

Operation & Production Improvement Plan

Today's Mill Manager needs to **develop a clear vision** of the mill's future, and then put in place the people and resources to get it done.

Quad's **Operation & Production Improvement Plan** uses a computerized simulation model of the mill operation to allow the mill vision to be organized and quantified to ensure success. This includes:

- Identify how to improve the operation so the mill operators can be more productive and get the most out of the existing equipment.
- Develop a solid mill improvement plan that ensures capital spending yields the desired return on investment (ROI)
- Quantifying the effect of any changes or improvements ensures that the resources (people and money) are put in the right place at the right time.

The Operation and Production Improvement Plan is a tool to better understand the mill and clearly see the **production improvements opportunities**. The effects of people, process and technology are considered:

Simulation Summary

Annual Production:		625,000		
Total Hours:		8,000	% Total Time	
Total Unscheduled Delay Hours		1,750		21.9%
Gap Time between Billets	350		4.4%	
Cobbles	240		3.0%	
Mechanical	225		2.8%	
Electrical	195		2.4%	
Operational Mill	390		4.9%	
Operational Finishing	350		4.4%	
Other	0		0.0%	
Total Scheduled Delays		855		10.7%
Product Changes	210		2.6%	
Pass Changes	245		3.1%	
Sizing & Adjustments	175		2.2%	
Heat Changes	150		1.9%	
Finishing End Changes	75		0.9%	
Total Rolling Hours at Bottleneck		5,395		67.4%
Tons per Scheduled hour	78.1			
Tons per Rolling hour	115.8			
Shift Utilization	67.4%			
Cobble Rate	0.60%			
Defect Rate	0.8%			
Billet Yield	96.5%			
Total Prime Yield	95.1%			

- **People** – are the crews working effectively and consistently. Is there too much variation between crews?
- **Process** – are the pass design and setup sheets optimized to maximize TPH, yield and utilization?
- **Technology** – is the equipment functioning properly (delays) and would revamping or upgrading selected equipment increase productivity. When changes are made, where will the production limit (bottleneck) move to?

Operation & Production Improvement Plan

The simulation results are clearly summarized using the key production indicators used daily to monitor the plant operation. TPH, yield, utilization, delays, cobbles, product changes and achieve section are a few of the common key indicators used.

Improvements are converted into yield and productivity increases for each case so the financial benefits can be quantified.

Phased Simulation Summary

	Phase 1	Phase 2	Phase 3
Annual Production:	430,000	452,000	474,000
Total Hours:	8,000	8,000	8,195
Total Unscheduled Delay Hours	1,995	1,862	1,781
Gap Time between Billets	826	704	640
Cobbles	289	295	278
Mechanical	359	343	343
Electrical	264	264	264
Mill Operations	64	64	64
Finishing Operations	192	192	192
Total Scheduled Delays	1,613	1,542	1,595
Product Changes	591	472	472
Pass Changes	202	208	219
Adjustments	266	280	294
Heat Changes	459	483	506
Finishing End Changes	94	99	104
Total Rolling Hours at Bottleneck	4,393	4,595	4,819
Tons per Scheduled hour	53.7	56.5	57.8
Tons per Rolling hour	97.8	98.4	98.4
Shift Utilization	54.9%	57.4%	58.8%
Cobble Rate	0.63%	0.62%	0.55%
Defect Rate	0.80%	0.80%	0.80%
Billet Yield	96.50%	96.50%	96.50%
Yield	95.07%	95.08%	95.15%

Additional Tons during Rolling Hours	14,050	22,290	21,740
% improvement	3.4%	5.2%	4.8%
Increased Rolling Time (hours)	145	202	225

Yield Improvement (%)	0.03%	0.02%	0.07%
Yield Improvement Tons	110	76	311

the simulation. The effects of changes to the product mix, rolling schedule, order sizes, number of crews or scheduled shifts, etc can all be simulated and the effects quantified.

As improvements are implemented, the mill simulation can be updated and the next phases re-forecast to reflect the new current operating condition and the new projected benefits and ROI.

The current operating conditions and equipment design are used to establish the existing mill operating capability.

A computerized simulation of the mill operation is developed and verified using the prior year's production results. The mill simulation quantifies the effects of any operating or equipment changes to determine the overall production improvement.

Combining the capital cost estimates with operating improvements determine the return on investment (ROI) for any proposed changes.

The long term improvement plan is summarized onto phases showing the benefits and ROI.

The current product mix or a future projected product mix can be used in