

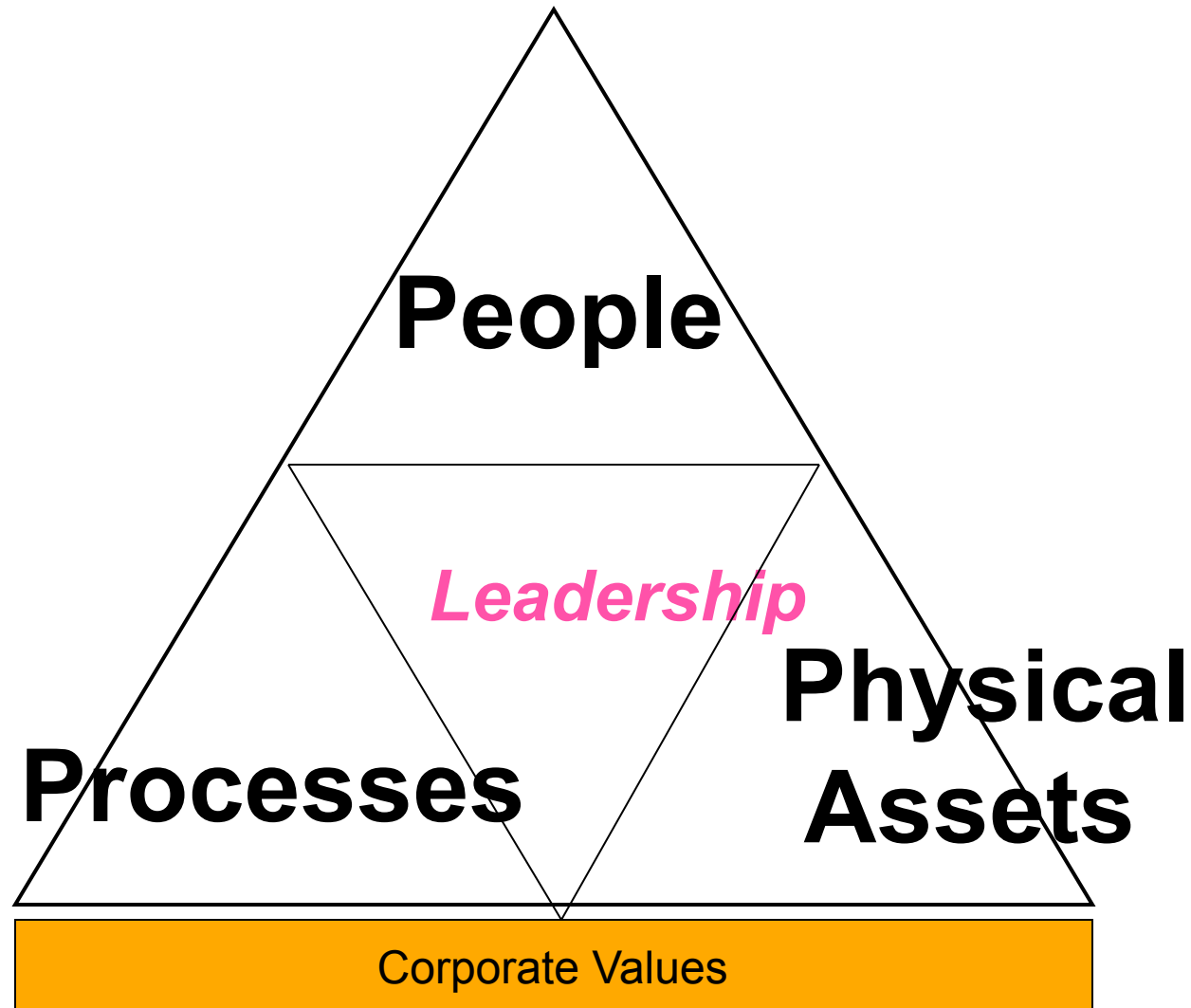
Haulage & Loading 2007
Machines, Mining and
Mankind:
Finding a Balance



The Last Area of Sustained Competitive Advantage-Human asset

Steve Altman, VP North America

The three P's of a Corporation



People

provide the **ONLY** area:

for sustainable

\$ COMPETITIVE ADVANTAGE \$

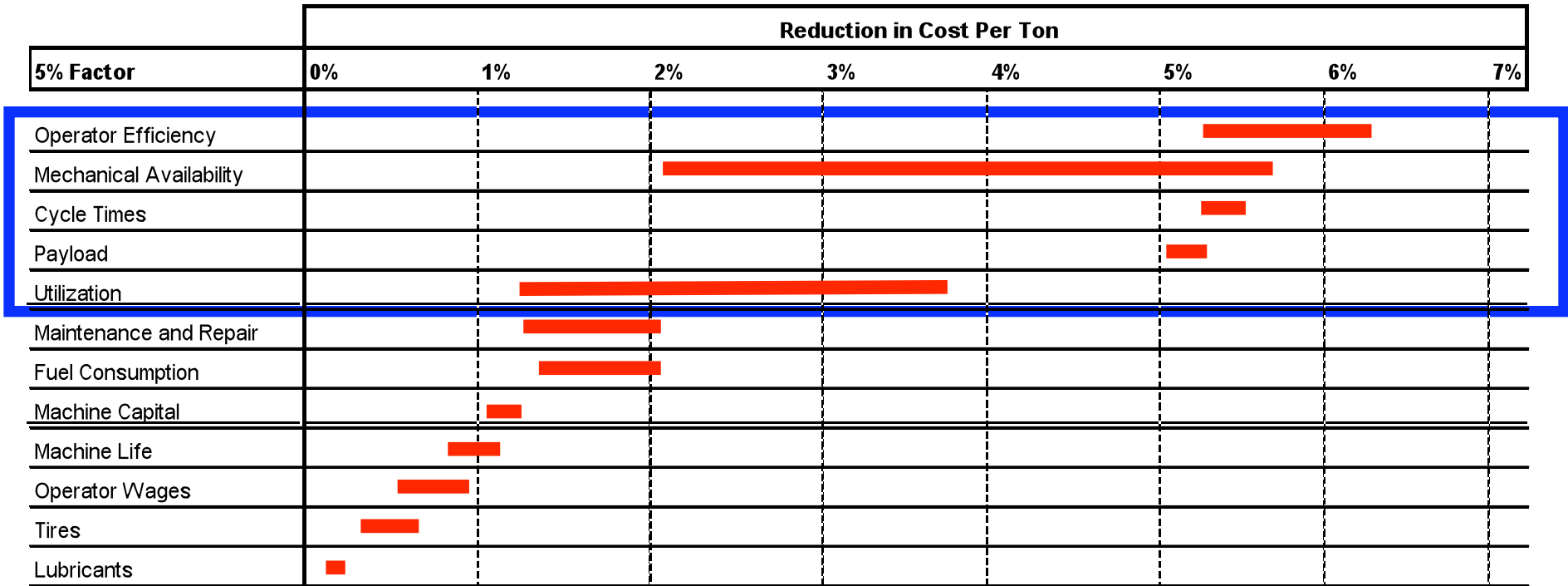
Take away

Where could investment dollars come from?

Cost per Ton Evaluation: Sensitivity

The Top 5 Factors in Cost Per Ton relate to Productivity... Not Cost

A 5% Change in Each of the Listed Factors Cause the Following % Reduction in Cost Per Tonne



Approximate range of final results, based on analyses to date. Cost parameters, including fuel, may vary greatly by location and application.



Case Study – Operator Efficiency

Link to Cost Per Ton – Operator Efficiency

Why would an operator perform at less than maximum efficiency?

- Operator confidence level ←
 - Based on skills
- Poor haul roads
 - Operator comfort, avoiding obstacles, design, congestion
- Operator skill level ←
 - Lack of training, incorrect training, etc.
- Fatigue
 - Long shifts, cab ergonomics, etc.
- Operator breaks



Source: Caterpillar [MineEIA](#) Presentation

Assertions

- **People** provide the largest opportunity for improvement in a mining (only area of sustained competitive advantage)
- Large amounts of **money** await those companies that can address development of their **human asset** efficiently

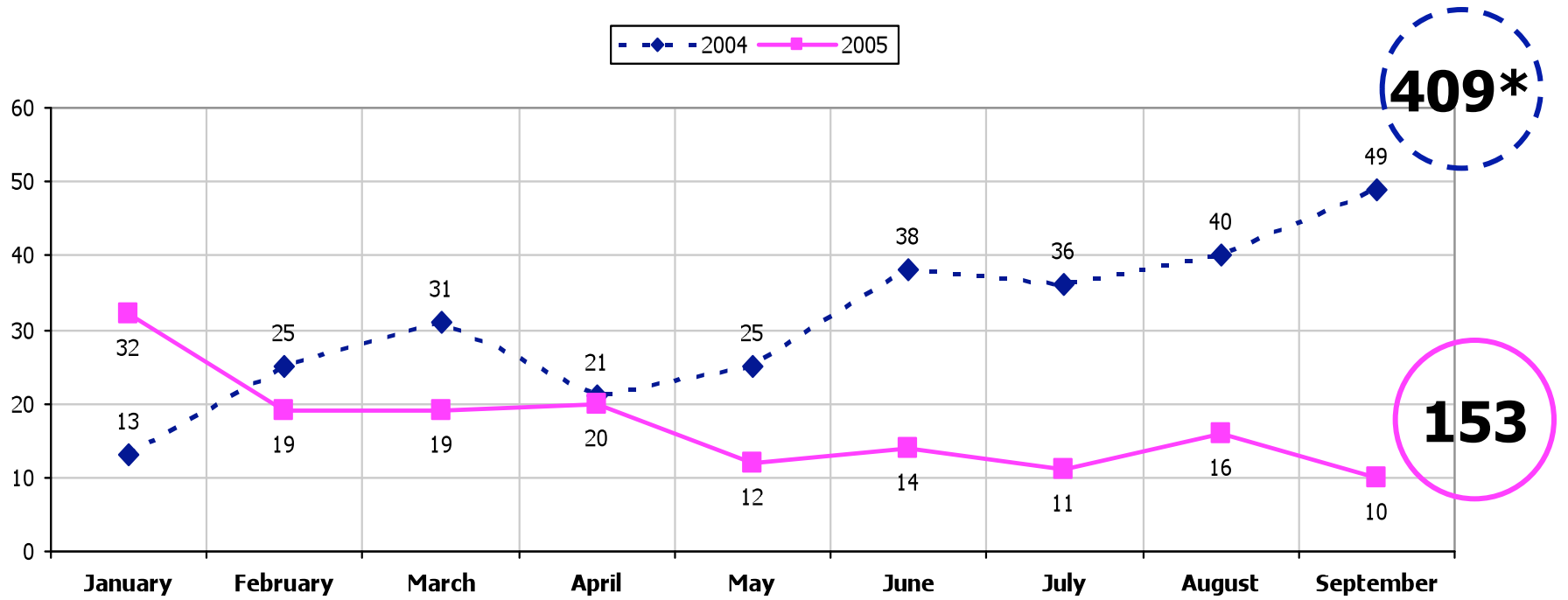
Take away



Operator Effectiveness Maximization- A Case Study

Comparison of October 04 to October 05

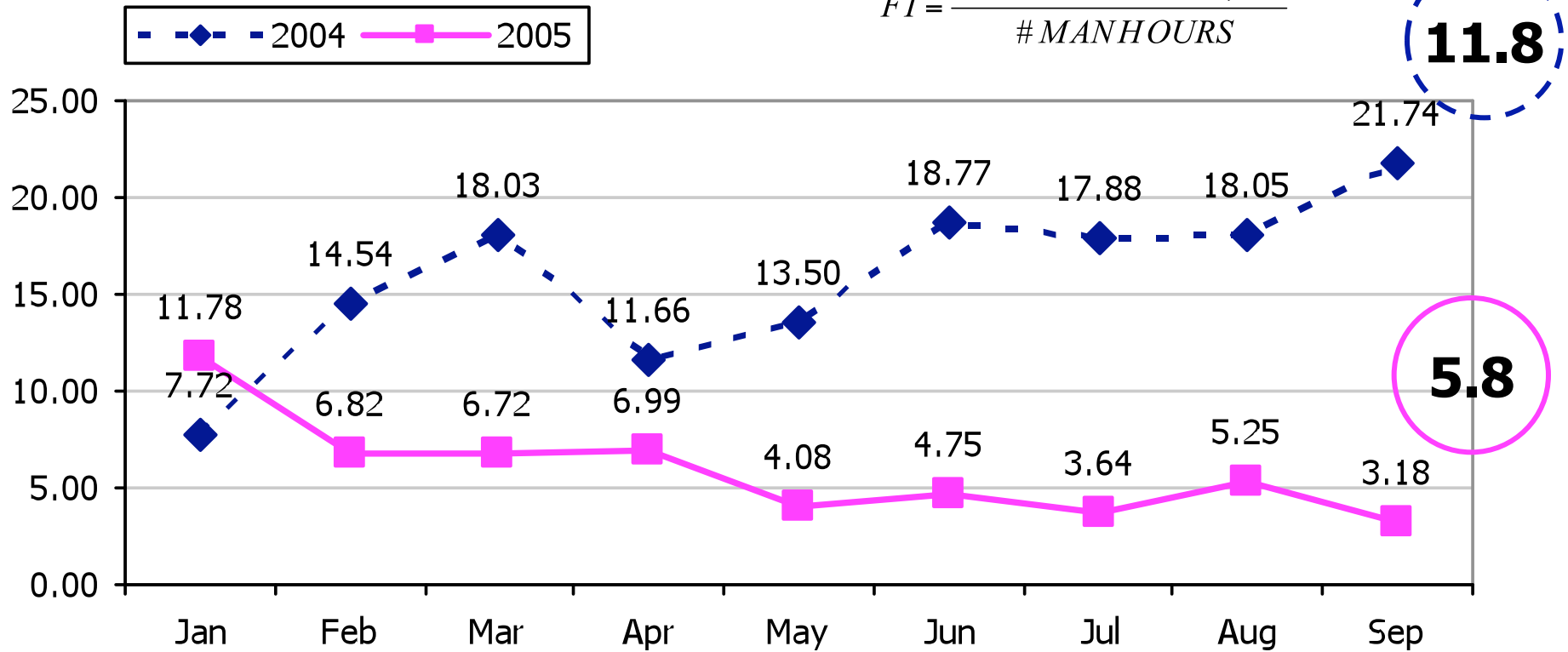
Incidents



*normalized to workforce size

Incident Rate

$$FI = \frac{\#INCIDENTS * 200,000}{\#MANHOURS}$$



Skill Incident Correlation*

Skill Level	Incident Rate
Low	15
▪	8
▪	5
High	.2

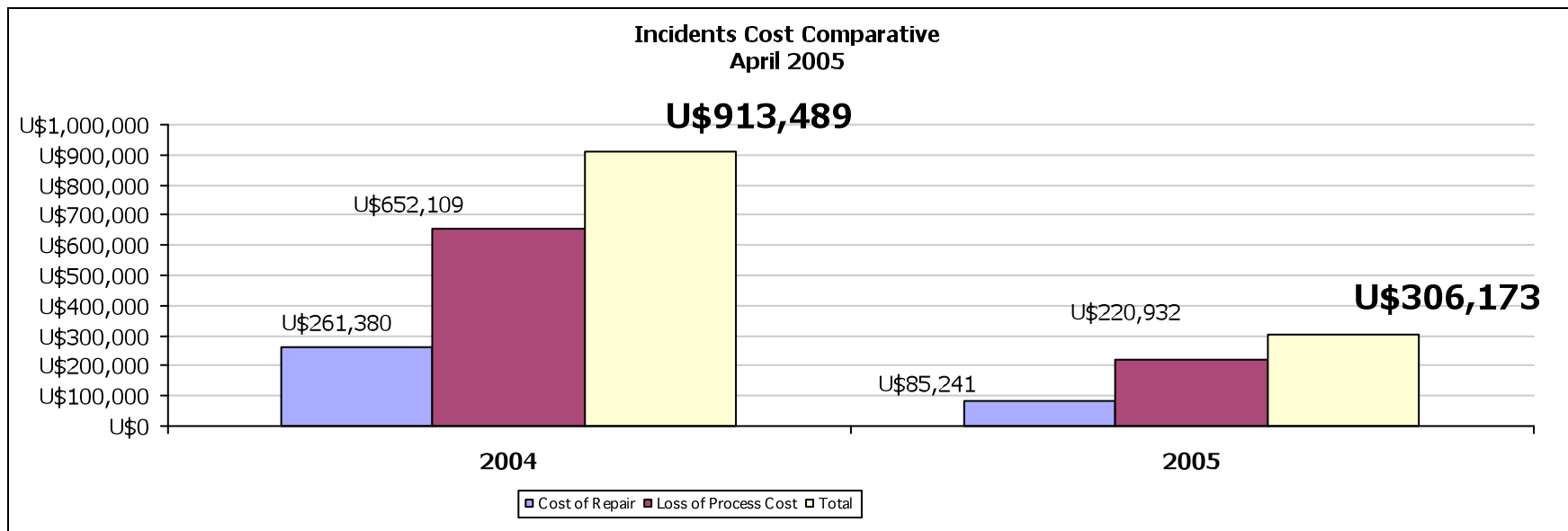
*(per 200,000 man hours)

Equipment Damage

(Dollars)

Incident Rates	Major 1X	Serious 10X	Minor 30 X	Total
15	1,500 K	9,800 K	6,750 K	\$17,250,000
8	800 K	4,000 K	3,800 K	\$9,200,000
5	500 K	3,000 K	2,250 K	\$5,750,000
.2	20 K	120 K	90 K	\$230,000

INCIDENTS COST REPORT (Haul Trucks only)



*Only recorded actual cost of damage from incidents, and production lost from downtime

Technology is our servant not our master

-Dave Packard, HP

What is Simulation?

Digital simulation began in 1960's with flight simulators.

Industries

- Aircraft
- Shipping (Road & Sea)
- Heavy lifting
- Surgery
- Railroads
- Military industries
- Law Enforcement
- Emergency Services
- Earth Moving



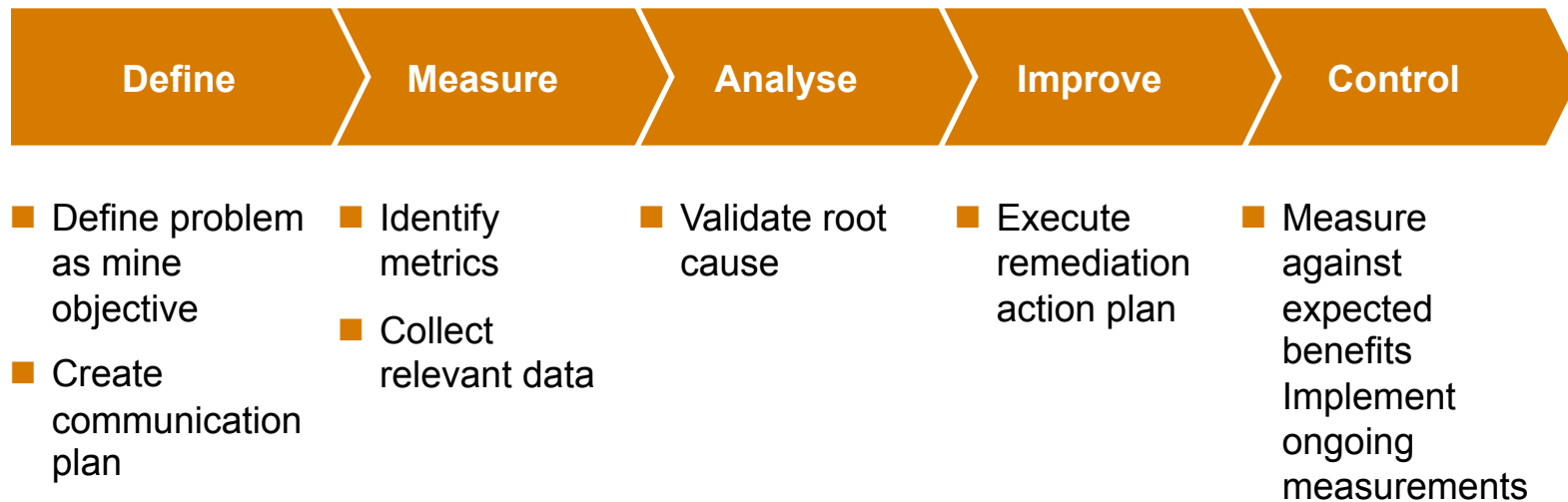
What is Simulation?



1. *Only way to objectively assess skill level of operators*
2. *Best method known to impart skill quickly and with high retention*

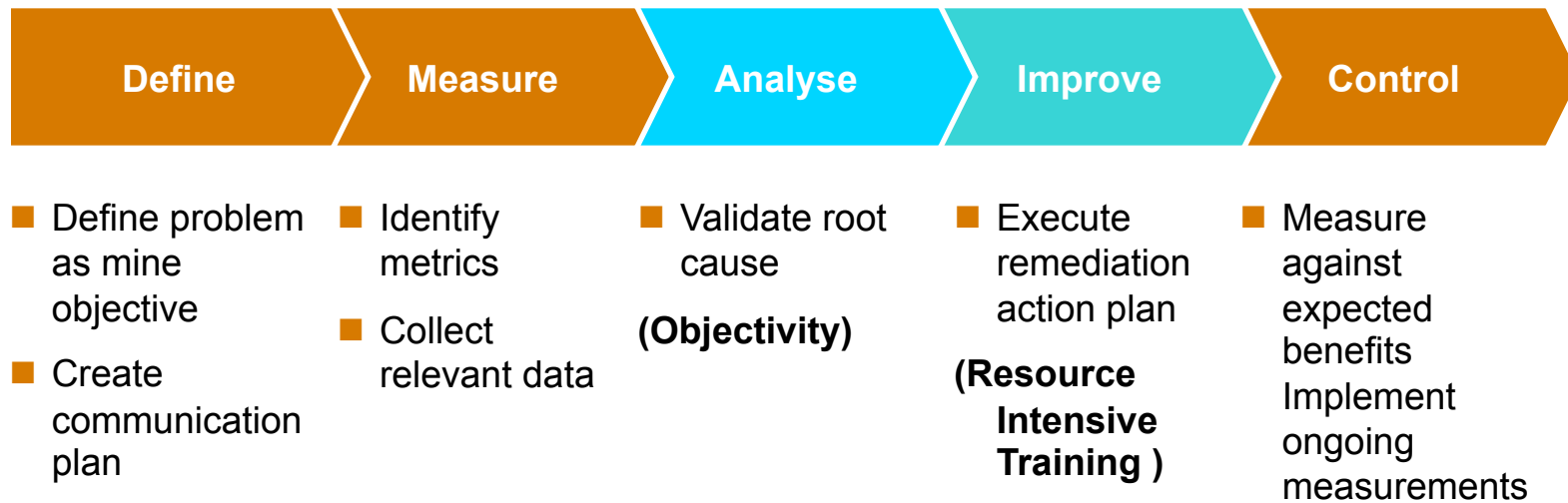
Take away

Method for Applying Six Sigma Continuous Improvement Approach



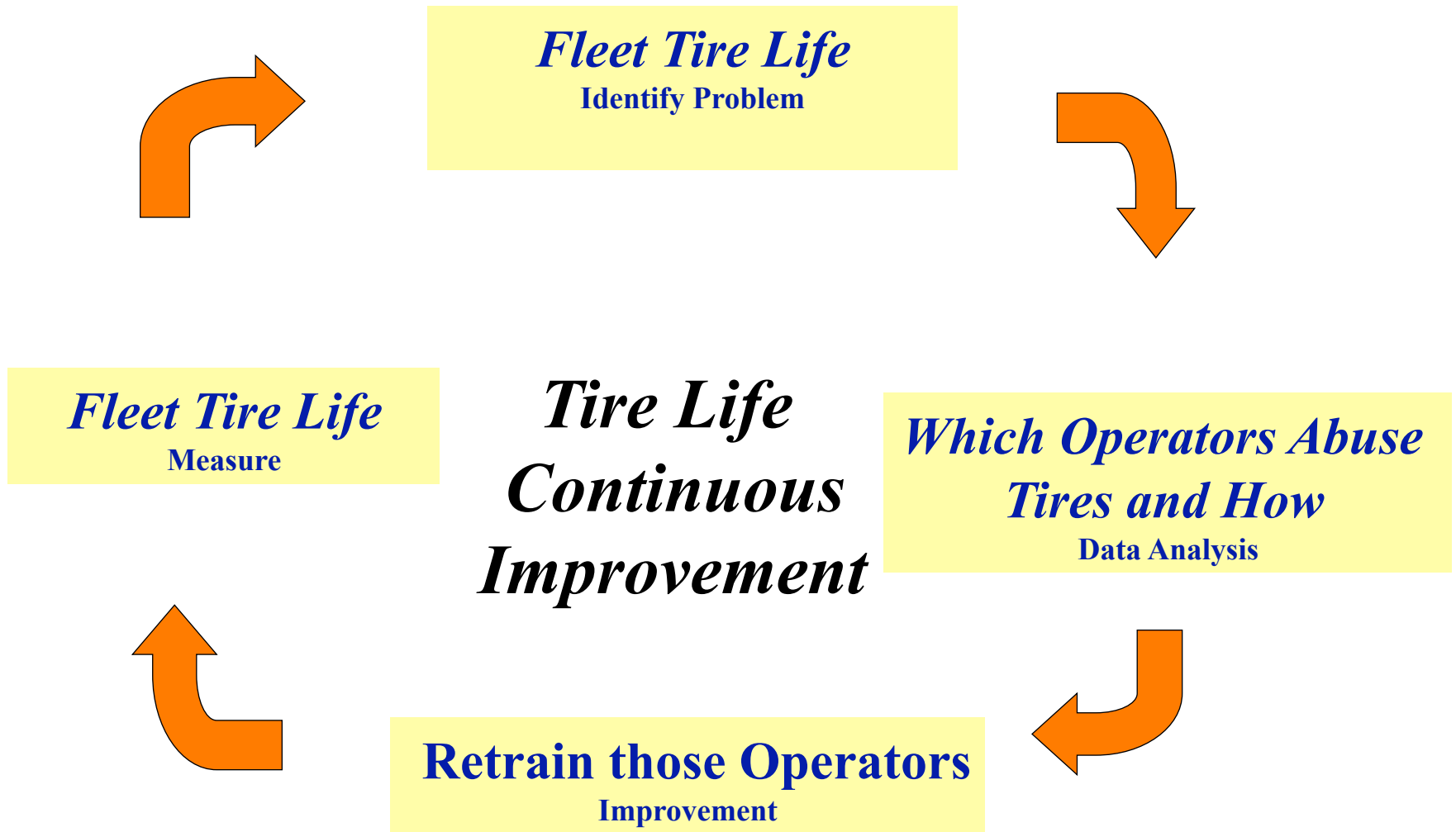
Example considerations

Method for Applying Six Sigma Continuous Improvement Approach

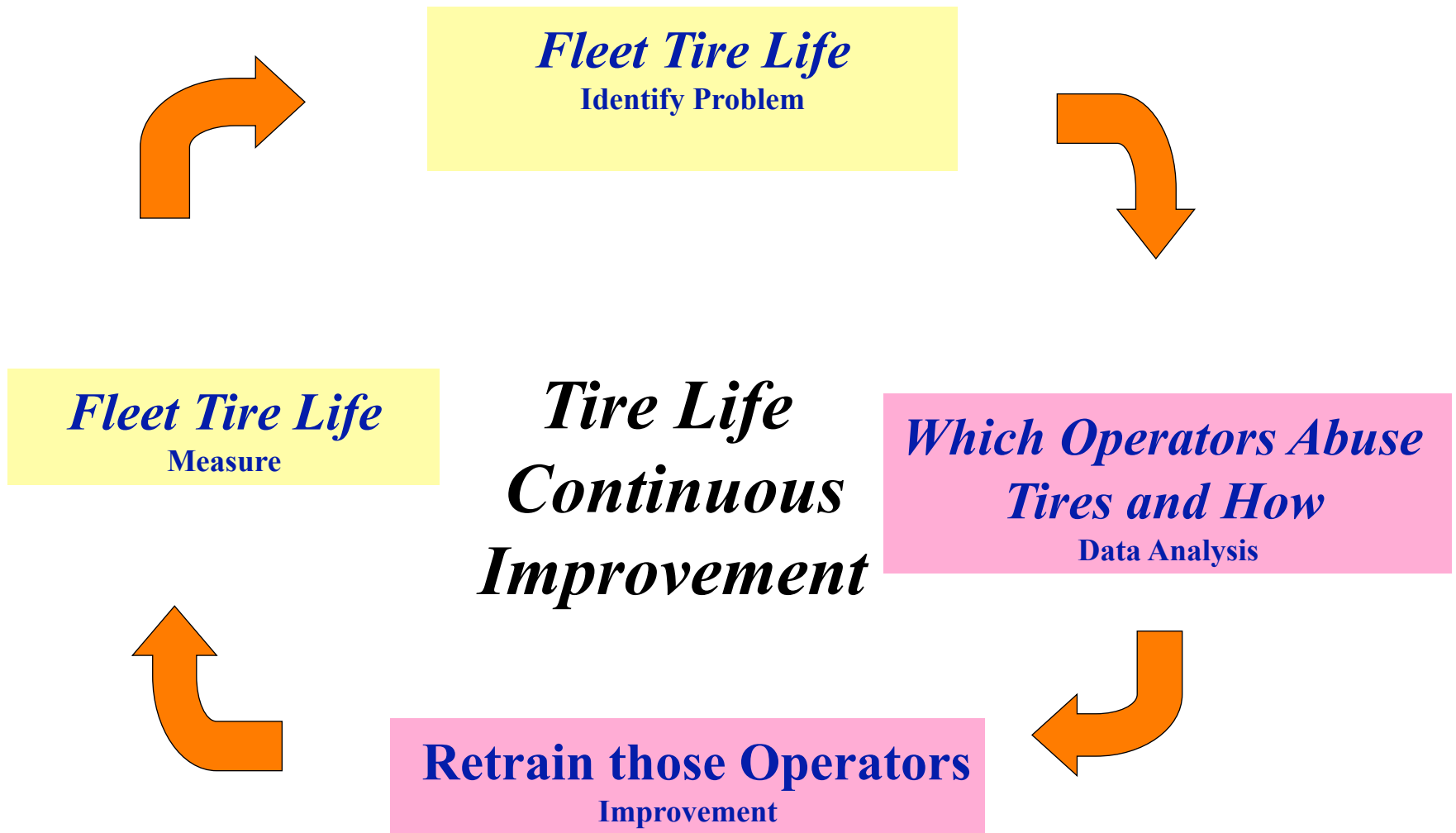


Example considerations

Continuous Improvement



Continuous Improvement



What is Simulation?



1. *Only way to objectively assess skill level of operators*
2. *Best method known to impart skill quickly and with high retention*

Take away

Case Study – Major Copper Producer

Context

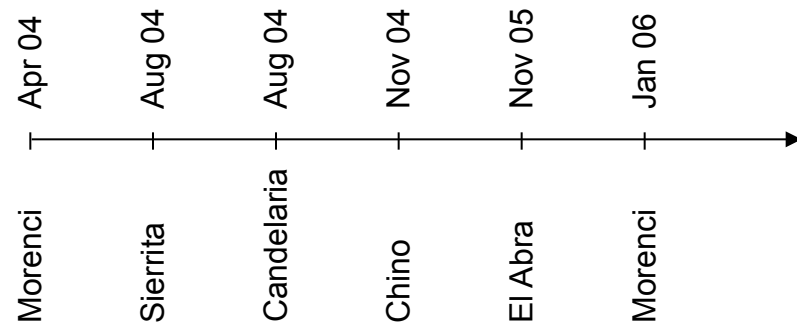
Need to reduce reactive maintenance – *Haul Truck & Shovel* and to enable zero production variance

Typical Mine Fleet:

- 40 x CAT 785B
- 200 x CAT 793C & 797B
- 26 x P&H 4100A and 22 other Shovel/Excavator

Approach

4 Simulators, 600 Operators, 3 Phases – *Baseline, Advanced Performance & New Operator Training*



Results

Baseline Findings – *Haul Truck*

- 80% failed fire emergency response
- 60% failed loss of brakes response
- 85% misused brakes
- 40% misused transmission

Advanced Performance Training

- Average crew improvement >19%, most improved operator + 79%
- 3 Month reduction in zero variance training equals millions per year
- US\$1MM saved annually at largest property-reactive maintenance

New Operator Training

- 275 trained over 2 years
- Reduced training time in field by 50%
- Established correct response to emergencies and desired behaviour, culture

Summary

- Big Dollars await those who can **efficiently** increase operator pool effectiveness
- **Technology** will enable that process
 - Simulation
- **People** comprise biggest area of improvement within mine

Thank you for your attention

