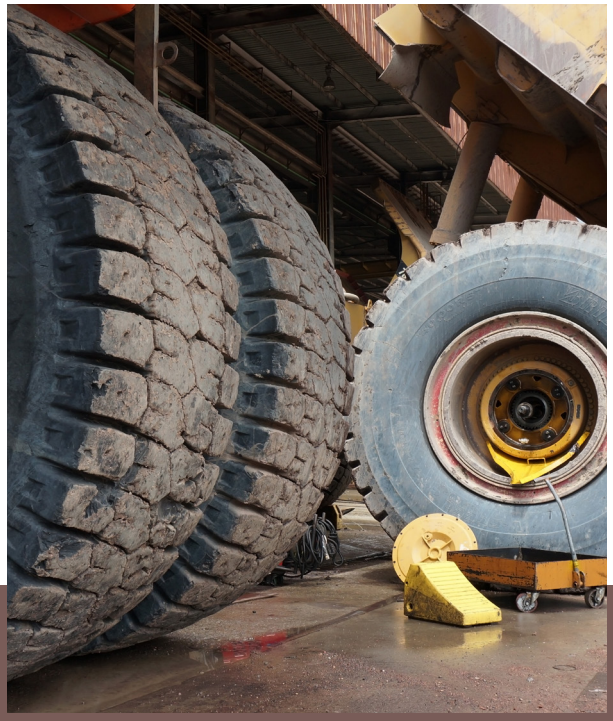
EMESRT

Earth Moving Equipment Safety Round Table



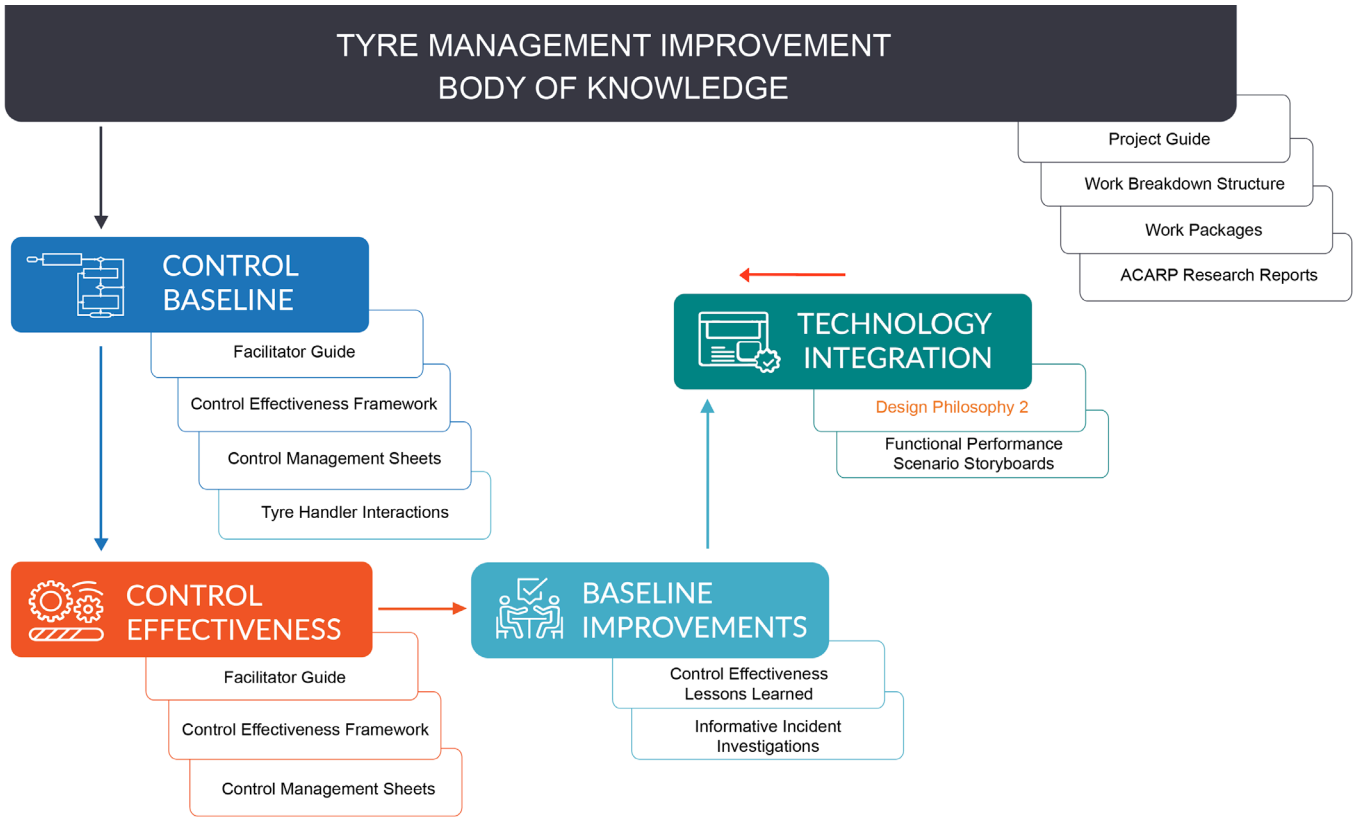
DESIGN PHILOSOPHY 2

TYRES AND RIMS

Objective

To prevent harm related to tyre and rim events to as low as reasonably practical, including consideration in design for foreseeable human error and material failures.

The diagram below provides an understanding of where the Design Philosophy 2 integrates into the overall Tyre Management Improvement Body of Knowledge industry resources.



General outcome

The intended design outcome should include/consider the following:

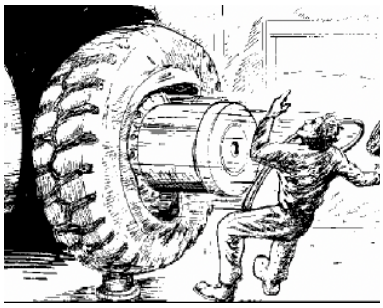
- Physical size and weight of tyres
- Stored pressures
- Tyre and rim monitoring technology
- Tyre handling equipment and tools
- Gripping/Handling of structurally damaged tyres
- Handling of spare tyres from storage or transport carriers

2.1 Causal Pathways

Harm due to uncontrolled release of pressure from the tyre and rim assembly during operation and maintenance due to:

- Complex design of rim assembly systems that initiate unwanted behaviours such as
  - Failure to remove pressure from tyres
  - Failure to follow the correct procedure or sequence when attempting to maintain or remove them
- Inter-reliance of components
- Undetectable failures or defects such as abnormal rim condition that becomes evident only when the rim fastening system is released





2.2 Causal Pathways

Harm due to assembly failure from mismatched components on multiple component rim assemblies.


2.3 Causal Pathways

Harm from pyrolysis/explosion of the tyre and rim assembly due to:

- Improperly fitted tyre/rim incorrect inflation pressure.
- Tyre operating condition becoming critical without the operator's knowledge



2.4 Causal Pathways

Harm from crushing of fingers/hands/body during maintenance activities due to:

- Physical size and mass of the wheels
- Design requires tasks that have people working inside the arms of tyre handler manipulators
- Unstable and inaccessible jacking points



2.5 Causal Pathways

Harm from musculoskeletal strains and sprains during maintenance activities due to:

- Inadequate diversity of ergonomic and anthropometric range that creates compromised postures
- Inappropriate or compromised hand/wrist posture due to mechanism required to manipulate/grasp
- Inappropriate or compromised shoulder and back posture due to extended reach
- Inappropriate or compromised posture
- Inadequate reduction of exposure to whole-body vibration



2.6 Causal Pathways

Chronic health implications (e.g. musculoskeletal disorders (MSD's), white finger, hearing loss) from high frequency use of maintenance tooling.