



*Mining Company Performance
Improvement Programs and Results*

Benchmarking Study Summer 2003

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- Barriers to Performance Improvement
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III. About Norbridge

Norbridge benchmarked seventeen companies to discuss performance improvement strategies in the mining industry

Industry Background

- Analysis of 25 top mining companies indicates that almost half lost money in 2001 and 2002
- In addition, about half had lower net income in 2002 than 2001

Benchmarking Introduction and Objectives

- The study was designed to be different – It focuses on performance improvement strategies, and results achieved by type of strategy, rather than traditional topics or statistics generally seen in other publications
- The primary objectives of the study were to:
 - Identify problems “holding back” companies from improving financial and operating results
 - Discuss paths that companies are taking to improve performance
 - Highlight results that are being achieved by type of path

Benchmarking Participants

Coal

- Arch Coal, Inc.
- CONSOL Energy
- Kennecott Energy Company
- Peter Kiewit Sons', Inc.
- North American Coal Corporation
- Peabody Energy Corp.

Metals

- Climax Molybdenum Co.
- EVTAC Mining
- Falconbridge Limited
- Freeport-McMoRan Copper and Gold Inc.
- Inco, Ltd.
- Placer Dome, Inc.
- Anonymous Mining Co.

Non-Metallic Minerals

- Hanson Building Materials America, Inc.
- IMC Global, Inc.
- Martin Marietta Materials
- PotashCorp

The benchmarking participants identified numerous barriers to performance improvement in three main categories

- At the corporate level, many companies are having trouble getting the “next generation” of productivity gains and cost reductions as they face capital constraints, depleting reserves, an aging workforce, and other difficulties
- At the facility level, many mines and processing plants are facing “age old” problems
 - Reacting to unexpected problems, rather than addressing them with proactive “game plans”
 - Problems with the “basic building blocks” of mining success, like teamwork, communication, equipment maintenance, standard operating procedures, and parts/supplies
- At the corporate and facility level, many companies are getting limited leverage from their measurement systems to improve performance or sustain results that have been achieved

Barriers to Performance Improvement

Corporate Level

- Productivity stagnation
- Cost pressure
- Capital shortages
- Reserve depletion
- Workforce aging
- Safety shortfalls

Facility-Specific

- Lack of proactive planning
- Inconsistent teamwork
- Limited SOP usage
- Communication disconnects
- Maintenance shortfalls
- Material bottlenecks

Measurement Systems

- Limited usage as proactive tool
- Lack of “early warning” measures
- Limited distribution of results

Based on the benchmarking, many companies are aiming at “processes” to generate the “next round” of performance gains

- Firms are supplementing “traditional” efforts to improve performance, as benefits may be slowing
- In particular, there is a growing focus on improving processes via two primary “paths”
 - Path 1: Facility-specific or issue-specific projects
 - Path 2: Large corporate-level improvement programs
- This enables companies to draw on a full range of performance improvement levers as they strive to increase effectiveness e.g. processes, organization design, technology, management systems

Building on Traditional Mining Initiatives...

- Develop the franchise e.g. M&A; reserve acquisitions and sales; facility openings and closures
- Leverage the organization e.g. Restructuring; downsizing; streamlining; management changes
- Invest in technology e.g. Capital investment for new equipment



...With a Growing Focus on Process-Based Initiatives

Path 1

Facility-Specific or Issue-Specific Projects

- Facility-based projects or “game plans”
- Sharing best practices across mines and plants
- Issue-specific initiatives e.g. safety, preventive maintenance, belt availability

Path 2

Large Corporate-Level Improvement Programs

- Six Sigma
- Change Acceleration
- Business Process Improvement Program
- Other

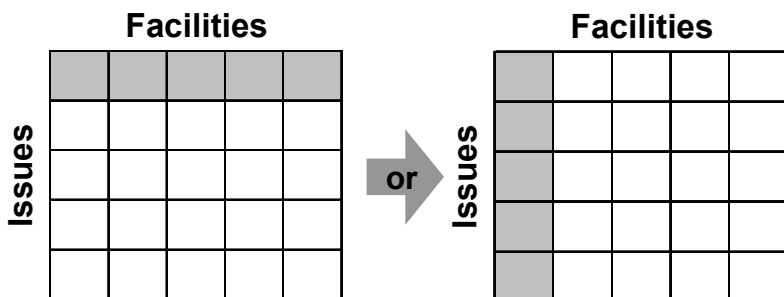
Each of the paths to improve mining processes has different characteristics and requirements

- Companies usually pursue one path, but can pursue a mixture/blend of the two paths
- For example, one firm views their “next wave” of performance-based initiatives to be improving “handoffs” from one facility to the next, which they feel includes elements of each path

“Path 1”

- **Definition:** Facility-specific or issue-specific projects
- **Sponsors:** Facility management or corporate champion for a specific issue
- **Support Requirement:** Might require outside consulting support
- **Required Resources:** Typically requires limited financial and manpower investment for specific project
- **Scope:** Typically addresses one issue at many facilities or many issues at one facility

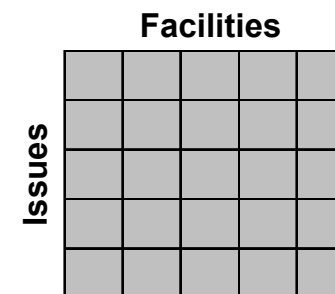
-- Program Scope --



“Path 2”

- **Definition:** Broad corporate-level programs to enhance performance
- **Sponsors:** Typically corporate management
- **Support Requirement:** Usually requires outside consulting support
- **Required Resources:** Often requires significant financial (>\$1 Million) and manpower investment
- **Scope:** Generally addresses multiple issues at many facilities

-- Program Scope --



“Path 1” programs have generated strong results with facility-specific “game plans” and targeted issue-specific initiatives

Benchmarking Examples of “Path 1” Programs and Results

Path 1 Program Description

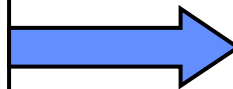
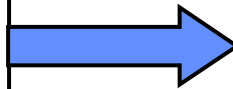
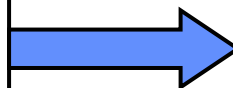
Results

Facility-Specific Game Plans

- Game plan at underground mine to address issues including: standard operating procedures, communication, loading time lost, belt and power moves, maintenance, equipment, performance measures, and other areas
- Game plan at processing plant with focus on maintenance, operating schedules, organizational structure, roles and responsibilities, measures, and other areas

Issue-Specific Initiatives

- Company-wide belt availability program focused on belt up-time, power generation, maintenance, water management and clean-up
- Benchmarking of truck/shovel operations at mining companies which resulted in process and equipment changes at company mines



- Mine capacity utilization rate has risen 7-9 percentage points to almost 70%
- Plant availability exceeds 90%, even as plant utilization has risen above 90%
- Magnetite usage cut by over 60%, with over \$0.5 Million in annual savings
- Led to standardization of processes across facilities and company-wide increase in belt availability of 3-4%
- Improved productivity at company's truck/shovel operations from “middle of the pack” to “top 10%”

“Path 2” programs have also achieved major performance improvements

Examples of “Path 2” Programs and Results

Path 2 Program Description

- “**Quest for Zero** gives employees a set of tools and principles that allows them to work systematically toward zero safety and environmental incidents, zero variability in production processes and costs, zero waste, and zero product defects.” – *Phelps Dodge Corporation, 2002 Annual Report*
- “At the center of the continuous improvement objective is the launch of IMC Global’s first-ever **Six Sigma** process... Six Sigma is a comprehensive and robust problem-solving methodology that is statistically based and has a target of achieving less than four defects per million opportunities” – *IMC Global, 2000 Annual Report*
- “**ForCE 21** is a way of helping us all move in the same direction. By standardizing the ways we work, we will be working smarter and living better.” – *Cleveland-Cliffs Corporate Website*
- “Utilizing the team approach developed through our **Business Process Improvement program (“BPI”)**...” – *Florida Rock Industries, 2002 Annual Report*



Results

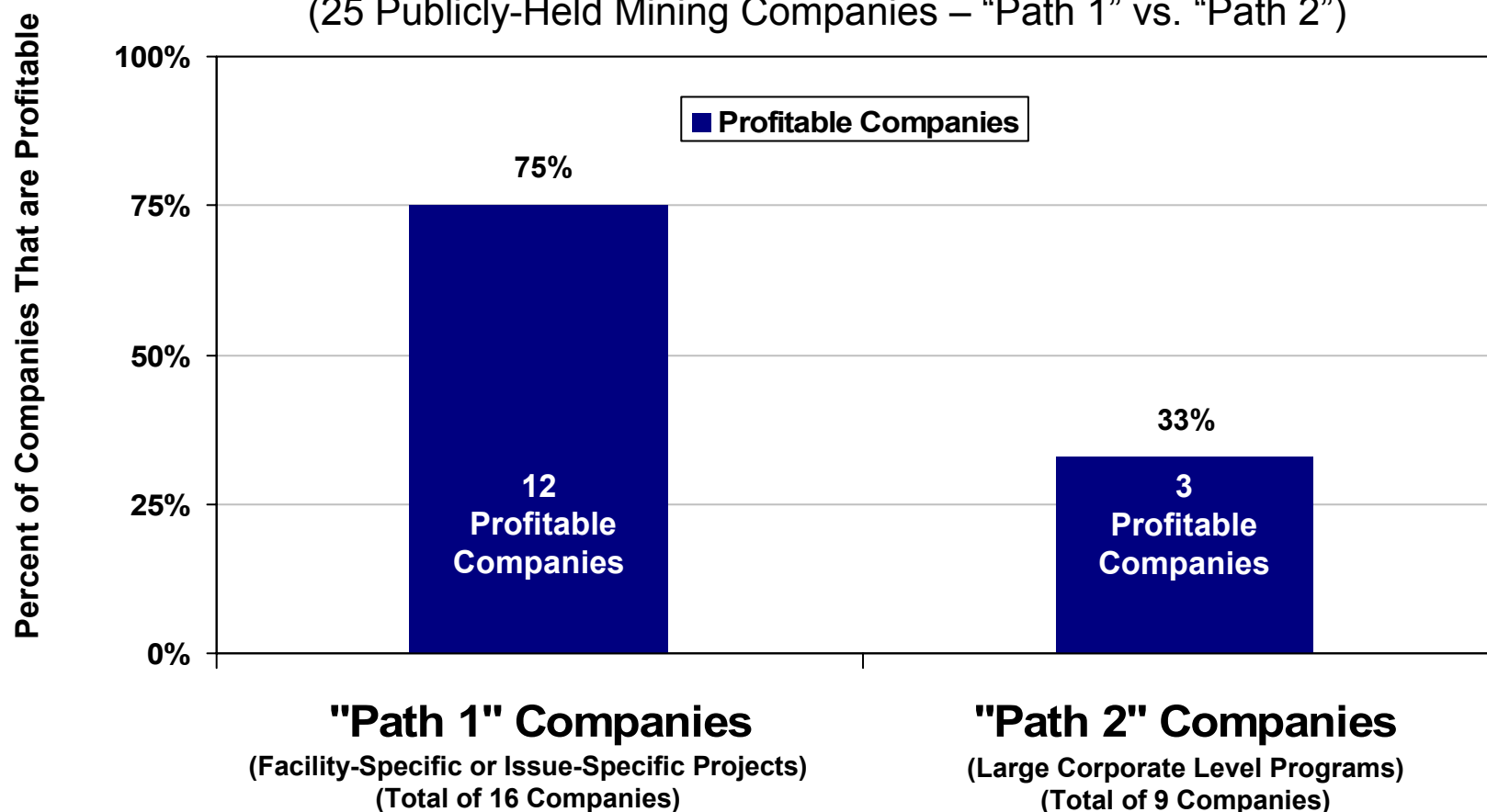
- “We introduced Quest for Zero in 2001 and realized \$55 million in annual improvements. During 2002, we gained an additional \$211 million in improvements, ending the year at a run rate approximating \$250 million.” – *Phelps Dodge Corporation, 2002 Annual Report*
- “Our Six Sigma program delivered cost savings in excess of \$8 million in 2002 from over 60 projects.” – *IMC Global Inc., 2002 Annual Report*
- “Mine operating costs...were down by 5% compared to 2001 costs...The teams provided over \$7 million in cost-reduction benefits on an annualized basis in 2002.” – *Cleveland-Cliffs Inc., 2002 Annual Report*
- “Utilizing ... our [BPI] program ... per unit variable costs came down almost four percent and gross profit increased just over sixteen percent ...” – *Florida Rock Industries, 2002 Annual Report*

Either path can improve performance. Results of “Path 1” companies were better than those of “Path 2” companies in 2002.

- Three-quarters of Path 1 companies were profitable in 2002 versus one-third of Path 2
- Also, about two-thirds of Path 1 companies increased their net income from 2001 to 2002, versus one-quarter of Path 2 companies

2002 Net Income

(25 Publicly-Held Mining Companies – “Path 1” vs. “Path 2”)



Source: Annual reports and company websites

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■ **Introduction**

■ Barriers to Performance Improvement

■ Potential Paths to Better Performance

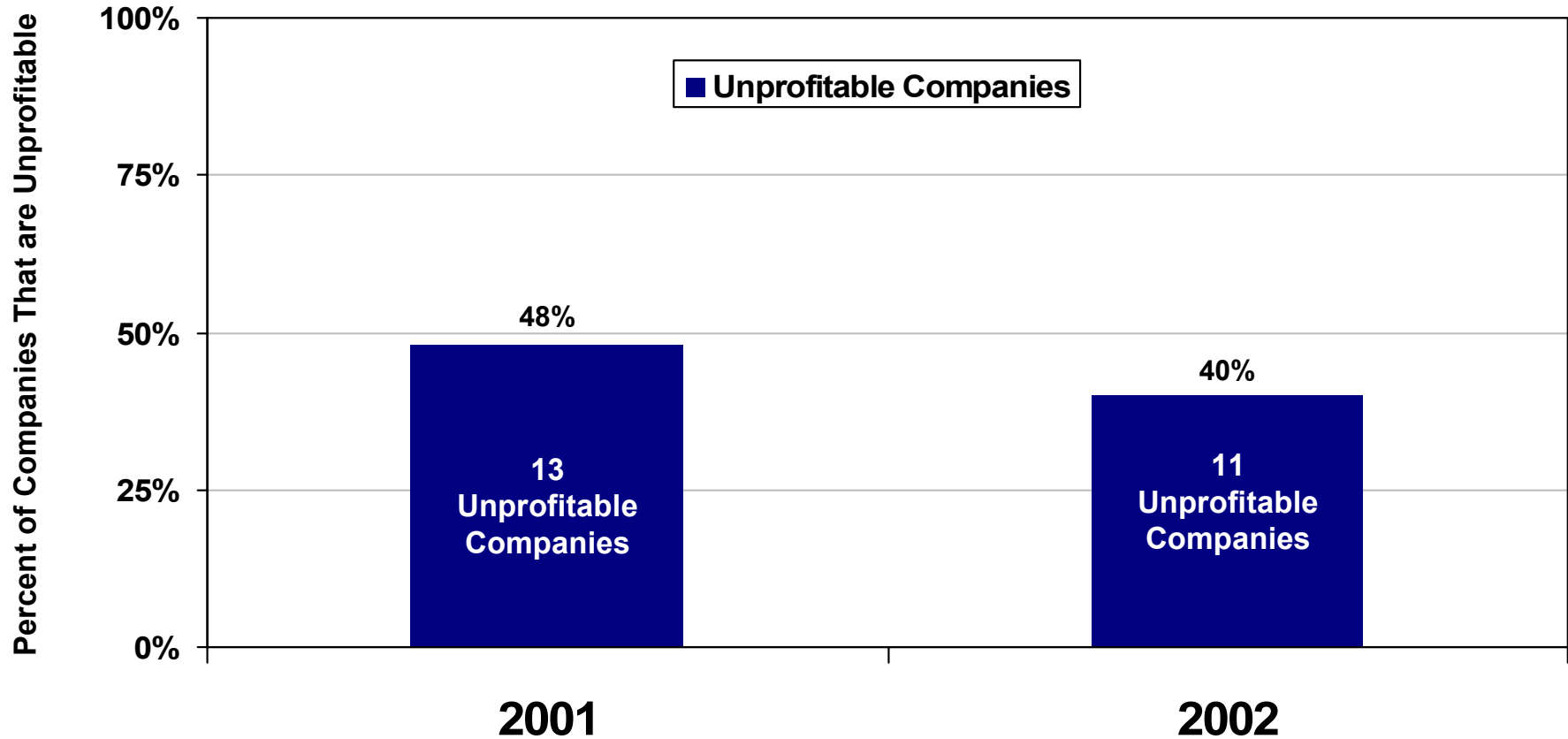
■ Results Achieved by Type of Path

III. About Norbridge

Times are tough in the mining industry. Analysis of 25 top mining companies indicates that almost half lost money in 2001 and 2002.

- In addition, 52% (13 companies) had lower net income in 2002 than 2001

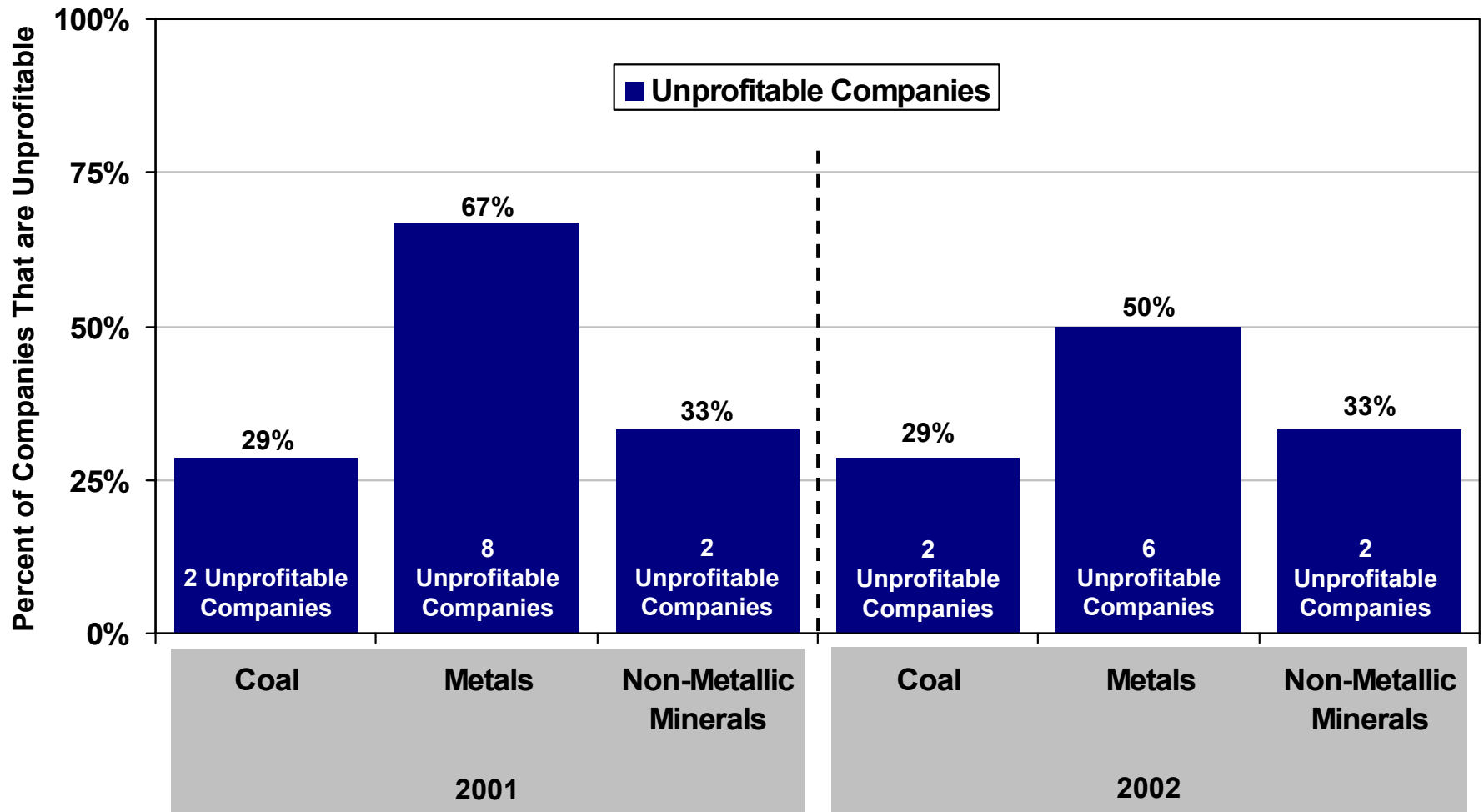
Net Income for 25 Publicly-Held Mining Companies*



*Includes 7 coal companies (Alliance Resource Partners, Arch, Consol, Massey, NACCO, Peabody and Westmoreland); 12 metals producers (Barrick Gold, Cleveland Cliffs, Couer D'Alene, Falconbridge, Freeport McMoran, Grupo Mexico, Inco, Newmont, Noranda, Phelps Dodge, Placer Dome and Teck Cominco) and 6 non-metallic minerals firms (Florida Rock, IMC Global, Martin Marietta Materials, Oglebay Norton, PotashCorp, and Vulcan Materials)
Source: Annual reports and company websites

Weak financial performance is not confined to a specific industry segment

Net Income Summary for 25 Publicly-Held Mining Companies by Industry Segment
 (7 Coal Companies, 12 Metals Companies and 6 Non-Metallic Mineral Companies)



Source: Annual reports and company websites

Norbridge benchmarked seventeen companies to understand mining company strategies to improve performance

Summary of 17 Companies That Participated in the Norbridge Benchmarking Study

Coal (6 Companies)

- Arch Coal, Inc.
- CONSOL Energy
- Kennecott Energy Company
- Peter Kiewit Sons', Inc.
- North American Coal Corporation
- Peabody Energy Corp.

Metals (7 Companies)

- Climax Molybdenum Co.
- EVTAC Mining
- Falconbridge Limited
- Freeport-McMoRan Copper and Gold Inc.
- Inco, Ltd.
- Placer Dome, Inc.
- Anonymous Large Mining Company

Non-Metallic Minerals (4 Companies)

- Hanson Building Materials America, Inc.
- IMC Global, Inc.
- Martin Marietta Materials
- PotashCorp

Companies have annual mining revenue ranging from about \$100 Million to approximately \$3 Billion

Source: Annual reports and company websites

Norbridge interviewed senior executives or managers at the seventeen participating companies, and also conducted other research

- The benchmarking study was designed to be different – it focuses on performance improvement strategies, and results achieved by type of strategy, rather than the traditional topics or statistics that are generally seen in other publications
- The primary objectives of the study were to:
 - Identify problems “holding back” companies from improving financial and operating results
 - Discuss paths that companies are taking to improve performance
 - Highlight results that are being achieved by type of path
- We supplemented the benchmarking study with additional research, including a review of:
 - Annual reports
 - Company websites
 - Industry articles and websites

Results of the study are summarized in the following sections*

* Quotes from annual reports and company websites are attributed to specific companies throughout the document. However, comments from benchmarking discussions are not attributed to specific companies to maintain confidentiality for participants.

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Barriers to Performance Improvement

Corporate Level	Facility-Specific	Measurement Systems
<ul style="list-style-type: none"> ■ Productivity stagnation ■ Cost pressure ■ Capital shortages ■ Reserve depletion ■ Workforce aging ■ Safety shortfalls 	<ul style="list-style-type: none"> ■ Lack of proactive planning ■ Inconsistent teamwork ■ Limited SOP usage ■ Communication disconnects ■ Maintenance shortfalls ■ Material bottlenecks 	<ul style="list-style-type: none"> ■ Limited usage as proactive tool ■ Lack of “early warning” measures ■ Limited distribution of results

Each category of issues is discussed in the following pages*

* Please note that comments in this section frequently highlight issues or problems which were raised during discussions, and may not reflect other “positive” comments which were made.

Barriers to Performance Improvement – Corporate Level

Productivity Stagnation

- **Difficulty getting the “next generation” of productivity growth**
 - Many companies cited examples of mines or regions where productivity is flat
- **Technology is no longer the major driver of productivity improvement**
 - “We have reached the point of diminishing returns for investment in automation”
 - “Mines don’t always benefit from the newest equipment”

Cost Pressure

- **Many companies faced with cost increases, including pensions and input costs**
 - “...We are facing upward cost pressures from higher energy prices and employment costs, including increased pension expense, and higher selling, general and administration costs... – *Inco, 2002 Annual Report*
 - “Costs are rising due to increasing natural gas prices. Other costs are also rising 2-4% per year”
 - “Costs are rising for maintenance as equipment ages, and for parts and support services costs”

Capital Shortages

- **Driven by ongoing market and financial problems**
 - “Only a few facilities can get capital since money is tight”
 - “Market conditions are down, therefore we can’t justify too much capital investment”
- **Reduces companies’ ability to drive the “next round” of productivity growth and cost reductions**

Barriers to Performance Improvement – Corporate Level (continued)

Reserve Depletion

- Mining “conditions” are becoming more difficult e.g. “We have older facilities. The mines are getting deeper and the travel distances are getting longer”
- This is putting pressure on productivity, cost, safety and other areas

Workforce Aging

- Many companies have a “skewed” workforce with lots of older workers, some younger ones, and few “in the middle”
 - “We have a big problem with demographics. As employees retire, there isn’t enough experience in the organization to provide the necessary resources”
 - “Guys are getting older. We are trying to add younger people when we can”
 - “As equipment operators retire, there aren’t enough qualified operators in the area to replace them”

Safety Shortfalls

- Many companies are now faced with more safety problems than anticipated
 - “Our company safety record has been getting worse in the last two years. We are not really sure why, but the decline is not expected given our standard operating procedures”
 - “Our safety trend is flat. This may be due to an aging workforce”
 - “We’ve hit a plateau on our safety performance”

Barriers to Performance Improvement – Facility-Specific

Lack of Proactive Planning

- **Some facilities deal with problems after they occur, rather than proactively planning for them**
 - “I wish we had a plan to prevent problems, rather than having to respond to them all the time”
 - “We spend a lot of time putting out fires”
 - “When crises hit, our plans tend to go out the window”

Inconsistent Teamwork

- **Teamwork can be weak, particularly between functions, shifts and crews**
 - “We have the traditional conflict between operations and maintenance. The operating guys want to run coal so the maintenance guys don’t get enough time to service the equipment”
 - “Each shift wants to get the best results they can, so they don’t really get ready for the next shift”
 - “Mine and processing plant production schedules aren’t coordinated”

Limited SOP Usage

- **Many facilities are inconsistent in their development and usage of SOP’s**
 - “We don’t have many procedures. We rely on good people to make good decisions”
 - “We have procedures for ISO, but most people don’t open them up or look at them”
 - “We have lots of procedures. It’s getting people to follow them that’s the hard part”
 - “Conveyer belt scrapers are being operated differently by each crew”

Barriers to Performance Improvement – Facility-Specific (continued)

Communication Disconnects

- **Lack of communication is a common contributor to poor performance**
 - Different departments often don't talk with each other e.g. operations and maintenance; maintenance and warehouse; operations/maintenance and safety
 - "Communication is pretty weak between crews at shift change. Everyone wants to go home."

Maintenance Shortfalls

- **Maintenance is critical to facility success and is growing in importance as equipment gets older**
 - "Equipment availability is a real problem"
 - "As the equipment gets older, it gets harder to maintain and breaks down more"
 - "Preventive maintenance is necessary, but is also an obstacle to productivity improvement"
 - "Most of the maintenance is fixing problems; we have little time for preventive maintenance"

Material Bottlenecks

- **Materials management bottlenecks impact production and cost**
 - "We need to have the right parts in the right place at the right time. It's a problem"
 - "The supply cars often don't come back out of the mine. People put them somewhere, then forget about it."

Barriers to Performance Improvement – Measurement Systems

Limited Usage as Proactive Tool

- **Limited depth of measurement systems beyond “critical areas” (production, cost, safety)**
 - “The only productivity measurement we focus on is production rate per man hour. We also measure costs and safety”
- **Little usage of measurement systems to target key problem areas “holding back” facility performance or help sustain results that have already been achieved**

Lack of “Early Warning” Measures

- **Limited use of “leading” measures to evaluate performance of mining “processes” and to provide “early warning” of potential problems in the future**
 - “We want to add some early warning measures, but aren’t sure what they should be”
- **Focus of most systems on “lagging” measures, which track results that have already occurred**

Limited Distribution of Results

- **Facility measures typically distributed in very limited way**
 - Generally provided to a few key people and then posted on bulletin board
 - Little (though growing) leverage of company e-mail or systems to share results more widely
- **Few key people usually look at results on a regular basis**
 - “Only two people really look at the reports”

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Building on Traditional Mining Initiatives...

- Develop the franchise e.g. M&A; reserve acquisitions and sales; facility openings and closures
- Leverage the organization e.g. Restructuring; downsizing; streamlining; management changes
- Invest in technology e.g. Capital investment for new equipment



...With a Growing Focus on Process-Based Initiatives

Path 1

Facility-Specific or Issue-Specific Projects

- Facility-based projects or “game plans”
- Sharing best practices across mines and plants
- Issue-specific initiatives e.g. safety, preventive maintenance, belt availability

Path 2

Large Corporate-Level Improvement Programs

- Six Sigma
- Change Acceleration
- Business Process Improvement Program
- Other

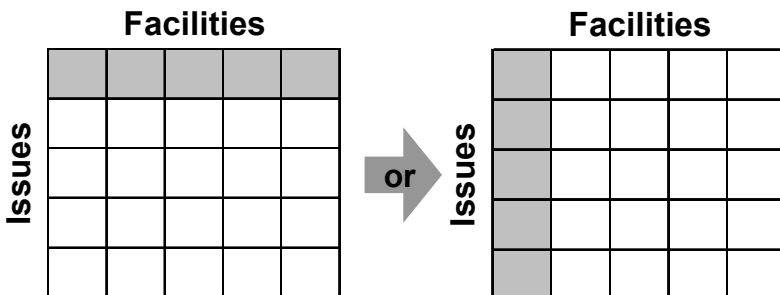
Each of the paths to improve mining processes has different characteristics and requirements

- Companies usually pursue one path, but can pursue a mixture/blend of the two paths
- For example, one firm views their “next wave” of performance-based initiatives to be improving “handoffs” from one facility to the next, which they feel includes elements of each path

“Path 1”

- **Definition:** Facility-specific or issue-specific projects
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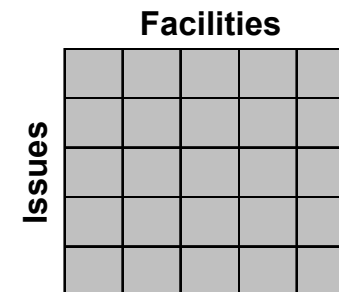
-- Program Scope --



“Path 2”

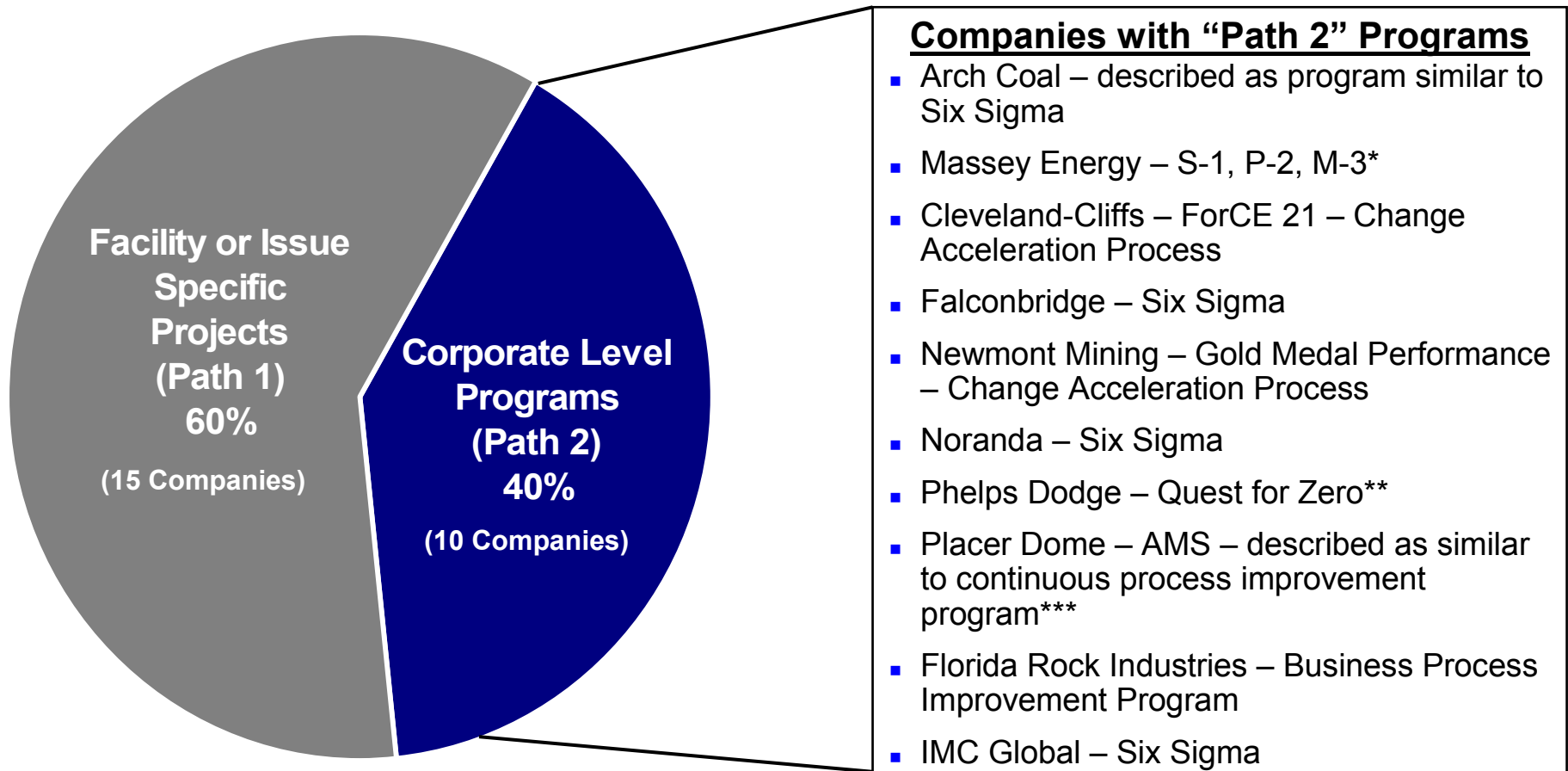
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-- Program Scope --



Based on available information, Norbridge evaluated the 25 public mining companies and found fifteen in “Path 1” and ten in “Path 2”

**Type of Performance Improvement Program – Path 1 v. Path 2
(25 Publicly-Held Mining Companies)**



Source: Benchmarking discussions, annual reports and company websites

*Provides corporate standards/guidelines for safety, productivity and measurement at each facility (based on information from corporate website)

** Described as “lean production program” and “enterprise performance system” in annual reports

*** Placer Dome indicates that they recently implemented their program

Some “Path 1” companies are developing facility-specific “game plans” to improve process performance at mines and processing plants

- “Game plans” are designed to address the specific needs/problems of a facility and to develop a tailored program to drive performance improvement
- Facility-specific initiatives can address multiple issues, including those shown in the table below, as well as individual problem areas

Examples of Issues Addressed in Facility-Specific Game Plans

General Issues	Mines (Example for Underground Mine)	Processing Plants (Example for Coal Prep Plant)
<ul style="list-style-type: none"> ■ Facility-based planning ■ Communication and teamwork ■ Standard operating procedures ■ Organization and staffing issues ■ Roles and responsibilities ■ Performance measurement ■ Work schedules ■ Maintenance planning and prioritization ■ Safety issues ■ Parts and supplies ■ Training 	<ul style="list-style-type: none"> ■ Production shortfalls ■ Loading time lost ■ Equipment issues ■ Timing of production and development ■ Usage of scheduled downtime ■ Belts ■ Belt and power moves ■ Construction planning and management ■ Drainage management 	<ul style="list-style-type: none"> ■ Plant availability shortfalls ■ Feed rates ■ Linkage to mine operating plans ■ Sampling ■ Refuse disposal ■ Mobile equipment productivity and management ■ Magnetite usage ■ Coal losses ■ Coal quality compliance

Companies following “Path 1” are also sharing best practices and focusing on issue-specific programs to improve process performance

Examples of “Path 1” Programs from Benchmarking Discussions

- **Sharing best practices across facilities at regular intervals**
 - Several companies have semi-annual or annual meetings to share best ideas and practices
 - One company has an annual meeting to share maintenance best practices
- **Belt availability program**
 - Focused on belt up-time, power generation, maintenance, water management and clean-up
 - Has led to standardization of processes across facilities
- **Benchmarking of truck/shovel operations at other mining companies**
 - Made changes at all mines, mostly in processes, but also with equipment
 - Changes impacted fuel practices, maintenance staffing, and loading procedures
- **Turning “large” mines back into “small” mines**
 - Sealing old entries and creating new entries to allow removal of coal closer to where it is mined
 - Expectation of significant “overhead” cost reduction
- **Preventive maintenance program**
 - All equipment is shut down for maintenance on defined schedules
 - Maintenance plan is followed closely, and is not sacrificed for short-term productivity gains
- **Switch to 12-hour shifts with enhanced focus on communication**
 - Production and maintenance people assigned to same shift to build working relationship
 - Pre-shift communication meeting held to coordinate production and maintenance issues
- **Pay system based on “pay for skills”**
 - Mine pays workers based on skill levels e.g. workers with more skills get paid more
 - For example, maintenance workers may run production equipment and vice versa
 - Drilling personnel may do blasting when needed

“Path 2” programs are typically a major strategic focus area for the corporation

Examples of Large Corporate-Level Programs (“Path 2”)

- “**ForCE 21** is a way of helping us all move in the same direction. By standardizing the ways we work, we will be working smarter and living better.” – *Cleveland-Cliffs Corporate Website*
- “**Six Sigma**...is now being widely applied” – *Falconbridge, 2002 Annual Report*
- “Utilizing the team approach developed through our **Business Process Improvement program (“BPI”)**...” – *Florida Rock Industries, 2002 Annual Report*
- “At the center of the continuous improvement objective is the launch of IMC Global’s first-ever **Six Sigma** process... Six Sigma is a comprehensive and robust problem-solving methodology that is statistically based and has a target of achieving less than four defects per million opportunities... Six Sigma is a corporate strategy for achieving dramatic operational and financial performance...” – *IMC Global, 2000 Annual Report*
- “The continuous improvement process is ongoing, as we utilize our **Gold Medal Performance** systems and procedures to position Newmont for continued growth and improved profitability in the future.” – *Newmont Mining, 2002 Annual Report*
- “Changing the way we do business has been consistent with our continued pursuit of **Six Sigma** performance.” – *Noranda, 2002 Annual Report*
- “Our **Quest for Zero** enterprise performance system...provides new tools to take charge of our business more rigorously than ever before... *Quest for Zero* gives employees a set of tools and principles that allows them to work systematically toward zero safety and environmental incidents, zero variability in production processes and costs, zero waste, and zero product defects.” – *Phelps Dodge Corporation, 2002 Annual Report*
- “Massey’s strategy for continued improvement is exemplified by three major management initiatives: **S-1** prescribes safety measures that go far beyond industry standards; **P-2** focuses on the application of best practices to continually strive for better productivity; and **M-3** is designed to continuously measure actual performance and report to management in a timely manner.” – *Massey Energy Company, 2002 Annual Report*

Large “Path 2” programs are generally multi-year efforts which involve significant corporate resources

Sample “Path 2” Program Resource Commitments	Sample “Path 2” Program Timeframes
<ul style="list-style-type: none"> ■ “To date, over 375 people have received training and that number will expand to over 600 by the end of 2003.” – <i>Falconbridge, 2002 Annual Report</i> ■ “We have utilized almost 100 CAP (Change Acceleration Process) teams since the commencement of the program in April 2000 and have trained hundreds of employees to be members of CAP teams.” – <i>Cleveland Cliffs, 2002 Annual Report</i> ■ “Six Sigma encompasses a rapidly growing number of ‘black belt’ and ‘green belt’ employees, some 250 at this writing...” – <i>IMC Global, 2002 Annual Report</i> ■ “(The program) involves people from both corporate and the mine – right now about 80 people are involved worldwide – mostly mine personnel. A vice president was also hired to run the program” ■ “Every employee at every site is trained” 	<ul style="list-style-type: none"> ■ “This is a five year program to get the big processes mapped and modified. It will then evolve into a continuous improvement program” ■ “The program is new and will take about three years to implement” ■ “The program was implemented about four years ago and is just now beginning to bear fruit” ■ “The program is changing the culture of the company to be performance-based, which we have been working on for 4-5 years” ■ “The program is about 3 years old. The company is still growing the program and adding resources”

About half of the benchmark companies indicate a growing focus on updating and leveraging their performance measurement systems

- Measurement systems are being updated by companies in Path 1 and Path 2 to monitor and sustain performance levels

Examples of Performance Measurement Changes

- Changes to specific measures being tracked and reviewed
 - **Adding and subtracting measures** to make system more meaningful
 - Increased **focus on “early warning” measures** to highlight potential problem areas e.g. “near misses” (safety), oil analysis, geometry studies (for roof control issues), component life, percent of scheduled maintenance completed
 - Growing focus on **measures that highlight process performance**
 - More **standardization of measurement methodology** across facilities
- Usage of system as **proactive tool to improve performance**
 - **Greater involvement of management team** in measurement program
 - **Broader distribution of results** through e-mail, internet and corporate systems
 - More focus on **leveraging systems to identify problems and opportunities**
 - “A broad mix of people are using the system to look at opportunities to increase efficiency”
- Usage of measurement systems to help **sustain results** after performance improvement projects are completed
 - After projects are done, some companies indicate that they have good results for a while, but then performance tends to slip. Monitoring systems are considered an important part of sustaining results over time.

One company has developed an extensive company-wide measurement system for Six Sigma

Example: Company-Wide Measurement Program

- There are **measures for each level of the organization**
 - **Key performance indicators (KPI's)** are created at the highest management level
 - KPI's are then **broken down into component measures**, which are the responsibility of the next level of management
 - These **measures are “tied together” and can be “rolled up”** to the intermediate level or to the highest level; for example:
 - A high level manager is responsible for **safety – a KPI is created**
 - A person who reports to him is responsible for **Lost Time**
 - A person at the next level down is responsible for **Lost Days**
 - A person at the next level down is responsible for **Number of Injuries**
 - There are **5-8 KPI's per person**
- These KPI's are **reviewed regularly**
 - Detailed KPI's – reviewed daily
 - Mid-level KPI's – reviewed weekly
 - High-level KPI's – reviewed monthly
- Measurements are **available to employees via a web-based system**
- “The intent is to let people see how they are doing with their KPI's and how their KPI's are impacting the company”

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“Path 1” programs have generated strong results with facility-specific “game plans”

Examples of Path 1 Results – Facility-Specific “Game Plans”

- Since implementation of a “game plan” at an underground mine, **mine capacity utilization has risen 7-9 percentage points to almost 70%**, and mine performance has helped generate significant company investment in 2003
- Since implementation of a game plan at a processing plant, plant performance has significantly improved
 - **Plant availability goal of 90% is being consistently achieved, and has remained high as plant utilization has risen above 90%**
 - Plant performance has helped generate significant company investment in 2003
 - **Magnetite usage and cost has declined by over 60% since project implementation, generating over \$0.5 Million in annual savings**
- At an underground mine, **feet mined per unit shift increased by 26% and costs declined by 9%** after development and usage of game plan

“Path 1” programs have also generated gains with targeted issue-specific initiatives

Examples of “Path 1” Results – Issue-Specific Initiatives

- A corporate benchmarking study of truck/shovel performance at multiple companies resulted in changes that **improved productivity at their truck/shovel operations from “middle of the pack” to “top 10%”**
 - A corporate program to improve belt availability has led to a company-wide **increase in belt availability of 3-4%**
 - A switch to 12-hour shifts, and the introduction of pre-shift communication meetings, has resulted in a **20% increase in units per man hour** at a mine during the past year
 - Through an extensive preventive maintenance program, one mine has achieved **equipment availability exceeding 90% for fifteen 240 ton trucks which have more than 55,000 hours of service**
 - Installation of a GPS system on dozers at a mine site led to **payback of the investment in six months**; company also migrated GPS technology to all mine sites
 - A mine installed joy sticks on its drag lines. Once proven to be successful, the company installed them at all mine sites.
-
- One company indicated that they have reduced their overall cost structure by about \$250 million over the past 5-6 years with numerous productivity improvement projects focused on specific facilities or specific issues

“Path 2” programs have also achieved major performance improvements.

Sample “Path 2” Program Results

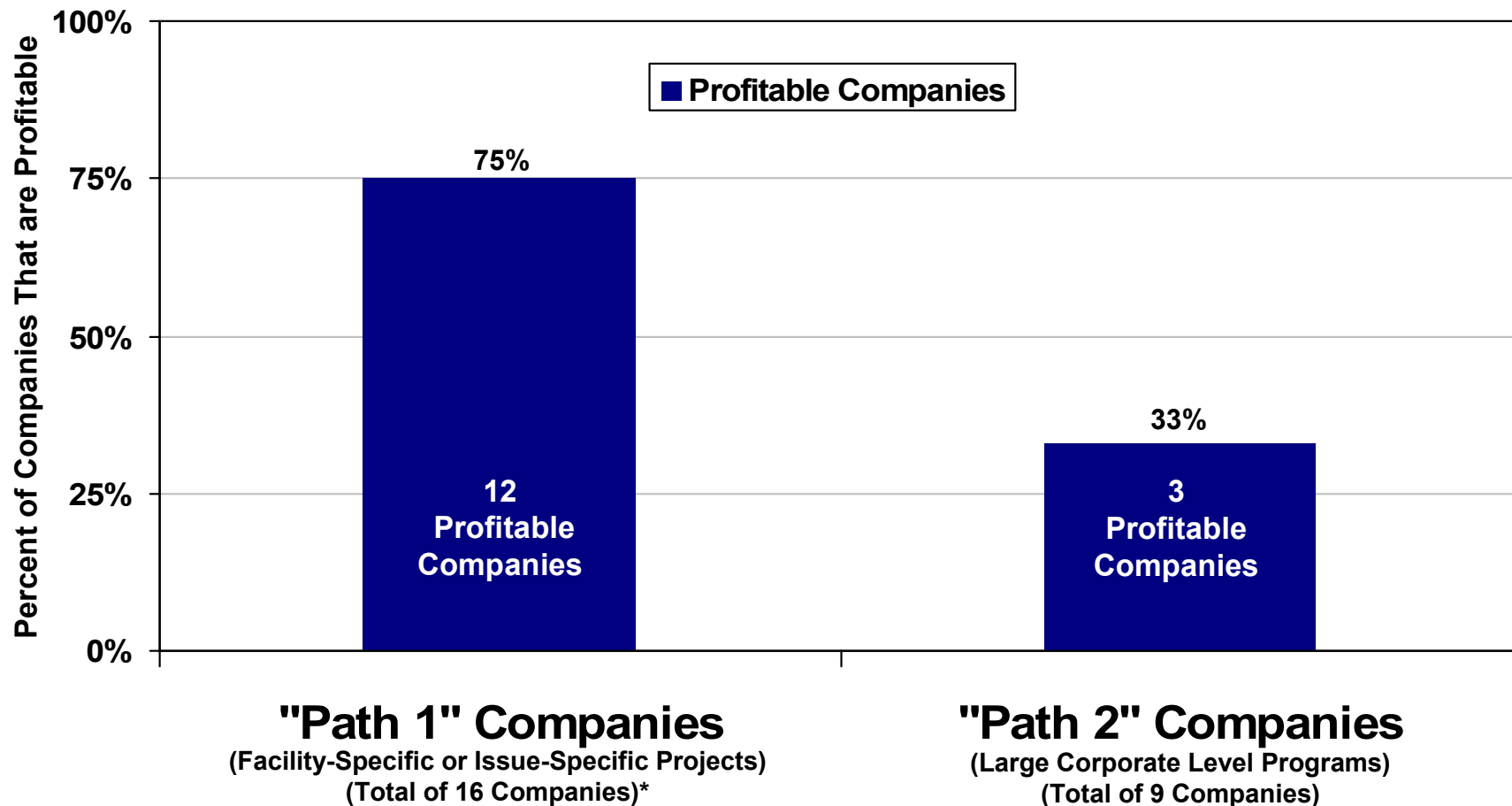
- “We introduced Quest for Zero in 2001 and realized \$55 million in annual improvements. **During 2002, we gained an additional \$211 million in improvements, ending the year at a run rate approximating \$250 million.**” – *Phelps Dodge Corporation, 2002 Annual Report*
- “Our Six Sigma program delivered **cost savings in excess of \$8 million in 2002** from over 60 projects.” – *IMC Global Inc., 2002 Annual Report*
- “Our ForCE 21 Operations Excellence program continues to produce cost savings and improvements in product quality and safety. **Mine operating costs, excluding costs of production curtailments, were down by 5% compared to 2001 costs...The teams provided over \$7 million in cost-reduction benefits on an annualized basis in 2002.**” – *Cleveland-Cliffs Inc., 2002 Annual Report*
- “Utilizing ... our Business Process Improvement program ... **per unit variable costs came down almost four percent and gross profit increased just over sixteen percent ...**” – *Florida Rock Industries, Inc., 2002 Annual Report*

Either path can improve performance. Results of “Path 1” companies were better than those of “Path 2” companies in 2002.

- Three-quarters of Path 1 companies were profitable in 2002 versus one-third of Path 2

2002 Net Income

(25 Publicly-Held Mining Companies – “Path 1” vs. “Path 2”)



Source: Annual reports and company websites

*Includes Placer Dome since their corporate program was implemented only recently

A larger percentage of “Path 1” companies improved their financial performance in 2002 than “Path 2” companies

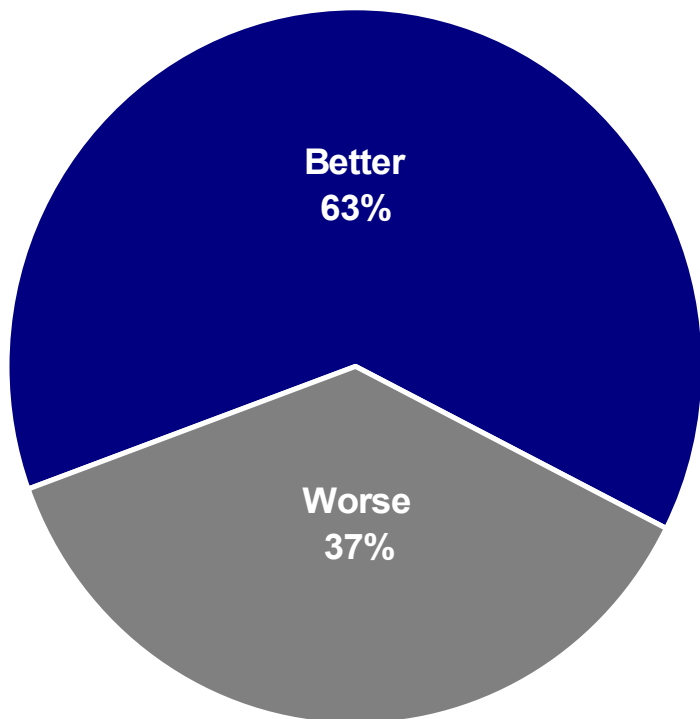
- About two-thirds of Path 1 companies improved performance in 2002 versus one-quarter of Path 2 companies

Net Income Comparison

(2002 vs. 2001)

“Path 1” Companies

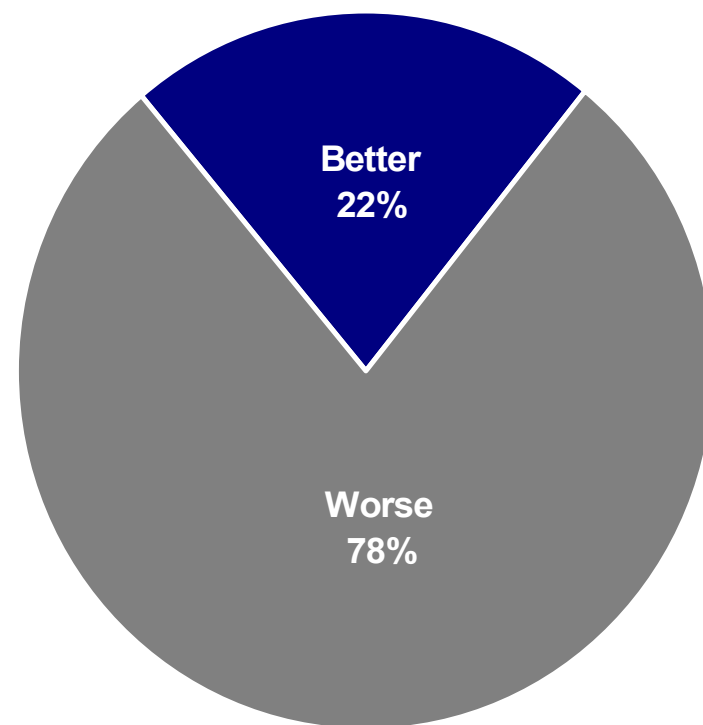
(Facility-Specific or Issue-Specific Projects)



Total of 16 Companies

“Path 2” Companies

(Large Corporate Level Programs)



Total of 9 Companies

Note: Factors other than “Path” have not been accounted for, but may influence financial results

Source: Annual reports and company websites

Companies highlighted numerous pitfalls which can impact results for “Path 1” or “Path 2” programs

Examples of “Path 1” or “Path 2” Program Difficulties

- “**Flavor-of-the-day programs do not work well here.** We have tried to implement them and haven’t gotten anything out of them. None have been tailored to our specific situation”
- “We mapped every process in the company, but **no one uses it or looks at it anymore**”
- “Do what works for your operation – **there is no ‘one size fits all’ solution**”
- “**Field personnel fought the program** – they didn’t want to make all of the decisions”
- “**Employees spent lots of time in team meetings**, then had to work overtime to get the work done”
- “We attempted to standardize processes across mines. **It has not been very successful due to different personalities, equipment and conditions across different locations.**”
- “The program has put a **strain on operations as they lose people to corporate programs**”
- “There were **not enough people to cover all of the (program positions)**”
- “Our projects have been successful in improving results, but you **need the right systems in place to sustain the results over time**, including management systems, monitoring systems and communication systems”

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III. About Norbridge

Norbridge believes consulting is a relationship business built on trust, hard work, and a track record of excellence in creating client value

Introduction to Norbridge

- Management consultants
- Founded in 1993 (Formerly CFGW, Inc.)
- Headquartered outside of Boston in Concord, Massachusetts, a quarter mile from The Old North Bridge (see right)
- Other offices are located near:
 - Washington, D.C.
 - Chicago, IL
- Staff of 25
- **In the last two years, Norbridge has conducted over 100 projects for 20 clients**



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We provide a wide range of services

Norbridge Industry and Functional Focus

Core Industries

- Mining
- Transportation
- Maritime and ports
- Electric utilities
- Pharmaceutical and medical products

Functional Services

- Operations improvement
- Process management
- Corporate and business unit development and planning
- Business modeling
- Market, product, and sales strategy
- eCommerce strategy
- Organization development
- Supply chain and logistics management
- Purchasing and procurement

A broad range of general management consulting support for a select group of industries and clients

Norbridge also works with mining companies to improve performance at mines and processing facilities*

Norbridge's Facility-Specific Approach

- **Our projects are highly results-driven.** We focus on achieving significant and sustained performance improvements in the areas that clients care about most: production, cost, safety, communication, teamwork and other areas.
- **Our Norbridge project teams are cost effective.** We do not send a large project team to "swarm" across mining operations, but rather work closely with the project team and tailor our efforts to do what needs to be done.
- **We are facilitators and problem solvers.** We do not come in, claim to be mining experts, and tell people what to do. Rather, we work closely with the project team to identify the problems, develop and implement the game plan to improve performance, and "make it stick".
- **We are not the program of the month.** The "game plans" that our project teams implement are strong, flexible, and designed to "stand the test of time".
- **We build teamwork and get employees involved.** To improve performance significantly and sustain strong results over the long-term, mining facilities need a strong management team and a workforce that feels they are an important "part of the team". The teamwork and communication when we finish a project is typically much stronger than when we arrive on site.
- **We build strong performance measurement systems.** To improve performance, we work with the project team to build an integrated performance measurement system including two types of measures: current performance measures and early warning measures. To manage mining operations most effectively, it is particularly important to have a measurement system for each facility which tells management what they need to know today, but also which highlights potential problems for the future that need to be addressed. Our measurement systems often track issues, problems or processes that have not been tracked by our clients in the past.