

SHUTDOWN / TURNAROUND / OUTAGE (STO) OPTIMIZATION SERVICES

- ✓ Optimize Labor Utilization
- ✓ Improve Contractor Management
- ✓ Standardize Processes
- ✓ Reduce STO Cost
- ✓ Decrease STO Duration
- ✓ Increase Plant Availability and Reliability
- ✓ Decrease Risk Through Statistical Analysis



Shutdown/Turnaround/Outage (STO) Readiness Index Sample Timeline and Methodology

The Readiness Index (RI) increases the probability of a successful STO and lowers the probability of unexpected and costly problems. The RI process is cost-effective for a wide range of companies; from companies that need to learn “the basics” to companies that only need to “fine tune” their strategy. Don’t guess on your preparedness, have Synterprise give you an objective third-party analysis.

12 months Pre-STO	Duration & Schedule Approval?
	Budget Approval?
	Capital Project Schedules Reviewed?
9 months Pre-STO	Preliminary Schedule Established?
	Long Lead Material Identified & Status Checked?
6 months Pre-STO	Eng. & Long Lead Material Ordered?
	Lessons Learned Reviewed & Incorporated?
5 months Pre-STO	Doc's & Drawings Issued & Received?
	Materials on Schedule?
4 months Pre-STO	Pre-STO Work Scheduled?
	Material Handling Plan in Place?
3 months Pre-STO	Eng. & Long Lead Material on Schedule?
	Non-eng Material on Order?
2 months Pre-STO	Integrated Schedule in Place?
	Manpower Curves in Place & Levelized?
1 month Pre-STO	Scope Frozen?

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Labor Utilization Studies

Labor Utilization Studies, sometimes referred to as “wrench-time studies”, are designed to collect information about how workers are spending their on-the-job time. Outage craft performance is the most common measurement, but the same methodology can be used to measure contractor performance, capital project contractor performance, plant routine maintenance effectiveness and operations labor effectiveness. The methodology is based on standard Industrial Engineering principles and statistical computations that have been in use for many years. The proprietary Synterprise methodology also includes a statistically-valid randomized data collection process.

The typical application of the Labor Utilization Study methodology involves data collection during every shift, including 30 minutes before and after each shift. The statistical analysis does not require data collection during the entire duration of the STO. The time required for high-confidence-level results depends on the number of crafts, workers, and contractors plus the complexity of the STO projects and plant site. Typical large and complex STOs only require three data collectors working for three to five weeks. The number and duration of data collection is determined by the number of observations required for a statistically valid analysis

Please note that the data used in these tables is “example only” and does not represent actual study results or accurate numbers for “Typical”, “Best Practices” and “World Class”. Synterprise customer reports include current and correct calculations for each of these comparisons.

SUMMARY					
GROUP	EXAMPLE OUTAGE SPRING 2008 LABOR UTILIZATION STUDY PERFORMANCE DATA COMPARISONS				
	CURRENT RESULTS	[CURRENT VS. WORLD CLASS] ROUTINE PERFORMANCE IMPROVEMENT TARGET [2008 - 2010]			
ACTIVITY	TOTAL EXAMPLE	FALL 2007 BASELINE	INDUSTRY BEST PRACTICE	WORLD CLASS	CURRENT VS. WORLD CLASS
Hands On	27.14%	33.83%	42.80%	48.00%	-20.86%
Assist	0.00%	0.23%	2.20%	2.00%	-2.00%
DIRECT	27.14%	34.06%	45.00%	50.00%	-22.86%
Plan & Instruct	10.62%	7.79%	5.43%	6.00%	4.62%
Tools & Materials	13.27%	11.13%	8.34%	7.00%	6.27%
Work Wait	7.67%	7.90%	5.91%	6.00%	1.67%
Transport	12.68%	9.47%	9.87%	8.00%	4.68%
Elevator Wait	2.65%	1.00%	1.88%	2.00%	0.65%
INDIRECT	46.90%	37.29%	31.43%	29.00%	17.90%
Travel	16.22%	16.30%	12.35%	12.00%	4.22%
General Wait	6.78%	4.66%	5.22%	5.00%	1.78%
Breaks	2.36%	3.44%	4.00%	2.00%	0.36%
LS / EQ	0.59%	4.10%	2.00%	2.00%	-1.41%
NA	0.00%	0.15%	0.00%	0.00%	0.00%
DELAY	25.96%	28.65%	23.57%	21.00%	4.96%
TOTAL	100.00%	100.00%	100.00%	100.00%	0.00%

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Statistically-Valid Data Reduces the Risk of Capital Expenditures

The following table illustrates how statistically-valid data can be used to improve capital improvement decision-making. The performance gains shown below were accomplished by improving break-area location and improved elevator usage. This company required a ROI pay-back of 18 months or less. Given that three Outages would occur during the following 18 month period, it was calculated that up to \$1,719,000 (3 x \$573,000) could be justifiably spent and still stay within the corporate ROI guidelines. The actual cost was less than \$1,200,000. Thus, the decision was easy and stress-free because the decision was made using results that were based on statistically valid data. The “numbers told the story” rather than reliance on personal judgment or anecdotal evidence.

Example Labor Utilization Improvement for Consecutive Outages at the Same Plant

CATEGORY	ACTIVITY	OUTAGE #1	OUTAGE #2	% CHANGE	TREND
		UNIT 3	UNIT 4		
CATG. 1	Hands On	32.01%	38.67%	6.66%	IMPROVED
CATG. 2	Assist	7.03%	8.01%	0.98%	
	DIRECT	39.04%	46.68%	7.64%	IMPROVED
CATG. 3	Plan & Instruct	5.15%	5.00%	-0.15%	IMPROVED
CATG. 4	Tools & Materials	11.27%	10.54%	-0.73%	IMPROVED
CATG. 5	Work Wait	7.03%	7.85%	0.82%	
CATG. 6	Transport	6.15%	6.96%	0.81%	
CATG. 7	Elevator Wait	1.90%	1.23%	-0.67%	IMPROVED
	INDIRECT	31.50%	31.59%	0.09%	UNCHANGED
CATG. 8	Travel	8.78%	6.74%	-2.04%	IMPROVED
CATG. 9	General Wait	2.92%	3.91%	0.99%	
CATG. 10	Breaks	4.38%	3.06%	-1.32%	IMPROVED
CATG. 11	LS / EQ	13.37%	8.02%	-5.35%	IMPROVED
CATG. 12	NA	0.07%	0.00%	-0.07%	IMPROVED
	DELAY	29.52%	21.74%	-7.78%	IMPROVED
	TOTAL	100.00%	100.00%		

Comments:

Both Outages had similar scope

Both Outages had average labor cost of \$60 so a 1% improvement = \$.60 per hour

The second Outage had 125 craft for 50 days and two 10 hr shifts = 125,000 man hours

The benefit of 1% improved labor utilization: 125,000 hrs x \$.60 = \$75,000

The benefit of improved labor utilization this Outage: \$75,000 x 7.64 = \$573,000

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How to Negotiate Low-Risk “Gain Share” Labor Contracts

The following table could be used to make comparisons between contractors and/or to negotiate more advantageous labor contracts. Once contractors understand the methodology, they are more willing to commit to “gain sharing” contracts calculated by a third-party. Both companies and contractors can improve profitability from higher labor productivity.

EXAMPLE OUTAGE LABOR UTILIZATION TOTALS FOR CRAFTS AND CONTRACTOR							
ACTIVITY	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	WEIGHTED AVERAGE
	MECHANICAL	ELECTRICAL	CONTRACTOR 1	CONTRACTOR 2	CONTRACTOR 3	CONTRACTOR 4	
Hands On	36.19%	33.02%	36.84%	44.61%	42.76%	29.31%	37.79%
Assist	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DIRECT	36.19%	33.02%	36.84%	44.61%	42.76%	29.31%	37.79%
Plan & Instruct	10.00%	12.74%	6.43%	6.27%	6.44%	1.72%	6.77%
Tools/Materials	9.52%	6.60%	5.44%	11.03%	13.79%	0.00%	9.13%
Work Wait	5.71%	4.72%	11.62%	8.77%	9.43%	6.90%	8.49%
Transport	16.67%	13.68%	15.95%	9.27%	11.95%	24.14%	13.99%
Elevator Wait	5.71%	2.83%	2.60%	2.01%	0.46%	0.00%	1.98%
INDIRECT	47.62%	40.57%	42.03%	37.34%	42.07%	32.76%	40.37%
Travel	11.90%	19.81%	15.70%	12.28%	10.80%	24.14%	16.20%
General Wait	1.90%	4.72%	2.97%	4.76%	3.22%	3.45%	3.97%
Breaks	0.95%	1.89%	0.87%	0.50%	0.23%	1.72%	0.67%
LS / EQ	1.43%	0.00%	1.61%	0.50%	0.92%	8.62%	1.01%
NA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DELAY	16.19%	26.42%	21.14%	18.05%	15.17%	37.93%	21.85%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Example “Gain Share” Contract Process and Calculation

Step One: Calculate the contractor’s current “direct labor”. The statistically-valid results from Labor Utilization Studies are typically used to determine a “mutually agreed upon” baseline number.

Step Two: Set a reasonable goal for direct labor improvement

Step Three: Determine the number of craft workers, the total number of hours they are budgeted to work and the average cost per hour.

Step Four: Negotiate a “fair” distribution of the expected gain in productivity.

Step Five: Conduct a Labor Utilization Study to calculate actual performance then divide the benefit.

Calculation example: Both sides agree that a 5% increase in productivity is reasonable. The contractor plans to use 100 craft at \$60 per hour, 20 hours per day for 20 days. $100 \times 60 \times 20 \times 20 = \$2,400,000$ labor cost $\times 5\% = \$120,000$ gain to be divided between the company and the contractor per the terms of the agreement.

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Now It's Possible to Reward Good Performance and Set Reasonable Goals

FLEET SUMMARY		LABOR UTILIZATION STUDY SINGLE PLANT COMPARISONS				
GROUP						
	CURRENT VS. OUTAGE RESULTS COMPARISON					CURRENT VS. BEST PRACTICE
ACTIVITY	2008 PLANT OUTAGE	2007 FLEET BASELINE	TYPICAL UTILITY DATA	INDUSTRY BEST PRACTICE	2008 VS. BEST PRACTICE	2008-2010 GOAL
Hands On	36.23%	35.04%	27.27%	50.86%	-14.63%	14.63
Assist	1.69%	1.13%	9.42%	16.68%	-14.99%	14.99
DIRECT	37.91%	36.17%	36.69%	67.54%	-29.63%	29.63%
Plan & Instruct	6.85%	7.59%	5.46%	3.25%	3.60%	3.60%
Tools & Materials	7.07%	7.45%	8.47%	6.78%	0.29%	0.29%
Work Wait	8.14%	7.22%	6.23%	4.13%	4.01%	4.01%
Transport	3.95%	4.69%	6.37%	3.47%	0.48%	0.48%
Elevator Wait	4.52%	3.75%	6.14%	2.20%	2.32%	2.32%
INDIRECT	30.53%	30.70%	32.68%	19.83%	10.70%	10.70%
Travel	10.46%	12.66%	8.38%	3.60%	6.86%	6.86%
General Wait	9.11%	9.59%	4.95%	5.03%	4.08%	4.08%
Breaks	5.58%	3.26%	4.64%	2.00%	3.58%	3.58%
LS / EQ	6.41%	7.61%	12.66%	2.00%	4.41%	4.41%
NA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DELAY	31.55%	33.12%	30.63%	12.63%	18.92%	18.92%
TOTAL	100.00%	100.00%	100.00%	100.00%	0.00%	29.63%

Mutually-acceptable goals are easy to set when you use industry benchmarks. Using third-party statistically-valid measurements builds trust and consistency across the organization.

Why Synterprise?

Many power-generation companies depend on Synterprise to calculate fleet-wide and multi-year labor utilization. These comparisons include "Performance this STO vs. Previous STO", "Plant vs. Fleet", "Plant vs. Typical", "Plant vs. Best Practices", "Plant vs. World Class", "Fleet Comparison by Plant", "Fleet vs. Typical", "Fleet vs. Best Practices", and "Fleet vs. World Class".

The Synterprise Labor Utilization Study methodology is rapidly becoming the power-generation industry standard. The Synterprise STO database includes millions of labor activity observations. This allows for several types of statistically-valid comparisons and provides a statistically high confidence level for Synterprise recommendations. Synterprise's approach is to "let the numbers speak for themselves" thus limiting prejudice based on personal opinion and anecdotal evidence.

"The ROI we can expect to derive in 12-18 months . . . is a ratio of 20:1 for the cost of the program..."
Outage Plant Manager, Imperial Oil

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Shutdown Turnaround Outage Improvement Tools

- ✓ Planned Outage Labor Utilization Studies
- ✓ Coaching and Staffing
- ✓ STO Readiness Assessments (Planned)
- ✓ STO Readiness Assessments (Planning for Unexpected Production Interruptions)
- ✓ STO Process Integration to Planning/Scheduling/Maintenance Software (Maximo, SAP, Primavera)
- ✓ “Best Practice” process development and documentation
- ✓ Gap Analysis Against Industry Standards
- ✓ Capital Project Labor Utilization Studies
- ✓ Routine Maintenance Labor Utilization Studies
- ✓ Work Package Development and Optimization (Materials, Human Resources, Drawings, Tools/Equipment)
- ✓ Decision support for Capital Improvements – Receive high confidence level ROI calculations based on a statistically-valid methodology
- ✓ “Best Practice” training at plant site or in fleet-wide seminars

Projected STO Direct Labor Performance by Using Synterprise Methodology and Recommendations

