



An Introduction to Mining Business Improvement Initiatives – Mapping the Steps to Increased Profits

Mike Beare, Minex Conference 2009

WHAT IS BUSINESS IMPROVEMENT?

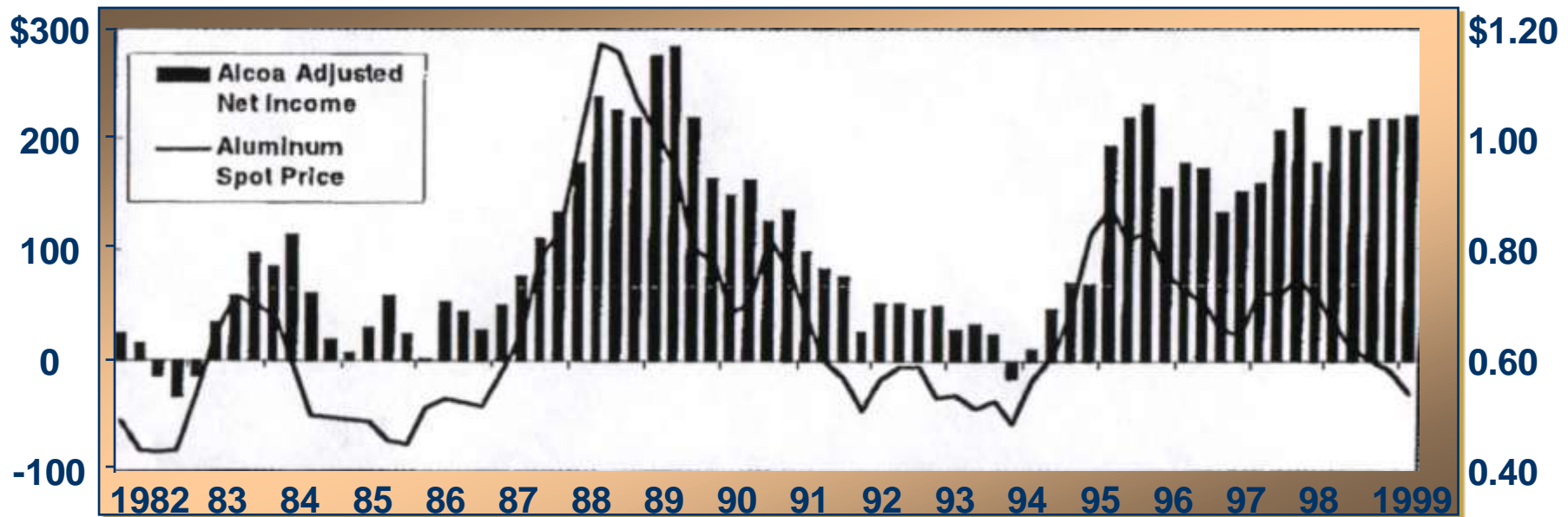
- Achieving more with less. Utilise existing equipment and people more effectively to impact the bottom line of a business. Its about identifying and improving efficiency
- Large subject, has various names e.g. Continuous Improvement, Kaizen, Six Sigma, Barrick Operating System, etc
- Based on applying various principles to analyse, diagnose and implement improvements to production system or organisation
- Uses a structured approach and covers strategic, technical and operational matters
- Various tools can be applied to assist in the process – eg RCPS, decision trees, focused interviews, time studies, work studies etc
- Despite jargon, it is not technically complicated or difficult - process driven

WHY DO WE NEED TO APPLY BUSINESS IMPROVEMENT (2)?

- Increase return on investment for share holders
- Cost curve position. Cyclical nature of industry means that every 4-7 years prices slump and its beyond our control, our efficiency is something we can control – cannot gamble on the commodity prices going up
- Our competitors are doing it and they will force us up the cost curve if we don't (eg British Coal efficiency drives in 1980s)
- Our strategy will be out of date if we don't review regularly – this could result in us losing out to competitors
- Ethical reasons – a green perspective can be attractive to investors or even a prerequisite for some. There can be strong financial incentives to going green

ALCOA PROFITS INCREASE DESPITE A LONG SLUMP IN METAL PRICES

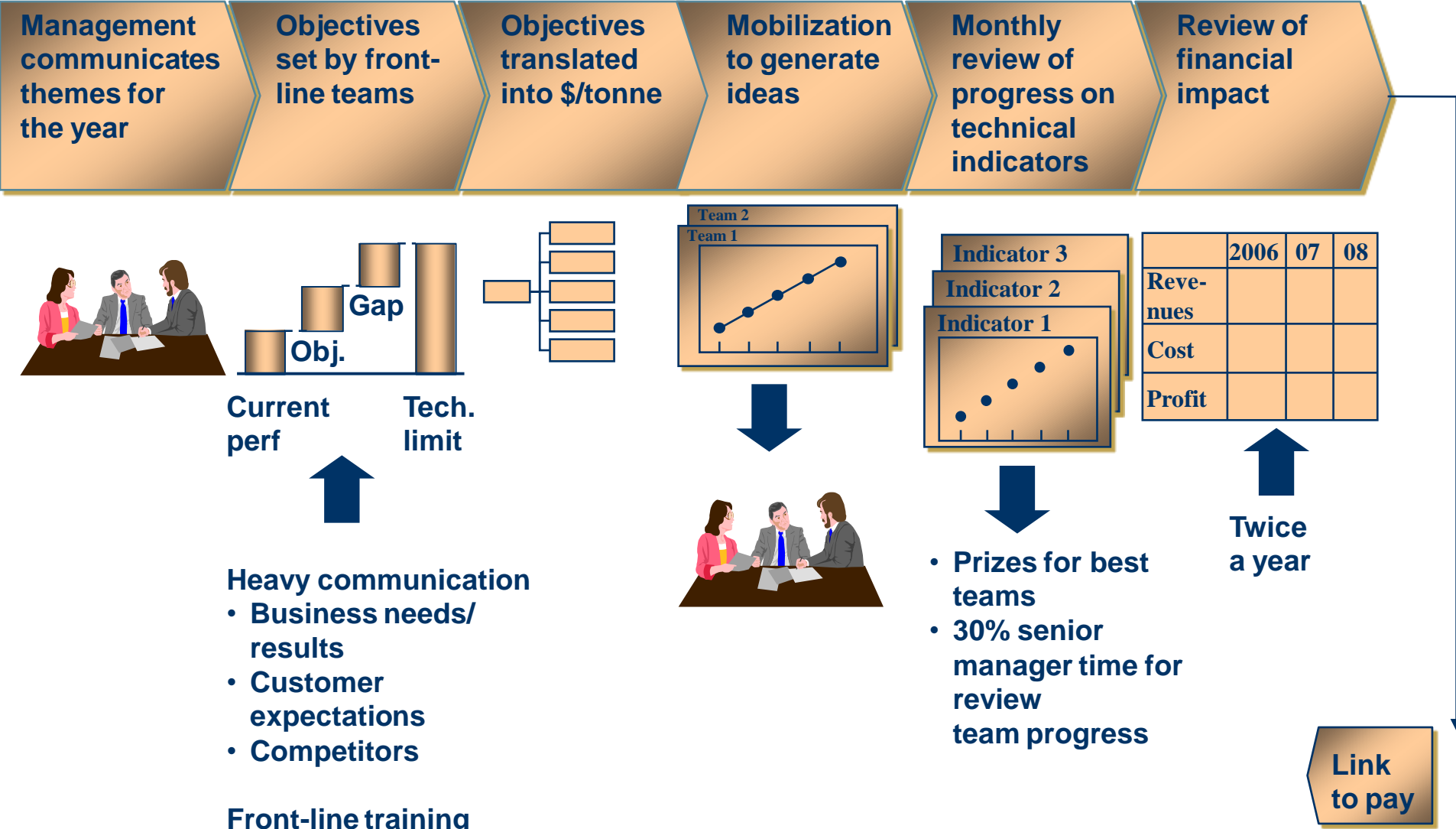
Adjusted net income in \$ millions (left axis), and spot price of aluminium in \$/lb on the London Metal Exchange (right axis)



* Alcoa's quarterly net income adjusted for special items

Source: Platt's Metals Week; Wall Street Journal; McKinsey Metals Practice

SUCCESSFUL COMPANIES “PULL” IMPROVEMENTS FROM THE FRONT LINE VS. “PUSHING” THEM



Heavy communication

- Business needs/ results
- Customer expectations
- Competitors

Front-line training

- Prizes for best teams
- 30% senior manager time for review team progress

Twice a year

Link to pay

WHAT IS A TYPICAL BUSINESS IMPROVEMENT PROCESS ?

3-Step Process



- Review Phase – analyse and diagnose the sources of losses
 - Value losses
 - Identify solutions
 - Prioritize solutions
 - Prepare implementation plans
- Make the implementation plans happen
 - Change management – strategy , policy, enhanced working practices, better supervision, training, new technology
- Ensure the improvements are maintained and enhanced through ongoing review and support
 - Instill a culture of continuous improvement
 - Re-set technical limits – ‘raise the bar’

DIAGNOSIS AND ANALYSIS PHASE



Objectives

- Need to find out what is wrong with the operation and what is the most efficient way to fix it.
- Find out where working time is being lost and how more work can be achieved in the time available.
- An analysis of costs is usually required to complete the assessment.
- The inefficiencies are what are normally termed 'avoidable losses' – it's a loss of opportunity but can translate to a direct cash loss

Activities

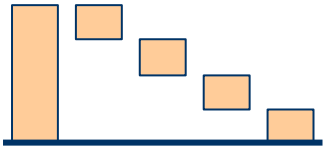
- **Data collection.** This is key. The more accurate data that is available the more analyses can be conducted – a good reporting system is required. Data can also be gathered by interviews and meetings – employees often hold the answers
- **Analysis of data.** The analysis will show where the problems lie and their magnitude
- **Generate technical limits** for top line key performance indicators (KPIs) – target operational improvements
- **Solutions.** After the key losses are identified then solutions are assessed and valued. A matrix approach is applied where solutions that have high impact and high value are implemented

DIAGNOSING THE OPPORTUNITY/SETTING GOALS

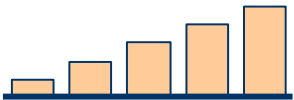


Build a fact base to understand operations

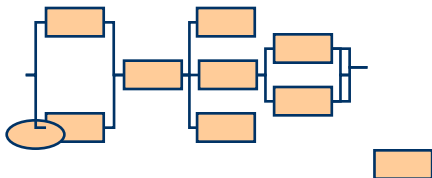
Operating equipment effectiveness



Historical performance



Process maps



Use appropriate tools to set targets

- Theoretical/design limits of equipment (adjust \pm for safety factor)
- Benchmarking
- Repeated best
- Observations/trial
- Management consensus

Key end products

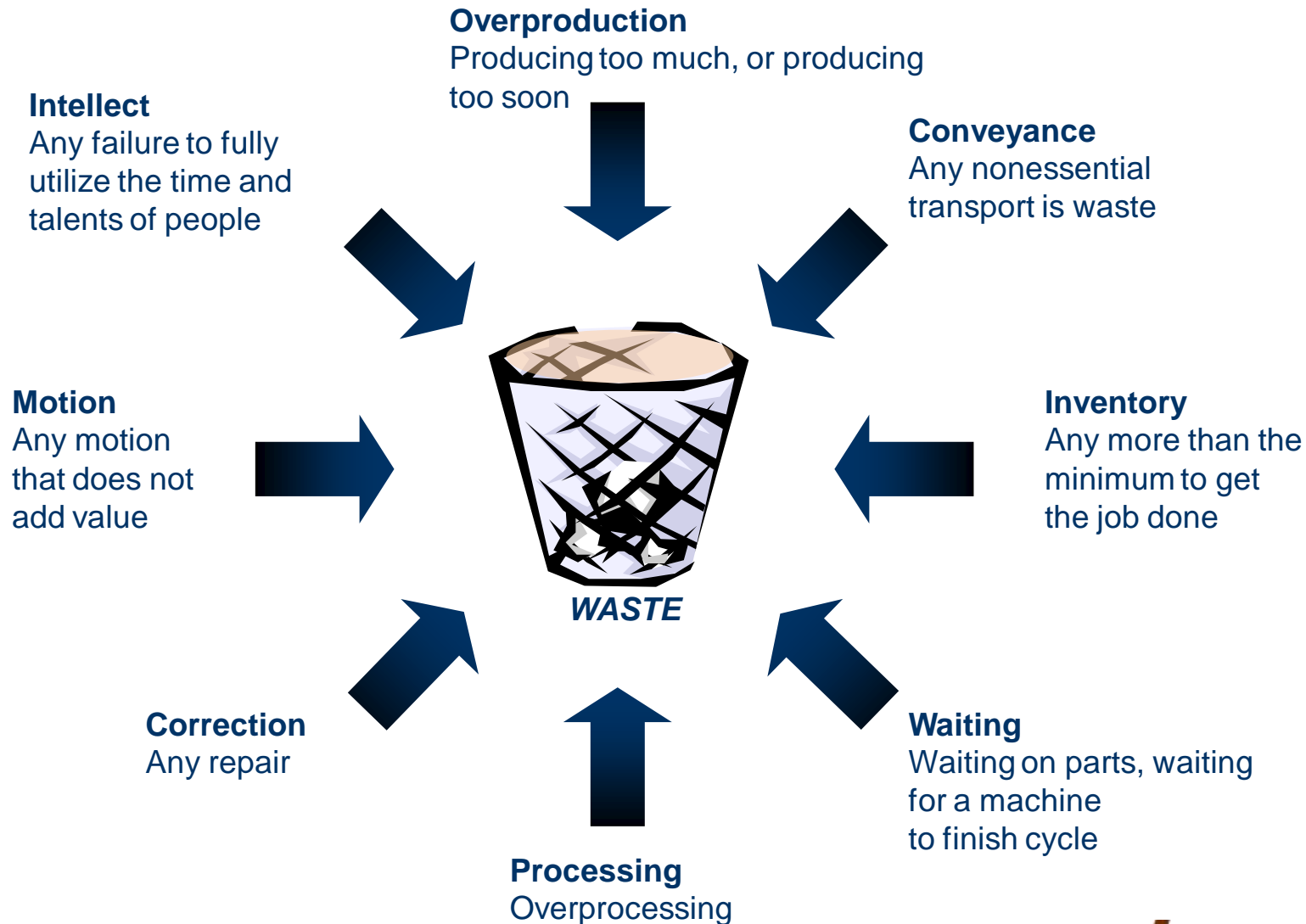
- Solid understanding current operating situation
- Prioritized set of KPIs that drive value
- Specific limits and targets for highest value KPIs

ANALYTICAL TOOLS - MAINTENANCE BENCHMARKING

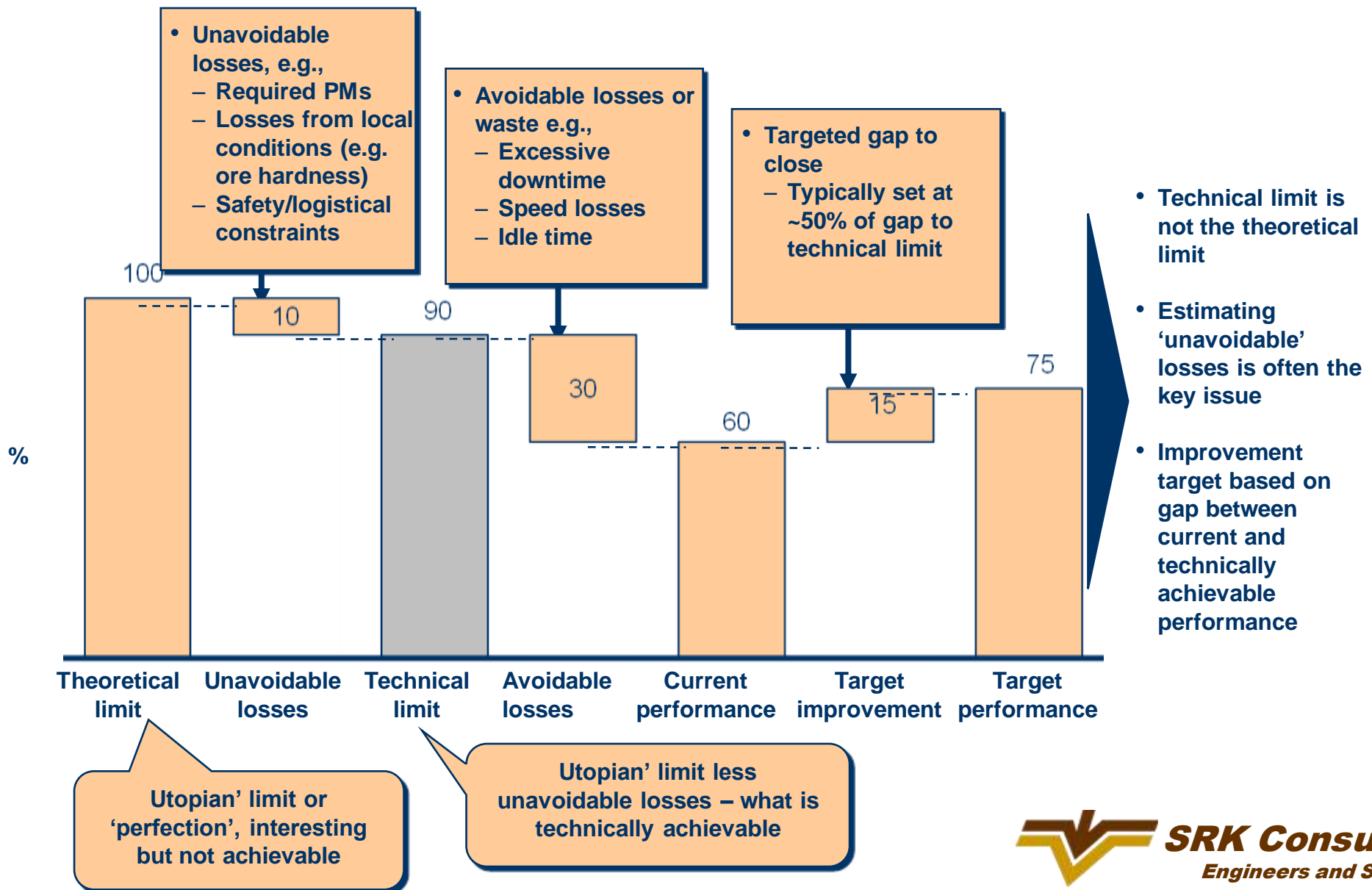


Performance levels	Equipment maintenance strategy	Organization structure	Early equipment management	Spare parts and contractor management
Level 1 "Expert" "Best Practice"	<ul style="list-style-type: none"> • Maintenance strategy is in place with excellent results • Maintenance prevention is the main focus 	<ul style="list-style-type: none"> • Workers are flexible to work in different areas • Team leader concept is fully in use 	<ul style="list-style-type: none"> • Purchasing of equipment is based on total cost of ownership, ramp-up time, changeover time, maintainability, reliability 	<ul style="list-style-type: none"> • Number of vendors reduced • Parts availability, quality, inventories, and usage are under control • Full standardization achieved for all machines/parts
Level 2	<ul style="list-style-type: none"> • Maintenance system exists with good results • Diagnostic tools are introduced • Strategy for major equipment is in place 	<ul style="list-style-type: none"> • Org boundaries crossed often • Span of control appropriate for nature of work/worker skills • Organizational structure clear 	<ul style="list-style-type: none"> • Lifecycle costs part of purchasing decision • All depts are involved in purchasing process • OEE is improving fast • Standardized parts list is widely used 	<ul style="list-style-type: none"> • Vendors are selected • Parts availability and usage daily tracking is in place • Pull replenishment system is in place to reorder parts
Level 3	<ul style="list-style-type: none"> • Machine history is recorded and analyzed • Criticality of parts is understood 	<ul style="list-style-type: none"> • Span of control manageable • Staffing is applied well across shifts • Few classifications exist 	<ul style="list-style-type: none"> • Maintenance is involved in purchasing of new equipment • TCO is defined • Standardization has begun • Model lifecycle cost equipment exists 	<ul style="list-style-type: none"> • Spare parts inventories have been decreased and new standards set • Parts usage is kept under control • Pressure is on parts quality
Level 4 "Basic"	<ul style="list-style-type: none"> • No clear maintenance strategy exists • Breakdown maintenance widely used 	<ul style="list-style-type: none"> • Organizational structure unclear • Large number of classifications • Staffing weak on shifts 	<ul style="list-style-type: none"> • New equipment purchasing is based on initial cost and technical specifications 	<ul style="list-style-type: none"> • Parts usage, quality, availability, and inventories have to be placed under control

PROBLEM-SOLVING TOOLS – 8 KINDS OF WASTE

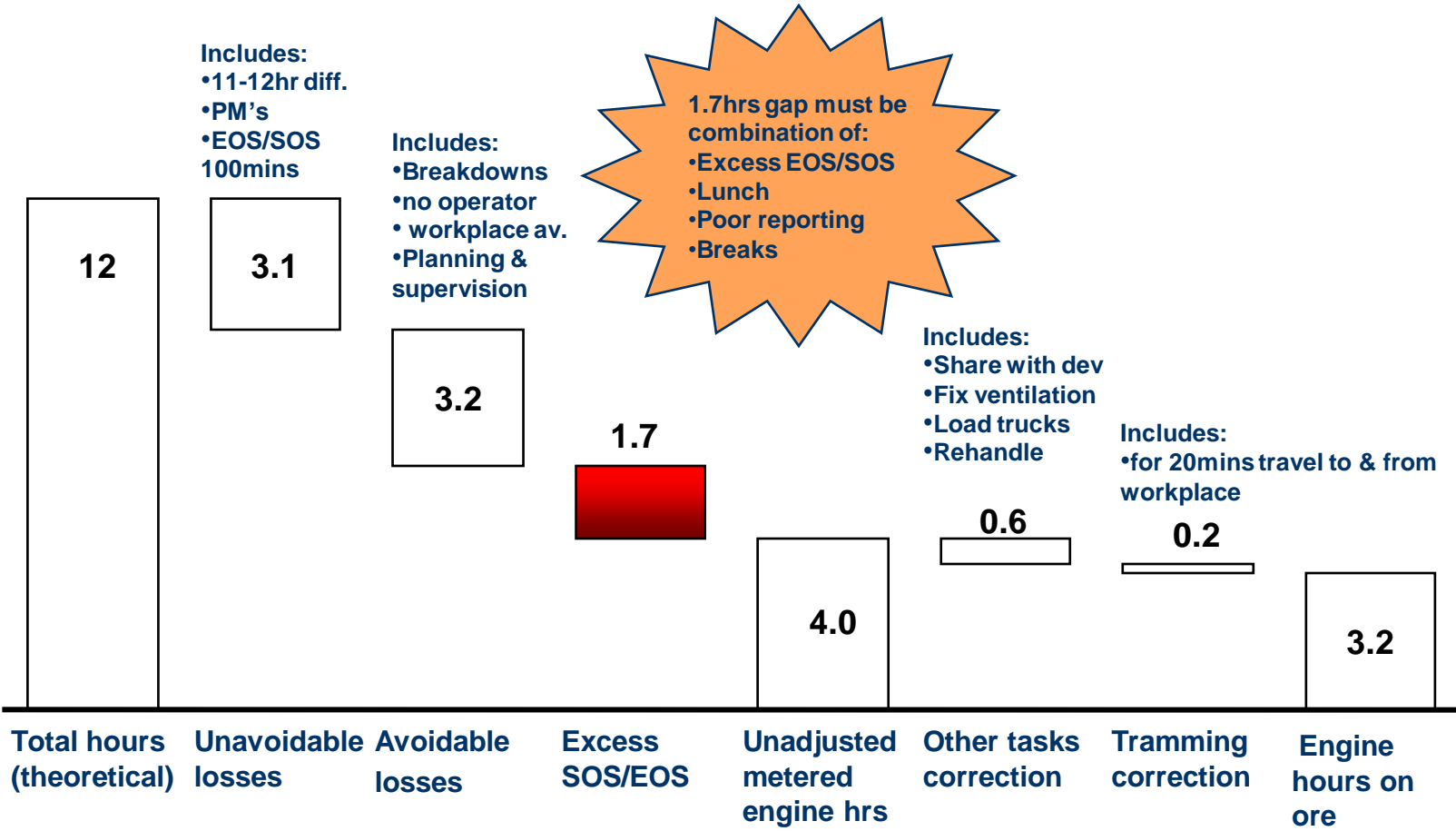


ANALYTICAL TOOLS - TECHNICAL LIMITS



ANALYTICAL TOOLS - EXAMPLE OF TIME LOSSES ON LOADERS

Distribution of working time Hours/shift/loader



NB EOS represents End of Shift and SOS represents Start of Shift
PM is Preventative Maintenance

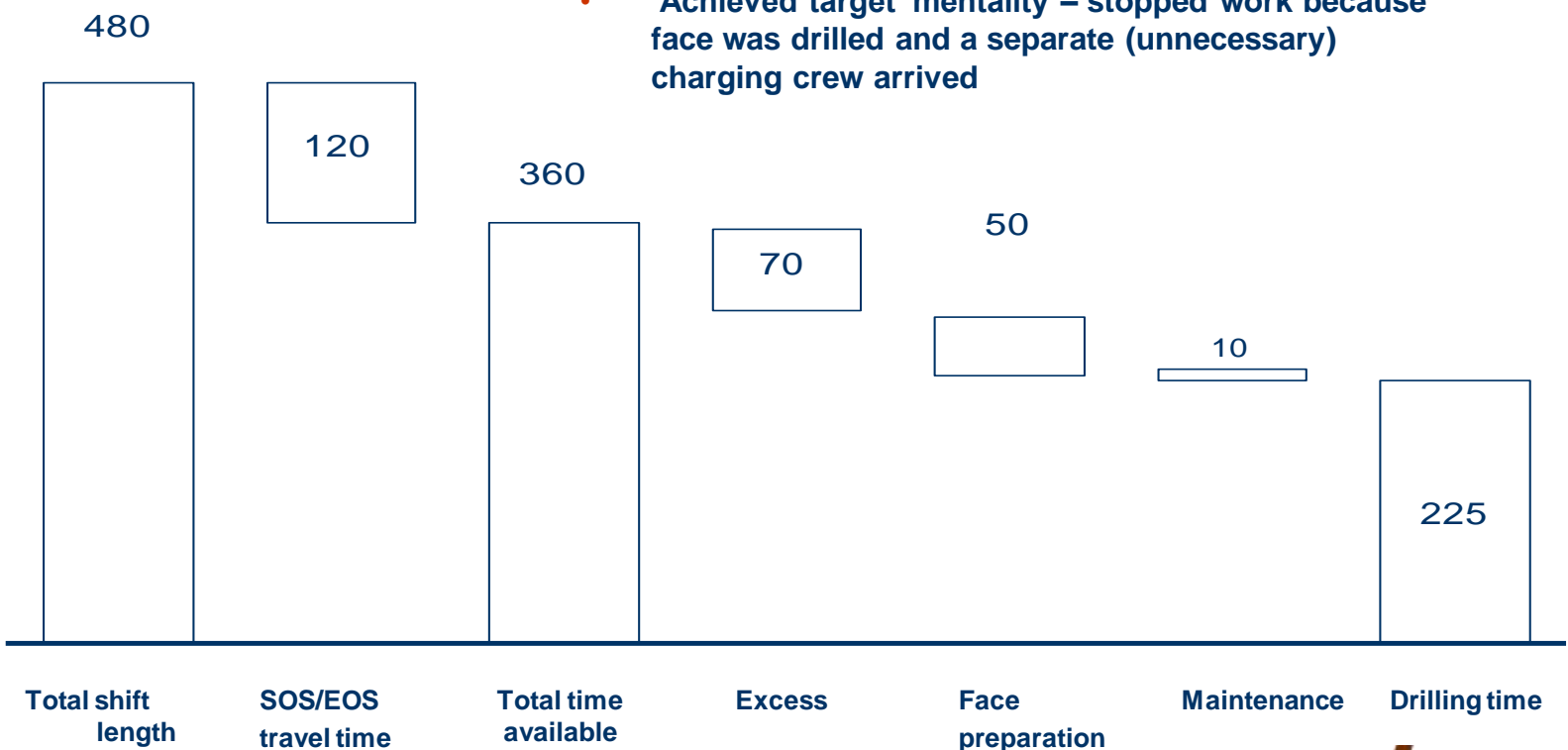


ANALYTICAL TOOLS - EXAMPLE OF TIME LOSSES ON DRILLING

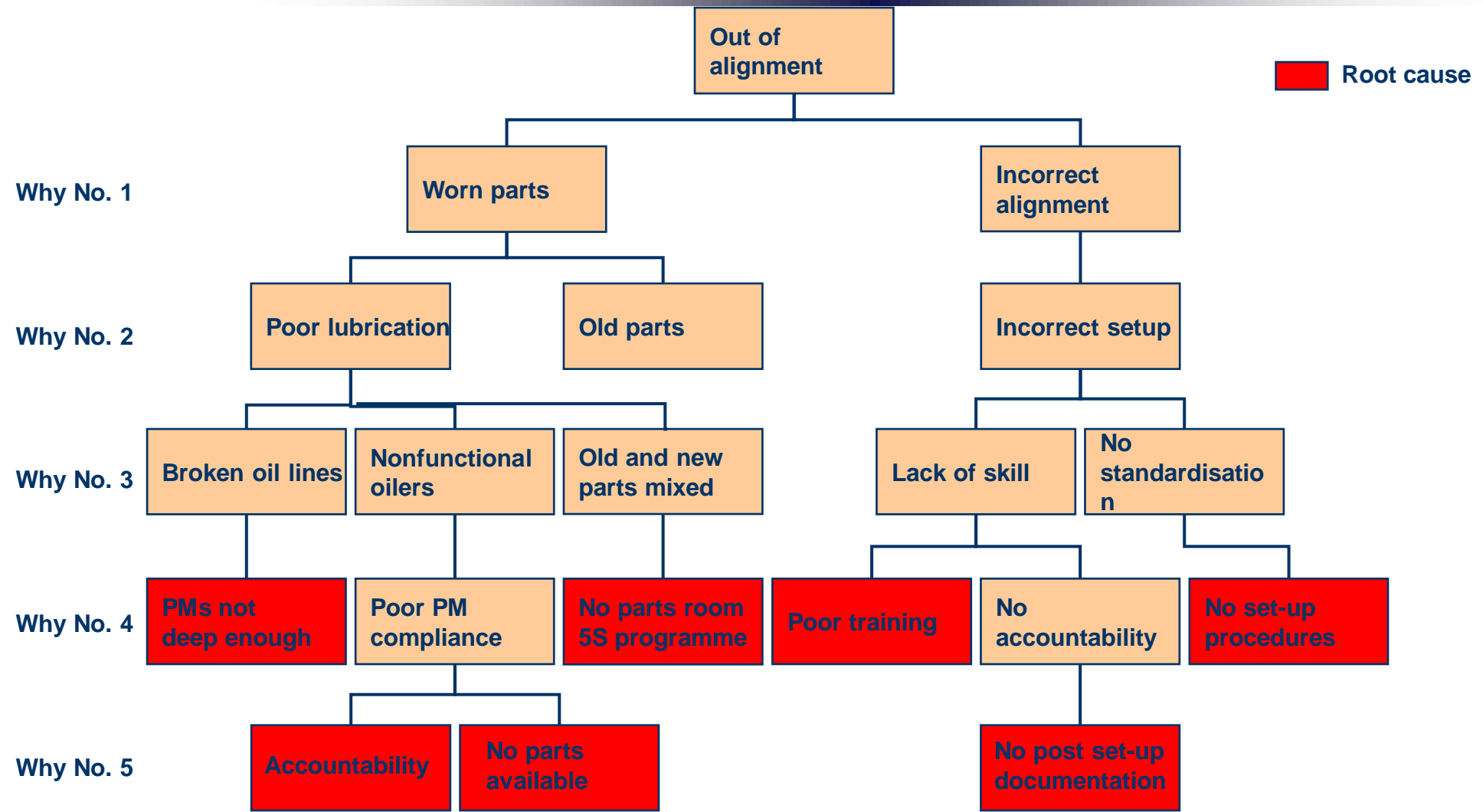
Analysis of contractor drilling crew in ore mins/shift

EXCESS DUE TO:

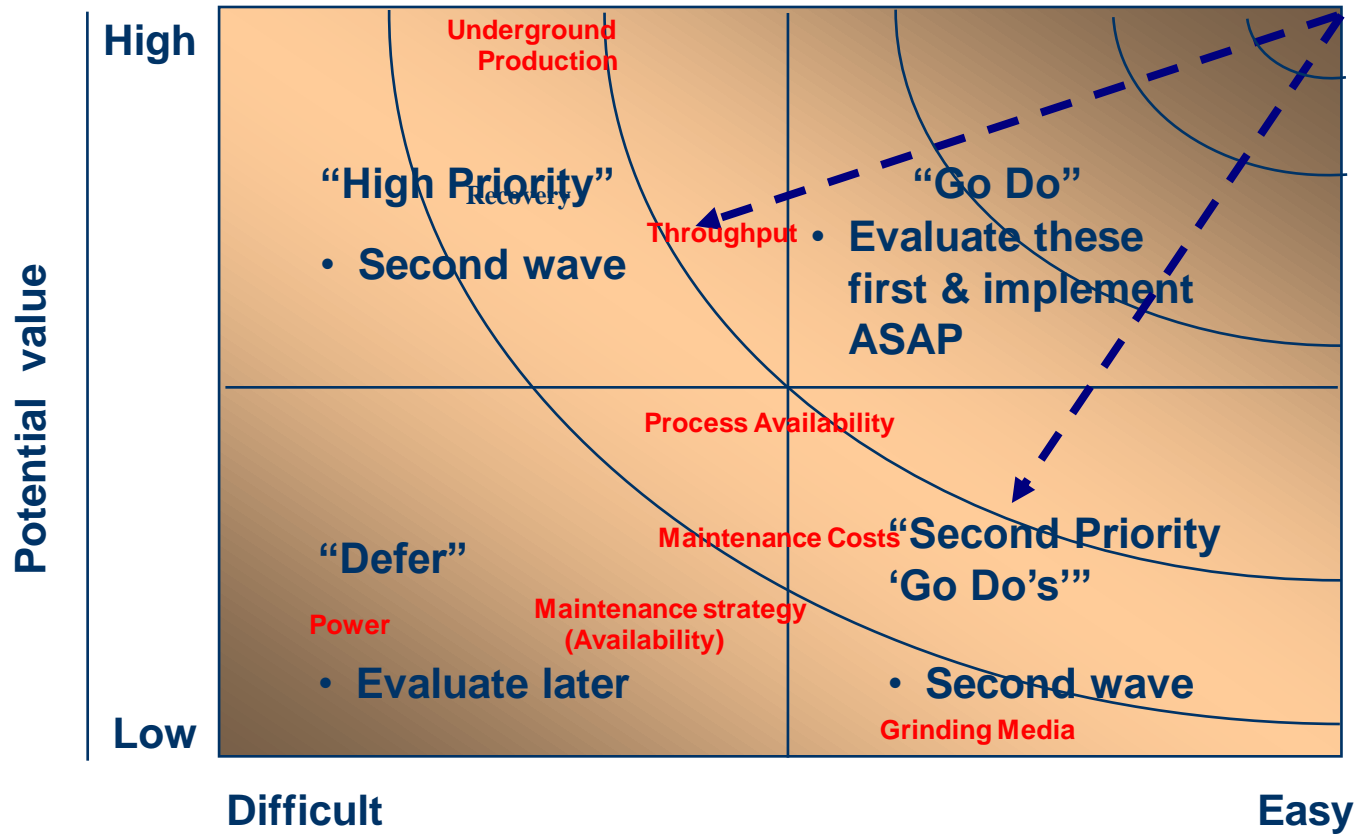
- Late start, early finish
- Blasting
- 'Achieved target' mentality – stopped work because face was drilled and a separate (unnecessary) charging crew arrived



TOOLS FOR ROOT CAUSE PROBLEM SOLVING: 5-WHY ANALYSIS



PRIORITIZATION OF IMPROVEMENT IDEAS



- Action Plans can be generated based on priorities
- Prioritized list of ideas to be further evaluated

Ease of Implementation

- Operational Risks (irreversible?)
- Need for capital
- Timing/resources required

IMPLEMENTATION PHASE



Objectives

- Take improvement ideas / solutions and make them happen
- Sustain the improvements in the medium to long term
- Roll out to other operations
- Start to build continuous improvement culture

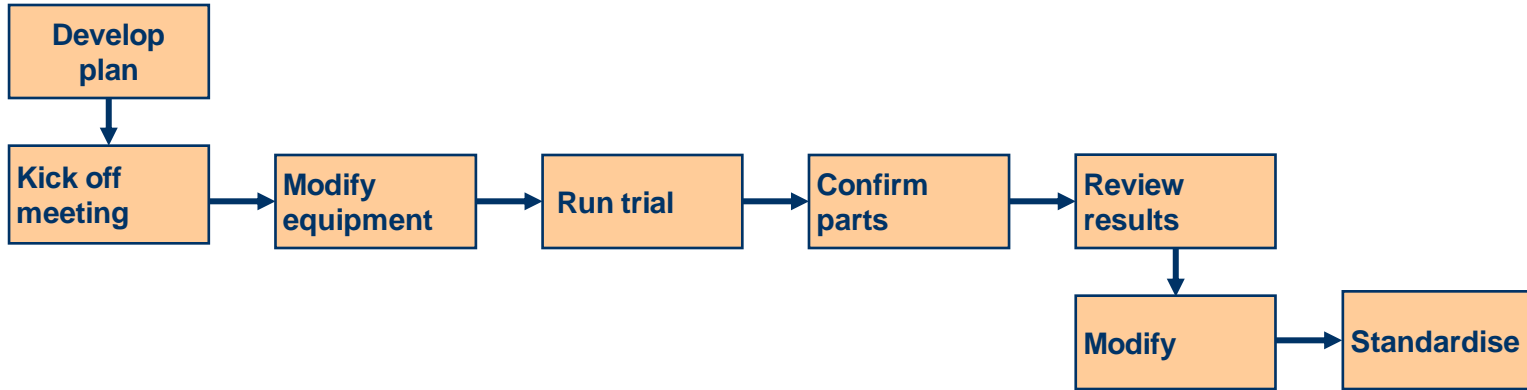
Activities

- Planning, trialing, communication of benefits, following up, reporting
- This involves change – new technology, enhanced designs, different working practices, change in organization, change in planning, changing strategy and focus
- Hardest part of an improvement initiative, communication is key
- Requires commitment from the top down and bottom up – workforce is key

PLANNING SOLUTION IMPLEMENTATION

Flow
chart

Flow charts are utilized to show logical steps involved in implementing plan



Gantt
chart

Gantt charts organize steps to be implemented and timing for each activity

	What	Who	Timeline			
1	Develop implementation plan		█			
2	Hold kick off meeting			█		
3	Start machine modification				█	
4	Run trial					█
5	Confirm parts					█
6	Report status					█
7	Modify if necessary					█
8	Standardized					█

KEY ELEMENTS FOR SUCCESSFUL IMPLEMENTATION




Comprehensive action plans

+

- Develops explicit action plan for each idea with well-understood actions, accountabilities, and milestones
- Integrates approved ideas into master plan for unit
 - Sequences ideas to maximize cash flow given the difficulty of implementation
 - Reprioritizes current activities (as appropriate) to account for new activities/responsibilities
- Builds understanding and commitment to plans among all relevant managers/stakeholders

Ongoing tracking process

- Monitoring process to ensure full implementation
 - Tracking of KPIs and actions
 - Regularly scheduled review meetings
- Identifies gaps vs. planned performance and ensures corrective actions taken



Integrated into
performance management



“No-escape” process to make improvements happen!



SRK Consulting
Engineers and Scientists

PERPETUATION PHASE



Objectives

- Sustain the improvements in the long term
- Reinforce continuous improvement culture
- Share ideas with other operations
- Always on the look out for ways to improve and learn

Activities

- Regular review of KPIs, following up of improvement initiatives
- Recruitment
- Training
- Small project teams (usually mine staff) assemble

PERPETUATION PHASE



Regular review meetings focused on activities and impact. . .

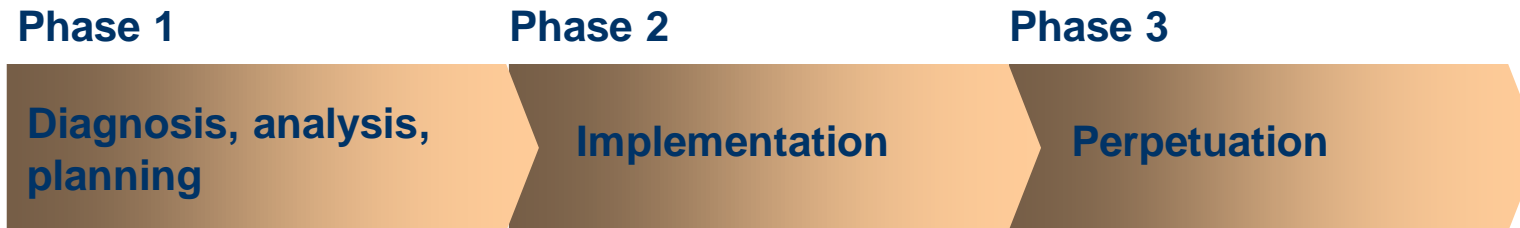
. . .by asking 4 key questions



1. Did we do what we said we would do?
2. Are we getting the impact?
3. What are we going to do about it?
4. What else can we do?

HOW IS BUSINESS IMPROVEMENT APPLIED ?

3-Step Process



- Review team visits site and prepares a Phase 1 plan in conjunction with mine staff
- A joint consultant / mine staff team carries out the Phase 1 work
- 3 to 9 months
- The focus for implementation is on the mine staff with training and support from consultants
- 6 months to 2 years
- Perpetuation is the responsibility of mine staff with periodic reviews by external consultants
- ongoing

WHAT CAN GO WRONG?

- Insufficient 'buy-in' from senior management leading to **apathy and low motivation** in the improvement teams
- Insufficient 'buy-in' from workers and middle management leading to complaints like “**why weren't we consulted?**”
- Poorly performing staff / departments can be rapidly pinpointed by enhanced reporting systems, this can lead to severe disruption if **personnel changes** are made during the project
- **Fix everything today.** Divide solution into easily manageable steps that can be monitored
- **Breakdown of communication** – everyone affected by the solution must be included in the implementation process. Keep everyone informed about what is happening – the plan, the goal, and how effectively things are being done. In Russia, language and prevailing culture can be an issue
- **Mismanaged expectations.** Be sure everyone knows what they have to do and stay in close touch with your manager
- **Slow progress.** Develop ways to streamline procedures, policies etc.
- **Jargon.** Some management consultants use jargon which can confuse and alienate
- **Tangible deliverables.** Important to focus on results in short, medium and long term
- **Cultural differences.** Agents of change must accept where they are and what is the norm
- **Lack of technical knowledge.** Many management consultants target work in the mining industry using specialists from manufacturing backgrounds who do not understand the technical aspects of mining – must go on a learning curve

WHAT IS THE SRK APPROACH?

- SRK philosophy – technically based, business focused, ‘hands on’ approach, providing the means by which mines can help themselves
- What do we like to see:
 - **Commitment** to change – reject the status quo
 - **Strategy** fully understood through every level
 - Well **qualified** people in the right positions
 - Ordered **organization** chart – spans of control and intervals of control
 - Strong **management operating system** – KPI reporting, reconciliation
 - **Performance management** – operational equipment effectiveness
 - Well **planned maintenance** – focus on metrics, no unplanned downtime
 - Strong **technical** dept – grade control, measurement, LoM plans and cash flow models, proper cut off grades
 - **Motivation** – effective supervision, incentive schemes that relate reward to achievements, good discipline