects an occupied tray, which should have been discharged to a lane, a discharge fault will be generated by the sorting system. The sorting system will direct that tray to the corresponding lane ramp again. After x-amount of attempts (parameter in the sorting system), sorting system will direct that tray to the corresponding exception destination (error laneramp).

Handling of stray items

If the system recognized a container on a tray which was not assigned to that tray at the induction, the tray will be discharged to the exception destination (error laneramp).

A typical scenario is a bad inducted container which goes to tray x+1 instead of tray x.

Disabled laneramp

A disabled lane ramp means that the ssorting system assumes the lane ramp is electrically disconnected. The lights, valves etc. will not be activated from the control. If a lane ramp is disabled by the sorting system (Operator Station, local visualization of the sorter), containers for that lane ramp will re-circulate at the sorter. Depending of the parameter settings for re-circulation they will be assigned to an exception destination (error laneramp).

Exception destinations on the sorter

Each exception reason may be assigned up to 6 different destinations (means lanesramp). In sorter configurations with multiple inductions areas it typically makes sense to configure a destination in each sorter area for each

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reason. In the case where more than one destination has been configured for a specific reason, the sorter discharges the item at the nearest destination (➔ as fast as possible).

Index	Reason	Description
0	Discharge fault bag	Container unable to discharge to disabled destination
1	Discharge fault carton	Container unable to discharge to disabled destination
2	Stray container	Unknown container detected on a tray
3	No-Read	Unknown container detected on a tray
4	Multiple read	Two or more different barcodes read by scanner
5	Max. recirculations bag	Container has re-circulated RECIRCS times,
6	Max. recirculations carton	Container has re-circulated RECIRCS times
7	No Data	No parcel data found for this barcode
8	No Sorting plan bag	Carrier-ID not found in sorting plan [tbd] BEUMER → no difference any longer bag/carton (Miroslav: but maybe: manual box, bag, medium carton, large carton)
9	No Sorting plan carton	Carrier-ID not found in sorting plan [tbd] BEUMER → no difference any longer bag/carton (Miroslav: but maybe: manual box, bag, medium carton, large carton)
10	General fault	Should never be used → software faults; will get directed to the Jackpot destination of the area

These parameters are set in the standalone program BeSSView of the sorter system (not in KiSoft).

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4.3 Cage / Pallet Build up from non error chutes

The cage / pallet build up process describes the functionality of taking containers from the ~~lanes~~ ramp and put them logically and physically on a cage or a pallet. A mobile terminal is used for this process.

The decision to take a cage or pallet is made by the operator (no system decision).

Depending on the rules explained in section 3.6.4~~3.6.3~~ Assignement of the ~~Assignement of the Chutes~~ there are different ways of the build up process possible.

Previous to cage build up, the operator must sign on a ~~chute~~ ramp ~~(physical chute).~~

Important (valid for the whole document):
Due to the change in the assignements all validations, if a container is allowed to be scanned on a cage/pallet is not only due to the dispatch tour (TourID or LDPG) but is extended to:

- **dispatch tour (TourID or LDPG) and**
- **sorting method and**
- container type and
- status of the cage/pallet.

Some locations in this document use already this changed description, but not all!

4.3.1 Assignining Cages/Pallet to Locations

For non error ramps, each ramp has 10 locations allocated. With the functionality “Assign Cage/Pallet to ramp location” cages/pallets are assigned to these locations.

Preconditions

- Each ramp has 10 locations allocated
- The location is empty

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Functionality:

1. The operator logs on the system (on a mobile terminal)
2. He chooses the functionality “Assign Cage/Pallet to ramp location”
3. He scans the barcode of a ramp-location
4. If the location is in use (already a cage/pallet is booked on it and this cage/pallet is not closed), the operator get’s an error message.
5. If the location is not used, the operator is asked to scan a cage/pallet licenceplate.
   The operator takes the LP from a preprinted role, sticks it on the cage/pallet, scans it and puts the cage/pallet on the location
6. Thus this licenceplate is assigned to the location
7. The operator may continue in step 3 or may choose to do something differently.

Result

As a result cages/pallets are assigned to locations on the ramps, and these cages/pallets can be used for the build cage/pallet build up process.

Errorcases

- Operator scans a location in use
  If the location is in use (already a cage/pallet is booked on it and this cage/pallet is not closed), the operator get’s an error message. He confirms the error message and may continue.
- The operator scans a licence plate already in use
  If the licenceplate is in use, the operator get’s an error message. He confirms the error message and may continue.
- The operator scans a not valid licence plate
  If the licenceplate is not valid, the operator get’s an error message. He confirms the error message and may continue.

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4.3.14.3.2 Build up method 1 (100% check) from the chutesRamps

Preconditions

- Operator is logged on the system
- Containers are on the chute ramp / in the lanes
- Status of the containers: the containers are at least booked on the sorter (this cage build up method doesn't need the eject message).
- The sorting method is either "Method 1", "Method 2", "Method 3", or "Method 4"
- All cage build up methods are allowed

Functionality

Important: If the cage build up process is changed later on
Most of the text is same for all cage build up methods – so please check this if changed later!

1. The operator logs on the chute ramp (by scanning the chute ramp barcode)
   [tbd] chute or ramp – due to sorting restrictions of BEUMER
2. The system checks if an operator has already logged on this chute ramp:
   If **"yes"** – the new operator has to use the same cage/pallet build up method as the already logged on operator.

   If **"no**": the system checks which sorting cage build up method is allowed on this chute ramp (see precondition). And based on this sorting method and the order type the operator may choose one of the allowed/displayed sorting cage build up methods.
3. In this case (2nd case above) the operator chooses the method 1
4. The operator scans the barcode of the first container from the chute ramp (no matter from which lane).
5. If the **target** (means cage/pallet) for this container **already exists** in the system (marriage cage/pallet licenceplate to location is done) **and** if this **target is not closed yet**, tThe system prompts the target

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(by displaying location number and licenceplate of the cage/pallet.

The operator takes the container he has taken from the chuteramp, puts it on the cage/pallet and scans either the licence plate of the cage/pallet or the location barcode. Thus the container is booked on the cage/pallet.

6. If the **target** (means cage/pallet) for this container **doens't exist** in the system (marriage cage/pallet licenceplate to location is not done yet) **or** if this target cage/pallet **is already closed**, the system asks for a licence plate.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan "LP of cage/pallet label" and scan "barcode of the location".)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks wheter the LP of the cage/pallet is known or not and wheter the location is free (just one cage/pallet per location is allowed)

7.6. The operator repeats from step 4 above till the cage/pallet is full or the chute ramp is empty.

8.7. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full. From that point onwards the operator is not allowed to put further containers on this cage. The location where the cage/pallet is booked on, gets free again.

8. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed cage/pallet is used for the follow up process of despatching which stays unchanged.

9. As a next step the operator has to assign a new cage/pallet to this empty ramp-location.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan "LP of cage/pallet label" and scan "barcode of the location".)
   After this the operator puts the container he has taken from the

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chute, puts it on the cage/pallet.

Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.

At the marriage the system checks wheter the LP of the cage/pallet is known or not and wheter the location is free (just one cage/pallet per location is allowed)

10. The operator decides now to continue the build up process with step 4 descriped above. Or he may log off this chute ramp and may log on an other chuteramp.

Note to step 5 above:
No matter if a carton or a bag is scanned, the system addresses these containers always to the same target cage. So the target cage is not container type clean.

But due to an operator decision, the operator may overrule the cage proposed by the system in step 5. Means the system prompts a target liceneplate after a bag/carton is scanned. For what reason ever, the operator doesn't want to put this specific bag/tote on this existing (open) cage, but he want's to use a different cage. This could be a new cage or an already existing (but not closed) cage which is assigned to the same dispatch tour (TourID or LDPG) and sorting method. Operational handling please see in the process figure below.

If several cages are assigned to one tour (one TourId or one LDPG) and oen sorting method, the system prompts always the cage with the lowest licence plate number.

Note to step 7 6 above:
An operator may change chutes ramps at any time no matter if there are containers on the chute or not (log off and log on on a different chuteramp). This log off has also to be done if a chute ramp is empty and if the operator wants to continue work on an other chuteramp. Later on the operator may continue with this chuteramp.

Several operators may assign simultaneously on one chuteramp.

Lost containers, means containers not found have to be solved organisationally – the follow up processes (like "tour closhure" stay unchanged).

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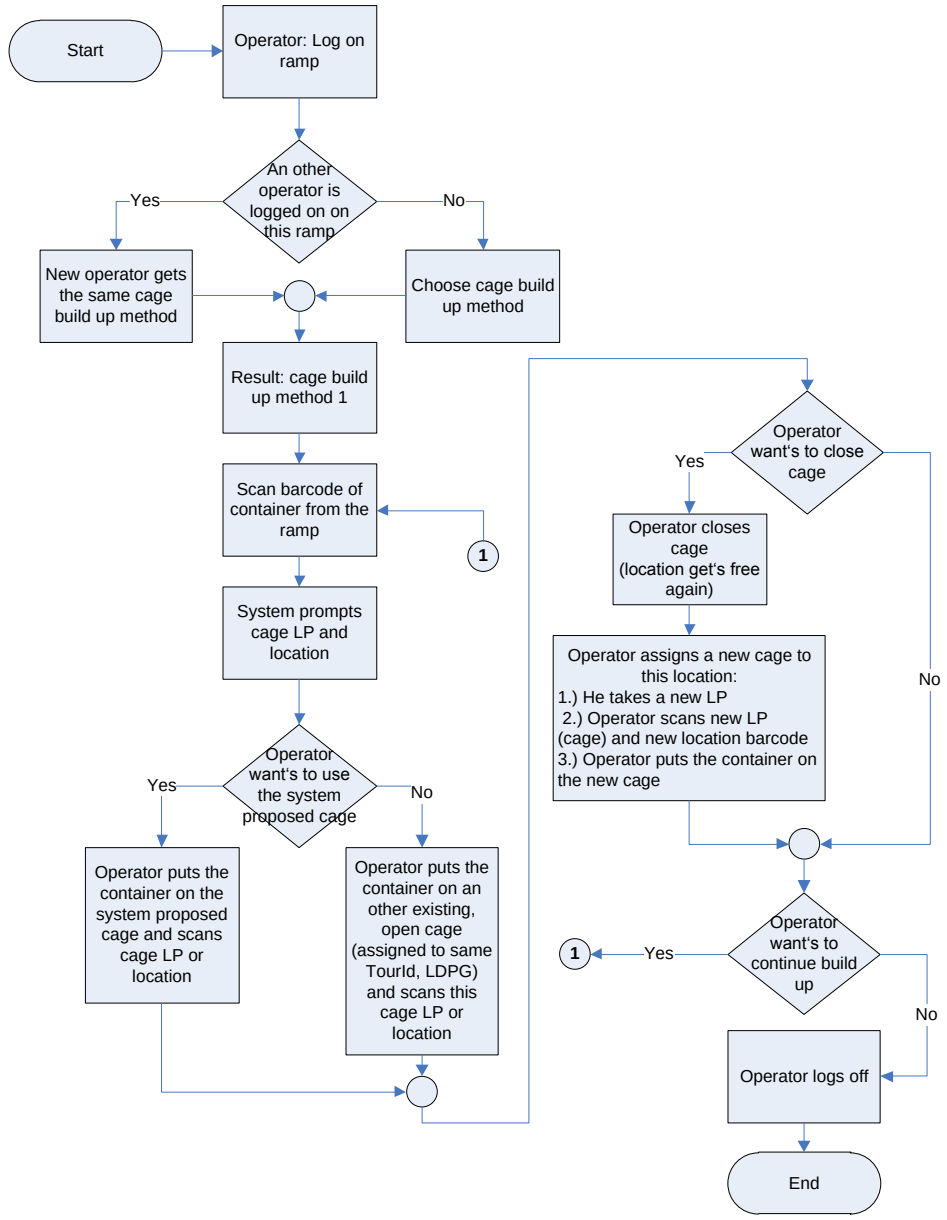

Figure 1513: Overview process build up method 1

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Result

As a result dispatch tour (tourID) or LDPG clean cages/pallets and sorting method clean are build.

The dispatch tour clean cages/pallets can be used for the following dispatch process. The LDPG clean cages/pallets can be used for a following separation process into dispatch (TourID) clean cages. This second separation is not described here and stays unchanged.

For

- For sorting method 1 and order type DTSFC: all sorting methods: as well cartons and bags are allowed on the same cage/pallet – so no check is done here.
- For an assignement of dispatch tours, dispatch tour clean cages/pallets are build.
- For assignement of LDPGs. LDPG clean cages/pallets are build (2 step process may follow).

Errorcases

1. Operator logs on an unknown dispatch ramp barcode
   The system displays an error message (“unknown chute/laneramp”).
   The operator confirms it and may continue.
2. The operator scans the barcode of an unknown container
   The system displays an error message (“unknown container”)
   The operator confirms it and may continue.
3. The operator scans the barcode of a container which belongs to a dispatch tour / LDPG not assigned to this ramp
   Distiction:
   *) container belongs to a tour (TourID, LDPG) assigned to an other lane ramp and container is at least booked on the sorter
   The system displays an error message (“take the container to the error chuteramp or error cage”); the operator has to bring this container to the error chuteramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).
   *) container belongs to a tour (TourID, LDPG) assigned to an other

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lane ramp but the container is not booked on the sorter, but WMS has requested a sortation
The system displays an error message (“take the container to the error chuteramp or error cage”); the operator has to bring this container to the error chuteramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).
*) container belongs to a tour (TourID, LDPG) assigned to an other lane ramp but the container is not booked on the sorter, but WMS has not requested a sortation
The system displays an error message (“container known, but wrong status”); further handling needs investigation in existing WMS/WCS/MOT/SRC screens
*) container belonges to a tour (TourID, LDPG) not assigned to any other lane ramp but at least booked on the sorter (reason could be an old/no longer active assignement) and container is at least booked on the sorter, but WMS has requested a sortation
The system displays an error message (“take the container to the error chuteramp or error cage”); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).
*) container belonges to a tour (TourID, LDPG) not assigned to any other lane chrampute but the container is not booked on the sorter, but WMS has requested a sortation
The system displays an error message (“take the container to the error chuteramp or error cage”); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage).

4. The operator scans the barcode of a container which belongs to the correct dispatch tour / LDPG, but the container was ejected on an other chute ramp of this dispatch tour/LDPG (just possible for n chutes assigned to one dispatch tour / LDPG)
   The operator may proceed (no error)

5. The operator scans the barcode of a container where no eject upload from the sorter is made
   No impact on this build method (just valid for build up method 4) – the container must be booked on the sorter (at least)

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6. The operator scans the barcode of a container from error ~~chute~~ramp
   Distinction
   *) The container belongs to a tour (TourID, LDPG) assigned to the ~~lane/chute~~ ramp the operator is logged on
   No error message, the operator may use this container in the build up
   *) The container belongs to a tour (TourID, LDPG) not assigned to the ~~lane/chute~~ ramp the operator is logged on
   The system prompts an error message (“take the container to the error ~~chute~~ramp or error cage”)
   The operator confirms it and may continue
   This tote is brought orginisationally to the error ~~chute~~ramp or error cage
7. The operator scans the barcode of a container which is already used on a cage.
   The system prompts an error message (“this container is already booked on cage lp [xxx]”)
   The operator confirms it and may continue
   This tote is brought orginisationally to the cage [xxx] where as [xxx] is the licence plate of the cage the container is booked on.
8. The operator uses a not valid barcode as cage/pallet licence plate
   The system prompts an error message (“invalid licence plate”)
   The operator confirms it and may continue.
9. The operator uses an already used licence plate for the cage/pallet
   The system prompts an error message (“invalid licence plate”)
   The operator confirms it and may continue.
10. The operator marries the cage/pallet to an location still in use
    The system prompts an error message (“location in use”)
    The operator confirms it and may continue.
11. The operator marries the cage/pallet to a location not assigned to the ~~chute~~ ramp he is logged on
    The system prompts an error message (“wrong target location”)
    The operator confirms it and may continue.
12. The operator confirms the container (bag / carton) to a different target (not the target requested by the system)
    If the target is assigned to the same tour (TourID or LDPG), this is possible (see process description above).

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If the target is not assigned to the same tour (TourID or LDPG), the system prompts an error message (“wrong target (cage/location)”) The operator confirms it and may continue.

13. The operator confirms the container (bag/carton) to an already closed cage/pallet.
    The system prompts an error message (“closed cage scanned”) The operator confirms it and may continue.

4.3.24.3.3 Build up method 2 (100% check) from the chutesramps

Preconditions

- Operator is logged on the system
- Containers are on the chute / in the lanesramps
- Status of the containers: the containers are at least booked on the sorter (this cage build up method doesn’t need the eject message).
- The sorting method is either “Method 1”, “Method 2”, “Method 3”, or “Method 4”
- All cage build up methos are allowed

Functionality

Important: If the cage build up process is changed later on
Most of the text is same for all cage build up methods – so please check this if changed later!

1. The operator logs on the chute ramp (by scanning the chute ramp barcode)
   [tbd] chute or ramp – due to sorting restrictions of BEUMER
2. The system checks if an operator has already logged on this chuter-amp:
   If **“yes”** – the new operator has to use the same cage/pallet build up method as the already logged on operator.

   If **“no**”: the system checks which sorting cage build up method is allowed on this chute ramp (see precondition). And based on this sort-

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ing method and the order type the operator may choose one of the allowed/displayed sorting cage build up methods.

3. In this case (2nd case above) the operator chooses the method 2
4. The operator scans the barcode of the first container from the chute ramp (no matter from which lane).
5. If the **target** (means cage/pallet) for this container **already exists** in the system (marriage cage/pallet licenceplate to location is done) **and** if this **target is not closed yet**, tThe system prompts the target (by displaying location number and licenceplate of the cage/pallet.

   The operator takes the container he has taken from the chuteramp, puts it on the cage/pallet and confirms the put on his mobile terminal (no scanning). Thus the container is booked on the cage/pallet.

6. If the **target** (means cage/pallet) for this container **doons't exist** in the system (marriage cage/pallet licenceplate to location is not done yet) **or** if this target cage/pallet **is already closed**, the system asks for a licence plate.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan "LP of cage/pallet label" and scan "barcode of the location".)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks wheter the LP of the cage/pallet is known or not and wheter the location is free (just one cage/pallet per location is allowed)

7.6. The operator repeats from step 4 above till the cage/pallet is full or the chute ramp is empty.

8.7. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full. From that point onwards the operator is not allowed to put further containers on this cage. The location where the cage/pallet is booked on, gets free again.

8. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed

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cage/pallet is used for the follow up process of despatching which stays unchanged.

9. As a next step the operator has to assign a new cage/pallet to this empty ramp-location.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan “LP of cage/pallet label” and scan “barcode of the location”.)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks whether the LP of the cage/pallet is known or not and whether the location is free (just one cage/pallet per location is allowed)
10. The operator decides now to continue the build up process with step 4 descriped above. Or he may log off this ~~chute~~ ramp and may log on an other chute.

Note to step 5 above:
No matter if a carton or a bag is scanned, the system addresses these containers always to the same target cage. So the target cage is not container type clean.

But due to an operator decision, the operator may overrule the cage proposed by the system in step 5. Means the system prompts a target liceneplate after a bag/carton is scanned. For what reason ever, the operator doesn’t want to put this specific bag/tote on this existing (open) cage, but he want’s to use a different cage. This could be a new cage or an already existing (but not closed) cage which is assigned to the same dispatch tour (TourID or LDPG) and sorting method. Operational handling please see in the process figure below.

If several cages are assigned to one tour (one TourId or one LDPG) and sorting method, the system prompts always the cage with the lowest licence plate number.

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Note to step 7 6 above:
An operator may change chutes ramps at any time no matter if there are containers on the chute or not (log off and log on on a different chuteramp). This log off has also to be done if a chute ramp is empty and if the operator wants to continue work on an other chuteramp. Later on the operator may continue with this chuteramp.

Several operators may assign simultaneously on one chuteramp.

Lost containers, means containers not found have to be solved organisationally – the follow up processes (like “tour closhure” stay unchanged).

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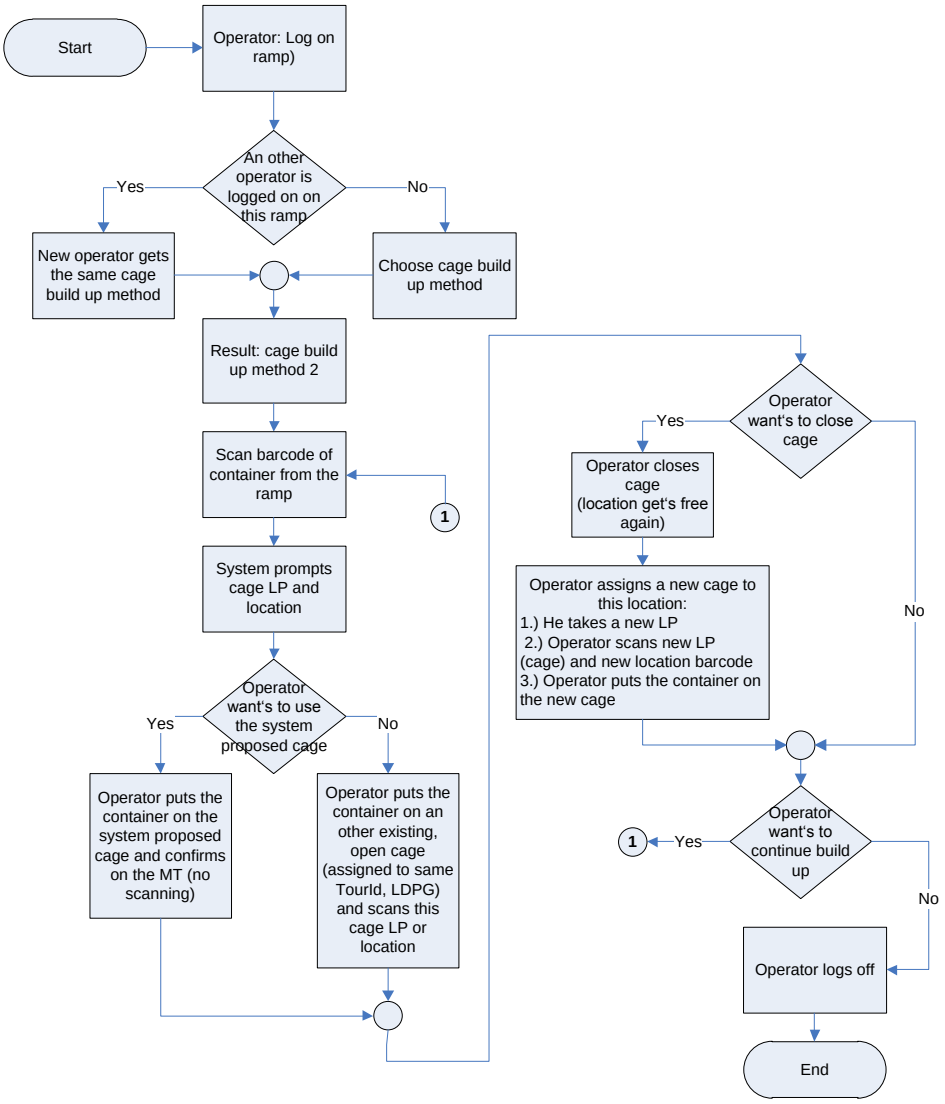

Figure 1613: Overview process build up method 2

Result

As a result dispatch tour (tourID) or LDPG clean and sorting method clean cages/pallets are build.

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The dispatch tour clean cages/pallets can be used for the following dispatch process. The LDPG clean cages/pallets can be used for a following separation process into dispatch (TourID) clean cages. This second separation is not described here and stays unchanged.

For

- For all sorting methodsAll sorting methods: as well cartons and bags are allowed on the same cage/pallet – so no check is done here.
- For an assignement of dispatch tours, dispatch tour clean cages/pallets are build.
- For assignement of LDPGs. LDPG clean cages/pallets are build (2 step process may follow).

Errorcases

Please see "Errorcases" in section 4.3.24.3.1 Build up method 1 (100% check) from the Build up method 1 (100% check) from the chutes.

Naturally all error cases which involve the scanning of the target (either location or barcode) are not possible/valid in this case.

4.3.34.3.4 Build up method 3 (100% check) from the chutesramps

Preconditions

- Operator is logged on the system
- Containers are on the chute ramp / in the lanes
- Status of the containers: the containers are at least booked on the sorter (this cage build up method doesn't need the eject message).
- The sorting method is either "Method 2", "Method 3", or "Method 4"
- All sorting methods are allowed

Functionality

Important: If the cage build up process is changed later on
Most of the text is same for all cage build up methods – so please check this if changed later!

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1. The operator logs on the chute ramp (by scanning the chute ramp barcode)
2. The system checks if an operator has already logged on this chuteramp:
   If **"yes"** – the new operator has to use the same cage/pallet build up method as the already logged on operator.

   If **"no**": the system checks which sorting cage build up method is allowed on this chute ramp (see precondition). And based on this sorting method and the order type the operator may choose one of the allowed/displayed sorting cage build up methods.
3. In this case (2nd case above) the operator chooses the method 3
4. The operator scans the barcode of the first container from the chute ramp(no matter from which lane).
5. If the **target** (means cage/pallet) for this container **already exists** in the system (marriage cage/pallet licenceplate to location is done) **and** if this **target is not closed yet**, tThe system prompts the target (by displaying location number and licenceplate of the cage/pallet.

   The operator takes the container he has taken from the chuteramp, puts it on the cage/pallet. Already the prompting of the target where the container has to be put on is booking the container on the target cage/pallet automatically. On the mobile terminal the scan field for the licence plate of the container is just empty at the first scan. When the next container is scanned this scan field on the MT is just overwritten.
6. If the **target** (means cage/pallet) for this container **doons't exist** in the system (marriage cage/pallet licenceplate to location is not done yet) **or** if this target cage/pallet **is already closed**, the system asks for a licence plate.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan "LP of cage/pallet label" and scan "barcode of the location".)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.

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Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.

At the marriage the system checks wheter the LP of the cage/pallet is known or not and wheter the location is free (just one cage/pallet per location is allowed)

7.6. The operator repeats from step 4 above till the cage/pallet is full or the chute ramp is empty.

8.7. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full. From that point onwards the operator is not allowed to put further containers on this cage. The location where the cage/pallet is booked on, gets free again.

8. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed cage/pallet is used for the follow up process of despatching which stays unchanged.

9. As a next step the operator has to assign a new cage/pallet to this empty ramp-location.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan “LP of cage/pallet label” and scan “barcode of the location”.)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks whether the LP of the cage/pallet is known or not and whether the location is free (just one cage/pallet per location is allowed)

10. The operator decides now to continue the build up process with step 4 descriped above. Or he may log off this chute ramp and may log on an other chuteramp.

Note to step 7 6 above
An operator may change chutes ramp at any time no matter if there are containers on the chute ramp or not (log off and log on on a different chuteramp). This log off has also to be done if a chute ramp is empty and if the op-

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erator wants to continue work on an other chuteramp. Later on the operator may continue with this chuteramp.

Several operators may assign simultaneously on one chuteramp.

Lost containers, means containers not found have to be solved organisationally – the follow up processes (like “tour closhure” stay unchanged).

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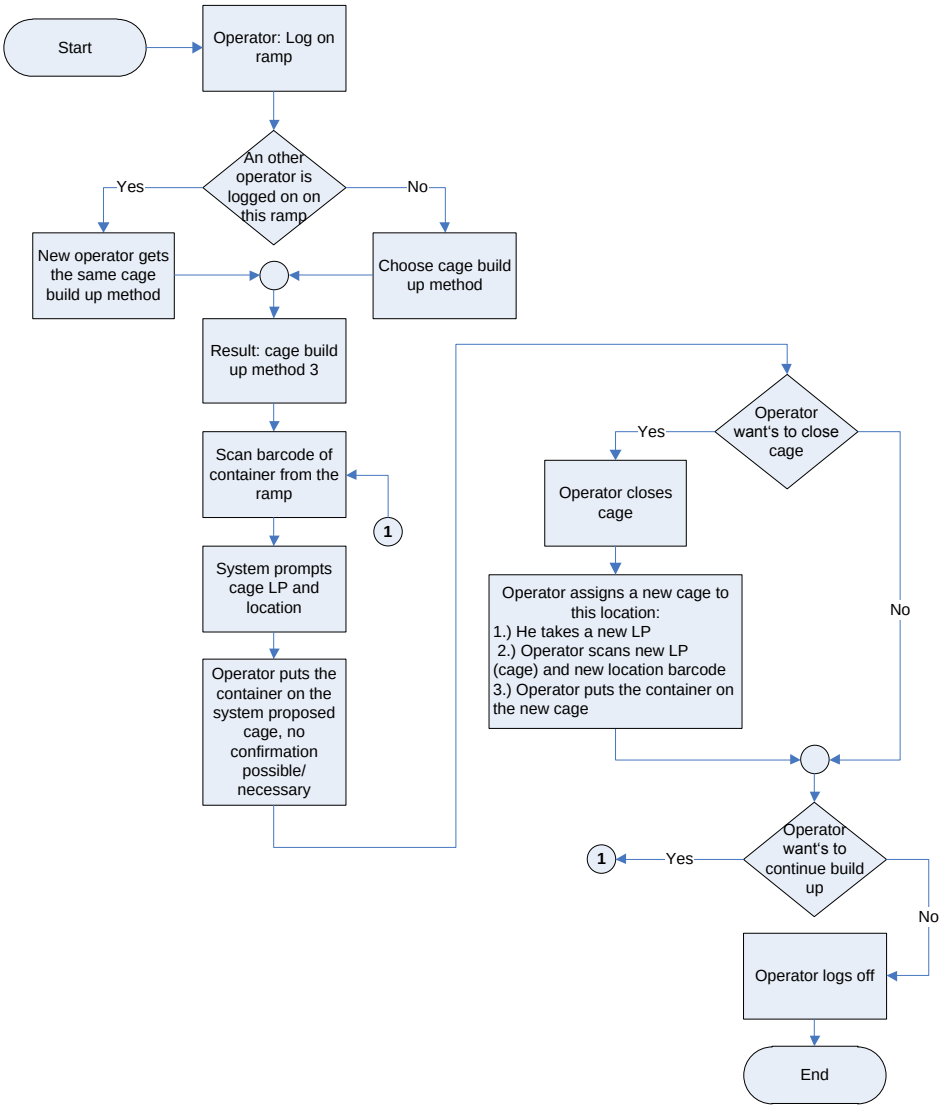

Figure 1713: Overview process build up method 3

Result

As a result dispatch tour (tourID) or LDPG clean and sorting method clean cages/pallets are build.

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The dispatch tour clean cages/pallets can be used for the following dispatch process. The LDPG clean cages/pallets can be used for a following separation process into dispatch (TourID) clean cages. This second separation is not described here and stays unchanged.

For

- For all sorting methodsAll sorting methods: as well cartons and bags are allowed on the same cage/pallet – so no check is done here.
- assignement of dispatch tours: dispatch tour clean cages/pallets are build.
- assignement of LDPGs:. LDPG clean cages/pallets are build (2 step process may follow).

Errorcases

Please see "Errorcases" in section 4.3.24.3.1 Build up method 1 (100% check) from the Build up method 1 (100% check) from the chutes.

Naturally all error cases which involve the scanning of the target (either location or barcode) are not possible/valid in this case.

4.3.44.3.5 Build up method 4 (0% check – automated build up) from the chutesramps

Preconditions

- Operator is logged on the system
- Containers are on the chute ramp / in the lanes
- For the containers the according eject message is uploaded to KiSoft from the Sorter system
- The only sorting method is "Method 2"
- Just one combination despatch tour / LDPG and sorting method is allowed on the according chuteramp
- All sorting methos are allowed
- **Just one operator is allowed to be logged on a chuteramp.**

Functionality

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Important: If the cage build up process is changed later on
Most of the text is same for all cage build up methods – so please check this if changed later!

1. The operator logs on the chute ramp (by scanning the chute ramp barcode)
2. When the operator logs on the chuteramp, the system checks if an other operator is already logged on the chute ramp and if the operator uses the build up method 4.
   If "yes" – this operator is not allowed to log on this ramp – he gets an error message.
   If no other operator is logged on the ramp the system checks which sorting cage build up method is allowed on this chute ramp (see preconditions). And based on this sorting method and the order type the operator may choose one of the allowed/displayed sorting methods.
3. In this case (2nd case above) the operator chooses the method 4
4. The operator scans the barcode of any container from one lane ramp(not chute). This does not have to be the first one in the lane ramp (but it could be).
   Thus the scanned container and all containers with an eject upload for this lane chute which are ejected previously to the scanned container will be booked on the target cage/pallet.
5. If the **target** (means cage/pallet) for these containers **already exists** in the system (marriage cage/pallet licenceplate to location is done) **and** if this **target is not closed yet**, tThe system prompts the target (by displaying location number and licenceplate of the cage/pallet.

   The operator takes the scanned container and all other containers which are in front of this container on this lane ramp and puts them on the cage/pallet. No confirmation is needed. Already the scanning books the container
6. If the **target** (means cage/pallet) for these containers **doens't exist** in the system (marriage cage/pallet licenceplate to location is not done yet) **or** if this target cage/pallet **is already closed**, the system asks for a licence plate.
   The operator takes a cage/pallet label from a pre-printed role, sticks

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it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.

(Scan "LP of cage/pallet label" and scan "barcode of the location".)

The operator takes the scanned container and all other containers which are in front of this container on this lane and puts them on the cage/pallet. No confirmation is needed.

Thus the containers are booked on the cage/pallet and the marriage location cage/pallet is done.

At the marriage the system checks wheter the LP of the cage/pallet is known or not and wheter the location is free (just one cage/pallet per location is allowed)

7.6. The operator repeats from step 4 above till the cage/pallet is full or the chute ramp is empty.

8.7. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full.

8. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed cage/pallet is used for the follow up process of despatching which stays unchanged.

9. As a next step the operator has to assign a new cage/pallet to this empty ramp-location.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the location.
   (Scan "LP of cage/pallet label" and scan "barcode of the location".)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks whether the LP of the cage/pallet is known or not and whether the location is free (just one cage/pallet per location is allowed)

10. The operator decides now to continue the build up process with step 4 descriped above. Or he may log off this chute ramp and may log on an

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Note to step 7 6 above":
An operator may change chutes ramps at any time no matter if there are containers on the chute ramp or not (log off and log on on a different chuter-amp). This log off has also to be done if a chute ramp is empty and if the operator wants to continue work on an other chuteramp. Later on the operator may continue with this chuteramp.

For this build up method just one operator may assign on one chute ramp at the time.

Lost containers, means containers not found have to be solved organisationally – the follow up processes (like "tour closhure" stay unchanged).

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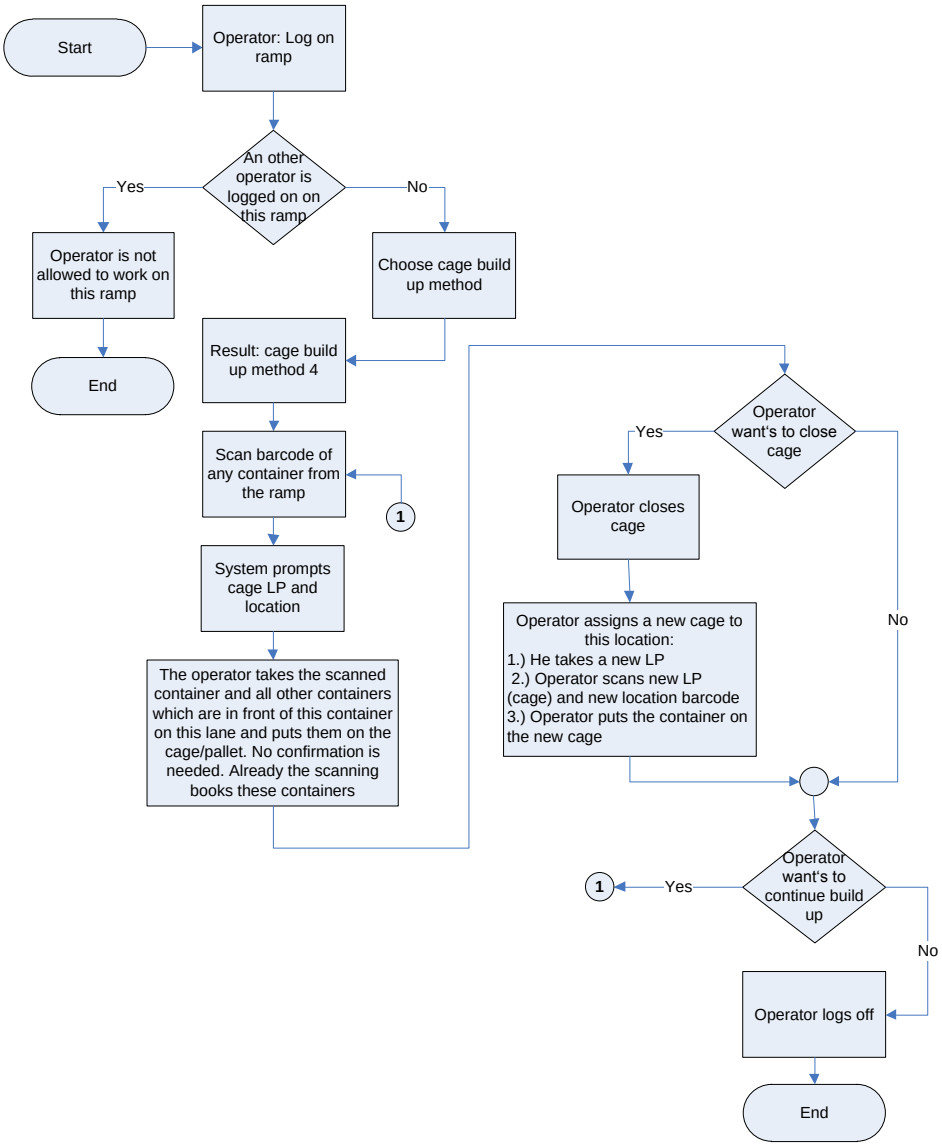

Figure 1813: Overview process build up method 4

Result (basically)

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As a result dispatch tour (tourID) clean or LDPG clean and sorting method clean cages/pallets are build which can be used for the following dispatch process. The resulting cage/pallet may have bags and cartons mixed (cage/pallet is not container type clean).

For assignement of LDPGs. 2 step process may follow.

Errorcases

1. Operator logs on an unknown dispatch ramp ramp barcode
   The system displays an error message (“unknown chute”). The operator confirms it and may continue.
2. The operator scans the barcode of an unknown container
   The system displays an error message (“unknown container”) The operator confirms it and may continue.
3. The operator scans the barcode of a container which belongs to a dispatch tour / LDPG not assigned to this chute
   Distiction:
   *) container belongs to a tour (TourID, LDPG) assigned to an other lane ramp and container is at least booked on the sorter
   The system displays an error message (“take the container to the error chute ramp or error cage – no other containers are booked to the cage”); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).
   [tbd] JLP. For all cases → Error message should be different to other cage build up methods – input JLP needed (proposal above)
   *) container belongs to a tour (TourID, LDPG) assigned to an other lane ramp but the container is not booked on the sorter, but WMS has requested a sortation
   The system displays an error message (“take the container to the error chute ramp or error cage – no other containers are booked to the cage”); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).
   *) container belongs to a tour (TourID, LDPG) assigned to an other lane ramp but the container is not booked on the sorter, but WMS has not requested a sortation
   The system displays an error message (“container known, but wrong status – no other containers are booked to the cage”); further han-

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dling needs investigation in existing WMS/WCS/MOT/SRC screens
*) container belonges to a tour (TourID, LDPG) not assigned to any other lane ramp but at least booked on the sorter (reason could be an old/no longer active assignement) but WMS has requested a sortation
The system displays an error message ("take the container to the error chute ramp or error cage – no other containers are booked to the cage"); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter). The transport to
*) container belonges to a tour (TourID, LDPG) not assigned to any other lane ramp (reason could be an old/no longer active assignement) but the container is not booked on the sorter
The system displays an error message ("take the container to the error chute ramp or error cage – no other containers are booked to the cage"); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).

Important: This scan of such a wrong container doesn't make a cage build up of any other container – so this wrong, single container must be treated and after this a new container must be scanned from the chuteramp/lane to continue the cage build up.

4. The operator scans the barcode of a container which belongs to the correct dispatch tour / LDPG, but the container was ejected on an other chute of this dispatch tour/LDPG (just possible for n chutes assigned to one dispatch tour / LDPG)
   The system displays an error message ("take the container to the error chute ramp or error cage – no other containers are booked to the cage"); the operator has to bring this container to the error chute ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).
5. The operator scans the barcode of a container where no eject upload from the sorter is made
   The system displays an error message ("container not booked on the chute ramp - take the container to the error chute ramp or error

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cage – no other containers are booked to the cage"); the operator has to bring this container to the error ~~chute~~ ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).

6. The operator scans the barcode of a container from error ~~chute~~ramp
   The system displays an error message ("container not booked on the ~~chute~~ramp ~~/lane~~ - take the container to the error ~~chute~~ ramp or error cage – no other containers are booked to the cage"); the operator has to bring this container to the error ~~chute~~ramp or error cage (organisationally) and there the follow up handling is made (build up error cage or send back to sorter).

7. The operator scans the barcode of a container which is already used on a cage.
   The system prompts an error message ("this container is already booked on cage lp [xxx] – no other containers are booked to the cage")
   The operator confirms it and may continue
   This tote is brought orginisationally to the cage [xxx] where as [xxx] is the licence plate of the cage the container is booked on.

8. The operator uses a not valid barcode as cage/pallet licence plate
   The system prompts an error message ("invalid licence plate")
   The operator confirms it and may continue.

9. The operator uses an already used licence plate for the cage/pallet
   The system prompts an error message ("invalid licence plate")
   The operator confirms it and may continue.

10. The operator marries the cage/pallet to an location still in use
    The system prompts an error message ("location in use")
    The operator confirms it and may continue.

11. The operator marries the cage/pallet to a location not assigned to the chute he is logged on
    The system prompts an error message ("wrong target location")
    The operator confirms it and may continue.

12. The operator confirms the container(s) (bag / carton) to a different target (not the target requested by the system)
    The system prompts an error message ("wrong target location")
    The operator confirms it and may continue.

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13. The operator confirms the container(s) (bag/carton) to an already closed cage/pallet.
    The system prompts an error message (“closed cage scanned”)
    The operator confirms it and may continue.

Important:
Build up method 4 is basically the opposite of a 100% check. To minimize possible errors, it must be strictly forbidden to change containers on the ~~chutes~~ ramps where such a build up is allowed. Still following errors may occur and can’t be detected by the system:

- container logically in cage – but physically not
- container physically in cage – but logically not

The quantity of these errors can’t be specified. These errors may have an additional impact on other dispatch tours and may prevent error resolutions on other ~~chutes~~ramps.

Example: a container “A” for ~~chute~~ ramp 011 is ejected by mistake on a ~~chute~~ ramp which uses this cage build up method 4. This container “A” is not detected by the operator and used for the physical build up. The cage/pallet is closed and dispatched. But now this container “A” is missing for a correct and entire cage build up at ~~chute~~ ramp 011.

4.4 Cage / Pallet Build up from error ~~chutes~~ramps

Important (valid for the whole document):
Due to the change in the assignements all validations, if a container is allowed to be scanned on a cage/pallet is not only due to the dispatch tour (TourID or LDPG) but is extended to:

- **dispatch tour (TourID or LDPG) and**
- **sorting method and**
- container type and
- status of the cage/pallet.

Some locations in this document use already this changed description, but not all!

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Preconditions

- Containers are on the error chutesramps

Functionality

At the error chuteramps(s) as well containers with errors and “normal” containers are ejected (see end of section 3.6.43.6.3 Assignement of the Assignement of the Chutes). Therefore it is not possible to predict how many ramp locatiosn are necessary for a cage build up. Thus a pool location 10 locations are is assigned to the error chute ramp (each error chuteramp).

The operator logs on at he chute ramp and chooses the functionality “cage build up from the error rampchute”.

This is an additional method of the cage build up necessary because:

- normal and error containers are possible
- and there are not individual locations but a pool location assigned to this ramp. on such a chute.

Important: If the cage build up process is changed later on
Most of the text is same for all cage build up methods – so please check this if changed later!

1. The operator logs on the chute ramp (by scanning the chute ramp barcode)
   [tbd] chute or ramp – due to sorting restrictions of BEUMER
2. The system checks if this chute ramp is used as an error chuteramp, if yes the operator gets automatically the cage build method for error chutesramps.
   Since the error chutes ramps are maintained in the sorter system and not in KiSoft, there is an additional information flag used in KiSoft. Using this flag the operator declares a chute ramp ([tbd]] lane) as an error chuteramp, thus the system knows if the chuteramp/lane the operator logs on is an error chuteramp/lane.
3. The operator scans the barcode of the first container from the chuteramp (no matter from which lane).

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4. The system checks
   - Is the chute ramp the operator is logged on a normal target for this container (and is the ejection upload in KiSoft) – then this container will be used for a normal **cage build up according to method "error ramp"according to method 1.**
     Only difference: the cages/pallets are not assigned to an individual locations, but all to a pool location
   - Is the chute ramp the operator is logged on **not** a normal target for this container– then this container is an error container and such containers have to be used
     either for the **cage build up according to method "error ramp"**
     or the container are directly scanned to the infeed back to the sorter and are put on this infeed.for the **cage build up according to method "error chute"**.
5. The operator repeats step 4 above till the cage/pallet is full or the chute ramp is empty.
6. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full. From that point onwards the operator is not allowed to put further containers on this cage. The location where the cage/pallet is booked on, gets free again.
7. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed cage/pallet is used for the follow up process of despatching which stays unchanged.
8. The operator decides now to continue the build up process with step 4 descriped above. Or he may log off this chute ramp and may log on an other chuteramp.

For **cage build up according to method 1** please see in 4.3.1 Build up method 1 (100% check) from the chutes

Cage build up according to method "error chuteramp"

1. The operator logs on the ramp (by scanning the ramp barcode)

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2. The system identifies the ramp as an error ramp and starts already with cage build up method similar to build up method 1.
3. The operator scans the barcode of the first container from source
4. If the **target** (means cage/pallet) for this container **already exists** in the system (marriage cage/pallet licenceplate to pool location is done) **and** if this **target is not closed yet**, the system prompts the target (by displaying pool location number and licenceplate of the cage/pallet.
   The operator takes the container he has taken, puts it on the cage/pallet and scans either the licence plate of the cage/pallet or the pool location barcode. Thus the container is booked on the cage/pallet.
5. If the **target** (means cage/pallet) for this container **doens't exist** in the system (marriage cage/pallet licenceplate to pool location is not done yet) **or** if this target cage/pallet **is already closed**, the system asks for a licence plate.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the pool location (important: one pool location for all cages).
   (Scan "LP of cage/pallet label" and scan "barcode of the pool location".)
   After this the operator puts the container he has taken from the ramp, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks wheter the LP of the cage/pallet is known or not.
6. The operator repeats from step 3 above till the cage/pallet is full or no containers are available or he want's to / has to change to any other operation.
7. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full. From that point onwards the operator is not allowed to put further containers on this cage.
8. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed

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cage/pallet is used for the follow up process of despatching which stays unchanged.

9. The operator decides now to continue the build up process with step 3 descriped above. Or he may log off this fallback mode.

After the operator has scanned the container and the system has identified an error container, the process is as following:

If the operator decides to put the container back on the conveyor “error ramp to sorter” again, the the operator scans the location number of this infeed conveyour instead of the lp of the target cage and puts the container on the infeed. This is an operator decision.

So from point of view cage build up there is no difference between a normal container and an error container on the error ramp.

Several operators may assign simultaneously on one error chuteramp.

Error codes of the container

Error code	Description
15301	stray container
15302	discharge fault
15341	Max recirculations
15362	Barcode / container unknown
15381	no record in sorting table

Result

As a result dispatch tour (tourID) or LDPG clean and sorting method clean cages/pallets are build during the normal cage build up or the containers are routed back onto the sorter.

Errorcases

For the normal cage build up – please see errorcases in section 4.3.2 Build up method 1 (100% check) from the Build up method 1 (100% check) from the ramps.

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4.5 Sorting Containers off an Error Cage/Pallet

Preconditions

- Containers where the operator gets the error message "("take the container to the error ramp or error cage" during the cage build up are used in this process.
- Error cages have a licenceplate out of a defined sequence. All numbers in this sequence are exclusively used for error cages.

Functionality

All container which fullfill the precondition may be put on such an error cages. These error cages are placed organisationally around the sorter and are used to collect such error container.

The process is as following (see also the different error cases):

1. The operator gets this error message during the cage build up
2. He takes the container (basically he has it still in hands) and goes to the nearest error cage (the operator is free to choose the error cage – no system driven process)
3. He puts the container on this error cage
4. And finally scans the LP of the error cage. Thus the container is booked on the error cage and the container data is already downloaded to the sorter system.
5. After this the operator goes back to his ramp and proceeds with his cage build up.

Note:

Due to no reads it is possible to scan a container several times to such an error cage or even to different error cages. If this happens on the same error cage the system just updates the time when the container is booked to the error cage. If this happens on a different error cage, the system books the container from the original error cages and books it on the new error cage.

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All error cages have defined licenceplates (which are used for no other purpose – see preconditions above)

An error cage is not stated as full. Its operator decision when to take this error cage to the infeed “error ramp back to sorter”. The containers of the error cage are put on the infeed “error ramp back to sorter” without any additional system interaction (no scanning). Logically these containers stay booked on the error cage, till an eject upload (container is ejected on a ramp) from the sorter system is uploaded. This eject message books the container of the cage and onto the ramp.

Additionally the following functionality is implemented for mobile terminals: “Info on error cages/pallets”

By using this functionality an operator may scan the licenceplate of an error cage and the system prompts the content of the scanned cage/pallet. Means a list of

- all licence plates booked on this cage
- and the time when the container was booked on the error cage (just the last booking time is kept/stored)

is shown. If the cage is logically loaded with containers, but physically empty, the according containers have to be treated with the already existing error resolution screens.

If the cage/pallet is logically empty, the display shows an empty message.

4.6 Reprint Shipping label

Near the error ramp a client PC with a shipping label printer is established (provided by JLP). On this client the operator may open a “reprint shipping label” screen.

The operator either scans or keys in the barcode of the shipping label. Thus a request to reprint the shipping label is send to Metapack. Metapack downloads the shipping label to the according printer, the shipping label is reprinted. The operator takes this reprinted label and apllies it on the according container.

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Important:
Due to the response times a 20 seconds time out is established after each requested reprint.

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5 Fallback Scenario

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Open issue: this fallback is not included in the sorter project – must be handled/ordered separately.

[tbd] still discussions Holensteiner / JLP – about a manual switch over to re-rout containers to separate converyor and manual sortation/build up – open issue: the conveyor layout (which types of containers are transported via conveyor – which are transported manually/organisationally) – the SW functionality itself is defined as following.

If the whole sorter sorter is down, the system can be switched over to an emergency mode.Is is done by an operator (on operator decision) by changing the WMS system parameter “SORTER_FALLBACK_ACTIVE” from “No” to “Yes”.

Thus all containers are routed or brought manually to [tbd – open] a dead end conveyor. There one pool location for all cages is installed. The cage build up itself is done from this conveyor part onto different cages on this pool location. The only cage build up method which is allowed, is cage build up method 1. Since all cages are booked on on-e location, there is no system guidance to find the cage which is requested by the systeme – this must be solved organisationally.

Containers used in this in this fallback scenario in the cage build up must have the correct status (at least WMS must have requested the sortation). Such containers my be on the following sources:

- Containers on this conveyor
- Containers on the way to the sorter – these are brought organisationally
- Containers already on the sorter sorter – these are brought organisationally

All containers on the chutes/lanesramps are treated via the normal process.

Functionality

Important: If the cage build up process is changed later on
Most of the text is same for all cage build up methods – so please check this if changed later!

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1. The operator logs on the fallback conveyor
2. The system logs the operator on and starts already with cage build up method 1.
3. The operator scans the barcode of the first container from source
4. If the **target** (means cage/pallet) for this container **already exists** in the system (marriage cage/pallet licenceplate to pool location is done) **and** if this **target is not closed yet**, the system prompts the target (by displaying pool location number and licenceplate of the cage/pallet.
   The operator takes the container he has taken ~~from the chute~~, puts it on the cage/pallet and scans either the licence plate of the cage/pallet or the pool location barcode. Thus the container is booked on the cage/pallet.
5. If the **target** (means cage/pallet) for this container **doens't exist** in the system (marriage cage/pallet licenceplate to pool location is not done yet) **or** if this target cage/pallet **is already closed**, the system asks for a licence plate.
   The operator takes a cage/pallet label from a pre-printed role, sticks it on the cage/pallet and marries the barcode (the LP) to the cage/pallet and to the pool location (important: one pool location for all cages).
   (Scan "LP of cage/pallet label" and scan "barcode of the pool location".)
   After this the operator puts the container he has taken from the chute, puts it on the cage/pallet.
   Thus the container is booked on the cage/pallet and the marriage location-cage/pallet is done.
   At the marriage the system checks wheter the LP of the cage/pallet is known or not.
6. The operator repeats from step 3 above till the cage/pallet is full or no containers are available or he want's to / has to change to any other operation.
7. If the cage/pallet is full (which is an operator decision), the operator states the cage/pallet as full. From that point onwards the operator is not allowed to put further containers on this cage.
8. Than the operator pushes the closed cage/pallet to a kind of pick-up and drop point (no system driven process). From here the closed

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cage/pallet is used for the follow up process of despatching which stays unchanged.

9. The operator decides now to continue the build up process with step 3 descriped above. Or he may log off this fallback mode.

Note to step 4 above:
No matter if a carton or a bag is scanned, the system addresses these containers always to the same target cage. So the target cage is not container type clean.

But due to an operator decision, the operator may overrule the cage proposed by the system in step 4. Means the system prompts a target liceneplate after a bag/carton is scanned. For what reason ever, the operator doesn't want to put this specific bag/tote on this existing (open) cage, but he want's to use a different cage. This could be a new cage or an already existing (but not closed) cage which is assigned to the same dispatch tour (TourID or LDPG). Operational handling please see in the process figure below,

If several cages are assigned to one tour (one TourId or one LDPG), the system prompts always the cage with the lowest licence plate number.

Several operators may assign simultaneously ~~on one chute~~for this fallback conveyor.

Lost containers, means containers not found have to be solved organisationally – the follow up processes (like "tour closhure" stay unchanged).

Result

As a result dispatch tour (tourID) or LDPG clean and sorting method clean cages/pallets are build.

The dispatch tour clean cages/pallets can be used for the following dispatch process. The LDPG clean cages/pallets can be used for a following separation process into dispatch (TourID) clean cages. This second separation is not described here and stays unchanged.

Errorcases

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1. Operator doesn't log on the fallback conveyor.
   The system displays an error message ("wrong ~~chute/lane~~ramp").
   The operator confirms it and may continue.
2. The operator scans the barcode of an unknown container
   The system displays an error message ("unknown container")
   The operator confirms it and may continue.
3. The operator scans the barcode of a container which is already used on a cage.
   The system prompts an error message ("this container is already booked on cage lp [xxx]")
   The operator confirms it and may continue
   This tote is brought orginisationally to the cage [xxx] where as [xxx] is the licence plate of the cage the container is booked on.
4. The operator scans a barcode of a container in the wrong status (not ready for sortation)
   The system displays an error message ("container known, but wrong status"); further handling needs investigation in existing WMS/WCS/MOT/SRC screens
5. The operator uses a not valid barcode as cage/pallet licence plate
   The system prompts an error message ("invalid licence plate")
   The operator confirms it and may continue.
6. The operator uses an already used licence plate for the cage/pallet
   The system prompts an error message ("invalid licence plate")
   The operator confirms it and may continue.
7. The operator marries the cage/pallet to a location different to the pool location
   system prompts an error message ("wrong location scanned")
   The operator confirms it and may continue.
8. The operator confirms the container (bag / carton) to a different target (not the target requested by the system)
   If the target is assigned to the same tour (TourID or LDPG), this is possible (see process description above).
   If the target is not assigned to the same tour (TourID or LDPG), the system prompts an error message ("wrong target (cage/location)")
   The operator confirms it and may continue.

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9. The operator confirms the container (bag/carton) to an already closed cage/pallet.
   The system prompts an error message (“closed cage scanned”)
   The operator confirms it and may continue.

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6 Data Reorg of the Sorter System

Data in the sorter system will be deleted as follows:

- Sorting plans: older than 40 days and if not active
- container data: older than x days (parameter)
- Statistical data: older than 365

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7 Visu

7.1 Standalone Visualisation of the Sorter System (BeOS)

The sorter is equipped with a local visualization called BeOS

Functions:

- Start / stop sorter
- Display of local fault messages
- Control positions of sensors (photocells)
- Data receipt point etc.
- Display of tray data within the PLC

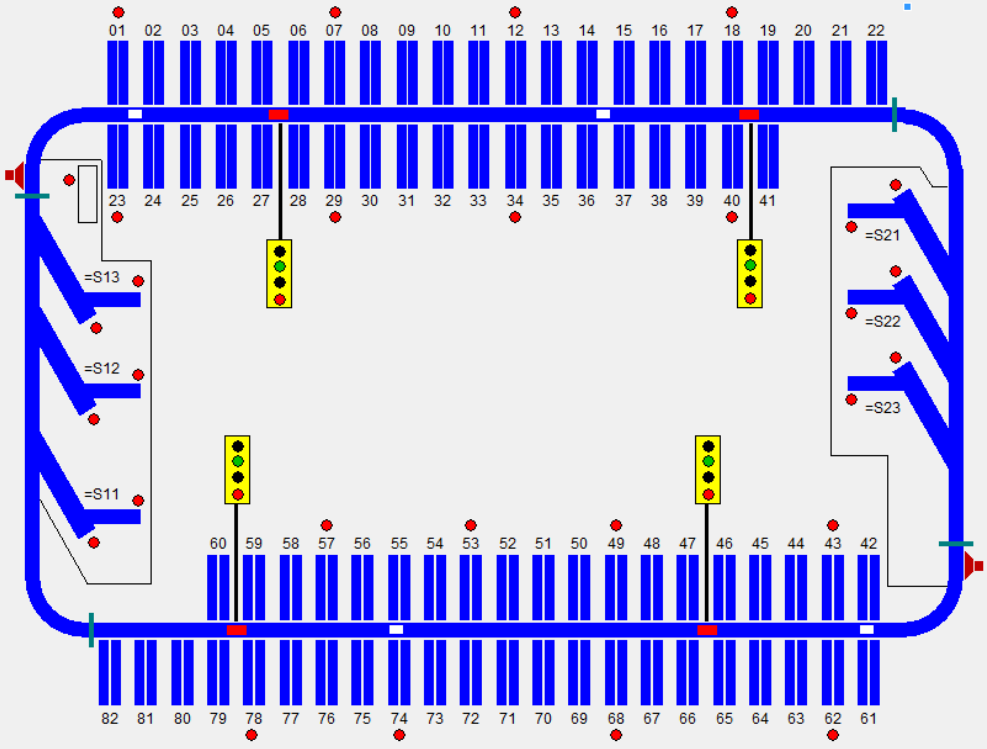

Figure 1914: BeOS main picture with all elements visible

Emergency stop

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 maintenance bulb

Lane colors BeOS

The different lanes in the program BeOS will be colored according to the following color table:

Color	State	Priority
Brown	no connection to PLC / BeDas	1
Blue	de-selected, blocked by BeOS not available totally	2
Dark blue	E-stop (usually all items are dark blue in case of E-stop)	3
Red white flashing	Error	4
Black	Blocked	5
White	Full	6
Cyan	Half full	7
Green	Running	7
Yellow	Ready, not full	8
Magenta	pre-Selected, ready to be "started" (if the sorter is not running)	9

7.2 Integration into KiSoft (ZenOn)

A separate document (excel-sheet containing the uploaded data points/information)

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8 Logging of the Sorter System

The logging module records all processes in the system. The logging module consists of three components:

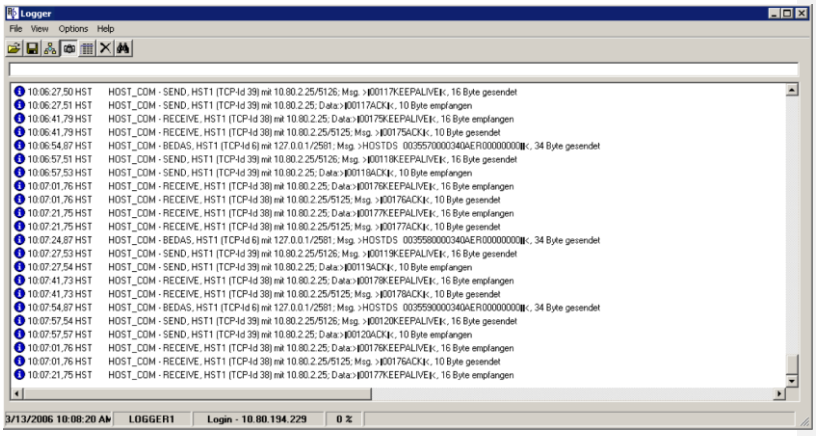
- Log-Base
- Logger
- Log-View

8.1 Log-Base

Log-Base is a program without user interface which links with each program running on the PC. All important processes are logged in special log files and stored on the hard disk. Further the current log messages will be sent to connected user interfaces called Logger.

8.2 Logger

The Logger is the user interface of Log-Base. Here, the operator can view the current processes listed in Log-Base. Once the logging module has been started, the Logger is linked directly with Log-Base and displays the current processes line by line.



The event buffer contains up to 300 entries. This event buffer is filled continuously with current entries. At the same time, older entries are deleted.

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If the cursor is placed on one of the entries (except for the last one), this entry is not updated any more. This way, the entry can be analyzed precisely.

The structure of the entries is as follows:

<Date><Time><Name of client><Message text>

The client name is an abbreviation of the program which has generated the respective message.

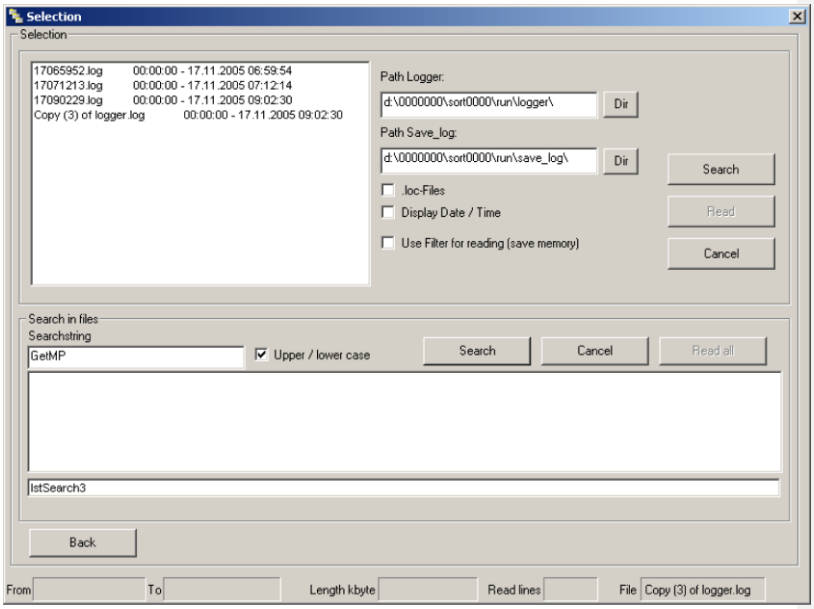
The logger offers three possibilities of filtering entries:

- Activate or de-activate clients individually.
- Activate or de-activate message text and group identifier.
- Use text filter.

8.3 Log-View

With Log-View, the saved log files can be viewed in chronological order.

The current log file of the Logger is filled with data up to 1 MB. Once this value has been reached, the contents are stored in the "save_log"file.



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9 Sorter System User Administration (BeAdmin)

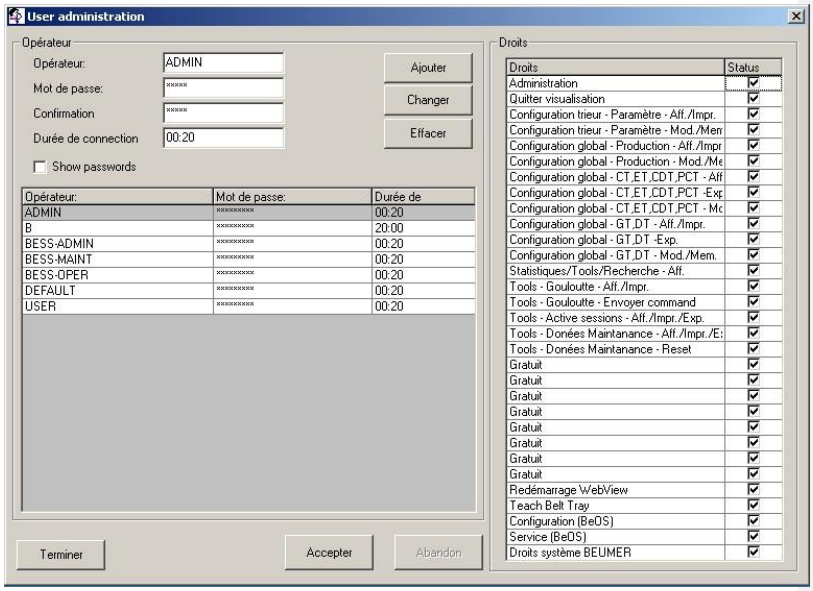
9.1 General

After starting of the BeOS or BeSSView, no user is logged in at first. Only general operator functions such as starting, stopping, resetting fault messages etc. can be carried out. Extended functions are available only to logged-in users with the respective user authorizations.

New users can be created with the BeAdmin user administration. In addition, existing user profiles can be modified or deleted. The settings in BeAdmin apply to BeOS and BeSS. BeAdmin is started in the "Start - Programs - BEUMER - BeAdmin" menu and is protected by a password.

BeAdmin is independent of the user administration in Windows.

9.2 Set rights



Max. 31 different rights can be assigned to a certain operator. The connection between a certain function (for example delete statistics) and the rights number is hard coded.

The different rights will be defined during the programming phase and is described in the document “Oper-BeSSView-612-0231-x”.

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9.3 Database Server

All relevant information and system parameters are stored in a local database on the BeSS server system. The database is based on Sybase SQL Anywhere.

9.4 BeDaS

The BeDaS is the BEUMER Data Server. It is a software module providing status and error information to the different visualization systems like BeOS.

9.5 BeSS Base

BeSS Base is a software module responsible for the sortation of containers in the system.

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10 Sorter System Backup Concept (cold backup)

Two identically installed and configured servers are delivered. Both server are usually started. During start of BeSS a so called virtual IP will be applied to the network card. BeSS is always reachable under this IP. In case of a failure the BeSS software can be stopped on the server and can be started on the other server. To handle this, the user interface BeSS-Monitor will be used.

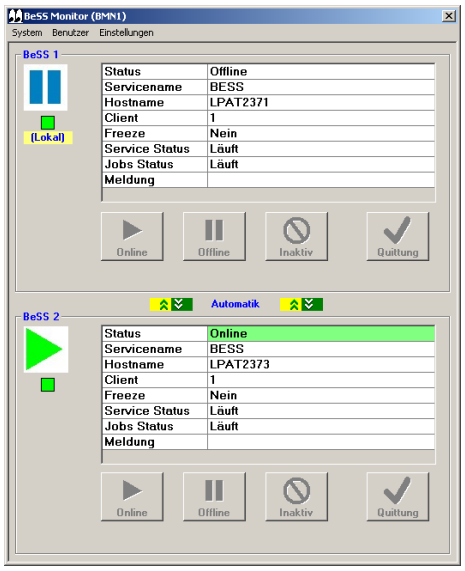

Figure 20156: BeSS-Monitor

The BeSS Monitor is used to show and control the current status of one or two attached BeSS Node(s). A single BeSS or a backup environment with two BeSS systems can be monitored. This application is communicating with the corresponding BeSS Application Managers (BeAppMgr) and displaying the received information.

In this project no data needs to be backed up. In worst case the following configuration can be entered manually after switching to the backup server (only if they have been changed since the commissioning):

- Special destinations (see section 4.2.7 Sorting ExceptionsSorting Exceptions)

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- System parameter (see section 3.9 Parameters of the Sorting SystemParameters of the Sorting System)
- User administration (see section 9 Sorter System User Administration (BeAdmin)Sorter System User Administration (BeAdmin))

Alternatively the database can be copied manually to the backup server. Therefore two files needs to be copied:

- D:\6120231\sort6270\run\data\db6270.db
- D:\6120231\sort6270\run\data\db6270.log

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11 User Interace Sorter System: Description BeSS-Monitor

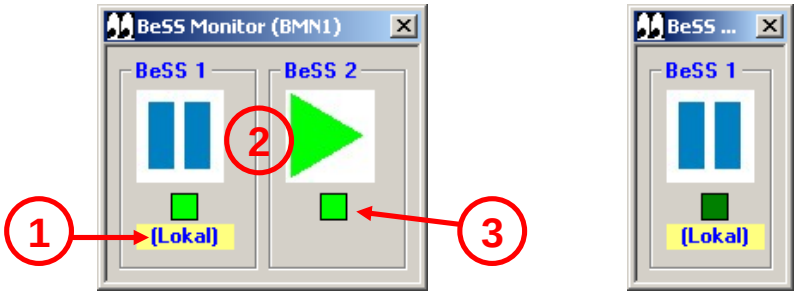
11.1 Main screen

The main screen of the application shows the current status of the attached BeSS system(s).

The screen size can be minimized or maximized by clicking the (left, upper) status icon, or by resizing the window.

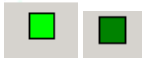
In maximized mode the status of the BeSS system can be reviewed more detailed and also be changed.

11.2 Minimized window:



If the BeSSMon is started locally on one of the two Nodes the “local” label will be displayed on the side of the current used Node

A defined icon shows the status of the node(s).

To visualize the current connection state the small green square is used. It changes the color every few seconds if the connection to the BeSS (Be-AppMgr) is established. 

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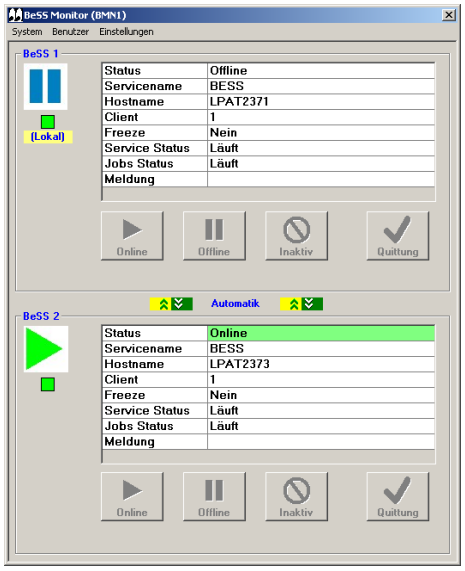
11.3 Maximized window:



Status icons:

The status icons are showing the current BeSS status.

	Online	This system is the current main BeSS system.
	Offline	This system is currently offline and executing offline jobs like data-base backup…
	Inactive	The system is inactive, no jobs are executed
	Error	An error occurred and needs to be acknowledged by 'Quit fault'
?	*Unknown*	The current status is unknown because the service is not running or there is no connection possible

Some additional information is displayed:

Service Name: The name of the registered windows service which starts the BeSS

Hostname: Computer name

ClientNbr: Number to identify the machine (1, 2, .. internal use)

Freeze: Yes if service is currently changing status

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Service Status: Status of the BeSS service itself

Jobs Status: Status of the configured jobs

Message: Current informational message (used during startup..)

Buttons:

To activate the buttons (like Quit fault..) a user with according rights has to log on to the system first.

Online: By this button the system will be switched to online mode

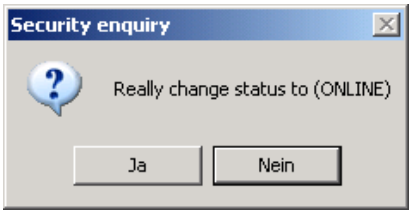
Offline: By this button the system will be switched to offline mode

Inactive: By this button the system will be switched to inactive mode

Quit fault: By this button a fault can be acknowledged

Refer also to description of the status icons.

Whenever one of the buttons is pressed a security enquiry will appear to confirm the current action:



By clicking one of the status lists in the main screen the resources dialog is displayed.

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11.4 Menu Tools

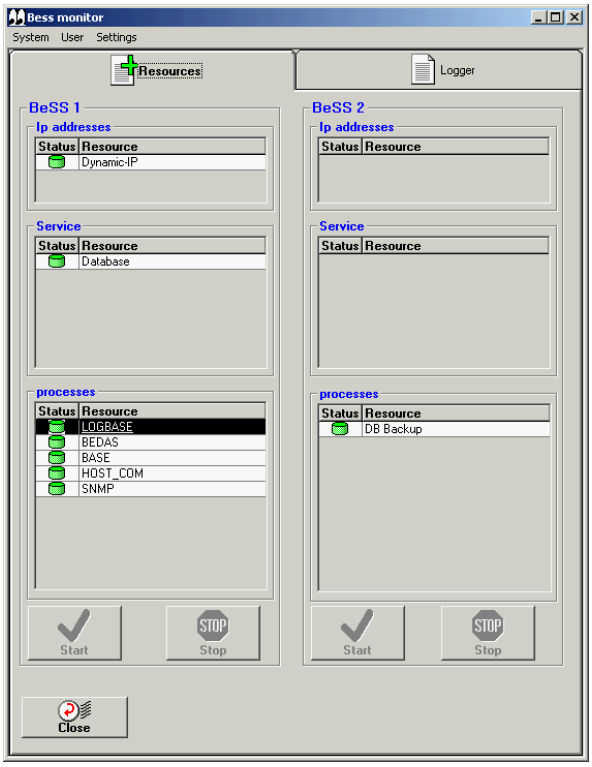
By this menu point the status of the BeSS resources can be reviewed and manipulated.

Furthermore a logger, which is connected to the BeSS service, displays additional information.

This dialog can also be opened by clicking one of the status lists in the main screen.

Resources

This dialog shows the current status of all configured jobs.



If the current logged in user does have the according rights the ‘Start’ and ‘Stop’ buttons become available. Hereby each selected resource can be started and stopped individually. A security inquiry will be displayed to confirm every action.

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Status icons:

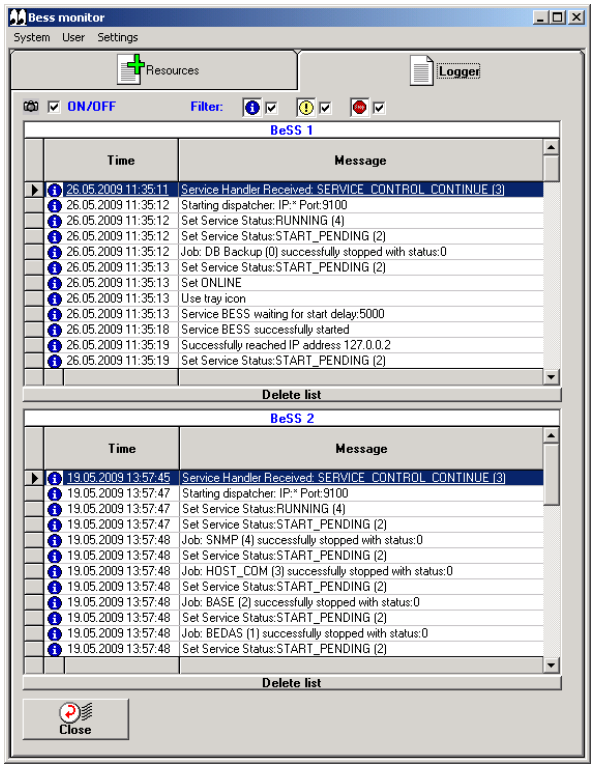
Resource running

Resource starting or ending

Resource not running

Logger

The Logger is connected to the BeSS service(s) itself and displaying (BEUMER internal) status messages.



A Filter can be defined here and the logging can be switched on or off. If a list is deleted the command is send to the BeSS service and the messages are deleted permanently.

Remark:

All messages are in English because the messages are for internal use only. The language of the displayed messages is not affected by the currently selected language.

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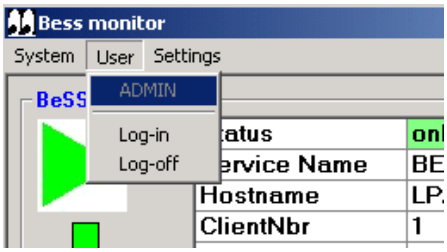
11.5 Menu About

The About box can be opened here. This dialog shows program version information

If a user with corresponding rights is active an internal tool dialog can be opened here additional.

11.6 Menu Log-in

To activate functions which are protected by user rights the user can log in to the system by this menu point. If the log in has been successful the current user is shown in the menu:



11.7 Menu Log-off

By this menu point the user can be logged off from the system. All previous enabled buttons and menus will be disabled again.

This menu point is used to adjust some program settings.

11.8 Show in taskbar

If this option is selected the program will appear within the taskbar.

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11.9 Always on top

If this option is selected the program will stay on top (like the windows task-manager).

11.10 Language

The language of all dialogs can be switched here.

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12 Abbreviations (Sorter System)

ACC	Maintenance Access
AP	Access-Point
BeOS	BEUMER Operator Station, local visualization for the BEUMER delivery
BeSS	BEUMER Sorting System, PC based
BEUMER	BEUMER Maschinenfabrik GmbH & Co KG
BSC	BEUMER sorter control, Siemens S7 based
Lane	Chute, physical lane (a side of the W-chute)
Destination	Logical destination (= lane)
Chute	Complete chute containing two lanes (W)
ES	Emergency Stop
MCP	Main Control Panel
MIS	Management Information System (SCADA)
Partner PLC	all PLC controlling equipment outside BEUMER scope of supply
PDP	Profibus DP
PLC	Programmable Logic Controller