

Overall Equipment Effectiveness Value of Improvement

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OEE Overview

Organizations are challenged to optimize performance as aligned to their strategic objectives. Typically, the foundation for performance improvement is the drive to do “more” with “less”. They want to increase the productivity of their people, expenses, and assets (inventory, equipment, buildings). In capital intensive companies, the production equipment is essential to ensuring they can meet demand requirements. So, how do you know if you are improving the productivity of that equipment?

Overall Equipment Effectiveness (OEE) is a compounded metric that indicates the resultant percent output of good parts relative to theoretical potential output for a given work center, production line, department or other business unit. While there are multiple factors of influence, and variations on how to calculate it, OEE provides a relative measure of improvement over time. Increasing the OEE towards 100% is directionally “good,” if properly aligned to the overall business objectives.

OEE should be considered in the context of impact to the business. In growing businesses with high demand, OEE may have a direct impact on ability to meet customer

requirements. When Demand is greater than the resultant output capability (as measured by OEE% of theoretical capacity), there is a risk of losing sales. In order to compensate, a company may have a contingency plan, such as buffer inventory, extra shifts, premium services, etc. Ultimately, the lost business (Gross Margin on those sales) is the difference of the demand vs. total output (OEE% of theoretical capacity plus the contingency output).

The lost business is not the only business impact. There are the additional costs to support the contingency, and the costs associated with the erosion of OEE from 100% (costs of waste). Those erosion costs are in the form of scrapped parts, downtime, wasted labor, maintenance, unused capital equipment, etc.

Conversely, companies that have diminished demand may find the resultant output from the OEE eroded capacity to be adequate. However, there are still the costs of waste, and possibly some contingency costs. Ultimately, it is essential to understand the context of the situation in order to properly prioritize actions.

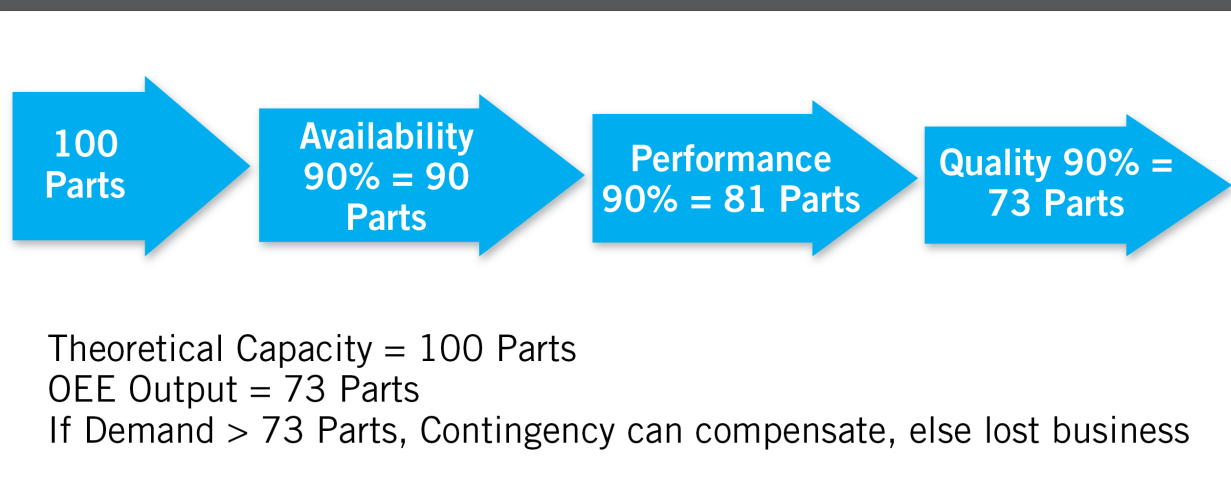


Figure 1 - OEE Factors

OEE Defined

OEE evaluates how effectively manufacturing operations are utilized (productivity of resources and equipment). The metric is best used to identify scope for process performance improvement and where to get the improvement. It is imperative, however, that the metric be aligned to the overall company objectives, with the recognition that it may be somewhat in conflict with the overall objectives at times.

OEE is calculated by recognizing the available capacity (vs. theoretical), the performance of the available capacity (vs. ideal), and the resultant quality of the output (good parts vs. total parts). (See Figure 1) The compounding affect (availability * performance * quality) may result in a significant reduction in the overall metric.

There are some interesting caveats as a company considers its OEE measure:

- If cycle time of producing a product is reduced, more product may be produced with less resource, while at the same time the OEE could be declining for other reasons.
- The products have varying margin, thus the mix has a significant impact. While more changeovers (set-ups) will lower the OEE, the inclusion of higher margin products could result in a higher overall margin.
- If Demand is greater than the OEE% resultant output, there is lost business. If Contingencies (e.g. Inventory, Overtime) are used to compensate the OEE% (increase output towards total Demand) – then improvement in OEE% will reduce the need for Contingency and Lost Business – which is a benefit.
- The investment required to improve OEE%, especially as you approach 100%, may have a diminishing return in benefits – thus may not be worth the effort, etc.

OEE Premise

The following comments establish the premise (baseline assumptions of truth) for analyzing the Value of improving OEE.

- OEE has a greater business impact on bottleneck operations, thus you should prioritize improvements on the bottleneck - until the bottleneck moves to another operation.
- OEE improvement has greater business impact if Demand is greater than the initial (As-Is) OEE% capacity.
- Companies have decreasing risk and business impact as they approach 100% OEE (less penalties, premium, lost business, etc.).
- The resultant Gross Margin of a company is impacted 3 ways due to OEE:
 - Cost of Waste: from the losses due to OEE erosion (Figure 2)
 - Contingency Costs
 - Lost Business
- Companies may maintain contingency to achieve output above the OEE% Capacity.
- $\text{OEE\% capacity} + \text{Contingency Capacity} = \text{Total Capacity}$ (Figure 3).
- Lost Business is the Gross Margin on the lost sales ($\text{Demand} - \text{Total Capacity}$) (if $\text{Demand} > \text{Total Capacity}$) (Figure 4).
- If Demand is greater than OEE% Capacity – the total costs include lost business, plus cost of waste and any contingency to build towards Demand and/or Inventory.
- If Demand is less than OEE% Capacity – the total costs include cost of waste (and possibly any contingency).
- As you improve capability toward 100% OEE - it reduces the lost business and/or cost of waste and/or Contingency investment.
- Benefits increase as the OEE GAP (gap of As-Is to To-Be) increases.
- Investments increase as the OEE GAP increases.
- There is a trade-off between investments and benefits, thus diminishing returns as you approach 100%, because the investments are too great.

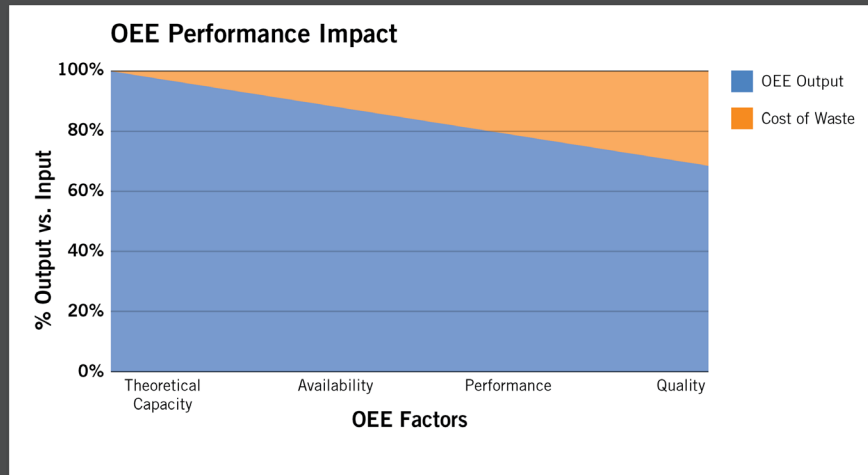


Figure 2 - OEE Output, Cost of Waste

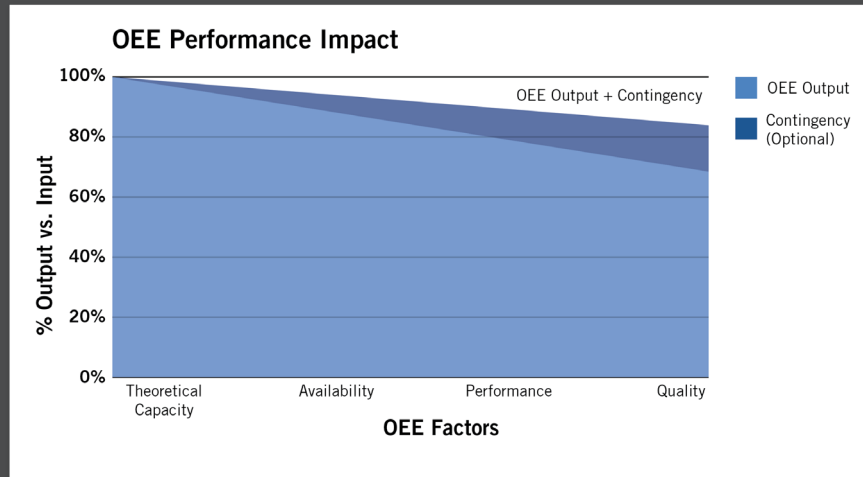


Figure 3 - Contingency

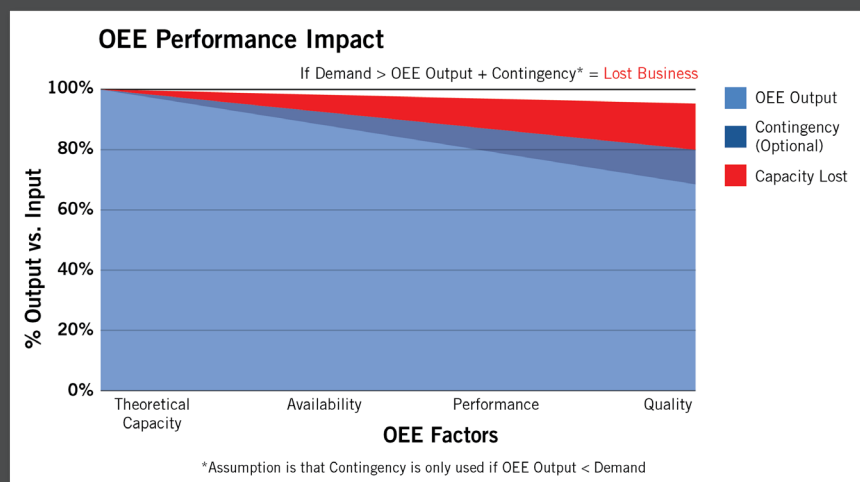


Figure 4 - Lost Business

Calculating the Business Impact: Benefits, Investments



The business impact of OEE improvement is evaluated through reductions in three cost categories as OEE increases, and the investments associated with increasing OEE. (Figure 5)

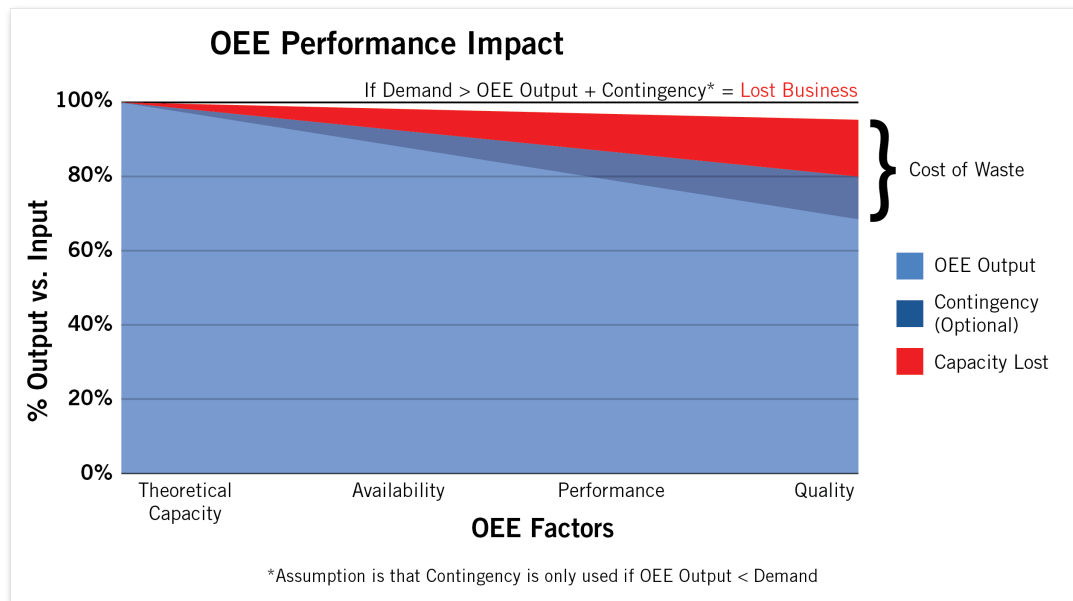


Figure 5 - Total Business Impact

Cost of Waste—The costs incurred as OEE erodes from 100%.

- Quality = All Direct Labor (DL), Material (within COGS) are wasted if a part can't be sold.
- Performance—Erosion from ideal is a DL (within COGS) waste.
- Availability = (No Cost) - The cost of equipment unavailable is wasted capacity, but is assumed a fixed cost. We can assume labor is reassigned or not paid.

Contingency—Additional resources applied to compensate for the erosion of OEE from 100%. Generally, this should only compensate the difference between the OEE% output, and up to the total Demand. The sum of the following 3 categories comprises the total costs spent on contingency. These costs conceivably will be reduced as you improve the OEE% towards Demand.

- Performance—Extra overtime, or contract used to compensate for off-ideal.
- Availability—Extra overtime, or contract used to compensate for unavailable capacity, plus maintenance costs to improve availability. The maintenance costs can be reduced with an increase of Preventive Maintenance rather than Reactive Maintenance.

Lost Business—Gross Margin lost for unfulfilled Demand = Demand minus (OEE capacity + Contingency capacity). For example, if Demand is 110 parts in a plant with 100% OEE Theoretical capacity of 100 parts, and the resultant OEE% is 73%—then the loss is sales of 37 parts (Gross Margin on 110-73 = 37 parts).

- Quality—Extra inventory (the annual carrying costs on inventory) or contract services/overtime used to compensate for reduced good parts.

The following chart (Figure 6) suggests possible improvement factors for the 3 OEE factors:

Possible Improvement Factors		
Availability	Performance	Quality
Increase Preventive Maintenance	Reduce Variance of Actual Cycle Time vs. Ideal Time	Ensure Good Parts
Improve Scheduling/Sequencing	Improve Efficiency	Avoid Tooling Degradation
Improve Labor Availability	Reduce Off Ideal Material	Avoid Operator Error
Reduce Setup Time		Reduce Over Engineering Design Specifications

Figure 6 - OEE Improvement

Investment to Improve OEE

In addition to the suggested Possible Improvement Factors, inventory is another investment to buffer against the inefficiencies, as well as provide contingency for volatile demand. Investments in inventory...(see Figure 7).

Overall, when the As-Is % OEE is low, and/or the the Gap between As-Is% and To-Be% is large—the investments must address step fixed costs such as capacity. Conversely, higher As-Is% and/or small Gap—the investments may be variable costs such as overtime and contract.

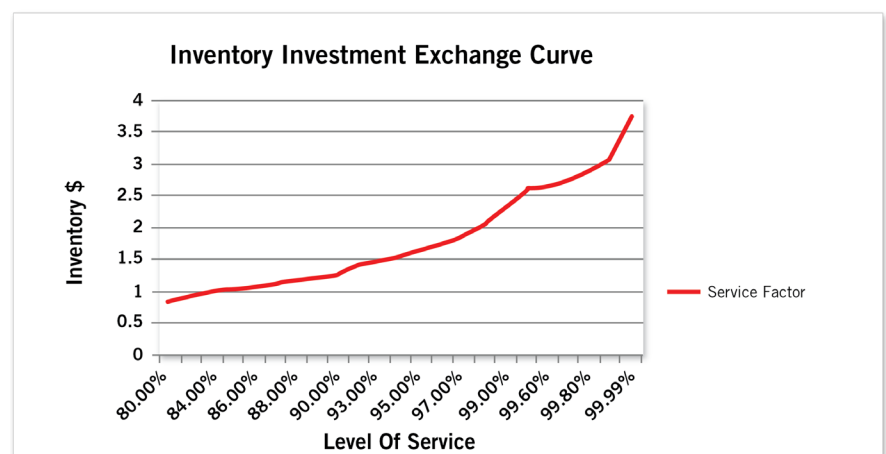


Figure 7 - Investment Exchange Curve

Value of Improving OEE



Scenarios

The bottom line value impact of closing the OEE GAP is dependent on a few variables including demand, capacity (organic, contingency), current state of OEE factors, and expected improvement in the OEE factors. By adjusting these variables, we tested various scenarios to understand the bottom line impact of OEE improvement using the OEE Improvement Model. The OEE GAP was adjusted by varying the As-Is OEE, while holding the To-Be OEE constant.

The OEE Improvement Model is used to test scenarios (sensitivity analysis) and to project the Value of improving OEE by comparing the incremental benefits and investments and projecting the resultant impact to Gross Margin. A more detailed explanation of how to use the model, and respective data inputs, levers, etc., is available upon request.

There are a few variables that can be observed having the biggest impact, including:

- The greater the (OEE GAP)—the larger the impact.
- The greater the Demand—the larger the impact.
- The type and amount of Contingency Capacity used to make up the difference of Demand vs. As-Is, To-Be OEE%.
- When the Gap of Quality (Q%) is a large proportion of the OEE GAP.

The analysis of the OEE GAP was performed by adjusting the (As-Is) Q%, P%, and A%* equally for each OEE GAP adjustment (40%, 30%, 20%, 10%). The To-Be OEE% (and mix of Q%, P%, and A%) were held constant at a 90% OEE. For example, the 40% OEE GAP adjustment has As-Is OEE at 50% and To-Be OEE at 90% (equal to Demand). A 20% OEE GAP adjustment has As-Is OEE at 70% and To-Be OEE at 90%.

Scenario 1

The first scenario has As-Is at less than Demand (and no contingency), and To-Be equal to Demand. **There was approximately 3-5 Points Gross Margin impact for each 10% OEE GAP.**

Scenario 2

The second scenario has As-Is OEE at less than Demand (and no contingency) when the OEE GAP is 40%, 30%, but equal or greater than Demand when the OEE GAP is 20% and 10%. The To-Be OEE (90%) is greater than Demand (70%). **There was approximately 3-4 Points Gross Margin impact for each 10% OEE GAP when As-Is is < Demand, but much less if As-Is is > Demand.** Also, the results of the second scenario were generally 2 points Gross Margin less for each data point, as compared to the first scenario.

Scenario 3

The third analysis has Demand at 50%, thus As-Is OEE is equal to Demand at 40% OEE GAP, and greater than Demand for (30%, 20%, 10%), with contingency. The To-Be OEE is greater than Demand in all cases. **There was approximately 3-4 Points Gross Margin impact for each 10% OEE GAP.** Also, the results of the third scenario were generally in the same range of Gross Margin for each data point in scenario two, except the 40% OEE GAP where it was approximately 4 points lower than scenario two – primarily since there was no improvement in “lost business”.

*The variations of mix of Q%, P%, and A% (which ones are adjusted) are also tested.

The primary difference in the three scenarios is that there was **lost business** in the Scenario 1 As-Is, while there was some lost business in Scenario 2 As-Is (at 40%, 30%, 20% Gap), and there was no lost business in Scenario 3 As-Is. Anytime you are limiting sales due to capacity, you are effectively missing valuable business that impacts the bottom line (in this case, Gross Margin). This impact is much greater than “tweaking” operational costs, etc.

Other scenarios show that managing the Quality (Q%) has the biggest impact, which is attributed to the fact that Material and Direct Labor are components of the Cost of Waste. For Performance, only Direct Labor is wasted, and for Availability it is assumed that there is no Cost of Waste (labor can be reassigned). In all three factors (Q%, P%, A%), the burden is semi-fixed thus not a cost of waste. Over a longer planning horizon, the capacity would be adjusted based on demand.

Scenarios that included a Contingency to compensate for higher Demand (than the resultant OEE% capacity) showed varying results. If the three factors (Q%, P%, A%) are balanced, then Contingency cancels out Lost Business (only variance of up to 1 Point GM between 40% Contingency and 0% Contingency, when Demand = 90%). However, if the Q% GAP is small (As-Is is relatively high) then Lost business is more expensive than Contingency; If P% GAP or A% GAP are small—then Contingency is less expensive than Lost Business.



Performance Accounting and Decision Support Impact on OEE



The improvement of OEE has a bottom-line impact on business through reduction of Direct Labor, Direct Material, and a reduction of the lost Gross Margin due to Cost of Waste, Contingency, and Lost Business. The improvement of OEE is enabled through software/technology, process improvement, and organizational development – which require investments that counter the bottom-line impact (benefits). In addition, the methods such as Performance Accounting and Decision Support provide further benefits through more rapid realization of OEE improvement, institutionalization of best practices, and additional increases in OEE improvement through discovery of business opportunities (not possible in more static analyses or reports) (Figure 11).

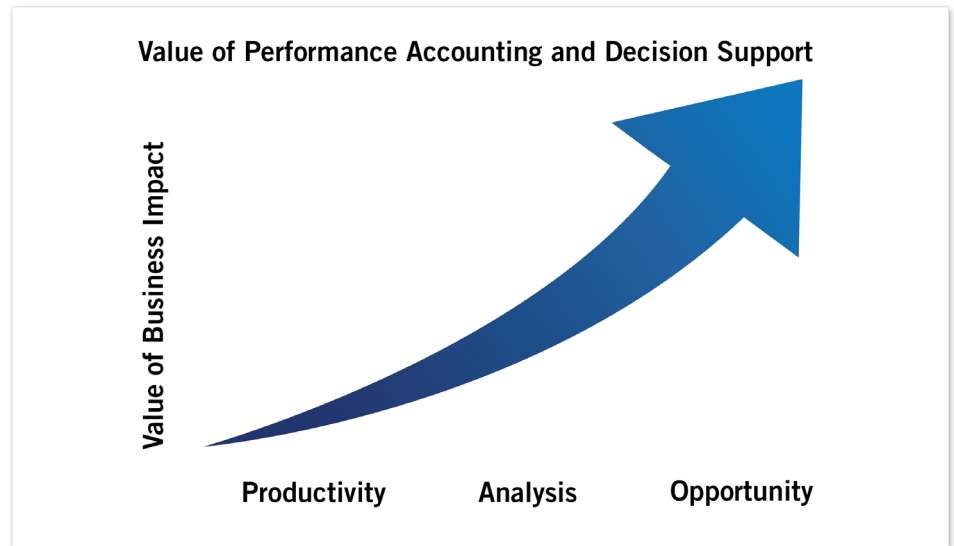


Figure 11 - Performance Accounting and Decision Support Impact

Productivity = automation of reports, metrics—replacing Excel reports, system customization

Analysis = use of Performance Accounting and Decision Support to investigate patterns of data, root cause of underperformance

Opportunity = frequent identification of new business opportunities which results in top-line impact, such as promotions, sales analysis, supply/demand

Salient Management (see scenarios below) provides automation of consolidation, aggregation, presentation, and synthesis of data from multiple sources. The technology enables timely analysis of business results in order to recognize patterns of behavior, and to project future results based on motivating factors (metrics). It is an enhancement over traditional reporting such as Excel reports, ERP customization, etc., as it automates the data gathering and formatting, thus providing productivity improvements. Additionally, Salient Management can provide benefits through timely exception-based investigation of data patterns and root cause of under-performance, which enhances the analyses capabilities. And, a very high level of benefit can be realized in situations where new

opportunities are afforded, such as insights on promotions, sales performance, new business ventures, supply and demand consolidations, etc. All of these improved practices are institutionalized through building the practice around each role of the company. This affords sustained continuous improvement—rather than ad-hoc findings.

In our Value of Improving OEE analysis, the additional benefits realized through the use of Salient Management were 1 to 3 Points of Gross Margin improvement. These benefits were due to faster reduction of the GAP (more months of reduced Costs of Waste, Lost Revenue, Contingency), and greater reduction through increased capabilities (Productivity, Analysis, Opportunities).

Example Scenario

Scenario 1: Machine Error Resulting in Bad Parts

Tracking OEE week to week, Highlights significant issue with Montgomery

– the overall OEE has dramatically fallen from 42.9% to 12.6%! Why?

Bookmark Info

OEE Week over Week by Plant

A typical review of OEE will be the weekly comparison by Plant vs. previous week. Highlighting will draw attention to Plants that are in decline (Pink). Montgomery looks to be an issue!

Last modified on Apr 02, 2016 at 01:50 PM by EFRANTZ

Resources (0)

No Resources Available.

Comments (0)

No Comments Available.

Comp ~ WE-Sunday 8/16/2015 vs. 8/9/2015

Context:

Add to path

By: Total_Company_Production Total Company Production \ 105 Charlotte

Product Data_Type Shift Plant Downtime_Code Sequence Line Work_Order Team

Total Total_Company_Production: 1

	OEE %	Availability %	Performance %	Quality %
	This Last	This Last	This Last	This Last
Total Company Production	26.3 41.4	89.0 81.0	30.3 52.2	97.7 97.9
104 Cincinnati	52.9 52.5	73.3 74.3	73.1 71.0	98.8 99.5
105 Charlotte	50.6 55.3	100.0 100.0	50.6 55.3	100.0 100.0
109 Rochester	44.9 42.8	79.3 75.0	58.7 59.1	96.4 96.6
112 Chicago	36.2 33.9	76.7 75.2	48.7 46.2	97.0 97.5
111 St. Louis	23.1 31.0	82.8 83.6	29.4 38.9	95.0 95.4
102 Montgomery	12.6 42.9	95.9 83.5	13.4 52.1	98.7 98.7
Totals	26.3 41.4	89.0 81.0	30.3 52.2	97.7 97.9

We review each Line, and clearly Performance for Line 1 is the issue.

Is this week an anomaly? We need to investigate further.

Bookmark Info

OEE Week over Week - Montgomery

Noticing that Montgomery Plant had dropped significantly, we investigate by Line to find the culprit! What is going on?

Last modified on Apr 03, 2016 at 11:25 AM by EFRANTZ

Resources (0)

No Resources Available.

Comments (0)

No Comments Available.

Comp ~ WE-Sunday 8/16/2015 vs. 8/9/2015

Context:

Total Company Production > 102 Montgomery >

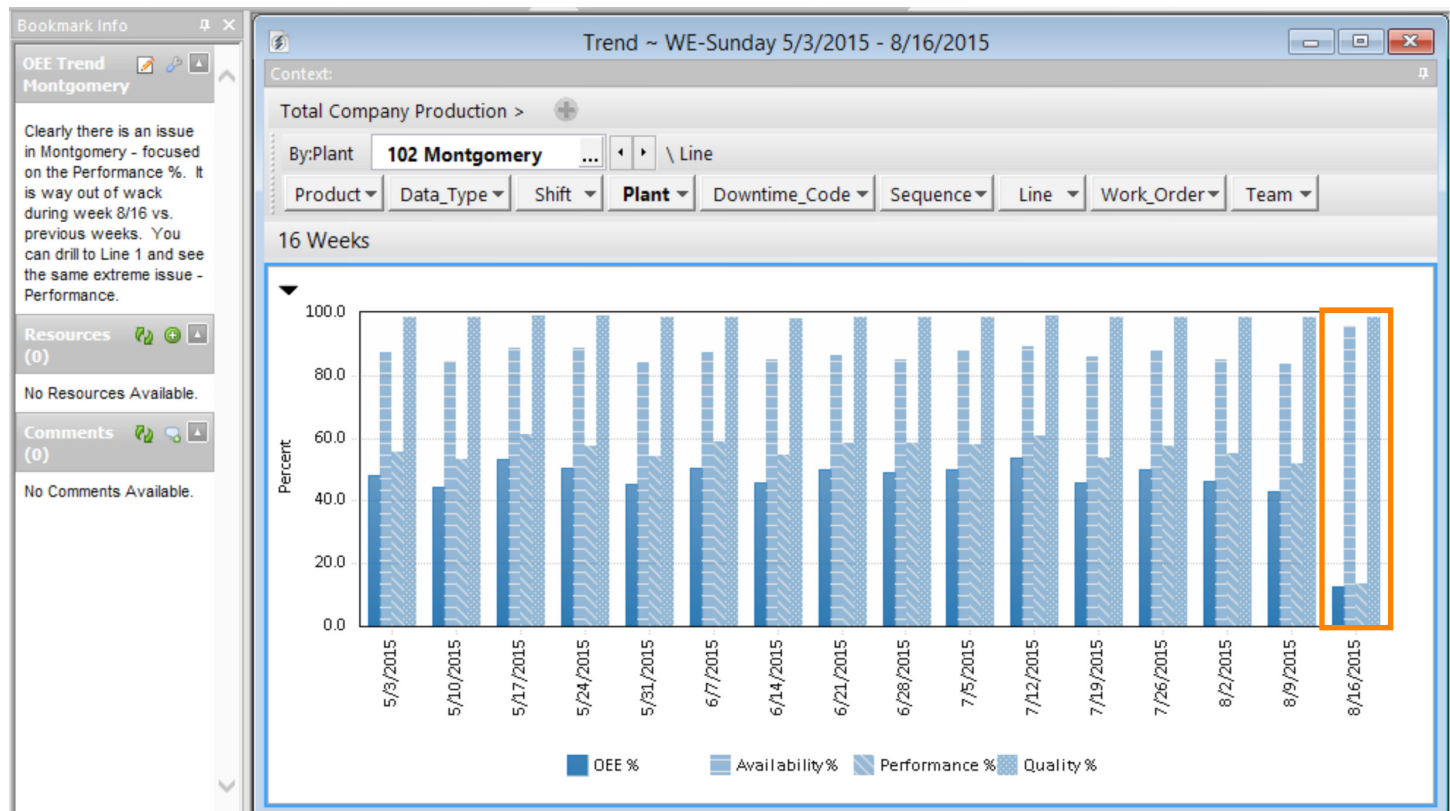
By: Line LN4

Product Data_Type Shift Plant Downtime_Code Sequence Line Work_Order Team

Total Line: 5

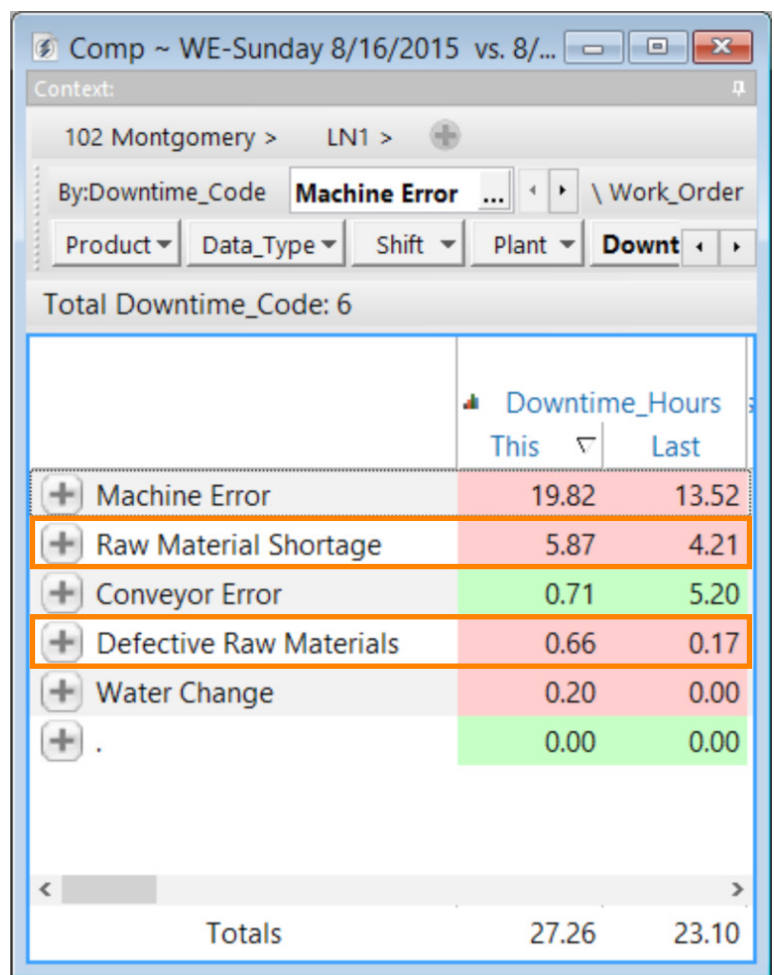
	OEE %	Availability %	Performance %	Quality %	Cases_Produced
	This Last	This Last	This Last	This Last	This
LN4	54.2 43.5	97.7 86.8	55.7 50.7	99.7 98.8	159,686
LN2	51.8 44.8	78.9 76.6	67.0 59.9	98.0 97.7	198,220
LN5	38.9 42.6	81.2 83.7	48.6 51.6	98.6 98.7	217,728
LN6	37.1 52.9	87.5 100.0	42.8 52.9	99.0 100.0	8,568
LN1	3.7 39.2	98.6 86.0	3.8 45.7	98.6 99.6	168,384
Totals	12.6 42.9	95.9 83.5	13.4 52.1	98.7 98.7	752,586

By reviewing the trend of Line 1, the week of 8/16 is definitely troublesome – but why?



We found at least 2 reasons.

The Downtime of Line 1 due to Raw Material Shortage and Defective Raw Materials is having an impact on Performance, as well as Availability. Defective Raw Materials may cause manufacturing issues such as tool problems, feeds and speeds, etc.— which could cause inability to meet the expected processing times.



Comp ~ WE-Sunday 8/16/2015 vs. 8/...

Context:

102 Montgomery > LN1 > +

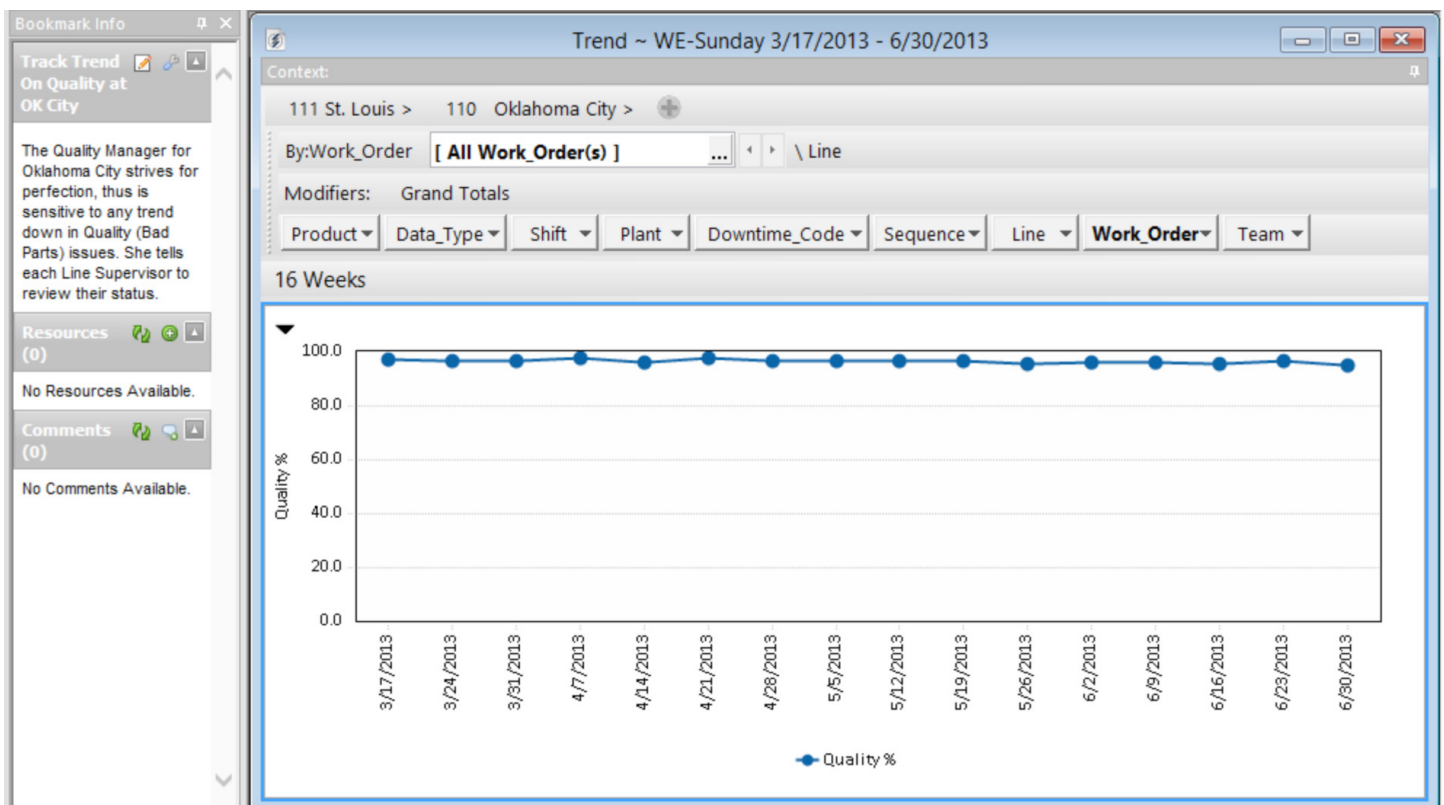
By:Downtime_Code **Machine Error** ... \ Work_Order

Product Data_Type Shift Plant Downt

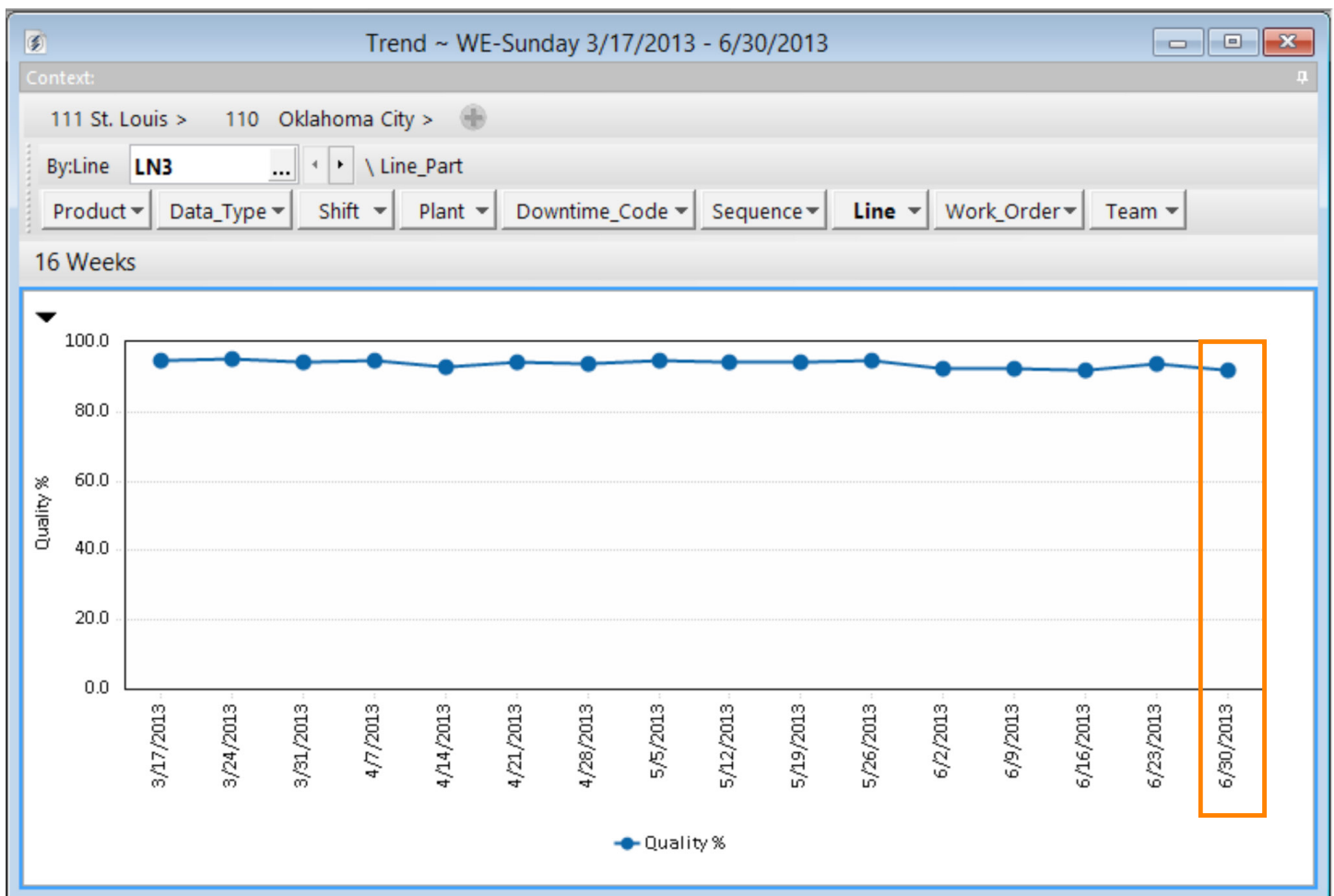
Total Downtime_Code: 6

	Downtime_Hours	
	This	Last
+ Machine Error	19.82	13.52
+ Raw Material Shortage	5.87	4.21
+ Conveyor Error	0.71	5.20
+ Defective Raw Materials	0.66	0.17
+ Water Change	0.20	0.00
+ .	0.00	0.00
Totals	27.26	23.10

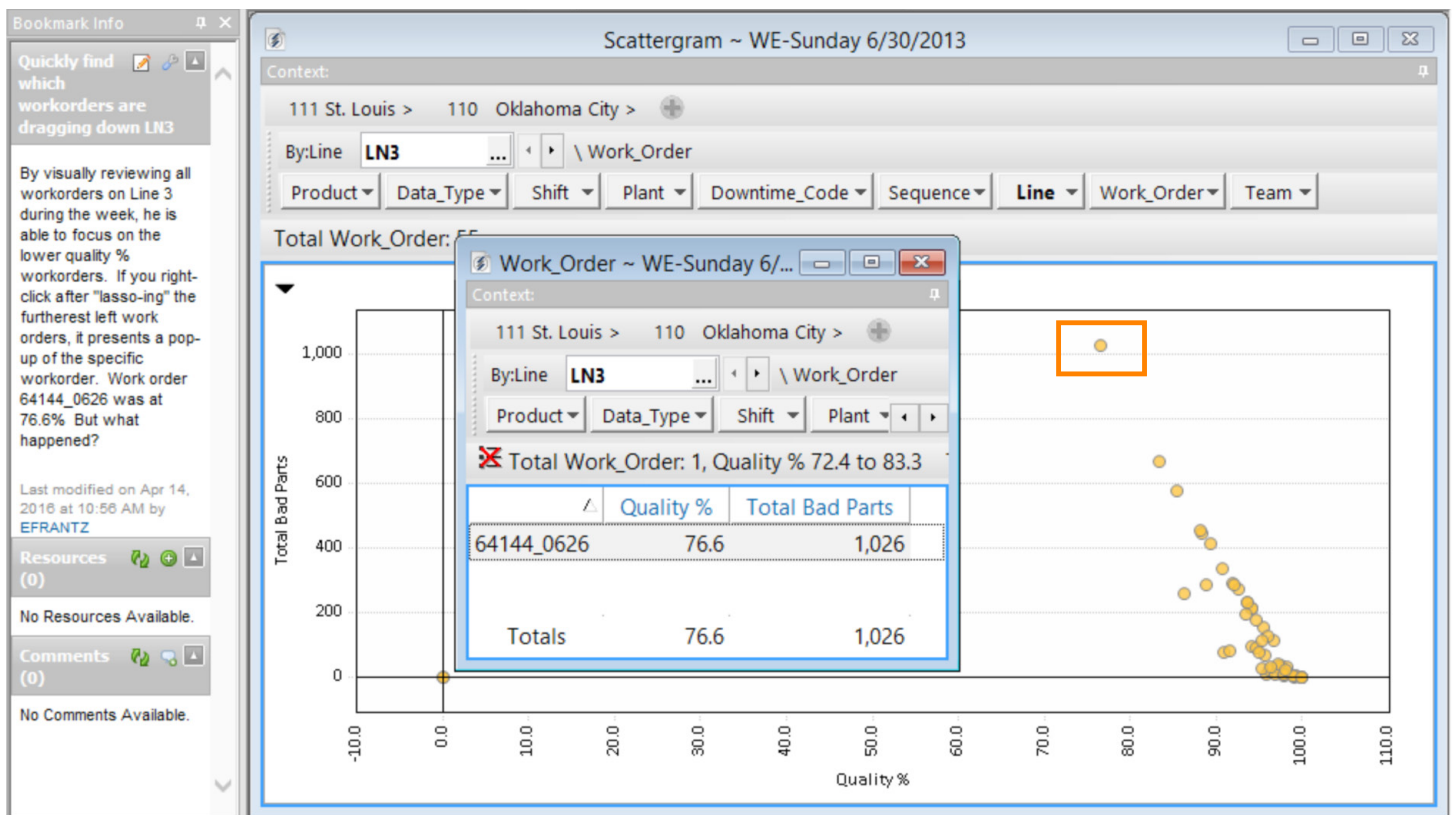
The Quality Manager for Oklahoma City strives for perfection, thus is sensitive to any trend down in Quality (Bad Parts) issues. She tells each Line Supervisor to review their status.



The LN 3 Supervisor notices a slight downtrend this week (6/30/13), thus wants to investigate further. Was there a particular work order or other issue?



By visually reviewing all work orders on Line 3 during the week, he is able to focus on the lower quality % workorders. If you right-click after rubber banding ("lasso-ing") the furthest left work orders, it presents a pop-up of the specific workorder. Work order 64144_0626 was at 76.6% But what happened?



The supervisor reviews Downtime on that workorder, and Line 3. There was 2.4 hours due to machine error — possibly due to tooling, programming, setup problems, etc. This can result in producing product out of tolerance, or with cosmetic issues — which are the reasons for the Bad Parts.

Bookmark Info

Investigate Downtime and Bad Parts - Cosmetic and Tolerance

The supervisor reviews Downtime on that workorder, and Line 3. There was 2.4 hours due to machine error - possibly due to tooling, programming, setup problems, etc. This can result in producing product out of tolerance, or with cosmetic issues - which are the reasons for the Bad Parts.

Resources
(0)

No Resources Available.

Comments
(0)

No Comments Available.

Comp ~ WE-Sunday 6/30/2013 vs. 6/23/2013

Context:

111 St. Louis > 110 Oklahoma City > LN3 > 164144 164144 > +

By: Downtime_Code **Machine Error** ... \ Date \ Sequence

Product ▾ Data_Type ▾ Shift ▾ Plant ▾ **Downtime_Code ▾** Sequence ▾ Line ▾ Work_Order ▾ Team ▾

Total Downtime_Code: 3


	Quality %		Downtime_Hours		Total Bad Parts		Bad_Tolerance		Bad_Cosmetic		
	This	Last	This	Last	This	Last	This	Last	This	Last	
Machine Error	0.0	0.0	2.40	0.00	0	0	0	0	0	0	
+ 06/26/2013	0.0	0.0	2.40	0.00	0	0	0	0	0	0	
+ Water Change	0.0	0.0	0.33	0.00	0	0	0	0	0	0	
+ .	76.6	0.0	0.00	0.00	1,026	0	513	0	513	0	
<div style="display: flex; justify-content: space-between; align-items: center;"> < <div style="flex-grow: 1; border: 1px solid #ccc; background: linear-gradient(to right, #ccc 49%, #fff 49% 51%, #fff 51%);"></div> > </div>											
Totals	76.6	0.0	2.73	0.00	1,026	0	513	0	513	0	

Scenario 2: Availability Affected by Machine Error

The Chicago Plant Manager is reviewing OEE, and is focusing on the Lines that are reduced week over week. Line 4 is first for review, and she notices that Availability is down slightly. Why?

Comp ~ WE-Sunday 8/25/2013 vs. 8/18/2013									
Context:									
Total Company Production > 112 Chicago > +									
By:Line LN10 ... \ Shift									
Product	Data_Type	Shift	Plant	Downtime_Code	Sequence	Line	Work_Order	Team	
Total Line: 10									
	OEE %		Availability %		Performance %		Quality %		
	This	Last	This	Last	This	Last	This	Last	
+ LN10	47.2	40.5	87.1	84.9	54.2	48.2	100.0	98.8	
+ LN1	46.3	39.1	77.0	77.1	62.4	52.6	96.4	96.4	
+ LN13	43.2	0.0	93.6	0.0	46.2	0.0	100.0	0.0	
+ LN4	38.3	38.6	71.7	72.5	55.6	55.1	96.2	96.8	
+ LN2	37.2	36.0	72.9	72.8	52.8	51.1	96.7	96.7	
+ LN9	35.0	44.5	81.6	88.9	44.4	51.7	96.5	96.9	
+ LN11	32.7	0.0	70.6	0.0	46.2	0.0	100.0	0.0	
+ LN7	22.8	25.1	88.6	92.9	26.0	27.5	98.9	98.2	
+ LN3	17.3	18.2	74.0	74.4	24.4	25.7	95.8	95.0	
+ LN6	15.7	17.0	70.0	70.6	23.2	24.7	96.6	97.4	
<									
Totals	34.9	34.0	74.2	75.0	48.8	47.0	96.4	96.5	

The Chicago Plant Manager notifies the Line 4 Supervisor, who reviews the results each day. Clearly the initial days of the week had issues! The Supervisor begins the investigation by day – starting with 8/19. Why is availability only 54%?

Comp ~ WE-Sunday 8/25/2013					
Context:					
Total Company Production > 112 Chicago > LN4 > +					
By:Shift B Shift B ... \ Date \ BrandType					
Product ▾	Data_Type ▾	Shift ▾	Plant ▾	Downtime_Code ▾	Sequence ▾ Line
Total Shift: 3					
		OEE %	Availability %	Performance %	Quality %
+ C	Shift C	60.6	78.3	77.4	100.0
+ A	Shift A	37.5	71.8	54.4	96.0
- B	Shift B	33.4	70.0	50.2	95.0
+ 08/21/2013		67.7	81.7	82.8	100.0
+ 08/23/2013		47.6	78.3	66.6	91.3
+ 08/20/2013		43.7	78.2	57.9	96.5
+ 08/25/2013		41.4	75.7	57.4	95.4
+ 08/22/2013		28.8	65.8	45.8	95.6
+ 08/24/2013		17.8	64.9	30.0	91.4
+ 08/19/2013		4.5	54.0	9.3	88.8
< 					
Totals		38.3	71.7	55.6	96.2

As the Supervisor investigates Line 4, Shift B — it is interesting that there is a significant Downtime (9.79 hours) vs. Manufacturing Hours of 11.5 hrs. — all attributed to one work order.

Comp ~ Days 8/19/2013 Mon vs. YAG

Context:

+ Add to path

By:Plant **112 Chicago \ ... \ ... \ 172697 172697** ... \ Line \ Shift \ Work_Order \ Work_Order

Product Data_Type Shift Plant Downtime_Code Sequence Line Work_Order Team

Total Plant: 6

		Total Prod Hours		Manufacturing_Hours		Downtime_Hours	
		This	Last	This	Last	This	Last
- 112 Chicago		139.49	77.17	97.70	63.92	41.79	13.25
+ LN7		11.13	0.00	10.00	0.00	1.13	0.00
+ LN6		0.00	16.07	0.00	13.67	0.00	2.40
- LN4		50.14	0.00	34.17	0.00	15.97	0.00
- B Shift B		21.29	0.00	11.50	0.00	9.79	0.00
- 172697 172697		21.29	0.00	11.50	0.00	9.79	0.00
- 500618		21.29	0.00	11.50	0.00	9.79	0.00
+ A Shift A		28.85	0.00	22.67	0.00	6.18	0.00
+ LN3		19.04	14.88	13.72	9.33	5.32	5.55
+ LN2		35.66	20.86	23.91	17.42	11.75	3.44
+ LN1		0.77	0.00	0.00	0.00	0.00	0.00
Totals		398.36	410.69	311.90	343.66	84.10	64.97

The cause of Downtime is attributed to Machine Error — thus the Supervisor's next call is to the operator and Maintenance Dept.

Comp ~ Days 8/19/2013 Mon vs. YAG

Context: 112 Chicago > LN4 > B Shift B > +

By:Downtime_Code Machine Error ... \ Work_Order_Product

Product Data_Type Shift Plant Downtime_Code Sequence Line Work_Order Team

Total Downtime_Code: 2

	Cases_Produced	Manufacturing_Hours	Total Prod Hours	Downtime_Hours
	This Last	This Last	This Last	This Last
Machine Error	0 0	0.00 0.00	9.79 0.00	9.79 0.00
.	3,864 0	11.50 0.00	11.50 0.00	0.00 0.00
Totals	3,864 0	11.50 0.00	21.29 0.00	9.79 0.00

Other Scenarios for other plants, lines, shifts also point to Machine Error and Changeover as causes for Downtime — thus impacting Availability.

Comp ~ Days 11/5/2011 Sat vs. 11/4/2011 Fri

Context: 109 Rochester > LN1 > 1 Shift 1 > 93079 93079 > +

By:Downtime_Code Machine Error ... \ Team

Product Data_Type Shift Plant Downtime_Code Sequence Line Work_Order Team

Total Downtime_Code: 3

	Total Prod Hours	Manufacturing_Hours	Downtime_Hours
	This Last	This Last	This Last
Machine Error	3.43 0.00	0.00 0.00	3.43 0.00
Changeover	0.03 0.00	0.00 0.00	0.03 0.00
.	4.50 0.00	4.50 0.00	0.00 0.00
Totals	7.96 0.00	4.50 0.00	3.46 0.00

Comp ~ Days 12/10/2012 Mon vs. YAG

Context: 140238 140238 > 510044 > +

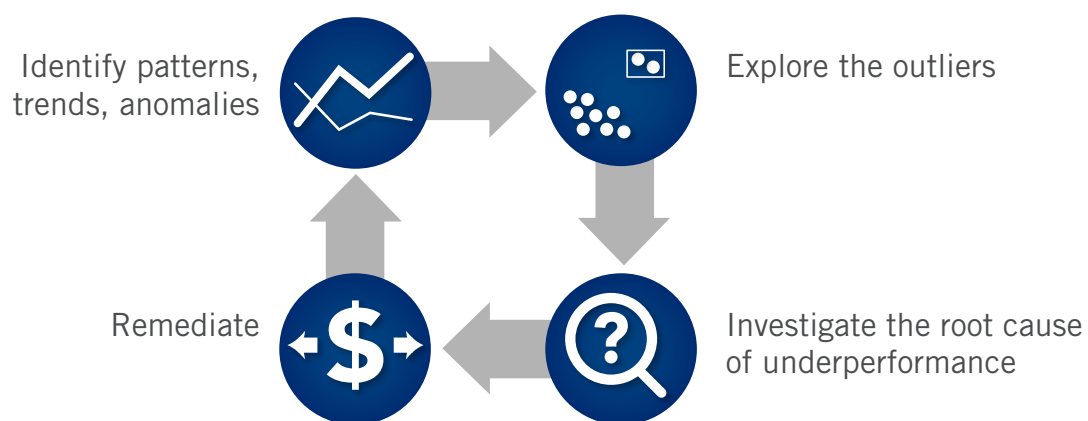
By:Downtime_Code Water Change ... \ PackageGroup

Product Data_Type Shift Plant Downtime_Code Sequence Line Work_Order Team

Total Downtime_Code: 5

	Total Prod Hours	Manufacturing_Hours	Downtime_Hours
	This Last	This Last	This Last
.	0.50 0.00	0.00 0.00	0.50 0.00
.	1.66 0.00	0.00 0.00	1.66 0.00
.	0.85 0.00	0.00 0.00	0.85 0.00
Lub,Adj,Ins,Repair	0.50 0.00	0.00 0.00	0.50 0.00
.	4.50 0.00	4.50 0.00	0.00 0.00
Totals	8.01 0.00	4.50 0.00	3.51 0.00

Other scenarios explored the Salient Management path of Continuous Improvement:



These scenarios found opportunities to:

- 1** Increase revenue capture through avoidance of lost business due to capacity issues
 - 2** Reduce inventory, outsourcing and capital requirements due to improved capacities, predictability, and shorter lead times
 - 3** Reduce material variance and COGS due to identification of “bad parts” causes
 - 4** Increase productivity of direct and indirect labor due to reduced waste and improved scheduling effectiveness
-and many more...

Conclusion

While Overall Equipment Effectiveness is one metric, it encompasses a broad set of variables that ultimately determine the capabilities of the respective production scope. The business impact of OEE improvement can be very significant. This is especially important for bottleneck operations and/or businesses. OEE not only tracks the output potential, it also provides insight as to areas of improvement which can have the greatest impact on the top and bottom lines of the business.

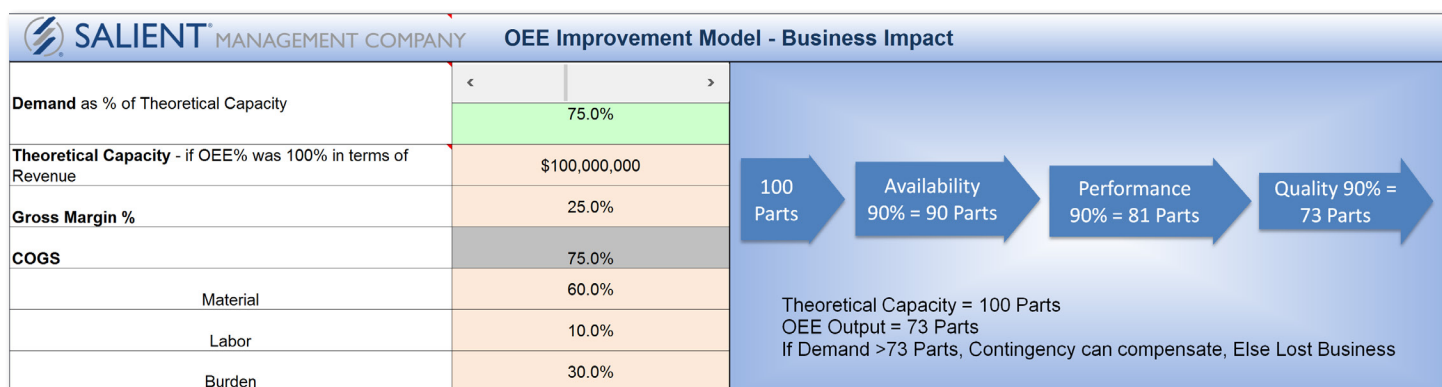
The OEE Improvement Model can be used for a sensitivity analysis, and considers the key factors that impact the measure including OEE GAP, OEE Factors (A%, P%, Q%), Contingency type and amount, Investment to improve, and Demand. It is conceivable that each 10 Point improvement in OEE results in 3 to 5 Points of Gross Margin – although results depend on the underlying variables. Additionally, another 1 to 3 Points of Gross Margin are benefits when Salient Management solutions for Performance Accounting and Decision Support are used to proactively manage the business.

So What? – Alignment of OEE to your business objectives will enable a significant impact to your bottom line by, not only giving you an indication of how you are tracking to the metric, but also providing a path for continuous improvement. By understanding the business impact of each factor, and each action, you will focus your resources most effectively.

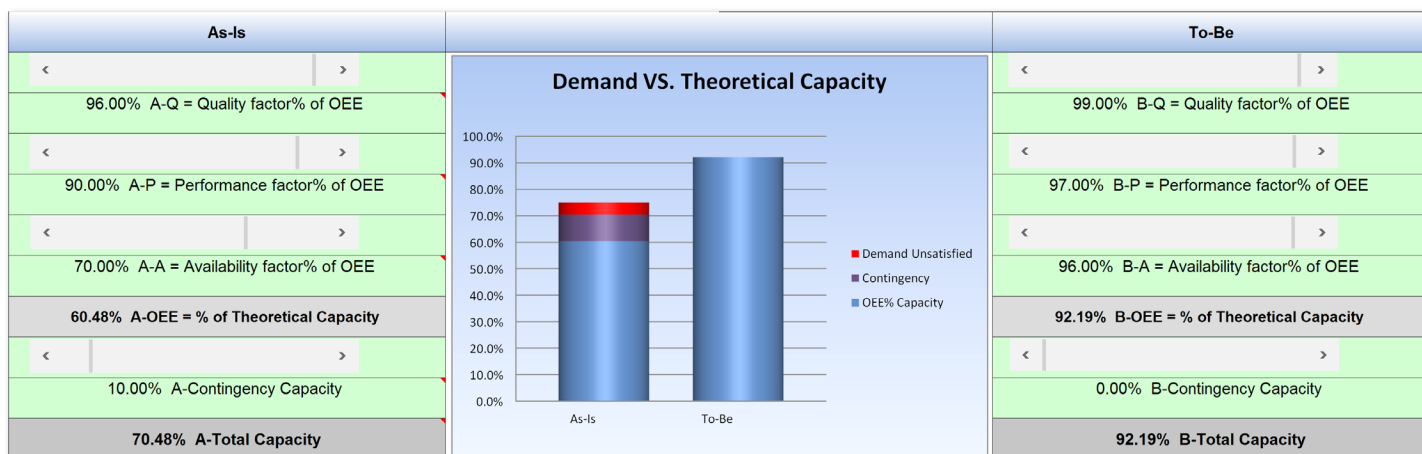


Appendix

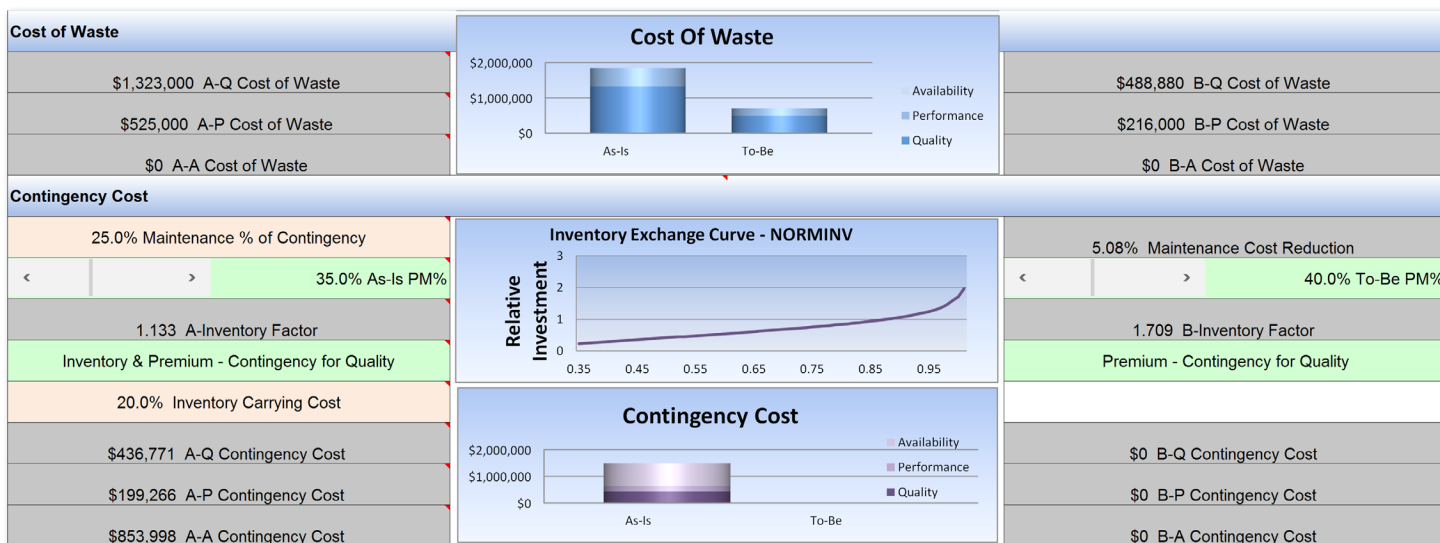
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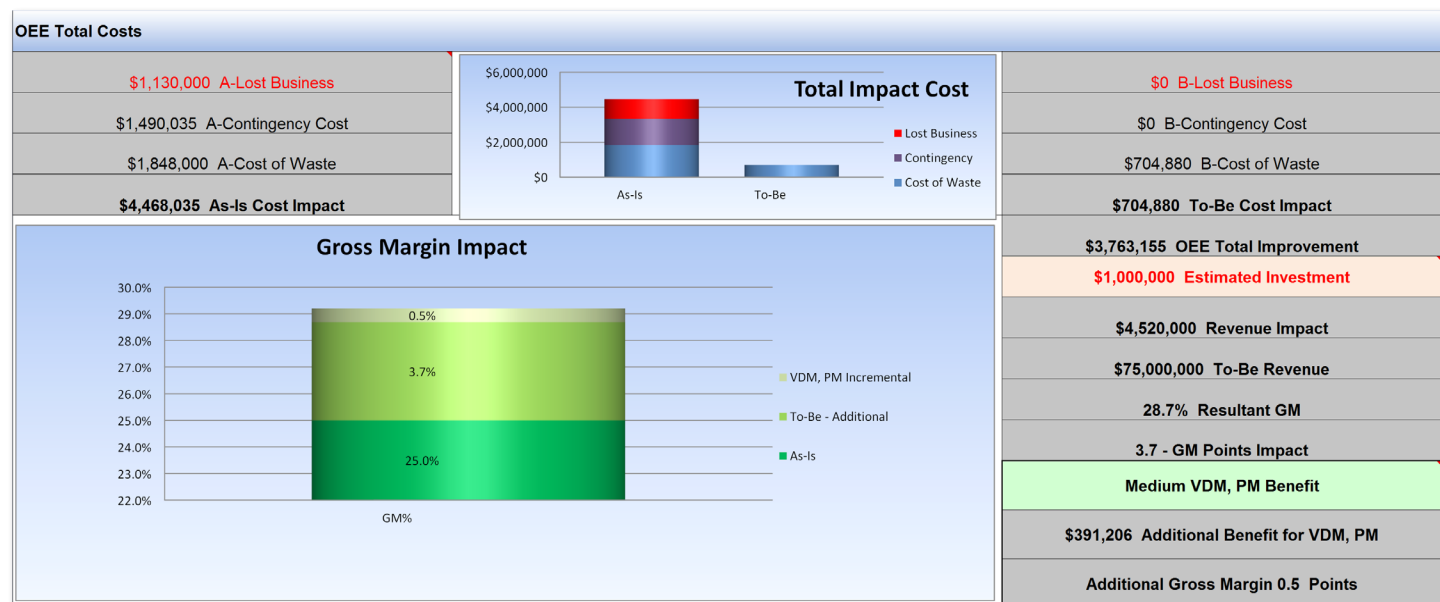
Screen 1 – Business Model Scenario (establishes the Theoretical Capacity, Demand relative to Capacity, and Cost Structure).



Screen 2 – OEE Gap (establishes the As-Is and To-Be OEE factors, and identifies whether Contingency capacity is available).



Screen 3 – Cost Factors (establishes the various cost components of As-Is OEE vs. To-Be OEE). This screen identifies the levels of Preventative Maintenance and methods of contingency (inventory or premium).



Screen 4 – OEE Gap Results (establishes the value of improving the OEE). This screen shows the comparison of As-is and To-Be OEE costs. The net improvement is reflected in the impact by \$ and Gross Margin Points. It also shows the incremental benefits of utilizing Salient Management's Performance Accounting and Decision Support solutions.
See Eric Frantz (efrantz@salient.com) for model demonstration.



Eric Frantz – VP, Value Assurance

- 30+ years in management and consulting positions with Salient, Cincinnati Milacron, Ernst & Young, Goulds Pumps ITT, Xelus, eLogic Group, QAD, Infor
- Focused career on Business Case - business change to Value
- University of Cincinnati - BS Mechanical Eng, MBA Operations Mgt
- Certified in Production and Inventory Management (CPIM) with The Association of Operations Management (APICS).

Eric has held management and consulting positions with Salient, Cincinnati Milacron, Ernst & Young, Goulds Pumps ITT, Xelus, eLogic Group, QAD, Infor and as an independent. He has focused much of his career on the translation of business objectives and policies into individual contributor actions.

Eric has developed unique techniques in mapping Value to business change, both in the capital appropriation process and through performance management systems. This entails knowing how to speak the C-Level language AND ensuring people understand their alignment to the company goals.

About Salient

Salient Management Company offers business and government a new solution for efficient management. Drawing on diverse data from multiple sources, Salient's technology measures how business activity creates value, quality, financial efficiency and productivity, while the user eliminates barriers to using this knowledge for continuous improvement.

Salient provides the world's most advanced performance accounting and decision support systems. Founded in 1986, Salient today serves more than 115,000 users in 61 countries.

For more information, visit www.salient.com.

