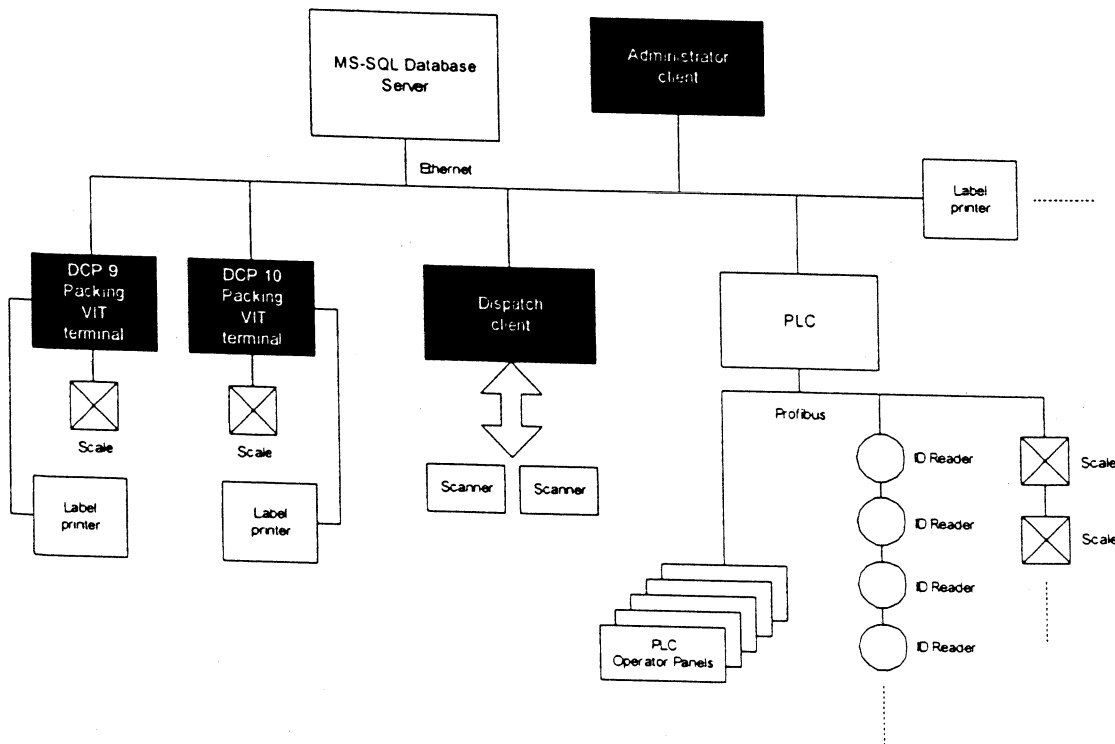# Scale and yield control system

1 System overview

The SFK yield control system is based on collection of production data to a central database server. From the central database server, various reports can be produced. The figure below shows a system overview of the yield control system. Please note that the diagram is not complete but acts as illustration of the connections between the different objects in the system.

```
MS-SQL Database          Administrator
    Server                  client

                    Ethernet                              Label
                                                         printer    ............

DCP 9          DCP 10
Packing        Packing        Dispatch            PLC
  VIT            VIT            client
terminal       terminal
                                                Profibus
  [X]            [X]                                        ⊙ ID Reader    [X] Scale
 Scale          Scale        Scanner  Scanner               ⊙ ID Reader    [X] Scale

 Label          Label                                       ⊙ ID Reader
printer        printer              PLC                     ⊙ ID Reader
                              Operator Panels
```

2 Shop floor diagram

The yield calculation is based on the registered weights to and from a recipe.
The figure below shows the product flow of the cutting, deboning, packing and dispatch areas.
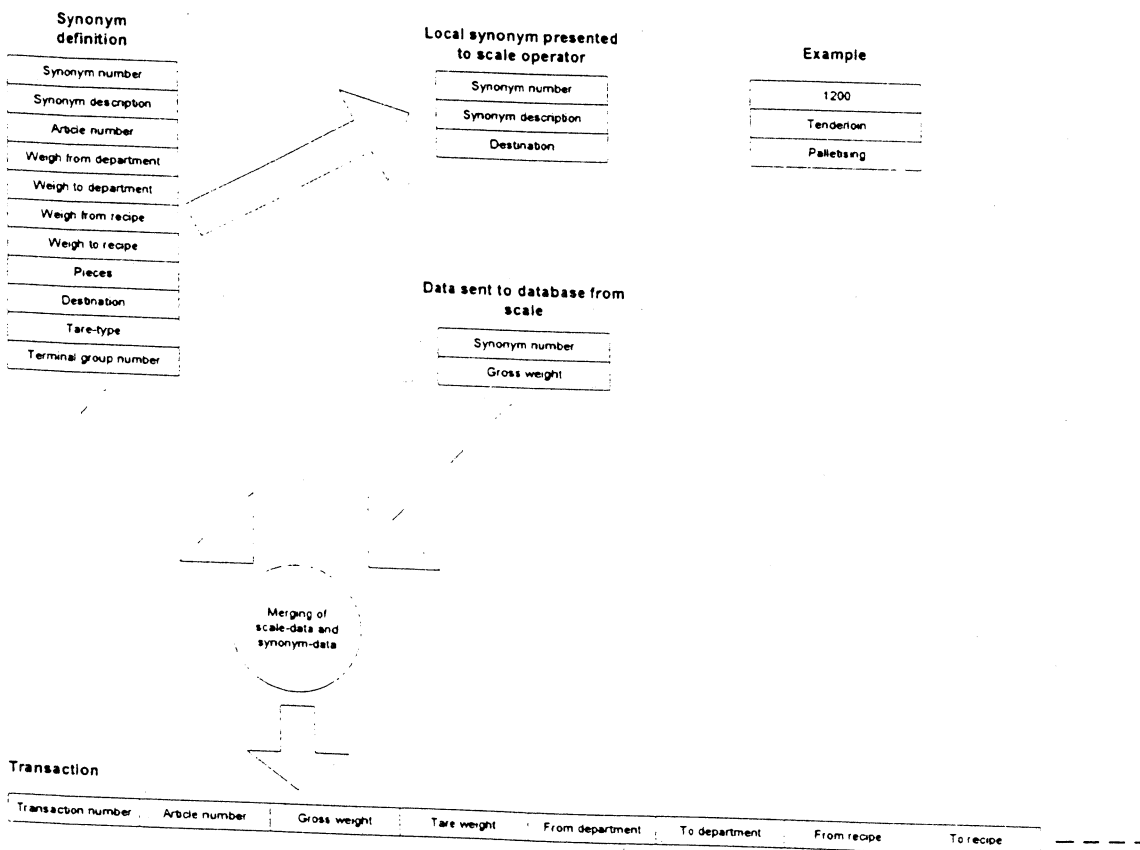
DCP: Data Capture
Point
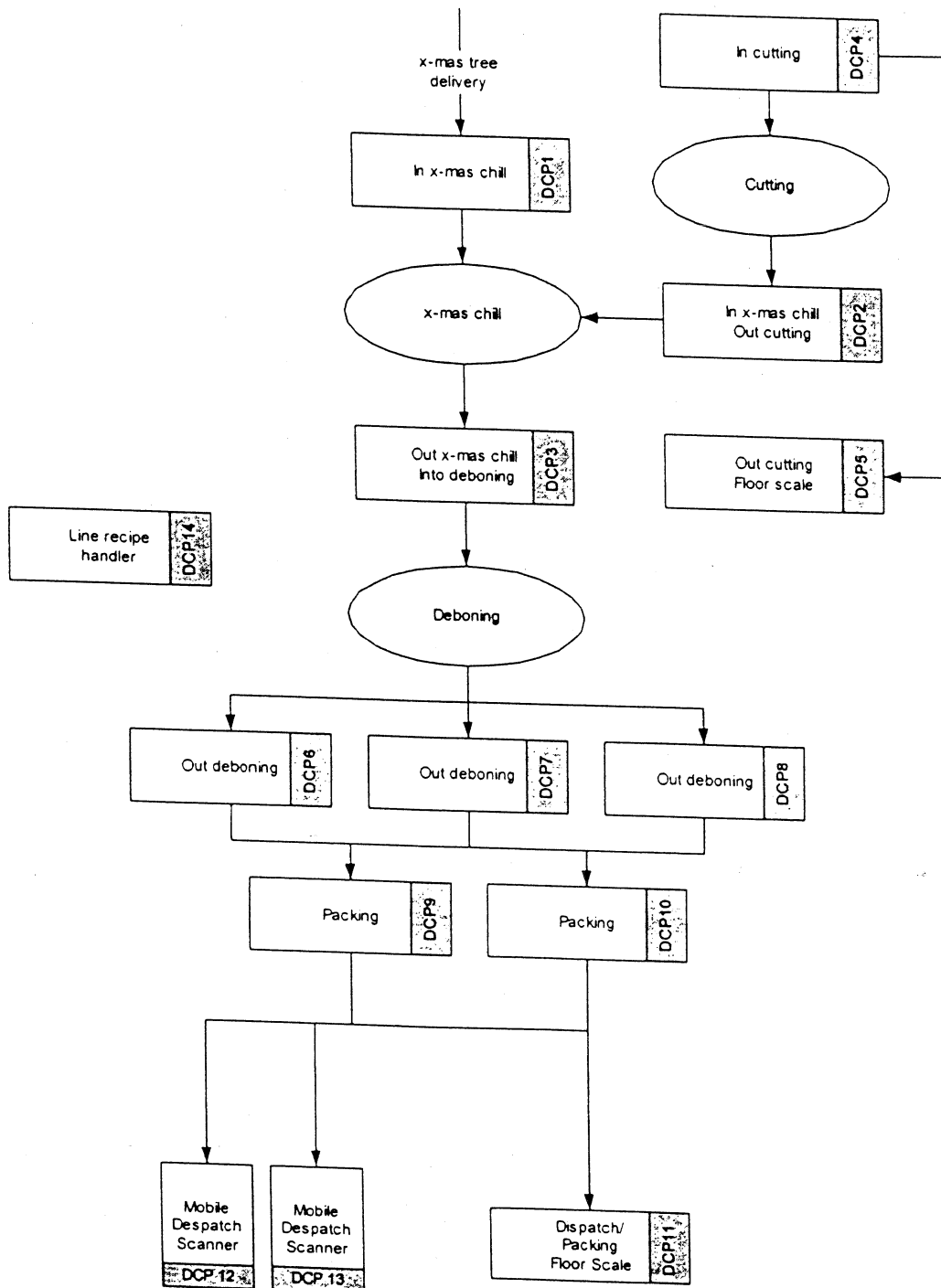
3 Functional description

The system is based on a Siemens S7-400 PLC connected to a MS-SQL 2000 database server via Siemens Industrial Databridge or a similar software tool, which enables data-transfer from PLC to database. For packing stations, SFK VIT terminals are used for increased speed and full offline capability.

3.1 User input

User input is performed through Siemens TP-270 operator panels and SFK-VIT PC-terminals. The registration of data from the scales is based on a synonym number. The synonym number is a shortcut that assists the scale operator in keying in information.
Only relevant data will be displayed at the operator panels and VIT terminals. When the operator registeres the weight on the scale, data will be sent to the database.
When data from the scales reaches the database, the data will be merged with the synonym number and weight sent from the operator panel/scale.

The system is illustrated below.

Synonym definition

| Synonym number |
| Synonym description |
| Article number |
| Weigh from department |
| Weigh to department |
| Weigh from recipe |
| Weigh to recipe |
| Pieces |
| Destination |
| Tare-type |
| Terminal group number |

Local synonym presented to scale operator

| Synonym number |
| Synonym description |
| Destination |

Example

| 1200 |
| Tenderloin |
| Palletising |

Data sent to database from scale

| Synonym number |
| Gross weight |

Merging of scale-data and synonym-data

Transaction

| Transaction number | Article number | Gross weight | Tare weight | From department | To department | From recipe | To recipe |

4 Recipe specification

A recipe is a specification of the expected output from a certain cut of meat. The recipe does not specify the input but only the output divided by article number.
The below illustration shows a recipe example.

Recipe number   Recipe name

Recipe	Description	QED	SYSTEMDATE	SYSTEMUSER
7313	Pork Picnic - B/Less	0	13-11-1999 19:45:19	PTMS2

Article no	Description	QED	Percentage	Main product	SYSTEMDATE	SYSTEMUSER
7320	Pork Collar - B/Less		67	☑	24-05-2004 14:48:59	PTMS2
7319	Pork Collar - B/In		12	☐	24-05-2004 14:49:16	PTMS2
7332	Pork 50% VL Meat		4	☐	24-05-2004 14:49:31	PTMS2
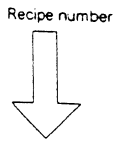
Article number   Article name   Expected yield

5 Yield report

The yield report is the output from the yield control system. The yield report compares the actual yields with the expected yields.
Below is an example of a yield report.
Note: this is only an example of the yield report layout, not a specification of the final report layout.

Yield report

Printed 24-05-2004 14:39:11

Recipe no.:	QED	Recipe description				Page 1
7313	0	Pork Picnic - B/Less			Report requested	
					24-05-2004 14:39:10	
From batch no:	To batch no:	From line no:	To line no:	From:	To:	
0	999999999999999	0	999999999999999	24-05-2002 00:00:00	24-05-2004 00:00:00	

Raw material

Article no	Description	QED no	Category	Pieces	Net weight	
7320	Pork Collar - B/Less		B	154	4430 00	
				154	4430 00	Input to recipe

Yields

Article no	Description	QED no	Pieces	Net weight	Yield	QED std	Dev from std	Weight dev.	Cost	Cost dev
7320	Pork Collar - B/Less		52	2989.69	67.48 %	67.00 %	0.48 %	21.26	3.20	68.04
7319	Pork Collar - B/n		100	400.00	9.02 %	12.00 %	-2.98 %	-132.01	0.00	0.00
7332	Pork 50% VL Meat		10	100.00	2.25 %	4.00 %	-1.75 %	-77.53	0.00	0.00
			162	3489.69	78.75 %	83.00 %	-4.25 %		3.20	68.04

Output from recipe

Standard yield (expected)

Actual yield (produced)

Deviation from standard yield

6 Label design

Label design will be handled through the SFK LabelWave software. SFK LabelWave is designed to work with Intermec label printers in FingerPrint mode. Label printers for packing operations will be connected directly to the packing terminals via RS-232. Other label printers will be connected to ethernet.

Screen example from SFK LabelWave
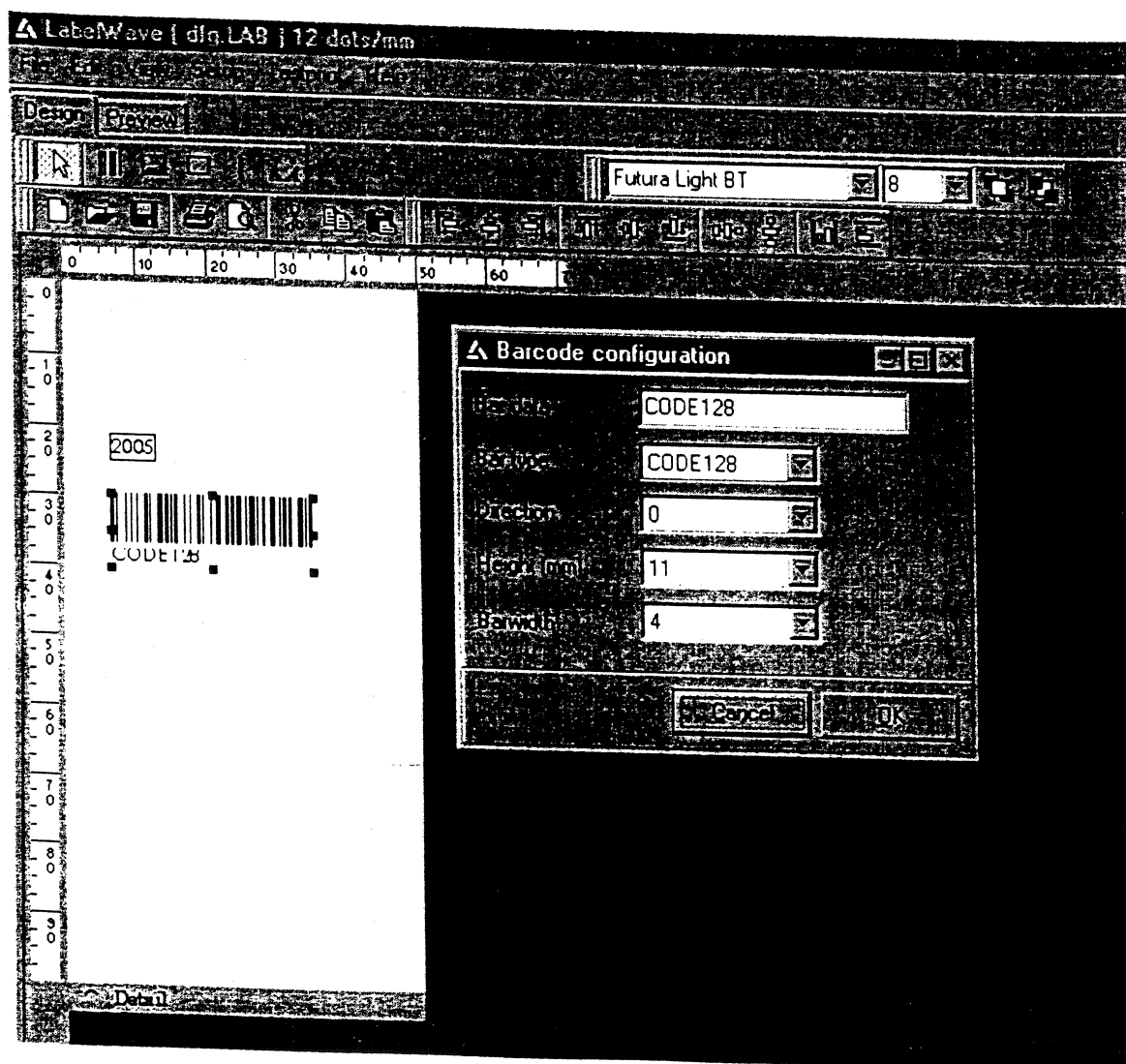
7 Description of data capture points (DCPs)

7.1 DCP 1, In x-mas chill (VIT terminal)

This DCP weighs x-mas trees into the x-mas tree chill. A label printer prints a label with a unique barcode and other details for the x-mas tree, each time a tree is weighed. The contents of the x-mas tree chill can be viewed at DCP1.

7.2 DCP 2, In x-mas chill/Out cutting (OP panel)

This DCP registres x-mas trees coming from cutting. For each tree a label is printed on a label printer.

7.3 DCP 3, Out x-mas chill/In deboning (OP panel)

This DCP weighs x-mas trees from the x-mas chill to deboning department. The weighings created at this DCP are the first part of the deboning yield.
A recipe and line number is assigned to each x-mas tree. Optionally a batch number can be assigned.

7.4 DCP 6,7 and 8, Out deboning (OP panel)

These DCP's are finalising the deboning yield by weighing product from the deboning recipe. A destination for the tray is also selected a this point. The destination is part of the synonym number and will be auto selected when the synonym number is selected.

7.5 DCP 9 and 10, Packing (VIT terminal)

To enable full off-line capability, these DCP's are VIT terminals and the external equipment - scale and label printer - is connected directly to the terminal via RS-232. The packing stations transmits data to the database, but are fully offline capable, which means that the packing proces can continue even though the network connection or database is down. Data will be stored locally on the terminal and transmitted when the system is online again.

7.6 DCP 11, Dispatch (OP panel)

For simple dispatch operations where a pallet or dolav must be registered as sent to a specific customer number, OP panels will be used at these DCP's.
If a more complex dispatch operation is required, the OP panels will be replaced with VIT terminals and special designed dispatch software.
Complex dispatch software is not part of the quoted system.

7.7 DCP 14, Line recipe handler

This DCP is controlling the recipe information assigned to trays leaving each deboning line. A tray arriving at the out deboning scales will have recipe information assigned. This means, that the operator will only have to select the product via the synonym number.

7.8 DCP 12 and 13, Dispatch scanners

The dispatch function is included to present a complete system. A more detailed functionality of the dispatch function must be agreed before a specification of DCP 17 and 18 can be completed.

The quoted system includes two simple dispatch functions:
- Building a pallet from individual cartons
- Scanning a carton or a pallet to a customer.

The quoted scanners are batch scanners and based on a dedicated PC to handle uploads from scanners.

The quoted system does not contain printing of dispatch documents.