

TAPPI 11th European PLACE Conference, Athens 2007

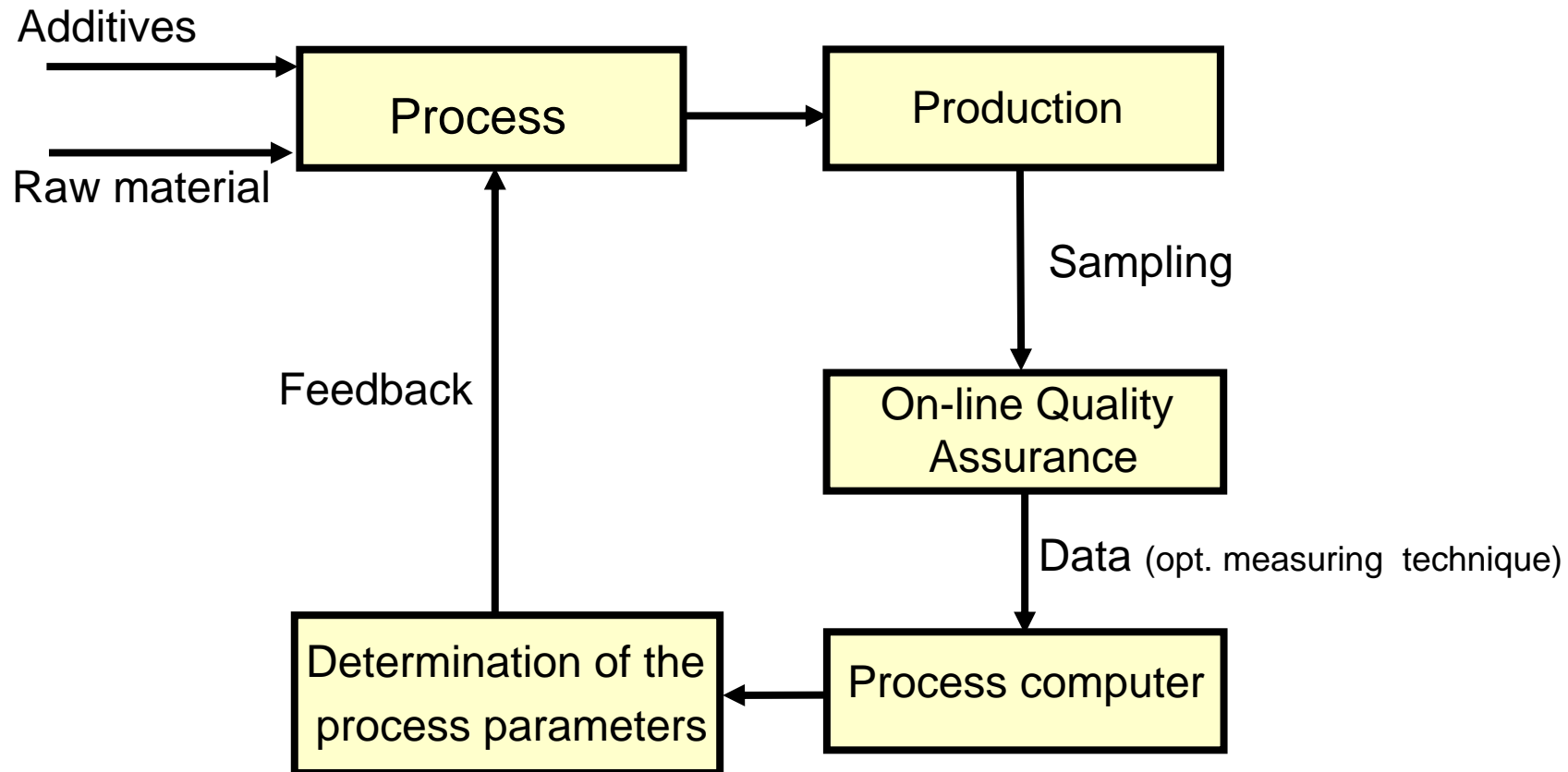


Online Quality Control of Polymers and Extruded Films

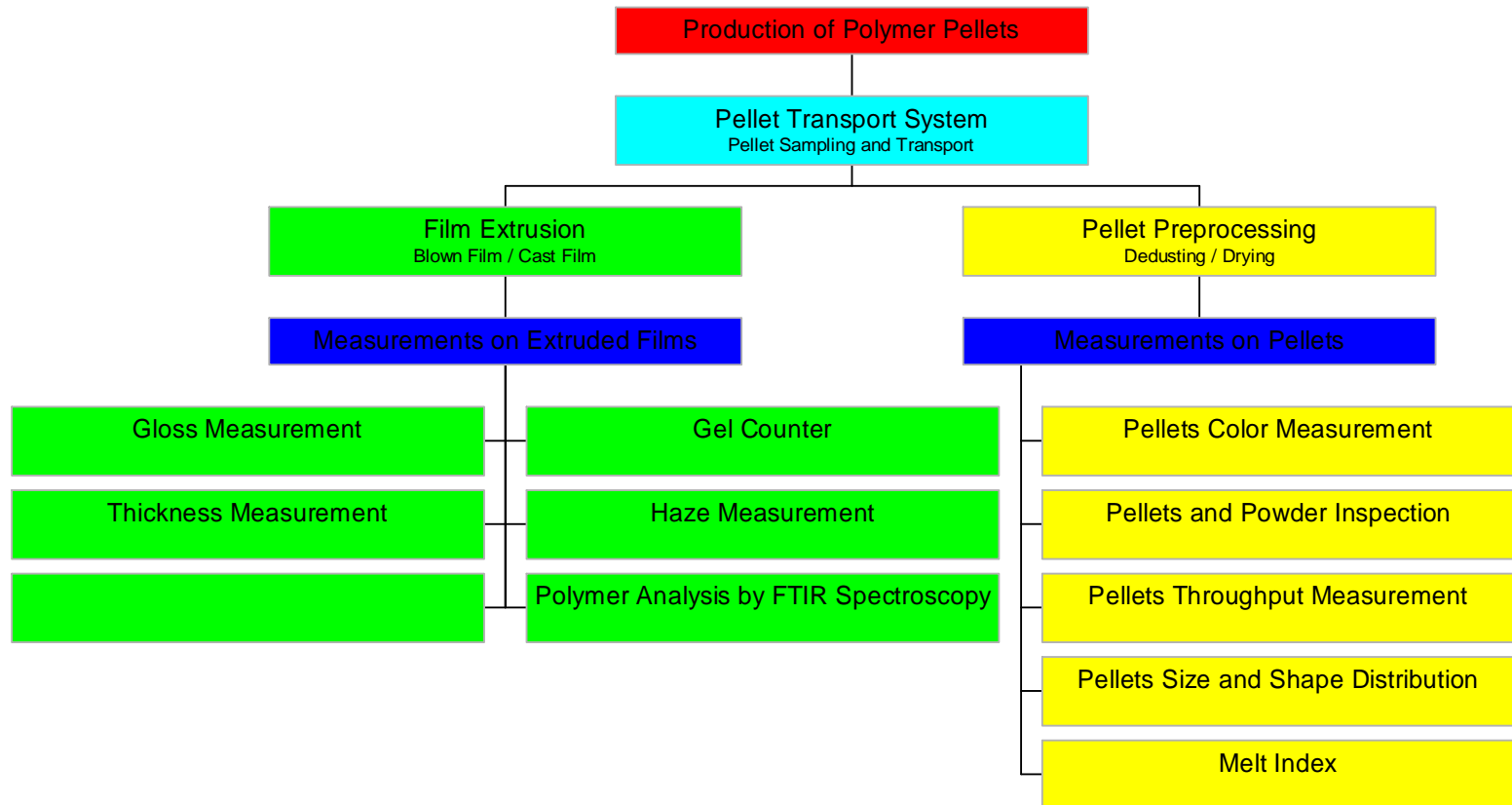
Contents

- Introduction
- Online Quality Control in Polymer Plants
Technology, Benefits, Online Lab, Close Loop Concept
- Web Inspection in Film Extrusion
Technology, Benefits, Integration
- Interrelationships and Correlation
- Practical Examples
- Summary

Online „Closed Loop Control“-Concept



Principal of Online Quality Control



Benefits of Online Control

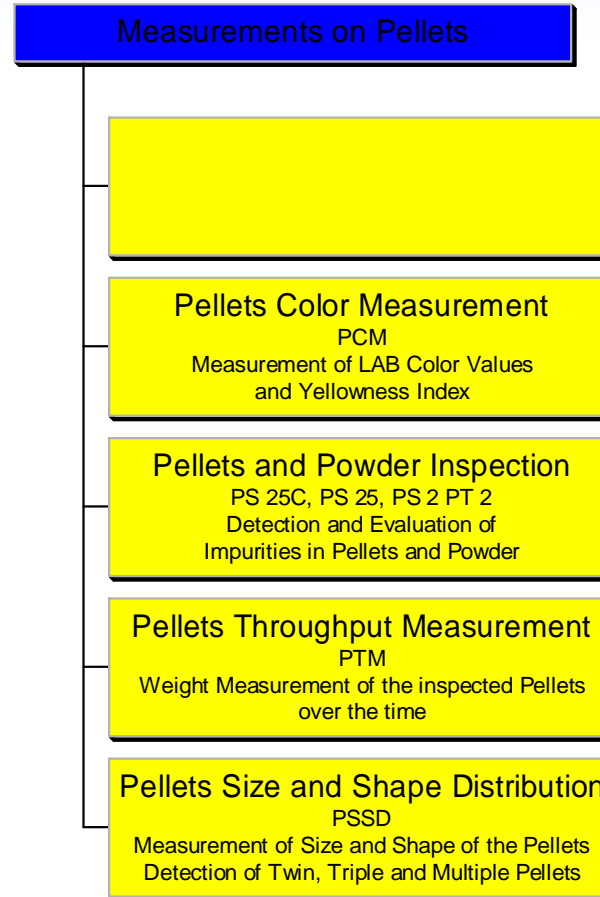
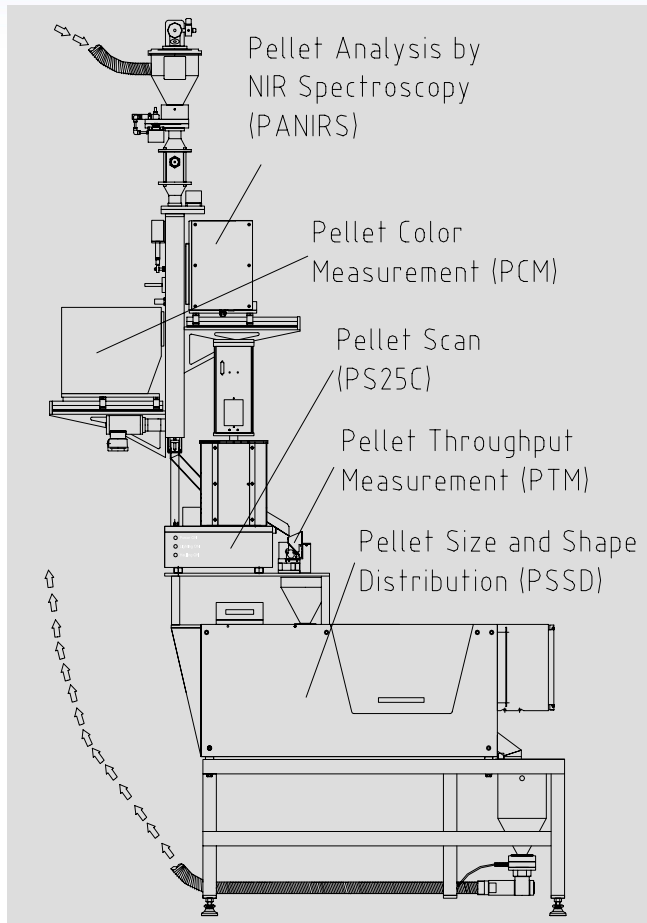
➤ **Process Control**

(Optimisation, capacity, cleaning, waste)

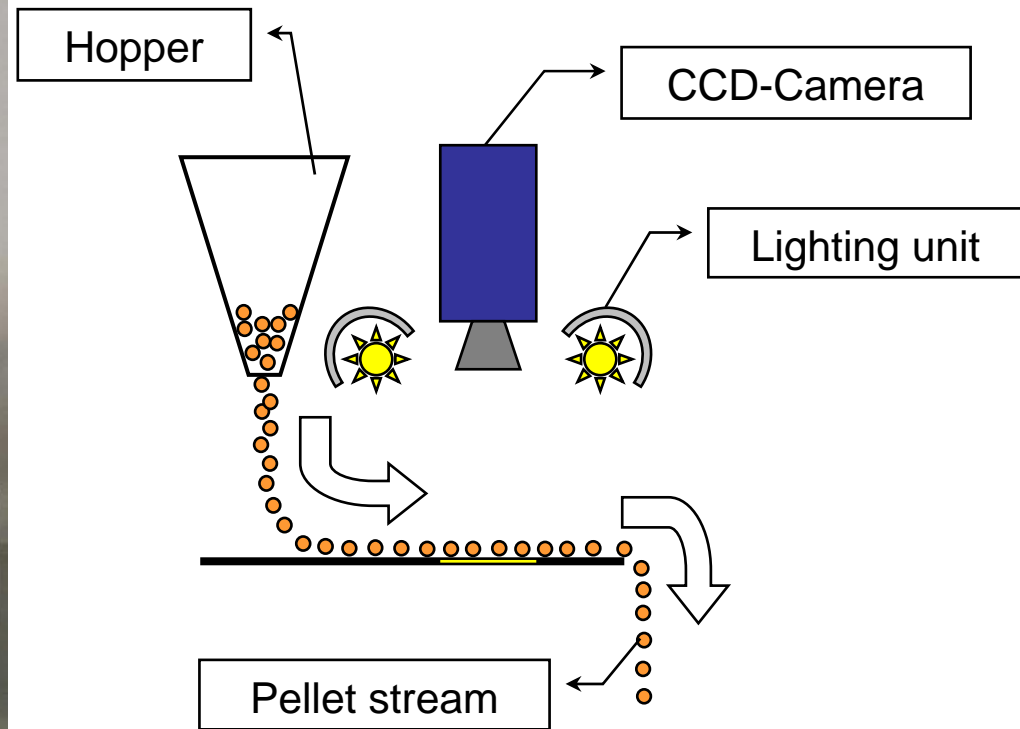
➤ **Product**

(better quality, customer satisfaction/relation, less claims, more competitive products)

Online Measurement of Pellets



Pellet Scan System



Pellet Scan System

PSC for Windows Copyright © OCS GmbH <PS-25C Measurements [OCS.CFG / DEVICE.TXT]

Operator	OCS GmbH
Company	ATOFINA / FKV
Material	PMMA
Sample	V046 R.102
	ZNH 174/B II.7 25/8/01
Weight	500 g
Filename	FSC00004
Directory	F:\delchato_ikv\
Start	12:53:05 05.02.02
Duration	0:09:56

Defect Counters		Defect Shapes		
Total	Interval [00:00:30]	Black	Other	
Sizeclass/ μm	Detect			
>=	41			
<	100	73	60	13
<	150	30	25	5
<	200	7	6	1
<	250	2	1	1
<	300	1	0	1
<	350	2	0	2
<	400	2	1	1
<	450	0	0	0
<	500	0	0	0
<	550	0	0	0
>>	0	0	0	0
Σ		117	93	24
Mean μm		99,17	89,76	135,63
StdDev μm		64,25	48,84	95,94
Area μm^2		1,29	0,77	0,52

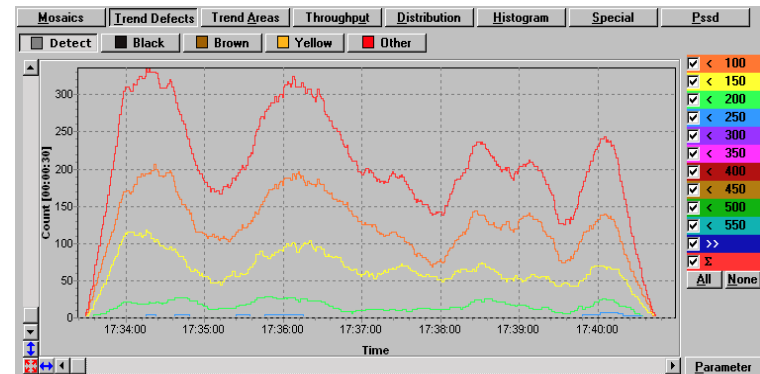
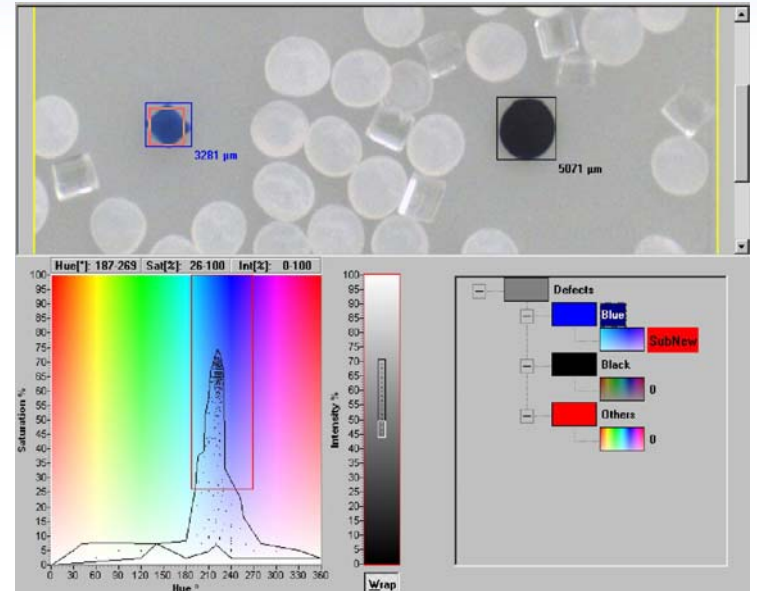
Mosaics | Trend Defects | Trend Areas | Distribution | Histogram | Special

Start [F1] | Stop [F2] | Pause [F3] | Load [F4] | Print [F5] | Settings [F6]

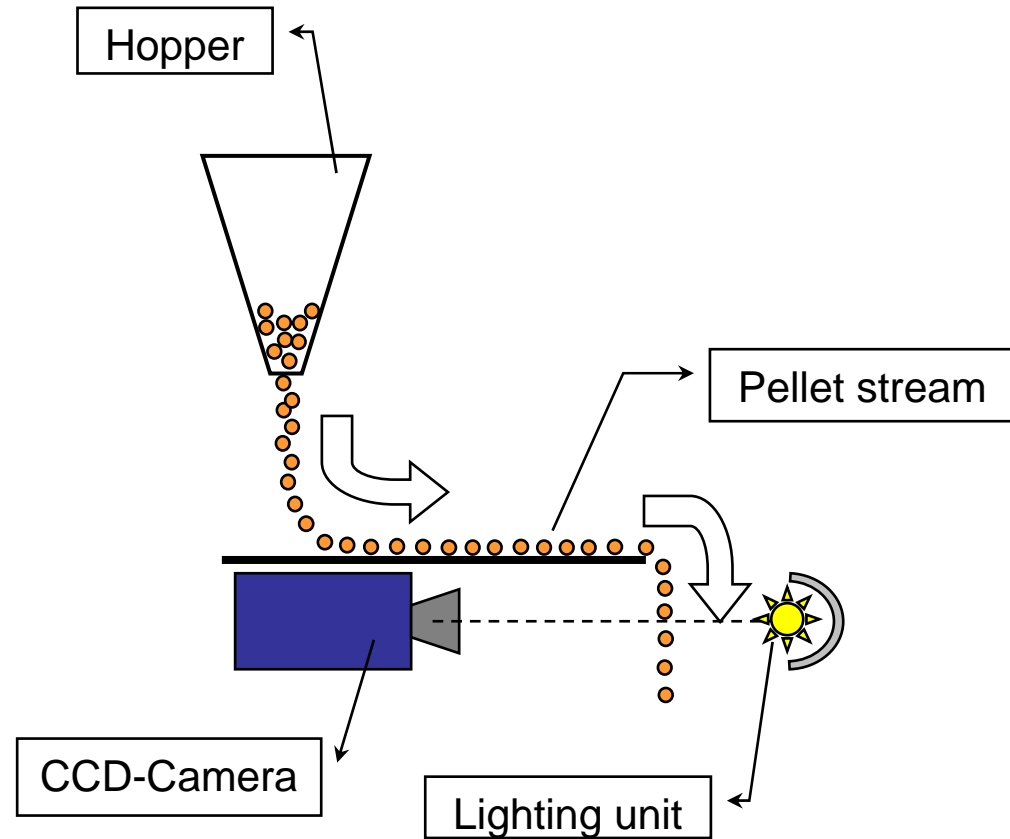
Full Screen | Preview | Transport | Cleaning

Info | Images: 117 | Filtered: 117 | +Restore All | -Remove All | Undo | Accept | Removed: 0

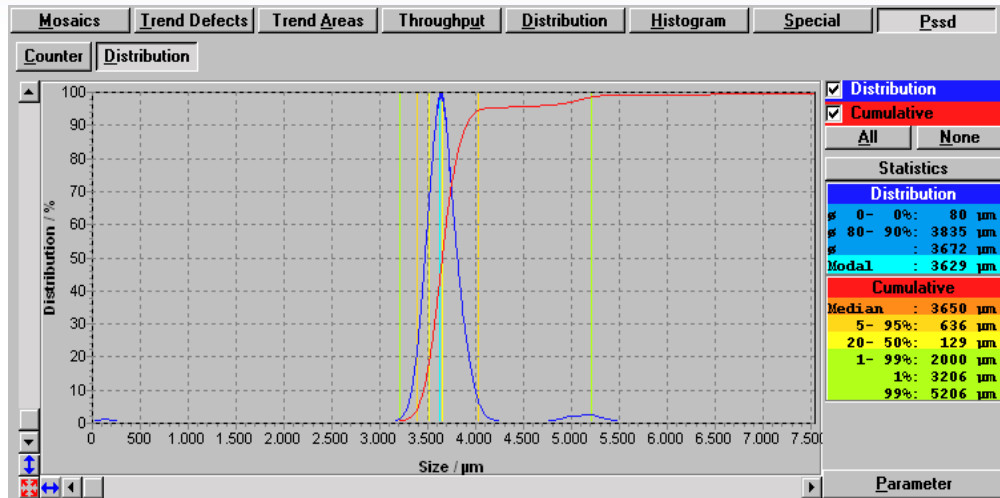
Fps: 25,0 | Com: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Disk: 1.749.688.128 Byte | Performance | Speed: 0,0 m/min | 0,0 kg/h | 61,0 % | Lamp: 67,0 %



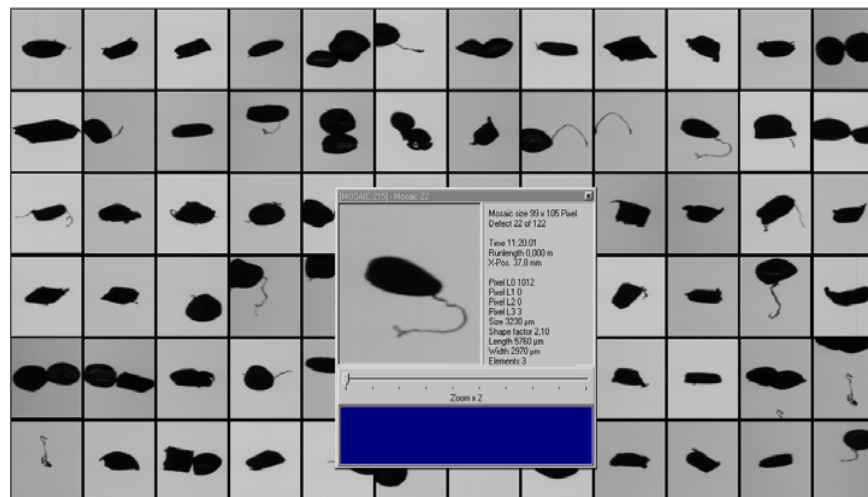
Pellet Size & Shape Distribution



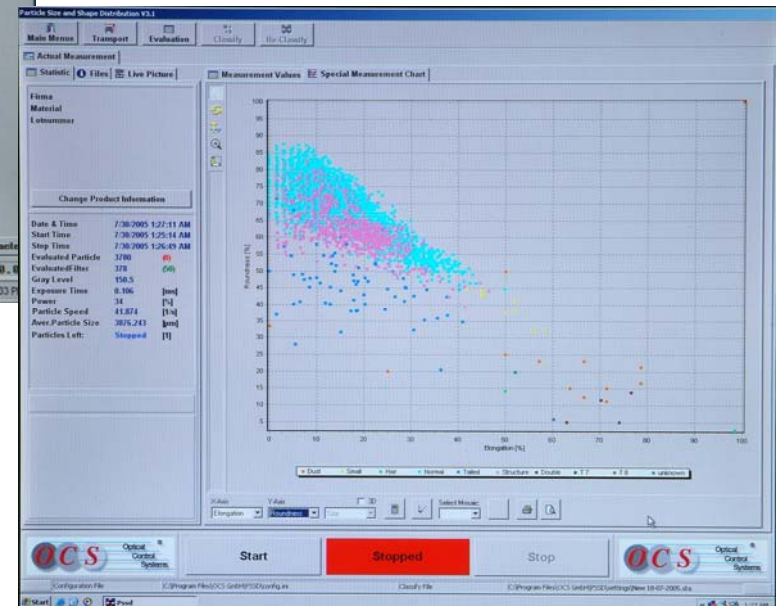
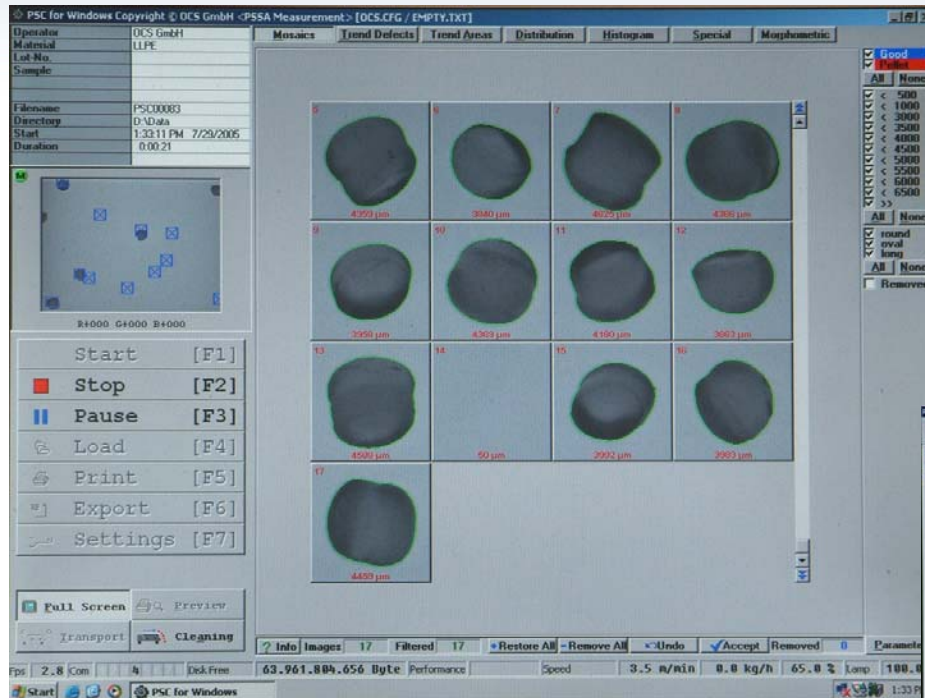
Pellet Size & Shape Distribution



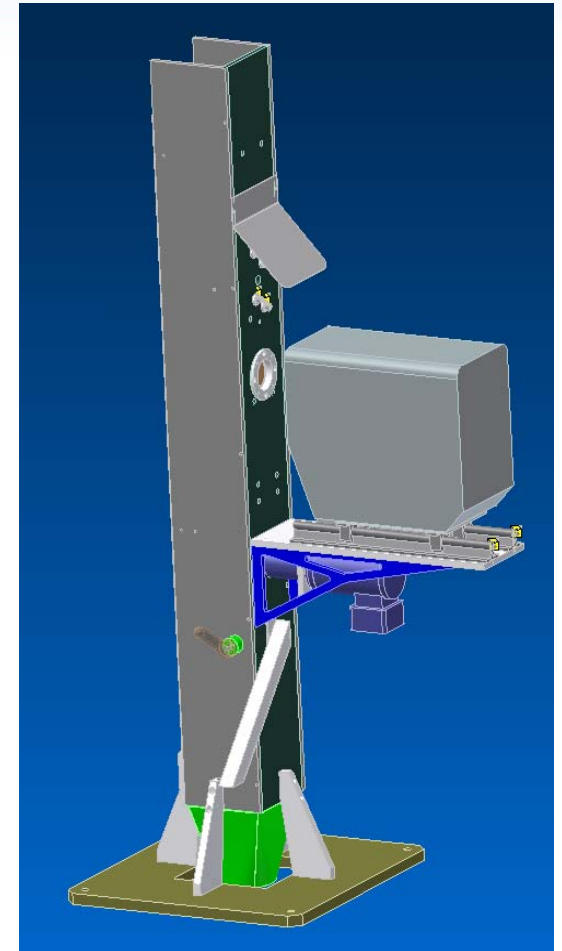
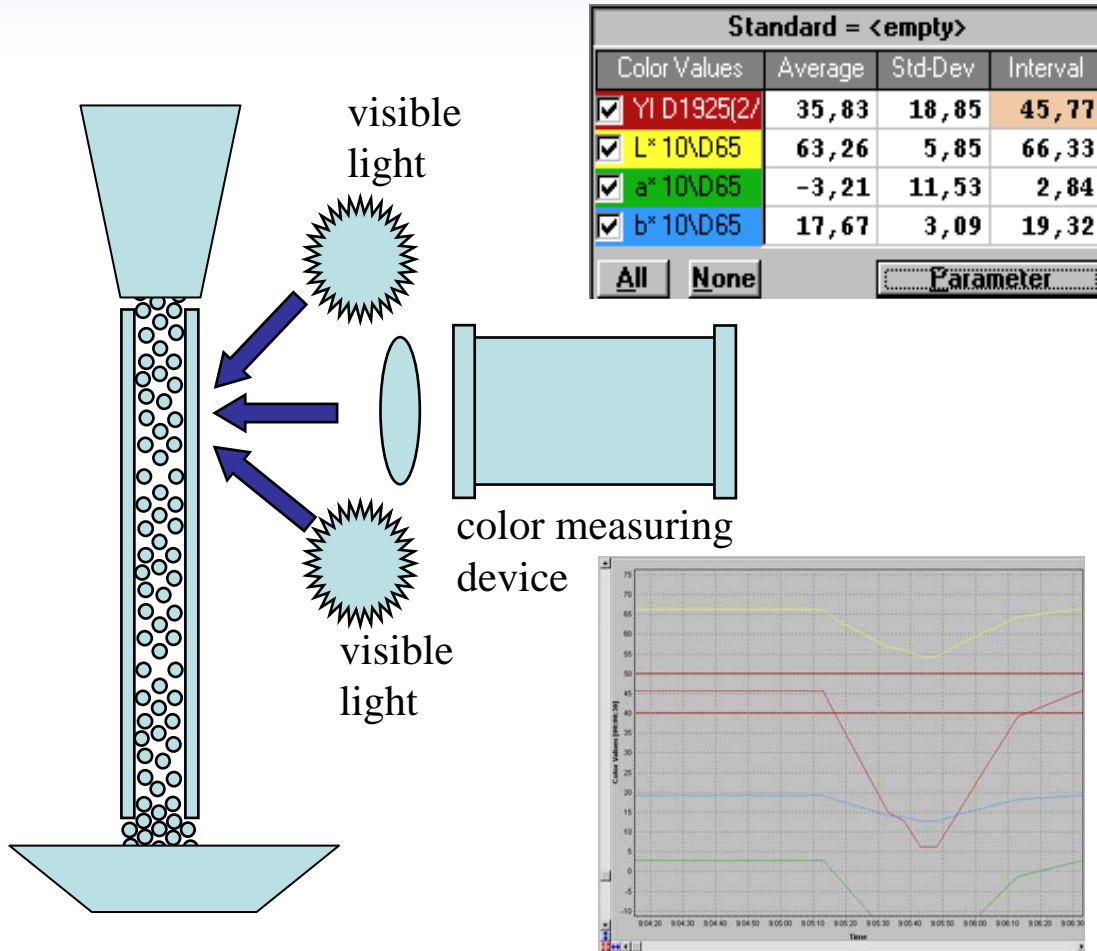
Sizecl. / μm	Percent				
	Total	SF-1,8	SF-3,5	SF-5,0	SF>5,0
- 500	463	337	108	14	4
- 1000	12	1	5	2	4
- 2000	1	0	0	0	1
- 3000	37	35	1	0	1
- 4000	62499	62469	29	1	0
- 5000	1878	1727	149	1	1
- 6000	1423	655	758	9	1
- 7000	54	1	51	2	0
- 8000	3	0	2	1	0
> 8000	1	0	1	0	0
Σ	66371	65225	1104	30	12
Mean / μm	3671,90				
StdDev / μm	432,45				
Weight/kg	-----				



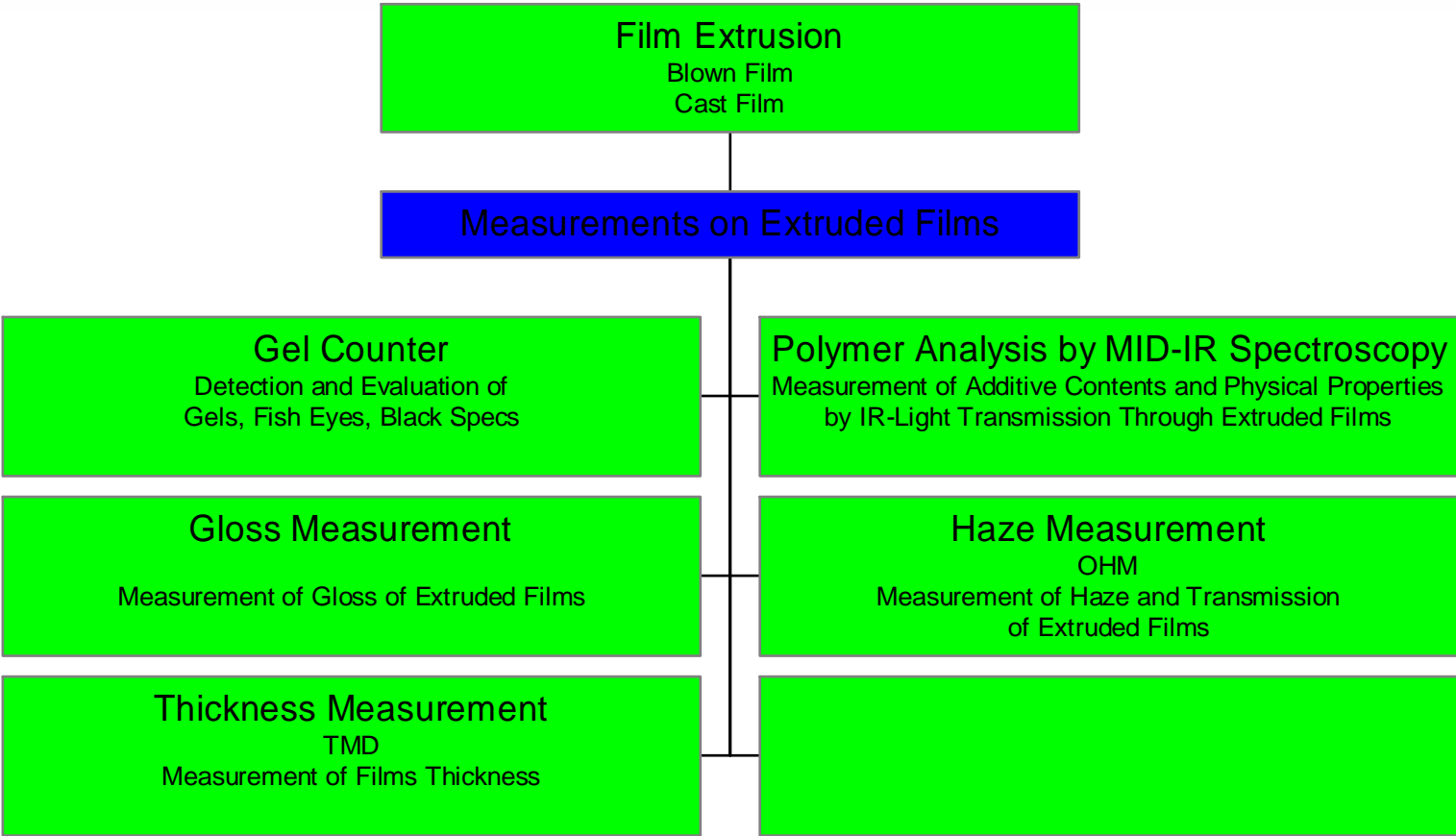
Pellet Size & Shape Distribution



Pellet Colour Measurement



Online Measurement on Extruded Films



Online Quality Control



Online Integrated Measurement Solution



Online Integrated Measurement Solution



Online Gel Count

Film Surface Analyzer 100 Measurement Window

Main Menu Evaluation

Current

Statistic Measurement File

Date & Time: 16:26:52 23.02.2007

Parcel Width: 153,600 [mm]

Parcel Length: 102,400 [mm]

Parcel Area: 0,016 [m²]

Inspected Parcels: 0,0 (50)

Inspected Length: 0,000 [m]

Inspected Area: 0,000 [m²]

Average Def. Size: 0 [μm]

Average Def. Area: 0 [μm²]

Def. Area / Ev. Area: 0,000 [ppm]

Mean Gray level: 0,0

Film Speed: 5,0 [m/min]

Noise: 0,391 %

Film Thickness: 50 [μm]

Material Information

Material

Lot number

Operator

Measurement Data Camera Picture Defect Pictures Time History Lane Distribution Size Distribution Histogram

Start Measurement Stopped Stop Measurement

COM: Configuration File: CONFIG.INI Extern Configuration File Defect Configuration File: Defect.typ

Material	Lot number	Operator

Online Gel Count

Film Surface Analyzer 100 Measurement Window

Main Menu Evaluation Table Piclist

Current

Statistic Measurement File Alarms

Date & Time: 3:06:13 PM 2/28/2006

Parcel Width: 140.800 [mm]

Parcel Length: 12.800 [mm]

Parcel Area: 1802.240 [mm²]

Inspected Parcels: 1702/0 (12)

Inspected Length: 21.786 [m]

Inspected Area: 3.067 [m²]

Average Def. Size: 78.4 [µm]

Average Def. Area: 6935.7 [µm²]

Def. Area / Ev. Area: 11.880 [ppm]

Mean Gray level: 170.5

Film Speed: 2.1 [m/min]

Noise: 5.311 %

Film Thickness: 50 [µm]

Material Information

2005-001

Measurement Data Camera Picture Defect Pictures Time History Lane Distribution Size Distribution Histogram Noise Clarity

Nr: 2530 56 [µm]	Nr: 2531 56 [µm]	Nr: 2532 79 [µm]	Nr: 2533 56 [µm]	Nr: 2534 56 [µm]	Nr: 2535 56 [µm]	Nr: 2536 97 [µm]	Nr: 2537 112 [µm]	Nr: 2538 97 [µm]	Nr: 2539 56 [µm]	Nr: 2540 56 [µm]
Nr: 2541 79 [µm]	Nr: 2542 56 [µm]	Nr: 2543 56 [µm]	Nr: 2544 218 [µm]	Nr: 2545 79 [µm]	Nr: 2546 56 [µm]	Nr: 2547 56 [µm]	Nr: 2548 138 [µm]	Nr: 2549 138 [µm]	Nr: 2550 56 [µm]	Nr: 2551 56 [µm]
Nr: 2552 79 [µm]	Nr: 2553 56 [µm]	Nr: 2554 56 [µm]	Nr: 2555 56 [µm]	Nr: 2556 195 [µm]	Nr: 2557 56 [µm]	Nr: 2558 56 [µm]	Nr: 2559 78 [µm]	Nr: 2560 1104 [µm]	Nr: 2561 56 [µm]	Nr: 2562 56 [µm]
Nr: 2563 56 [µm]	Nr: 2564 56 [µm]	Nr: 2565 79 [µm]	Nr: 2566 56 [µm]	Nr: 2567 56 [µm]	Nr: 2568 56 [µm]	Nr: 2569 56 [µm]	Nr: 2570 56 [µm]	Nr: 2571 56 [µm]	Nr: 2572 97 [µm]	Nr: 2573 56 [µm]

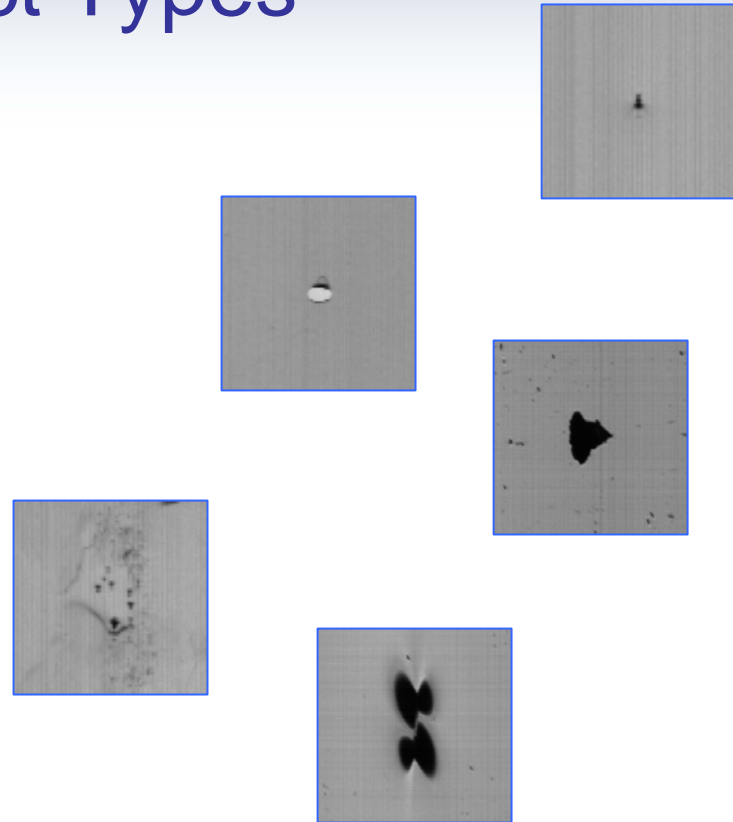
Pause Measurement Started Stop Measurement

Configuration File: config.ini Extern Configuration File Defect Configuration File: defect.ocs

Start Fsa100 FSA1 - Paint 3:06 PM

Defect Types

- Gels
- Black Specs
- Contaminations



Web Inspection in Film Extrusion

100 % Optical Control of the Web

- Photo of every defect
- Position of every defect
- Database Interface
- Reports
- Alarms

Benefits of Web Inspection

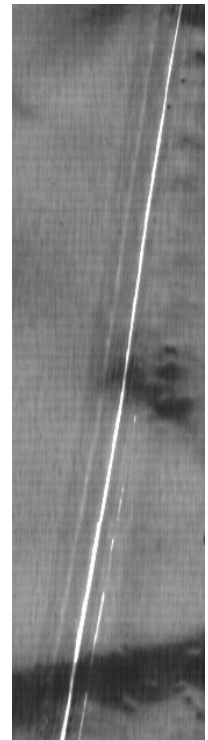
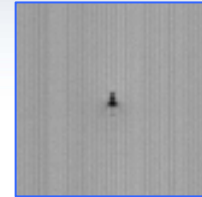
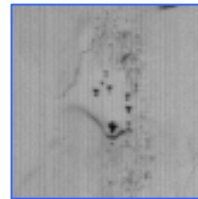
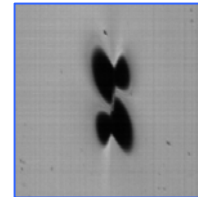
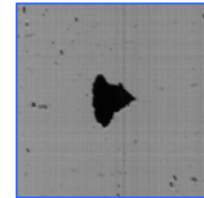
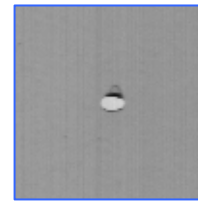
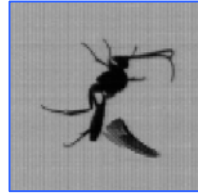
- **Process Control**
(Optimisation, capacity, cleaning, waste)
- **Raw Material**
(Optimisation material + recipe, control material)
- **Product**
(better quality, customer satisfaction/relation, less claims, more competitive products)

Origin of Defects in Extrusion

- Extrusion Line
(screw geometry / dead zones)
- Resin
(contamination, recipe)
- Production Process
(extruder temperatures, screen change)

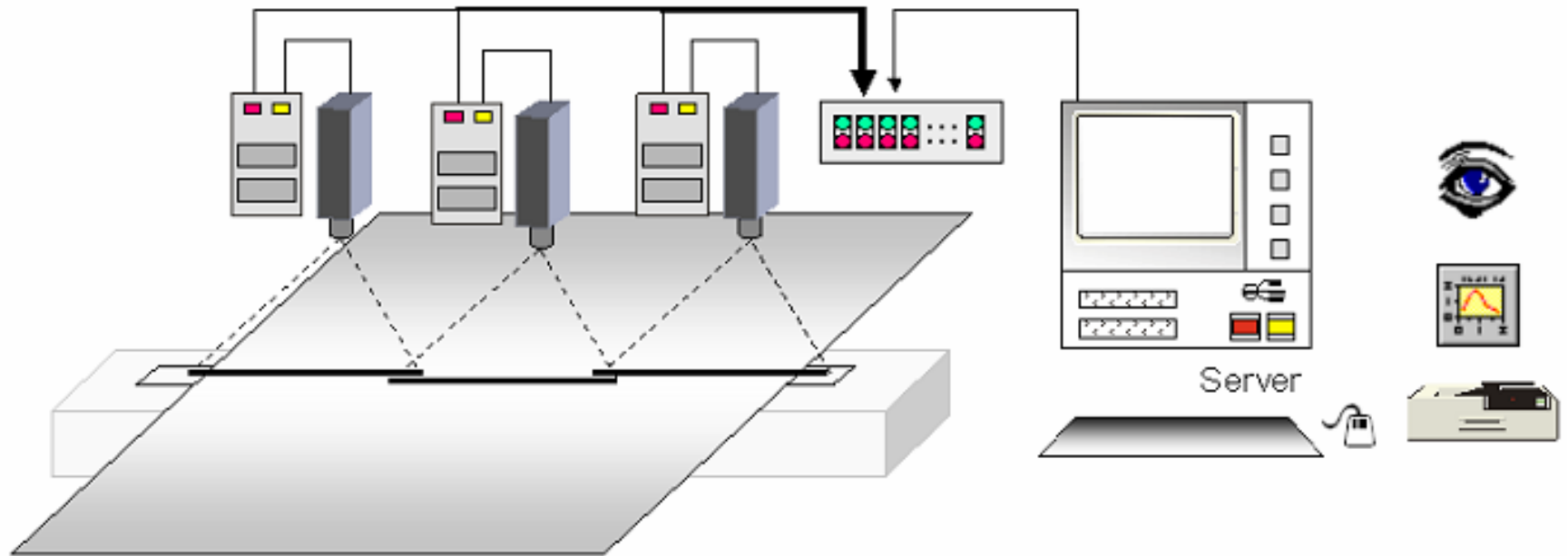
Defect Types in Film Extrusion

- Gels
- Black Specs
- Contaminations
- Die Lines
- Insects
- Lamination Defects
- Oil Stains
- Fish Eyes
- etc.



Web Inspection System

Embedded Multiple Camera Solution



Embedded Solution Technology

- High Speed CCD Line Scan Cameras
80 – 160 MHz, 512 – 8192 Pixel
- Embedded PC with High Speed Framegrabber
- Windows XP Server (network)
- Exact information on defects within the web
(mosaics, position, alarms, protocols, storage)

Quality Reports / Alarming

- Single Defect
- Trend Defects (20 gels per m²)
- Slit Defects
- Repeating Defect
- Gel Shower / Cluster
- Roll Defects

Rolling Map / Die Defect

FSP600 Breitbahn Inspektions System (c) S5 Inspektionssystem - Konfiguration : 1_Test.ini / 1_Test.sta

Datei Einstellungen Ansicht Service Fenster Hilfe

F1 - Messung start
 F2 - Messung stop
 F3 - Materialdaten
 F4 - Konfiguration
 F5 - Folienbreite
 F6 - Mosaik

Tabelle	Defekt Map	Mosaik	Zeitverlauf	Loneverteilung	Flauschen	Loneverteilung aktuell	Log
1053µm Dünnstelle (88,31)	569µm Dünnstelle (89,41)	620µm Dünnstelle (89,75)	834µm Stippe mit Hof (89)	620µm Dünnstelle (89,91)	527µm Anbrenner (55,35)	1688µm unbekannt	1033µm Dünnstelle (93,01)
1218µm Dünnstelle (88,11)	2549µm Dünnstelle (89,31)						

43.3 m Rolle 1 0.05 m 0.12 m 0.18 m 0.24 m

46.8 m

50.3 m

53.7 m

57.2 m

60.6 m

64.1 m

67.5 m

2.0 m Rolle 2

- 500 µm Anbrenner
 > 500 µm Anbrenner
 - 500 µm Stippe
 > 500 µm Stippe
 - 500 µm St. mit Hof
 > 500 µm St. mit Hof
 Dünnstelle
 Restfehler

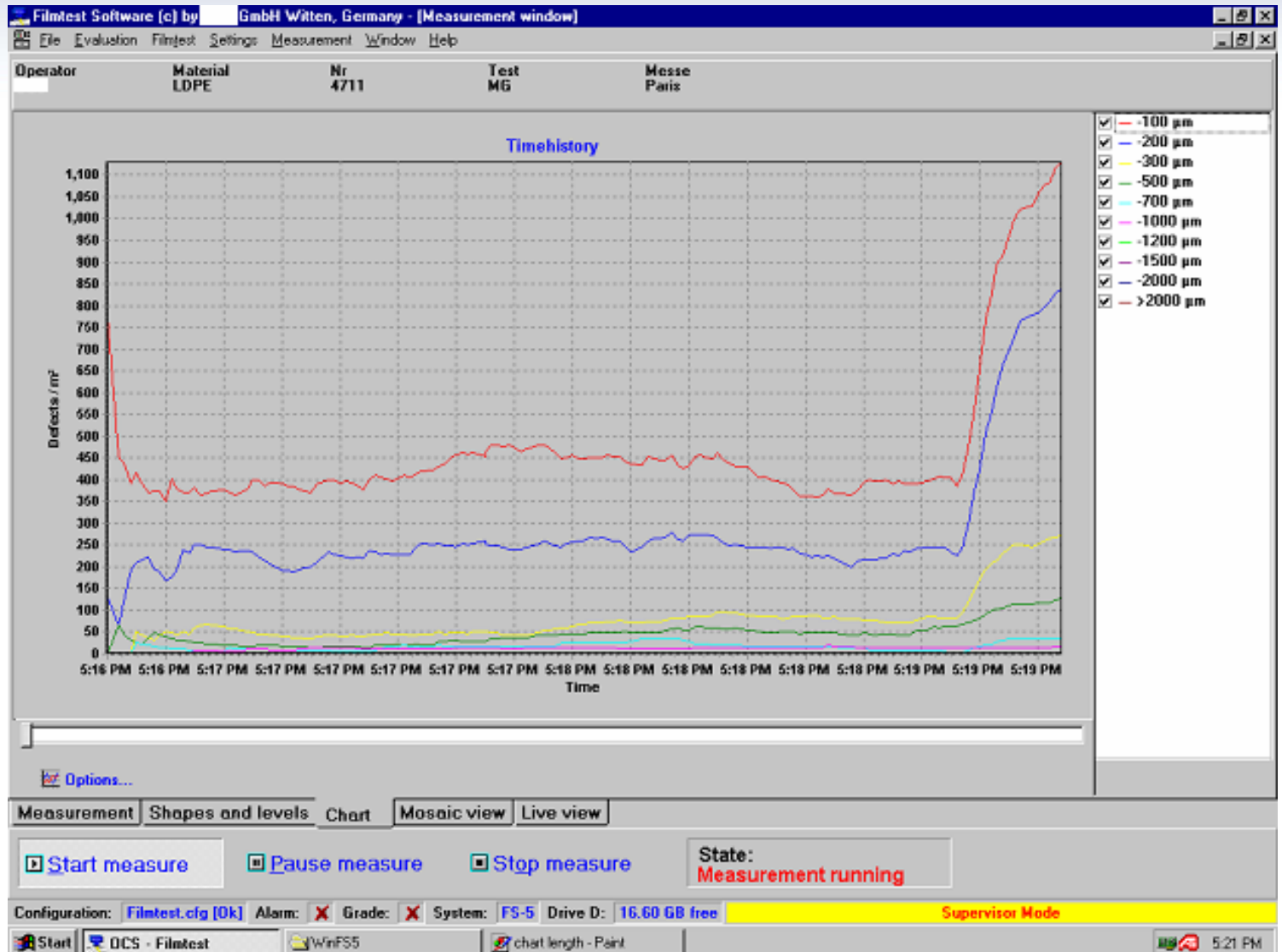
Grid

Aktive Alarme -> 0

left side **Filmbreite 0,300m** right side

Stations : 1 Configuration OK!!! Gap 0 (1 -> 1) Disk space : 622 MByte (D:\DATA) Printerjobs : 0

Time History (Gel Level)



Mosaic View

Grey value | Histogram | Classify

Grauwerte machine/cross direction

Machine direction

Cross direction

Grey value under cursor 122

Show pixel

Abbrechen 3D! Print

Learn

Grey value under cursor 122

Show pixel

Abbrechen 3D! Print

Defect type	unknown
Time	02.03.04 15:23:08
Runlength	89,2100 m
Camera : Number	0 : 235
Size	1025 µm
Mean x position	6,5 mm
Shape factor	10,3
Mean shape factor	2,8
Total elements	4
Elements bright	2
Mean transparency	56,0 %
Min transparency	38,0 %
Gradient	1,4E2 %
Mean pos. deviation	104
Max pos. deviation	104
Max deviation pixel-pixel	104
Pixel 1. neg	59
Pixel 2. neg	0
Pixel 1. pos	70
Pixel 2. pos	51
Defect length	960 µm
Defect width	1200 µm
First x position	6,5 mm
Last x position	6,5 mm

Alarm mark: Voll

Limits (0 = off)
 Min: 0, Max: 0
 Size: 0,0, Shape: 0,0

Contains pixel threshold: 1 2 3 4

Accept

Shape 2,1 X:97mm 15:22:58 -> 87,748n	Shape 1,3 X:4mm 15:22:59 -> 87,736n	Shape 6,4 X:10mm 15:22:59 -> 87,736n	Shape 24,0 X:19mm 15:22:59 -> 87,736n	Shape 1,4 X:13mm 15:22:59 -> 87,736n	Shape 1,3 X:13mm 15:22:59 -> 87,736n	Shape 1,3 X:97mm 15:23:05 -> 88,842n	Shape 10,3 X:6mm 15:23:08 -> 89,210n
156µm -> No 0:236 Stippe (80,5%)	238µm -> No 0:237 Delle (79,3%)	802µm -> No 0:238 unknown (0,0%)	556µm -> No 0:239 unknown (0,0%)	1068µm -> No 0:240 unknown (0,0%)	127µm -> No 0:241 Stippe (83,5%)	180µm -> No 0:242 Delle (85,0%)	201µm -> No 0:243 Delle (77,2%)
Shape 1,7 X:6mm 15:23:08 -> 89,210n	Shape 3,7 X:6mm 15:23:08 -> 89,210n	Shape 7,3 X:6mm 15:23:08 -> 89,395n	Shape 7,8 X:6mm 15:23:08 -> 89,395n	Shape 12,6 X:6mm 15:23:08 -> 89,395n	Shape 1,4 X:19mm 15:23:09 -> 89,395n	Shape 2,0 X:97mm 15:23:14 -> 90,316n	Shape 3,2 X:97mm 15:23:14 -> 90,316n
221µm -> No 0:244 unknown (0,0%)	90µm -> No 0:245 Stippe (88,4%)	238µm -> No 0:246 unknown (0,0%)	325µm -> No 0:247 unknown (0,0%)	238µm -> No 0:248 Delle (86,0%)	349µm -> No 0:249 unknown (0,0%)	127µm -> No 0:250 Stippe (88,4%)	255µm -> No 0:251 unknown (0,0%)
Shape 3,4 X:6mm 15:23:16 -> 90,695n	Shape 1,3 X:40mm 15:23:17 -> 90,869n	Shape 2,5 X:6mm 15:23:20 -> 91,238n	Shape 3,2 X:6mm 15:23:23 -> 91,791n	Shape 1,5 X:11mm 15:23:25 -> 91,975n	Shape 1,4 X:6mm 15:23:27 -> 92,344n	Shape 1,4 X:97mm 15:23:30 -> 92,897n	Shape 2,4 X:6mm 15:23:30 -> 93,085n

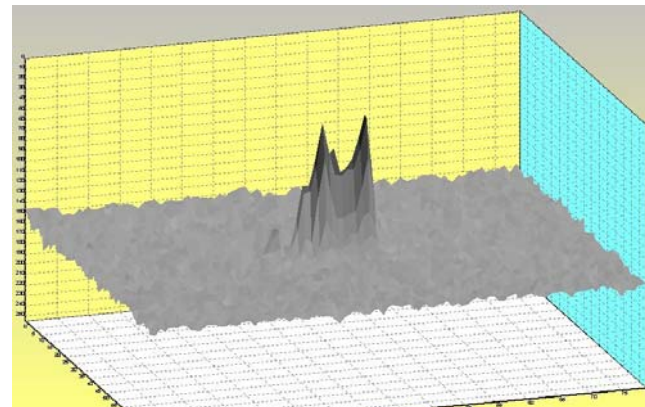
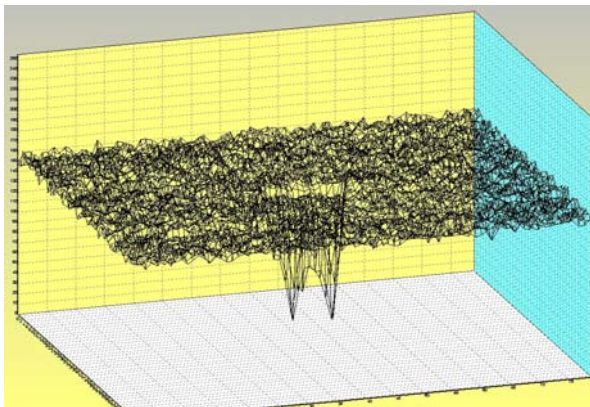
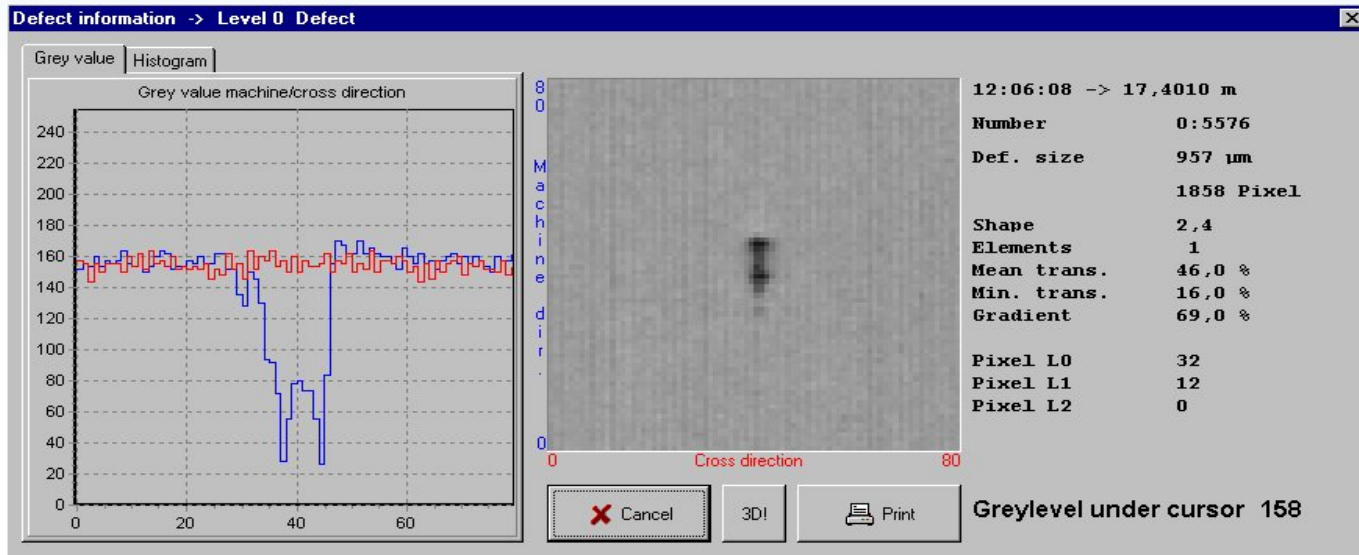
Start

Präsentationen

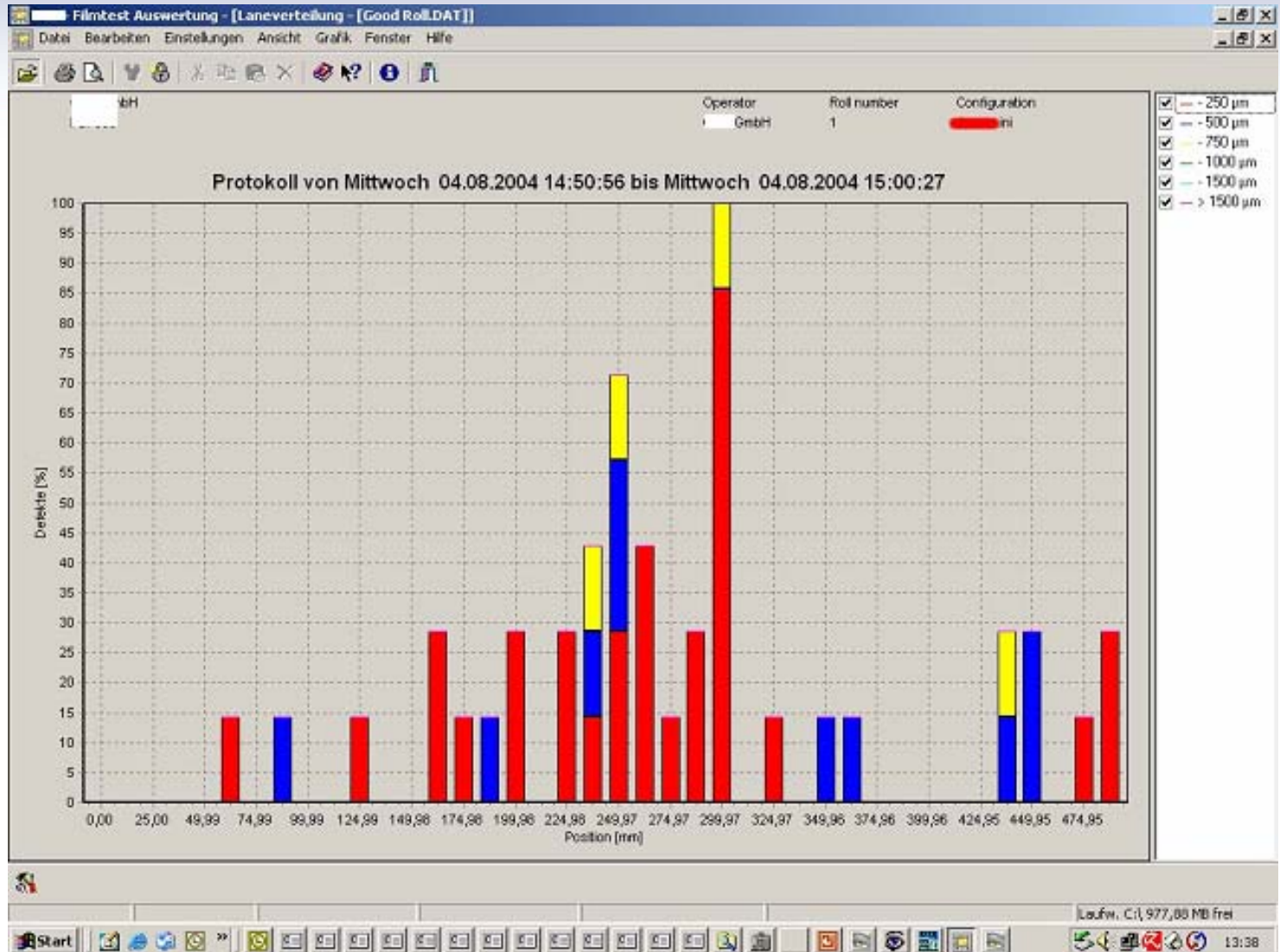
MapView

18:27

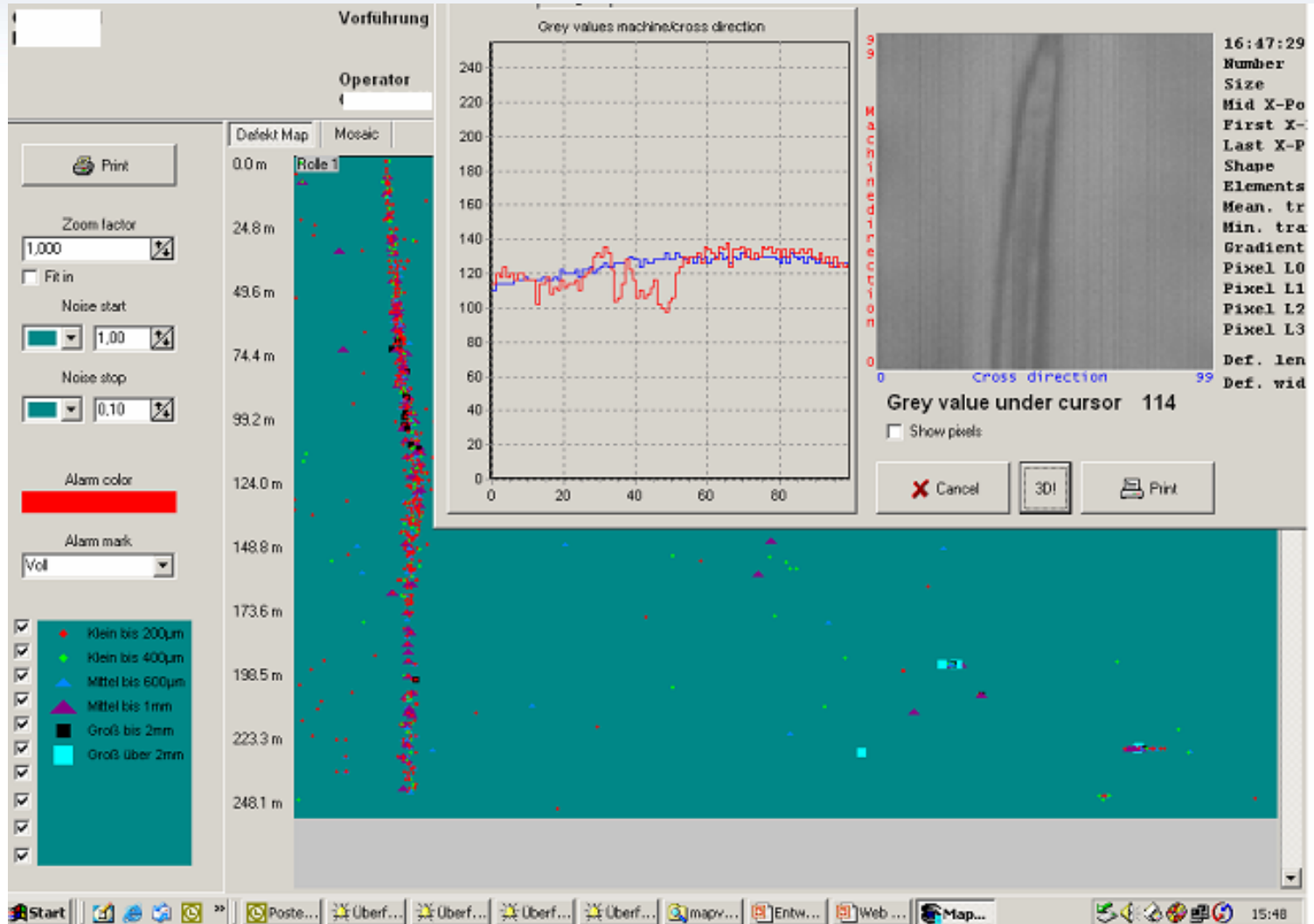
3-D Defect Analysis



Lane Distribution



Die Defect



Calander Defect

Print

Zoom factor
1,000

Fit in

Noise start
1,00

Noise stop
0,10

Alarm color

Alarm mark
Voll

- Kleine Stippen
- Mittelgroße Stippen
- Große Stippen
- Glättwerkfehler
- Mikrofalten
- Kleine Farbpartikel
- Große Farbpartikel

Grey values | Histogram

Grey values machine/cross direction

99
Machine direction
0
Cross direction 99

Grey value under cursor 142

Show pixels

X Cancel 3D! **Print**

00:43:24 -> 611,8890 m

Number 0:9788

Size 398 μm

Mid X-Pos 235,5 mm

First X-Pos 235,2 mm

Last X-Pos 235,8 mm

Shape 9,3(1,4)

Elements 7 (0)

Mean. trans. 74,0 %

Min. trans 73,1 %

Gradient ---

Pixel L0 12

Pixel L1 0

Pixel L2 0

Pixel L3 0

Def. length 1530 μm

Def. width 1020 μm

726.3 m

751.1 m

775.9 m

800.8 m

Start | Poste... | Überf... | Überf... | Überf... | Überf... | mapv... | Entw... | Web... | Map... | Unbe... | 15:51

Alarms / Repeaters

FSP600 Server (c) GmbH, Witten - [Inspektionssystem - Konfiguration: 1_blaui.nl / blaui.sta]

Datei Einstellungen Ansicht Service Fenster Hilfe

F1 - Messung start
 F2 - Messung stop
 F3 - Materialdaten
 F4 - Konfiguration
 F5 - Folienbreite
 F6 - Mosaik

Tabelle	Defekt Map	Mosaik	Zeitverlauf	Laneverteilung	Rauschen	Laneverteilung aktuell	Log
1015µm unknown	737µm unknown	1036µm unknown	610µm unknown	911µm unknown	863µm unknown	1184µm unknown	895µm unknown
927µm unknown	507µm unknown	1122µm unknown	756µm unknown	1354µm unknown			

0.0m Rolle 1 0.08m 0.17m 0.25m 0.34m

3.8m 7.7m 11.5m 15.4m

- Kleberpickel
- Stippe
- Scheibe
- ◆ Strich
- ◆ T 4
- ◆ T 5
- ◆ T 6
- ◆ T 7
- ◆ T 8
- ◆ unknown

Grid

left side **Filmbreite 0.419m** right side

Stations : 1 Configuration OK!! Gap 0 (0 -> 0) Disk space : 1.7 GByte (D:\DATA) Printerjobs : 0

Teach-In Function - Fly

Web - Inspection - System FSP600 © OCS GmbH, Witten - [Configuration: DEFAULT.INI / default.sta]

File Settings View Service Window Help

unknown

Grey value | Histogram | Classify | Reference

Greyvalue machine/cross direction

Teach

grey value under cursor 46

Show pixel

Cancel 3D! Print

defect name	on/off	taught	free	L-feature	L-feature	Pit
T 0 gel	on	7	43	present		nc
T 1 oil spot	on	7	43	present		nc
T 2 flies	on	5	45	present		nc
T 3 dust	on	8	42			nc
T 4 hair	on	3	47			nc
T 5 multi oil spot	on	4	46	present		nc
T 6 T 6	off	0	50			nc
T 7 T 7	off	0	50			nc
T 8 T 8	off	0	50			nc
U unknown	on					nc

files -> M 0 (2026 µm)
type: dark

files

mark defect pixel
 pattern valid

Copy mosaic
Move Mosaic
Delete Mosaic

correlation [%] [without limitation]

74,2 flies - 2
74,2 gel - 13
73,5 dust - 6
30,6 hair - 2
0 oil spot - 0
0 multi oil spot - 0

Defect map
Alarm
Special def.

teaching trend trend - feature pattern distribution gaussian curve @-value

Teaching trend

pattern no.	gel	oil spot	flies	dust	hair	multi oil spot
0	65	65	65	65	65	65
1	65	65	65	65	65	65
2	65	65	65	65	65	65
3	65	65	65	65	65	65
4	65	65	65	65	65	65
5	65	65	65	65	65	65
6	65	65	65	65	65	65
7	65	65	65	65	65	65
8	65	65	65	65	65	65
9	65	65	65	65	65	65
10	65	65	65	65	65	65
11	65	65	65	65	65	65
12	65	65	65	65	65	65
13	65	65	65	65	65	65

Def:0 Mos:0 (0MByte)

Start 7 Microsoft Outlook MapView OCS GmbH, Optical Cont... Wk_demo OCS FSP600 Lane Distribution.bmp - P... 14:20

Teach-In Function – Oil Stain

Web - Inspection - System FSP600 © OCS GmbH, Witten

File Settings View Service Window Help

Classification settings ... (FSP600) -> C:\Programme\OCS Gm...

Settings classification | Settings size calculation | User defined featur

80,00 Threshold correlation [%] Pixel 1. Le

defect name	on/off	taught	free	L-feature	L-feature	Pixel
T 0 gel	on	7	43	present		no l
T 1 oil spot	on	7	43	present		no l
T 2 flies	on	5	45	present		no l
T 3 dust	on	8	42			no l
T 4 hair	on	3	47			no l
T 5 multi oil spot	on	4	46	present		no l
T 6 T 6	off	0	50			no l
T 7 T 7	off	0	50			no l
T 8 T 8	off	0	50			no l
U unknown	on					no l

multi oil spot -> M 2 (5378 µm)
type: bright

multi oil spot

mark defect pixel
 pattern valid

Copy mosaic
Move Mosaic
Delete Mosaic

Grey value | Histogram | Classify | Reference

Greyvalue machine/cross direction

Teach

grey value under cursor 186

Show pixel

Cancel 3D! Print

Defect type	Level 0 Defect
Time	13.12.05 15:05:57
Runlength	16,0000 m
Camera : Number	0 : 252
Size	5378 µm
Mean x position	392,0 mm
Shape factor	7,2
Mean shape factor	2,5
Total elements	4
Elements bright	4
Mean transparency	---
Min transparency	---
Gradient	---
Mean pos. deviation	65
Max pos. deviation	77
Max deviation pixel-pixel	56
Pixel Level 1 neg.	0
Pixel Level 2 neg.	0
Pixel Level 1 pos.	331
Pixel Level 2 pos.	147
Defect width	11790 µm
Defect length	12314 µm
First x Pos.	2166,5 mm
Last x Pos.	2166,2 mm
Aspect (w/l)	0,957446808510638
Fill factor dark	---
Fill factor bright	0,156501182033097

correlation [%] [without limitation]

63 multi oil spot - 1
60,7 oil spot - 7
48,3 gel - 7
0 flies - 0
0 dust - 0
0 hair - 0

teaching trend | trend - feature | pattern distribution | gaussian curve σ -value

Teaching trend

correlation [%]

pattern no.

gel
oil spot
flies
dust
hair
multi oil spot

Defect map
Alarm
Special def.

Def:0 Mos:0 (0MByte)

Start 7 Microsoft Outlook MapView OCS GmbH, Optical Cont... Wk_demo OCS FSP600 Teach In Mode 4 hair.bm... 14:24

Teach-In Function - Gel

Web - Inspection - System FSP600 © OCS GmbH, Witten

File Settings View Service Window Help

F1 - Measurement start

Classification settings ... (FSP600) -> C:\Programme\OCS GmbH

Settings classification | Settings size calculation | User defined feature

80,00 Threshold correlation [%] Pixel 1. Lev

defect name	on/off	taught	free	L-feature	L-feature	Pixel
T 0 gel	on	7	43	present		no lir
T 1 oil spot	on	7	43	present		no lir
T 2 flies	on	5	45	present		no lir
T 3 dust	on	8	42			no lir
T 4 hair	on	3	47			no lir
T 5 multi oil spot	on	4	46	present		no lir
T 6 T 6	off	0	50			no lir
T 7 T 7	off	0	50			no lir
T 8 T 8	off	0	50			no lir
U unknown	on					no lir

gel -> M 7 (2383 µm)

type: bright

gel

mark defect pixel

pattern valid

Copy mosaic

Move Mosaic

Delete Mosaic

Grey value Histogram Classify Reference

Greyvalue machine/cross direction

Machine direction

Cross direction

grey value under cursor 160

Show pixel

Cancel 3DI Print

Defect type ...

Time 13.12.05 14:02:32

Runlength 4.5000 m

Camera : Number 0 : 7

Size 2383 µm

Mean x position 253,9 mm

Shape factor 1,5

Mean shape factor 1,5

Total elements 1

Elements bright 1

Mean transparency ...

Min transparency ...

Gradient ...

Mean pos. deviation 64

Max pos. deviation 94

Max deviation pixel-pixel 54

Pixel Level 1 neg. 0

Pixel Level 2 neg. 0

Pixel Level 1 pos. 65

Pixel Level 2 pos. 28

Defect width 2620 µm

Defect length 2620 µm

First x Pos. 1684,1 mm

Last x Pos. 1684,9 mm

Aspect (w/l) 1

Fill factor dark ...

Fill factor bright 0,65

correlation defect types | correlation feature

correlation [%] (without limitation)

- 71,1 oil spot - 6
- 70,3 gel - 10
- 54 multi oil spot - 2
- 0 flies - 0
- 0 dust - 0
- 0 hair - 0
- 0 multi oil spot - 0

New

Reset

Load

Save

Apply

Cancel

teaching trend trend - feature pattern distribution gaussian curve 0-value

Teaching trend

correlation [%]

pattern no.

gel

oil spot

flies

dust

hair

multi oil spot

Defect map

Alarm

Special def.

Def:0 Mos:0 (0MByte)

Start 7 Microsoft Outlook MapView OCS GmbH, Optical Cont... Wk_demo OCS FSP600 Teach In Mode 8 Oil Spot... 14:29

Teach-In Function – Black Spec

Web - Inspection - System FSP600 © OCS GmbH, Witten

File Settings View Service Window Help

F1 - Measurement start

Classification settings ... (FSP600) -> C:\Programme\OCS Gm...

Settings classification | Settings size calculation | User defined featur

80.00 Threshold correlation [%] Pixel 1. Le

defect name	on/off	taught	free	L-feature	L-feature	Pixel
T 0 gel	on	7	43	present		no l
T 1 oil spot	on	7	43	present		no l
T 2 flies	on	5	45	present		no l
T 3 dust	on	8	42			no l
T 4 hair	on	3	47			no l
T 5 multi oil spot	on	4	46	present		no l
T 6 T 6	off	0	50			no l
T 7 T 7	off	0	50			no l
T 8 T 8	off	0	50			no l
U unknown	on					no l

dust -> M 2 (4404 µm)

type: dark

dust

mark defect pixel
pattern valid
Copy mosaic
Move mosaic
Delete mosaic

correlation defect types correlation feature

correlation [%] (without limitation)

defect name	count
76.1 dust - 3	3
66.8 flies - 1	1
63.3 gel - 13	13
34.7 hair - 2	2
0 oil spot - 0	0
0 multi oil spot - 0	0

Teach

Grey value machine/cross direction

grey value under cursor: 138

Cancel 3D! Print

Defect type ...

Time 13.12.05 14:02:11

Runlength 1,0000 m

Camera : Number 0 : 152

Size 4404 µm

Mean x position 475.0 mm

Shape factor 2.0

Mean shape factor 2.0

Total elements 1

Elements bright 0

Mean transparency 25.9 %

Min transparency 7.0 %

Gradient 72.1 %

Mean pos. deviation ...

Max pos. deviation ...

Max deviation pixel-pixel ...

Pixel Level 1 neg. 222

Pixel Level 2 neg. 182

Pixel Level 1 pos. 0

Pixel Level 2 pos. 0

Defect width 6026 µm

Defect length 4716 µm

First x Pos. 186.3 mm

Last x Pos. 189.7 mm

Aspect (w/l) 1,277777777777778

Fill factor dark 0,536231884057971

Fill factor bright ...

Defect map

Alarm

Special def.

teaching trend trend - feature pattern distribution gaussian curve 0-value

Teaching trend

correlation [%]

pattern no.

pattern no.	gel	oil spot	flies	dust	hair	multi oil spot
0	60	60	60	60	60	60
1	60	60	60	60	60	60
2	60	60	60	60	60	60
3	60	60	60	60	60	60
4	60	60	60	60	60	60
5	60	60	60	60	60	60
6	60	60	60	60	60	60
7	60	60	60	60	60	60
8	60	60	60	60	60	60
9	60	60	60	60	60	60
10	60	60	60	60	60	60
11	60	60	60	60	60	60
12	60	60	60	60	60	60
13	60	60	60	60	60	60

Def:0 Mos:0 (0MByte)

Start 7 Microsoft Outlook MapView OCS GmbH, Optical Cont... Wk_demo OCS FSP600 Teach In Mode 9 Gel.bm...

Inspection Systems



Inspection Systems



Closed Frame

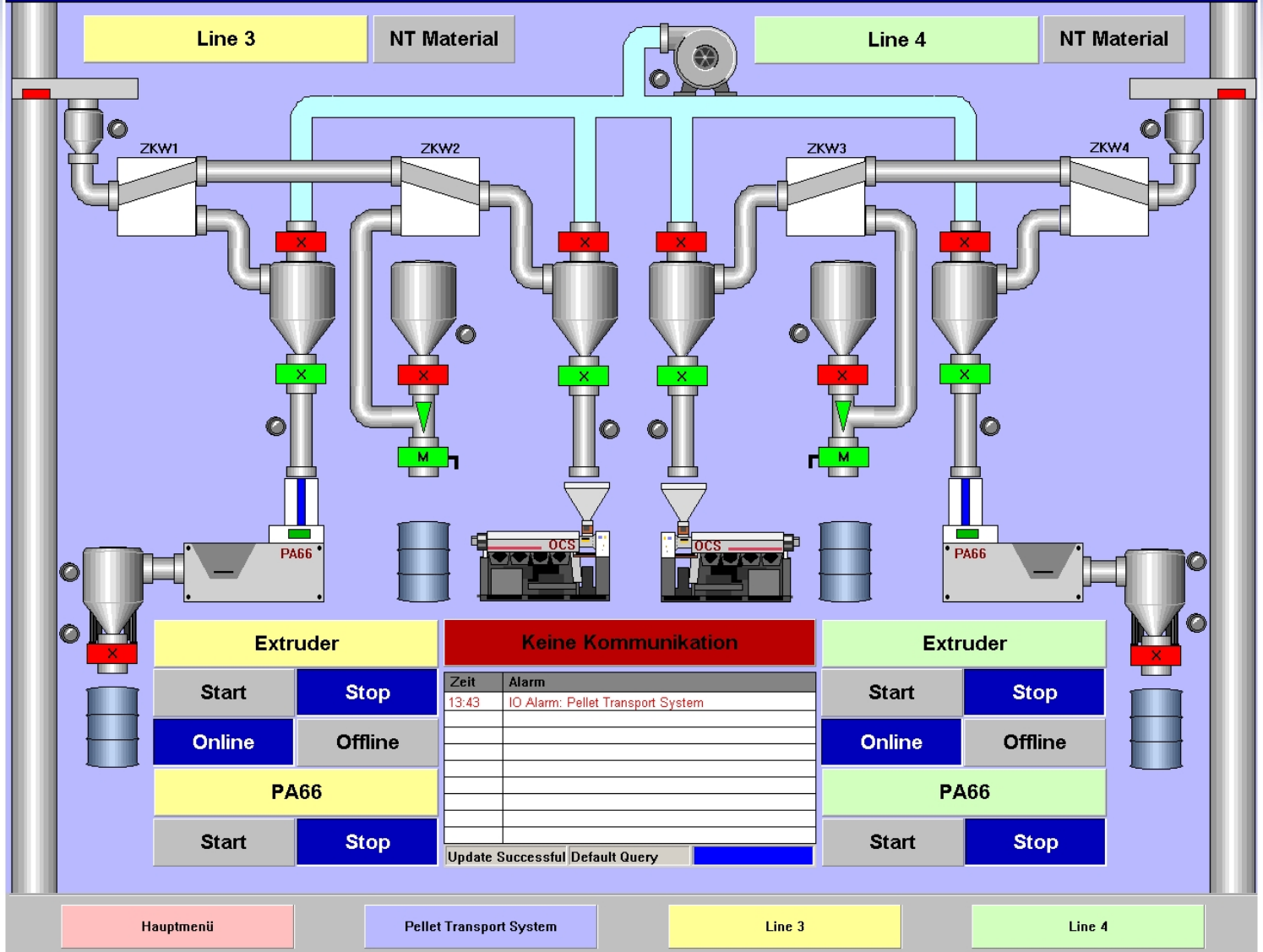


Interrelationship and Correlation Example

- Online Compound Control (Gel Analysis)
- Oracle Database Integration
- Decision for Film Extrusion Quality (Grading)
- 100 % Web Inspection in Cast Line
(Diaper Breathable Film)

Online Container for Plant Control (Example)





Abzug: 0.0 N | APLAIRS: IO Problem | FS5: IO Problem | Chill Roll: 0.0 m/min | Schmelze Druck: 0 Bar | Schmelze Temp.: 0 °C | Servoumrichter: 0.0 U/min, 0.0 Nm

Line 3

Extruder: Manuell | Chill Roll: Manuell

Zeit	Alarm
13:43	IO Alarm: Linie 3 SPS
13:43	IO Alarm: Linie 3 Chill Roll Umrichter 2
13:43	IO Alarm: Linie 3 Chill Roll Umrichter 1
13:43	IO Alarm: Linie 3 Servoumrichter
13:43	IO Alarm: Linie 3 Massedruck
13:43	IO Alarm: Linie 3 Massetemperatur
13:43	IO Alarm: Linie 3 Temperatur Zone 5
13:43	IO Alarm: Linie 3 Temperatur Zone 4
13:43	IO Alarm: Linie 3 Temperatur Zone 3
13:43	IO Alarm: Linie 3 Temperatur Zone 2

Update Successful

Thermostat

0 °C Wert
5 °C Sollwert
5 °C Delta

PA66 IO Problem

Zone 5	Zone 4	Zone 3	Zone 2	Zone 1
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C

10.0 °C
8.0 °C
6.0 °C
4.0 °C
2.0 °C
0.0 °C

Wert
Sollwert
Delta

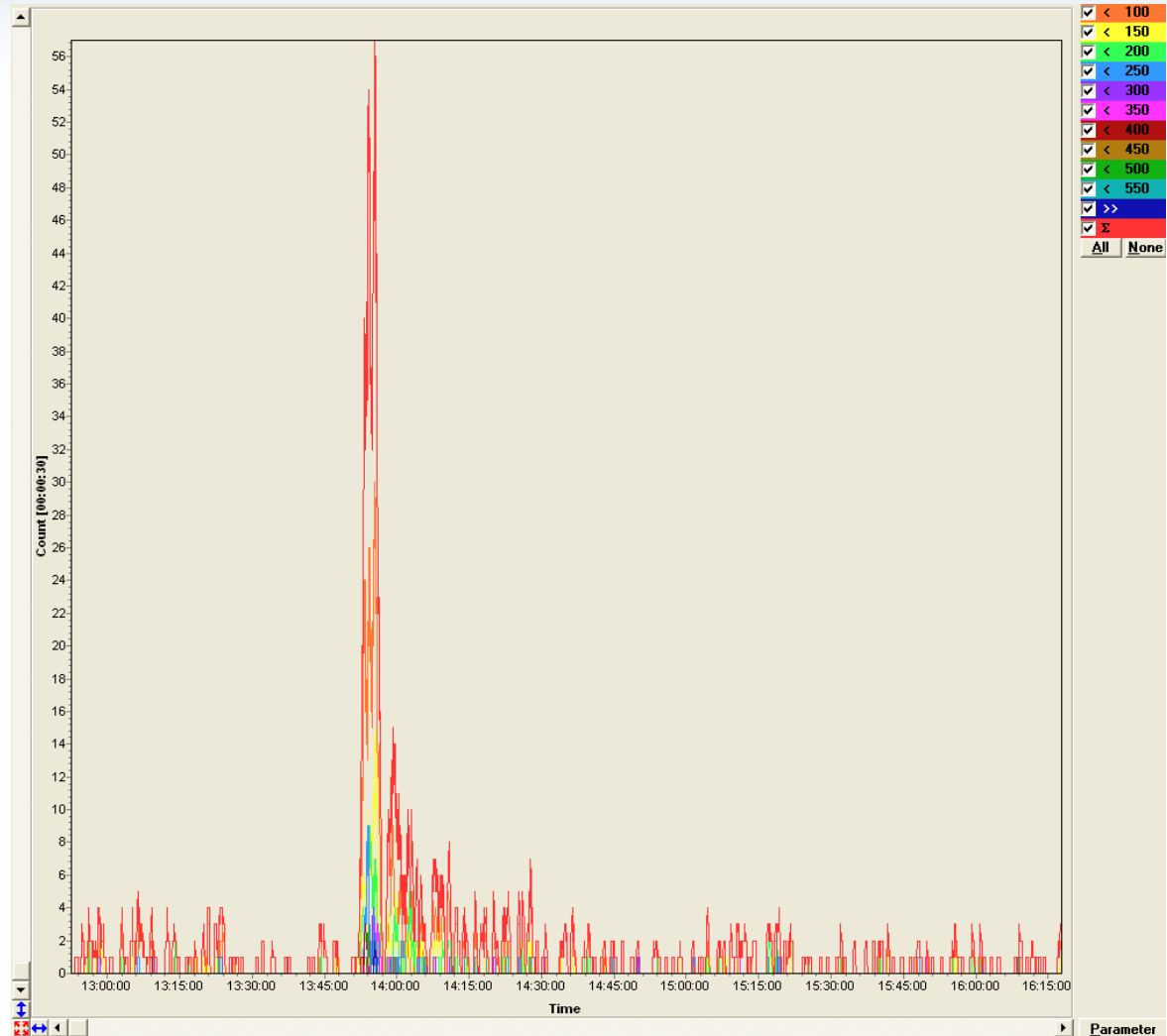
Hauptmenü

Pellet Transport System

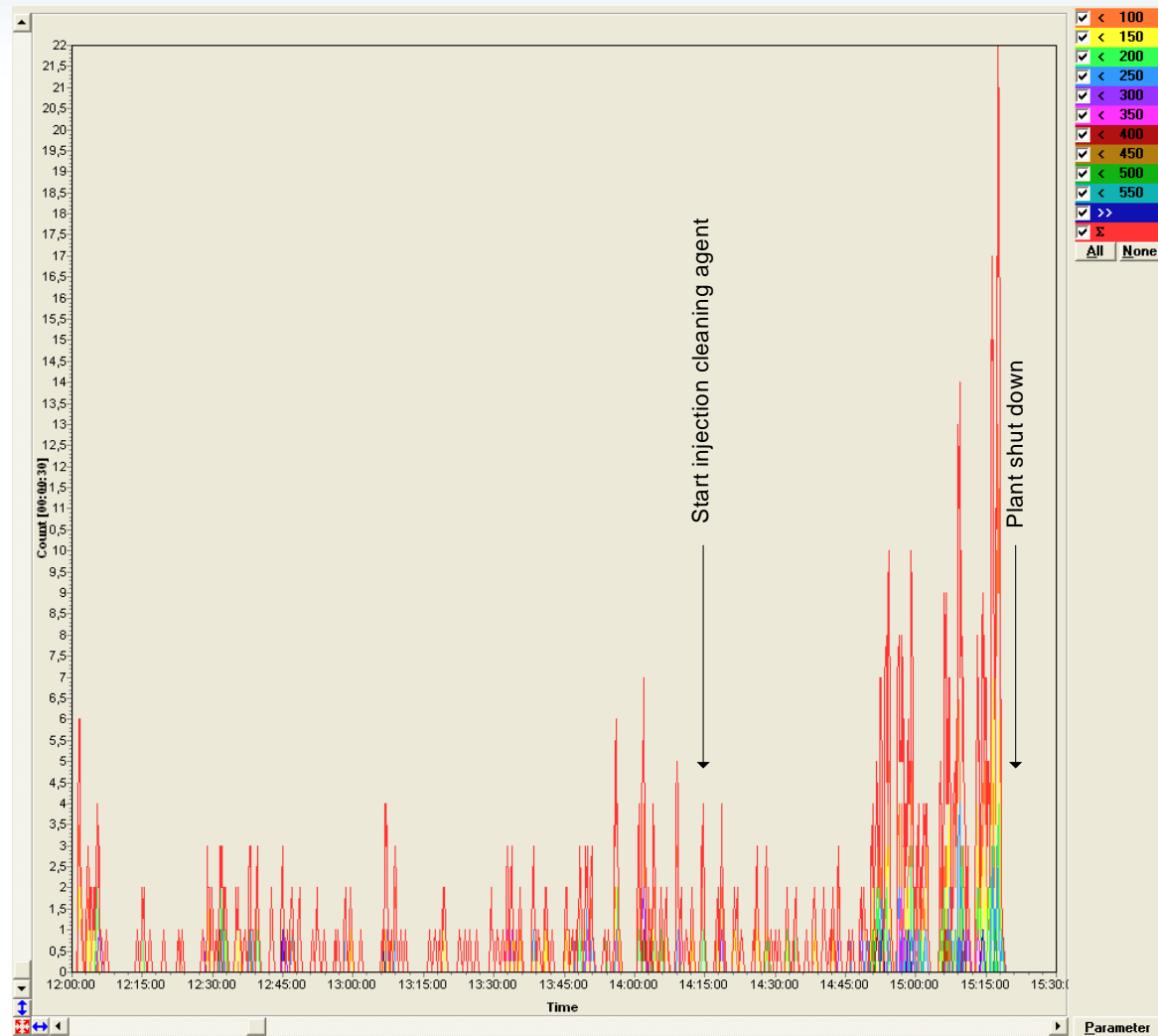
Line 3

Line 4

Gel Shower



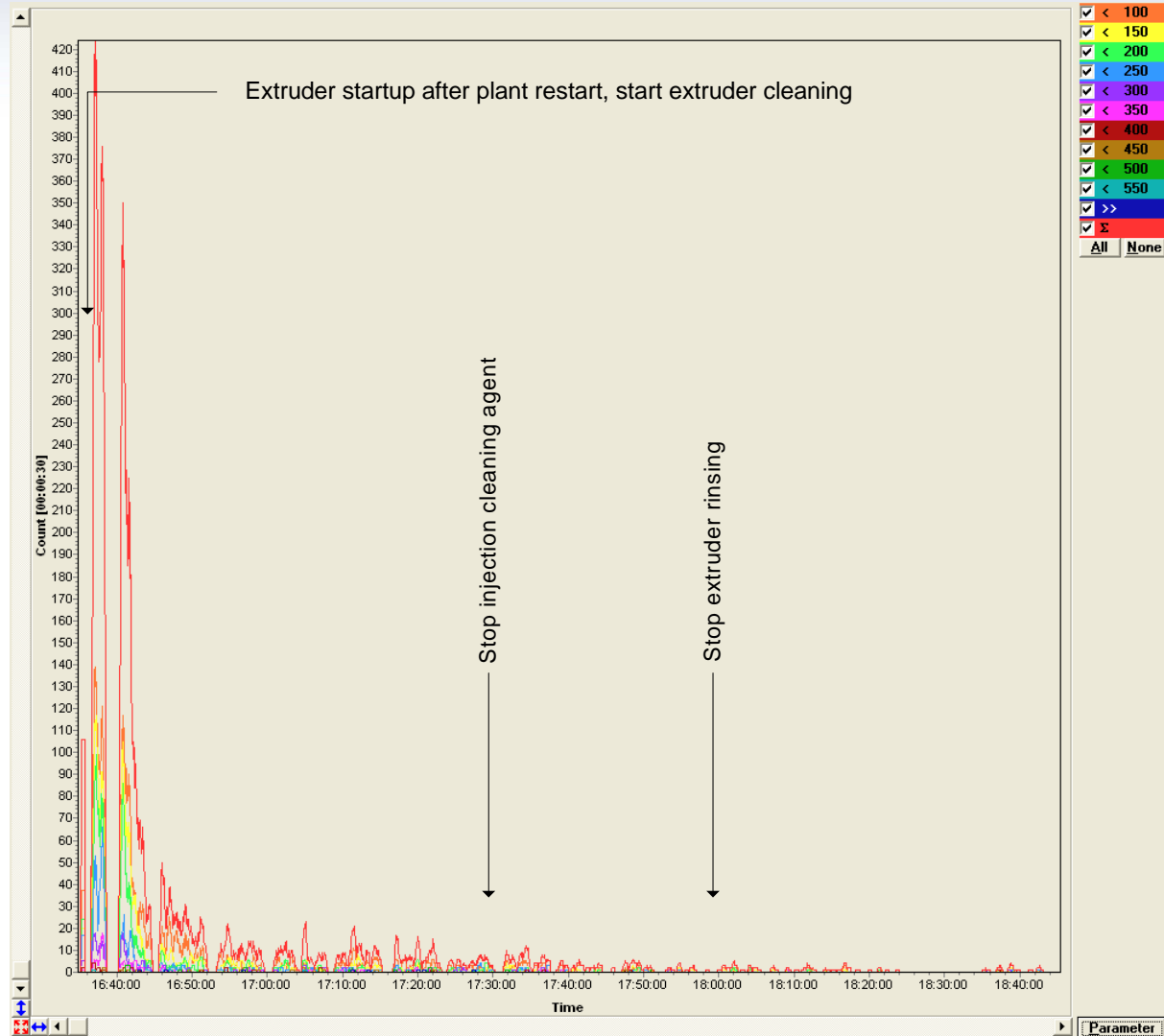
Online Anticipation of Plant Shut Down



Online Transition Control



Online Control of Extruder Start Up



Summary

- Close Loop Online Control (Process + Grading) is today's Standard in Polymer Plants
- 100 % Web Inspection in Film Extrusion
- Different Defect Types, but close Interrelation
- Working Together avoids Problems and improves Film Quality

**Thank You
very much
for Your Attention !**