

TRACKING DOWNTIME TO INCREASE PERFORMANCE

A SYSTEM FOR INCREASED OPERATING EFFICIENCY, PRODUCTIVITY & PACKAGED PRODUCT YIELDS

Malisko Engineering, Inc (MEI) was asked, to provide a Multi-Module System including **SPC** and **QUALITY TRACKING, LINE PERFORMANCE TRACKING,** and **DOWNTIME TRACKING** for a multi-national eye care products company. The System monitors multiple sterile fill packaging lines.

SPC:

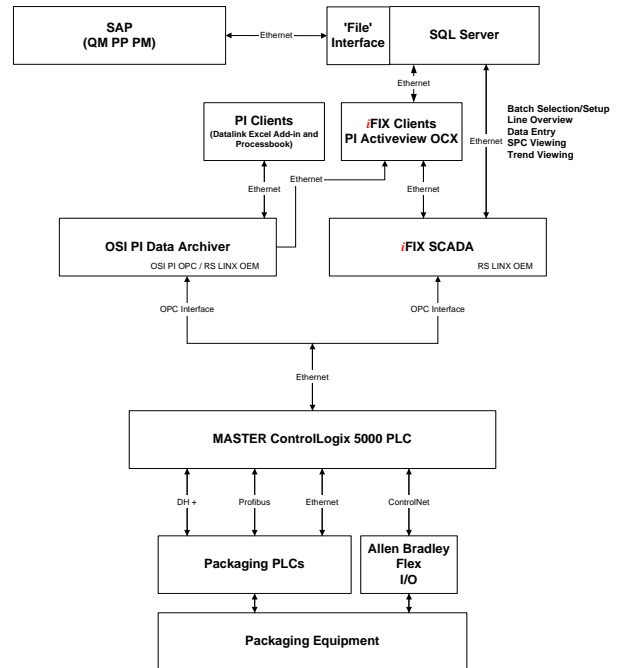
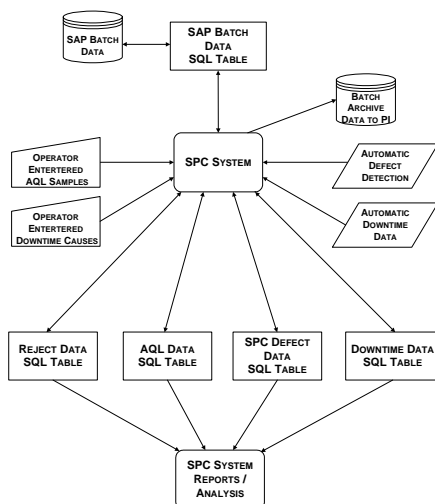
- Logs **QUALITY DATA** and **AQL SAMPLING** for up to two simultaneous batches running on the same line.

LINE PERFORMANCE:

- **PERFORMANCE DATA** is tracked by shift allowing for *shift comparisons*.
- **PERFORMANCE INDICATORS** are tracked and calculated. Results are stored in an OSIsoft PI® Data Historian.

DOWNTIME:

- For **MANUALLY CAUSED DOWNTIME** events, operators choose from seven (7) downtime categories and numerous specific cause codes under each category.
- The system tracks **AUTOMATIC DOWNTIME CAUSES** and records the cause and duration without operator intervention. Each downtime cause is logged to a database with time/date stamp, line #, category, cause, and duration.



TASKS AND SERVICES:

- Involved in developing the concept, architecture, capital budgeting and detailed designs,
- Wrote User Specifications, Functional Specifications and Detailed Design Documents,
- Designed, programmed, tested, and verified wiring,
- Validation and Production support,
- Integrated Intellution® iFIX SCADA, Microsoft SQL Server®, OSIsoft PI® Data Historian, ControlNet®, Remote I/O, Siemens S5 & S7 PLC's (Profibus to Ethernet), Allen-Bradley SLC-500® & ControlLogix® PLC's (Ethernet),
- Interfaced to existing SAP® system to upload and download quality data,
- Production and Maintenance training with a User's Manual for the System.

For More Information, please contact:

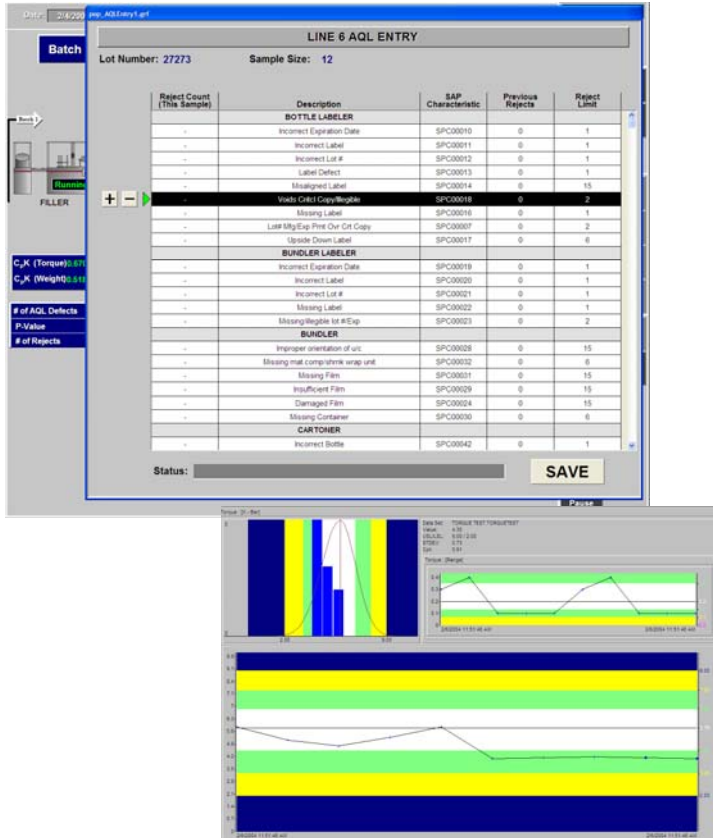
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ON-LINE SPC AND QUALITY TRACKING - INCREASED YIELD, REDUCED REJECTS AND DEFECTS



SYSTEM FEATURES:

- Operators select a batch from a list downloaded from SAP®.
- All sample quality data such as manual inspections, torque tests, and fill weights are uploaded to SAP® at the end of the batch.
- AQL Data, Defect Root Causes and Corrective Actions are stored in SQL for historical analysis.
- 21 CFR Part 11 Compliant.
- Sample Quantity is dynamically calculated based on the actual produced unit count, to ensure that enough samples are taken throughout the batch.
- QA Personnel analyze Fill Weights and Torques using per-configured as well as user-configured X-bar and r charts.
- Real Time Alarm notification prompts on the Line alert Operators when automatically detected rejects reach a specified percentage, set by QA Personnel.
- *p Values* (proportion of nonconforming items in a group) are calculated for the automatically detected rejects.
- Torque and Weight *C_{pk}*, Mean and Standard Deviation are calculated for the entire batch.
- Reports include AQL Manual Inspection, Leak Test, Torque Test and Defect Alarm Summary.

GOALS:

- Download **BATCH DATA** and **MANUAL INSPECTION LIST** with AQL's for each inspection from SAP®.
- Calculate **SAMPLE QUANTITY** based on **BATCH SIZE** and **CHARACTERISTIC SAMPLING PLAN** downloaded from SAP®.
- Upload **AQL SAMPLE RESULTS** back to SAP®.
- Split samples evenly across batch and dynamically adjust required sample size based on the number of units actually produced.
- Store **MANUAL INSPECTION DATA** for each batch in Microsoft SQL Server® for future Data Analysis.
- Locally alarms on defects and prompts for **Root Causes** and **Corrective Actions**.
- 21 CFR Part 11 Compliance.
- Track and Alarm on 100% Automatically Detected Inspections.

MANUAL INSPECTIONS REPORT

Batch Start: 11:10:09 AM, January 29, 2004	Material Description:
Lot #: _____	Line: 6
	Material ID: _____

Check Weigher Summary

Minimum:	Maximum:	Average:
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Operator	Sample Size	SampleDateTime
BELEFONTE, HARRY	24	2004/01/29 12:21:32
BELEFONTE, HARRY	24	2004/01/29 13:22:39
BELEFONTE, HARRY	24	2004/01/29 14:14:12
JONES, NORAH	24	2004/01/29 16:03:52
JONES, NORAH	24	2004/01/29 16:33:01
KRALL, DIANA	24	2004/01/29 17:31:48
JONES, NORAH	24	2004/01/29 19:09:02
JONES, NORAH	24	2004/01/29 20:05:11
JONES, NORAH	24	2004/01/29 21:22:50

BOTTLE LABELER

Incorrect Expiration Date	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incorrect Label	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incorrect Lot #	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Label Defect	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Misaligned Label	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Missing Label	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lot# Mfg/Exp Prnt Ovr Crt Copy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upside Down Label	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

BUNDLER LABELER

Incorrect Expiration Date	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incorrect Label	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Incorrect Lot #	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Missing Label	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Missing/Illegible lot #/Exp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

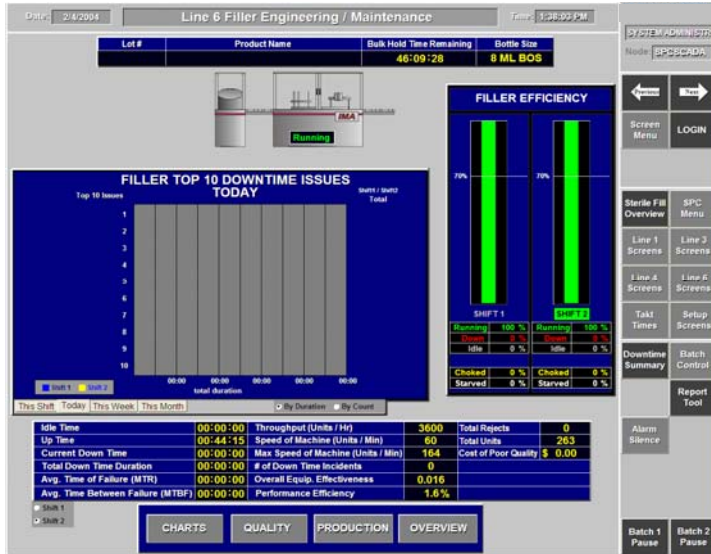
BUNDLER

Improper orientation of ulc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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Checked By: _____ Reviewed By: _____

TRACKING DOWNTIME TO INCREASE PERFORMANCE

LINE PERFORMANCE TRACKING - INCREASED OPERATING EFFICIENCY & PRODUCTIVITY



SYSTEM FEATURES:

- System logs the following Performance Indicators, by machine and by line:
 - Bulk Hold Time Remaining on Filler
 - Shift Elapsed Time
 - Idle/Run/Down/Starved/Choked Times
 - Number of Downtime Incidences
 - Six Sigma
 - Average Throughput/Hour
 - Average Units/Minute
 - Maximum Units/Minute
 - Instantaneous Units/Minute
 - Predicted Shift Output
 - Overall Equipment Effectiveness
 - Efficiency %
 - # of Rejects & Reject %
 - Cost of Poor Quality
 - Mean Time Between Failures
 - Mean Time to Repair
 - Probability of Run
 - # of Units Produced
 - Takt Time per Batch
 - Changeover Units
 - Changeover Rejects

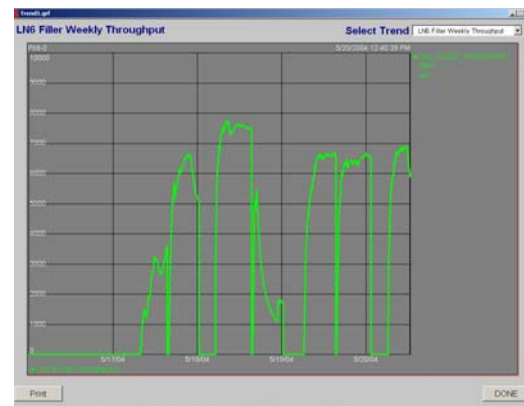
GOALS:

- Accurately capture and track **KEY PERFORMANCE INDICATORS (KPI's)** per machine and for the entire Line.
- Calculate and record **IDLE, RUN, and DOWNTIME** (including **STARVED** and **CHOKED**) percentages per shift.
- Log Historical data in OSIsoft PI® Data Historian.
- Provide Production Summary Reports listing **KPI's**.
- Provide a tool for Engineering and Production to identify production bottlenecks and to increase production efficiency.
- Provide a *Takt Time* hourly volume screen.

- Data is collected and stored for each shift to allow for shift-by-shift comparisons.

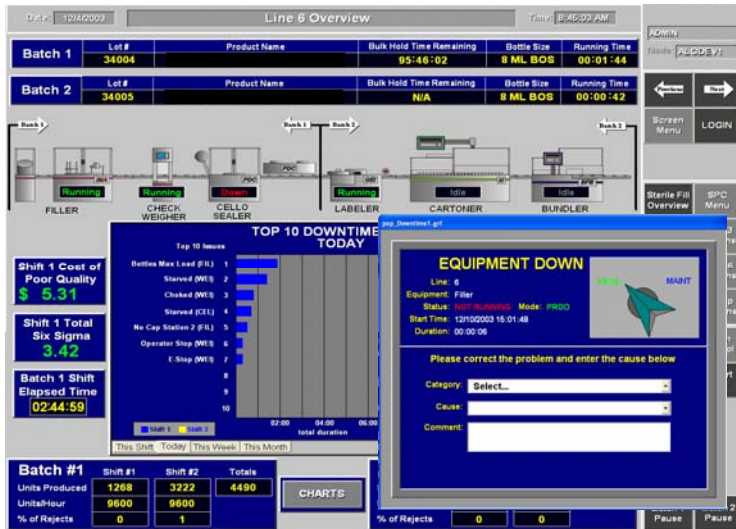


TIME	TARGET RATE	ACTUAL RATE	VARIANCE
11:00 - 12:00	252	230	-22
12:00 - 13:00	253	256	3
13:00 - 14:00	254	260	6
14:00 - 15:00	132	155	23
15:00 - 16:00	111	0	-111
TOTALS	1143	1168	25



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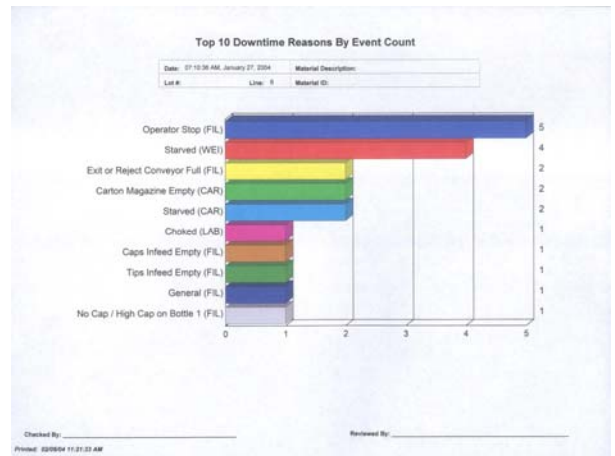
DOWNTIME TRACKING - INCREASED PRODUCTIVITY & MAINTENANCE EFFECTIVENESS



- Downtime is tracked per incident as well as total downtime per shift.
- Top 10 Downtime Chart by duration and by # of occurrences displayed for entire line, and for each piece of machinery.
- Ability to switch a machine into 'maintenance' mode to allow for multiple start/stops, while still tracking original downtime cause.
- Reporting system allows for a Top 10 Downtime Summary Report or a Detailed Downtime Report by a user-specified time range.
- System tracks Mean Time Between Failures (MTBF) and Mean Time to Repair (MTR) for each piece of machinery.
- Logs data continuously to OSIsoft® PI Data Historian.

GOALS:

- Accurately capture machine downtime causes,
- Track machine maintenance issues,
- Eliminate end of batch manual data entry by electronically logging downtime causes.



LINE:	LINE 6	THIS SHIFT	
EQUIPMENT:	ALL	TODAY	
CATEGORY:	ALL	THIS WEEK	
		THIS MONTH	
<input type="radio"/> By Duration <input type="radio"/> By Count			
SPECIFIC CAUSE	EQUIPMENT	EVENTS	TOTAL TIME (mm:ss)
Label Gap	Labeler	11	02:15:31
START TIME	DURATION	SHIFT	COMMENT
12/1/2003 12:13:36 AM	06:42:21	3	(auto)
12/1/2003 8:01:34 AM	00:58	1	(auto)
12/1/2003 8:12:34 AM	15:52	1	(auto)
12/1/2003 12:47:24 PM	00:31	1	(auto)
12/1/2003 1:14:13 PM	00:00	1	(auto)
12/2/2003 5:14:45 PM	00:17	2	(auto)
12/3/2003 10:09:50 AM	01:54:34	1	(auto)
12/3/2003 2:21:15 PM	01:16	1	(auto)
12/3/2003 2:25:12 PM	01:07	1	(auto)
12/3/2003 2:37:22 PM	00:09	1	(auto)
12/3/2003 3:56:42 PM	00:33	2	(auto)
12/3/2003 4:07:58 PM	00:14	2	(auto)

SYSTEM FEATURES:

- On **MANUAL DOWNTIME** causes, the operator enters *Category and Cause*, along with an associated *Comment*.
- **AUTOMATICALLY DETECTED** downtime causes are monitored and recorded without operator intervention.
- Downtime Events are recorded in SQL for each line and machine.
- Operator can query a *Downtime Summary* by line, machine, shift, day and month.

DOWNTIME DETAILS REPORT					
Date:	11/24/03 AM, January 31, 2004	Material Description:		Line #:	6
Line #:		Material ID:			
Check Weigher					
Start Time	Duration	Shift	Downtime Reason	Comment	
01/30/2004 11:39:50	00:00:12	1	Choked	(auto)	
01/30/2004 11:46:26	00:00:00	1	Starved	(auto)	
01/30/2004 12:06:47	00:00:00	1	Starved	(auto)	
01/30/2004 12:10:57	00:00:00	1	Starved	(auto)	
01/30/2004 12:12:21	00:00:00	1	Starved	(auto)	
01/30/2004 12:20:54	00:00:00	1	Starved	(auto)	
01/30/2004 12:33:05	00:00:00	1	Starved	(auto)	
01/30/2004 12:38:13	00:00:00	1	Starved	(auto)	
01/30/2004 13:02:31	00:00:00	1	Starved	(auto)	
Cello Sealer					
Start Time	Duration	Shift	Downtime Reason	Comment	
01/30/2004 11:40:23	00:09:42	1	Starved	(auto)	
Labeler					
Start Time	Duration	Shift	Downtime Reason	Comment	
01/30/2004 11:51:44	00:00:33	1	Choked	(auto)	
01/30/2004 11:52:31	00:00:24	1	Label Jams	(auto)	
01/30/2004 12:01:05	00:05:13	1	Wrong Code	(auto)	
01/30/2004 13:07:04	00:00:00	1	Wrong Code	(auto)	
General					
Start Time	Duration	Shift	Downtime Reason	Comment	
01/30/2004 12:47:57	00:05:41	1	General	Clean/Rollers	