Can Improvements In Design of Mobile Plant Improve Safety Outcomes in the Mining Sector

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New Penalties

Victorian OHS Act (2004) penalties apply from July 2006

- Designers $50,000 to $180,000
- Manufacturers, Suppliers, Construction $900,000
- Employers $900,000
- Queensland is Currently reviewing it's provisions

Industry History

- Australian Mining contributes fifty percent of all export earning
- Since early 1970's enormous growth in the Industry has seen the quadrupling in the size & complexity of mobile mining equipment
- Comparatively the Industry has a high death rate

Recent Studies

- NOHSC Coroners study (2004)compared two 4 year periods relating to fatalities in the Mining Industry (89 – 92) & (98-02)
- MISHC study (2005) on QLD Coal Industry
- NIOSH(US Bureau Mines) (1988)
- Up to 50% of the primary & secondary factors relating to fatalities were linked to design errors in mobile equipment

Industry Fatality History

Define Mobile Equipment in Mining

European Standard EN 292 Safety of Machinery Defines mobile plant as:

An assembly of linked parts or components, at least one of which moves, for a specific application for the processing, treatment, moving, or packaging of a material.

Multiple of machines becomes a machinery system

Truck & Shovel Fleet

Overburden Drill

Excavator & Truck Fleet

Dragline

Dragline Bucket

Design & Legal Duties

- Design is a plan of action to reach a goal. The plan ,is used by engineers, designers, drafters, scientists, technologists (Chalk 2004)

Duties of designers:

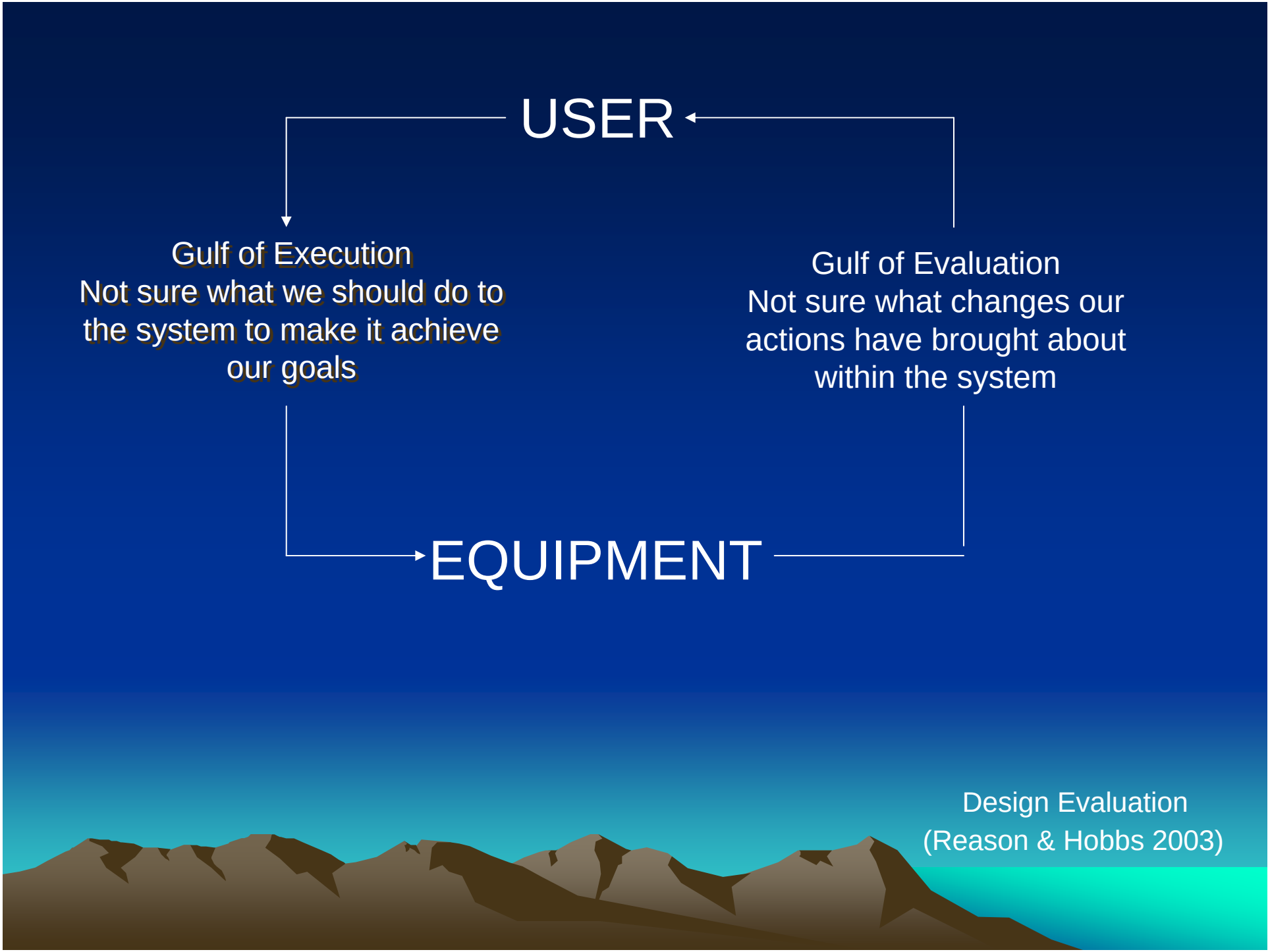
- *A person who designs a machine ought to reasonable know, that the machine or part of that machine is to be used as a workplace and its design must be safe and without risk to the health of the person using it.*

The Problem with Compliance of Designers, Manufactures & Suppliers

- Historic short coming in Legislation
- Assumes equipment is properly used by operators (When Properly Used)
- Unsafe Act or Unsafe Condition to blame
- Supplier instructions for proper use to wide
- Minimal Manufacturer life cycle liability
- “Use At Work” excludes Storage, carriage & processing

The Problem with Compliance of Designers, Manufactures & Suppliers

- The Designers perspective is not always aligned with purchaser's perspective and how the equipment needs to be used by the operator and maintainers
- Legislation does not require the involvement of the end user
- Ashton University (UK) Study of EU Machinery Directives only 62% compliance in Manufacturing Plant
- Gulf of Execution between the user & the equipment (Reason & Hobbs 2003)



Design Evaluation
(Reason & Hobbs 2003)

Problems for End Users

Maintenance Operator

- Access & Egress
- Confined Spaces
- Falling from heights
- Manual Handling
- Electrical Hazards

Machine Operator

- Traffic Management
- Fatigue
- Ergonomics
- Noise & Vibration
- Equipment impact

Design Evaluation: Poor Execution & Evaluation between User & Equipment

Problems with Equipment

- Poor original design or redesign
- Control-display layout
- Unguarded moving parts
- Restricted visibility
- Exposed wiring and hot surfaces
- Exposed sharp surfaces or pinch points

The report concludes the typical engineer does not consider human factors when designing

(NIOSH 1988)

Case Studies

Inspector Marsich v Race Industries P/L

Recent fatalities in Victorian Mining Industries

- Death of a Driller
- Death of a maintenance employee jump starting truck
- Death of a maintenance employee by crushing

Drill Rod lifted into the rotary head while rotating resulting in a fatality.

What is good design for mobile plant?

Key principles of good design

- End User involvement
- Technical expertise
- Knowledge of the full process & working environment of the machine

Examples of the use of good design

- Quarry drill hydraulic shutdown
- QLD jig for Truck strut pin removal
- QLD overburden drill access modifications

Quarry Overburden Drill
Hydraulic Interlock System

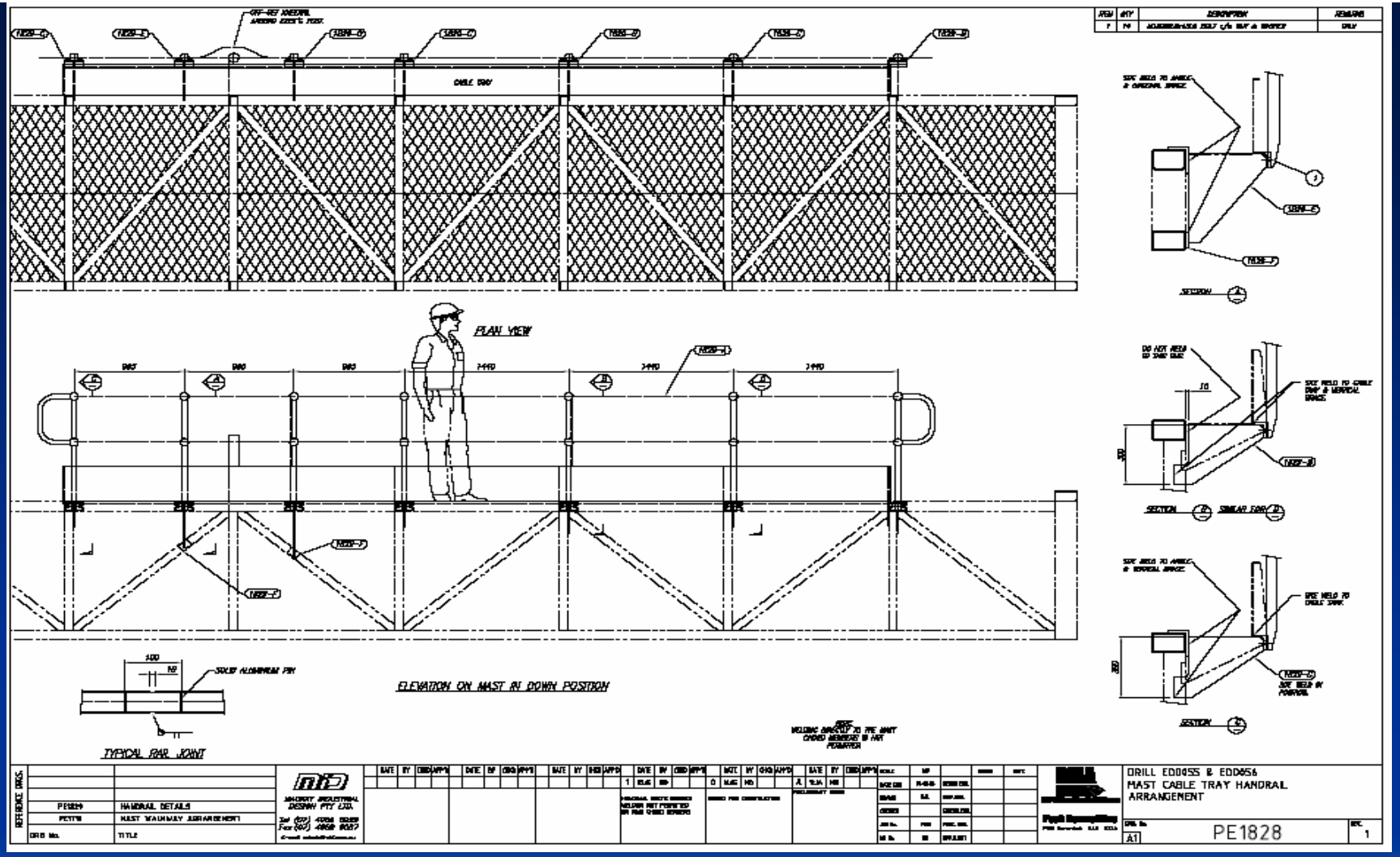
Cost $5000.00

Door deactivates all rotary parts when opened, can be seat mounted for deactivation

Truck Strut Pin
Removal 28 kg

Pin Jig lifting device

Drill Mast Access modifications



Manufacturer's Design required detailed engineering changes

Vehicle raised lights,
ROPS & aerial flag

National strategies to improve design of mobile plant

- ASCC “Eliminating Hazards at design stage”
- NOHSC Strategy (2002 -2012) “Safe Design Guidelines”
- NSW Construction Industry (employ facilitators)
- QLD Earth Moving Equipment Safety Round Table (EMSRT)
- Worksafe Victoria Guideline flowchart

Pre-Design Phase

Source known Hazards & Issues

Source Industry Injury stats

Source equipment standards

Obtain background information

Conceptual & Schematic Design

Preliminary Hazard Identification

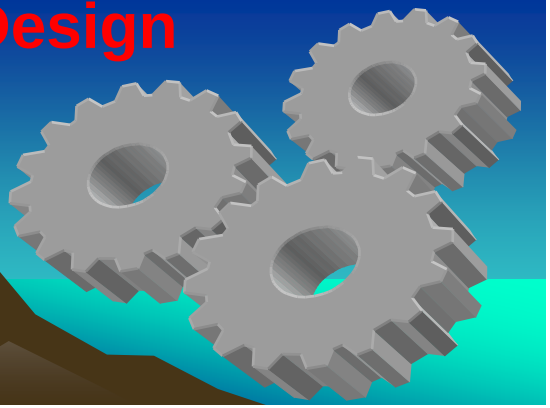
Identify All Hazards
-- Structure
-- System of work
-- Environmental conditions
-- Incident mitigation

Embedded Risk Management

Review Design

Identify Controls

Final Design



Industry Recognition

Industry recognised by

- WorkSafe Awards may provide contemporary examples of good design
- QLD Innovation awards
- Minex awards
- Fatal Risk Control Protocols recognised by industry result in standardised safety features.
- Hierarchy of control, engineering solutions
- State of Knowledge may make a legal argument in industry for change.
- Retro fitting is costly, design up front

Conclusions for Design Process

- Good design must firstly involve all parties in particular the End User
- Good design requires strict adherence to all standards and compliance
- Manufacturers must have life cycle responsibility for their products
- Government, Mine Owners, Unions must be proactively involved to ensure manufacturers suppliers, construction comply .
- Legislation regarding designers must involve the End User (Qld risk management approach)