TYREgate – a Causal Factors Database and Risk Management Decision Making Support Tool for Earthmover Tyres and Rims

http://mirmgate.com/tyregate

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Overview

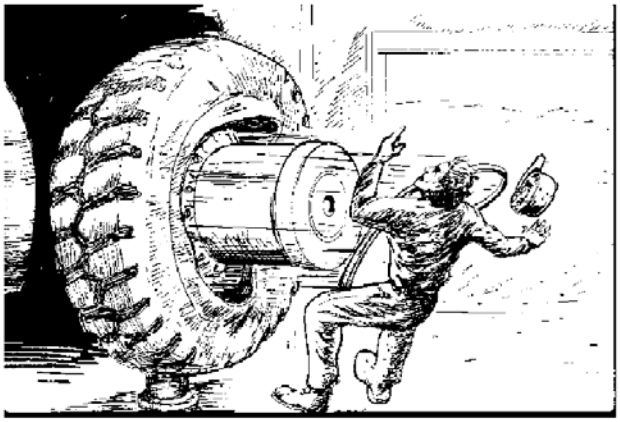
TYREgate is a new Minerals Industry Risk Management Gateway, known as MIRMgate, Causal Factors Database and provides a range of information, potential solutions and flags opportunities that can be used to improve safety of tyre and rim maintenance and use of rubber tyred equipment at any mine site, or related operation or service.

In contrast to other databases, it offers information and background on tyre and rim related accidents and incidents and what mitigative steps have been taken to reduce the risks that have led to the mishap. The latter is considered of high priority and value to safety and risk managers on mine sites, maintenance and operations personnel, manufacturers of tyres and rims, vehicle Original Equipment Manufacturers (OEMs), and tyre maintenance service providers that are proactively searching for sound advice to advance safety of tyre and rim usage.

A particular strength of this unique system is allowing searching through "**innovative graphing tool**". The tool will assist designers, manufacturers, importers and suppliers of plant to meet their legislative obligations to ensure the equipment or plant is fit for purpose so that, when used properly, the risk to persons from the use of the plant is at an acceptable level.

TYREgate builds on the general intent on MIRMgate – EMESRT (Earth Moving Equipment Safety and Round Table) project in specifically the online MIRMgate – EMESRT Tyres & Rims Design Philosophy http://mirmgate.com/tires_and_rims.asp.

TYREgate establishment is funded by the Australian Coal Association Research Program (ACARP).



Failure of rim/locking mechanisms during wheel maintenance is one of the highest cause of all tyre maintenance fatalities (U.S. Department of Labor, Mine Safety and Health, Administration, *Tire and Rim Safety Awareness Program*, in *Instruction Guide Series, MSHA IG 60*. 1996.

Why Gather & Analyse Tyres and Rims Related Accident and Incidents?

Tyres, rims and wheel assemblies are safety critical items which must be maintained and operated correctly to provide a safe working environment. Unfortunately less than adequate awareness of tyre and rim related hazards, in both the maintenance and operations areas continue to cause accidents and incidents across the industry, some of them fatal. Tyre maintenance and service work in particular is a high risk activity as it involves working with a number of high potential energy and hazard sources.

Typically tyre maintenance by its nature requires the tyre serviceman to use compressed air to inflate tyre assemblies, hydraulic tooling to break apart wheel assemblies, utilise bulky tyre handlers to manipulate very large and heavy tyres to mention a few known hazards that have played part in the causation of many incidents and accidents.

The risk of sustaining severe injury is further amplified in that any damage to tyres and rims can often not be readily identified, which if not observed/corrected will result in a safety issue. Risks here do not only expose tyre maintenance personnel, but also operations personnel.

The current global tyre shortage has also added a new element of risk, in that tyre owners and managers may be considering added preventative tyre and rim maintenance activities which inadvertently expose personnel more frequently to the inherent risks of tyre maintenance, if not properly controlled. Certainly the likely use of 'second hand tyres' for which little to no service history exists will create additional hazards for tyre service and operations personnel.

As such, given the hazard potential, ***tyre and rim maintenance incidents and accidents are more likely to result in serious injury or fatal outcomes, than many other industrial processes.***

It should be noted that during 2004 alone, six tyre fitters were fatally injured in the Australia-Asian region while carrying our routine maintenance on mining vehicles.

Analysis of Tyre Related Accidents and Incidents:

a Study with Recommendations to improve Tyre & Rim Maintenance and Operational Safety of Rubber Tyred Equipment

Incidents and accidents related to tyre and rim maintenance and operation continue to occur in the industry. Because of the energies involved such mishaps can easily result in serious injury, or even fatal outcomes. Even near misses, if properly assessed for their true risk potential can often be classified as 'high potential' events.

While there are a number of documents available that provide sound advice on tyre and rim maintenance and application, these may not provide the background on why, and for what reasons, in order of priority, certain actions are required. Also, this advice is often only aimed at the tyre maintenance service provider, which may or may not address the true root cause such as issues with product design which lie outside the service providers' scope of influence.

To address these issues, a comprehensive database of publications of available incidents and accidents was established, reviewed and analysed through a previous ACARP project (Rasche 2007[1]). To assist the industry in better prioritising its approach to safe tyre maintenance, aim of the 2007 project was to provide this sector and its stakeholders such as tyre and rim manufacturers and service providers, with an objective up-to-date 'all in one' analysis and summary of its incident and accident experience and to provide an insight into the real root and

[1] Rasche T 2006.*Review and Analysis of Tyre Related Accidents and Incidents – a Study with Recommendations to Improve Tyre & Rim Maintenance and Operational Safety of Rubber Tyred Equipment*, ACARP project C15046

contributing causes (acts and conditions, design issues etc.) that need to be addressed proactively to improve safety of tyre and rim maintenance, and application in the field.

In this study, the **Incident Cause Analysis Method**, **ICAM** methodology, was utilised to analyse the data and provide a logical description of the incident and accident causation thereby supporting the notion that most incidents and accidents are caused rarely by a single act or condition, but rather by a number of factors working together. The strength of this analytical approach and framework allows an objective examination into the root and contributing causes of the incidents and accidents but also into industry adopted means of hazard and risk control.

TYREgate Establishment: World's 1st Searchable Causal Factors Database

TYREgate, as a progression of the 2007 project, assists in creating safer and more reliable tyre and rim management strategies and organisations. Similar approaches have already been adopted by other high risk industries such as the nuclear, aviation and the petrochemical sector, with considerable success. TYREgate is hosted through the already existing Minerals Industry Risk Management Gateway, MIRMgate (Kizil, 2005[2]) (http://www.mirmgate.com) portal. Figure 1 shows the TYREgate home page.

The thrust of TYREgate was to make this invaluable information readily available to decision makers - not only the general mining community worldwide but also to tyre maintenance and tyre management personnel, and Original Equipment Manufacturers (OEMs). Specifically TYREgate offers "**Intuitive Searching and Reporting Tool"**

- covering Australian and International accident and incident data from both coal and metalliferous sector,
- providing root causes and contributing factors, particularly design, maintenance and operating issues,
- giving a list of published actions and recommendations that the mining and associate industry including manufacturers can use towards the elimination and better management of tyre and rims related hazards and impacts, based on the 'hierarchy of control',
- leading to tyre and rim related design improvements and initiatives covering a range of equipment and practices including enhancements of tyre and rim related design issues e.g.
    - design of rims,
    - design of tyre and rim specific safety innovations,
    - maintenance tooling, and
    - tyre handler and tyre manipulator improvements, through interfacing with existing Earth Moving Equipment Safety and Round Table (EMESRT) Tyres & Rims Design Philosophy (http://mirmgate.com/tires_and_rims.asp).

[2] Kizil G V, 2005. *The Development and Implementation of Minerals Industry Risk Management Gateway, MIRMgate*. 32nd International Symposium on APCOM. Applications of Computers and Operations Research in the Minerals Industry, 30 Mar – 1 Apr 2005. Tuscon, Arizona, USA.

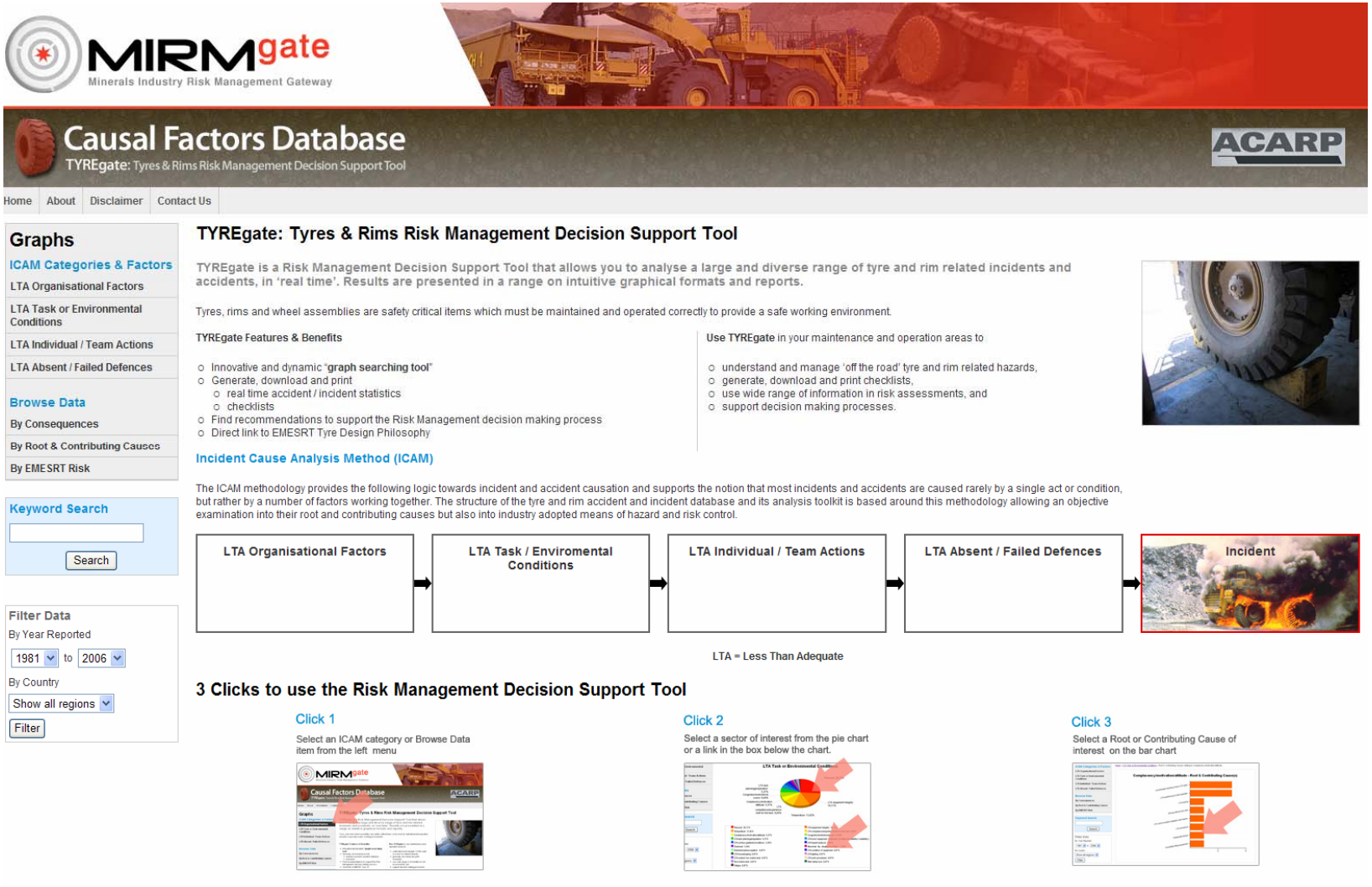


Figure 1. TYREgate: Tyres & Rims Risk Management Decision Support Tool Home page is shown.

TYREgate Features

"Innovative" Graph Searching Tool

A particular strength of this unique system is allowing searching through innovative graphing tool. The graphs are dynamically created to allow ease of access to root and contributing causes of tyres and rims related accident and incident data in "**3 clicks"**, provision of a range of incident and accident information, and risk mitigation recommendations, that if implemented will have a marked impact in reduction of this type of incident and accident scenario.

A key driver and deliverable of this approach was the aim to enable the TYREgate users, tyre service/management personnel, Original Equipment Manufacturers (OEMs), industry groups and mining companies, to access information easily and in an intuitive way to assist decision makers with objective information to make the mining industry a safer place of work.

While in the past improvements in tyre and rim related safety were (often by default) allocated to the actual tyre maintenance service provider, TYREgate now offers reliable data and information to all stakeholders to improve earthmover tyre and rim maintenance, operation and management activities particularly management of safety and health. TYREgate is also linked to the "**MIRMgate EMESRT Tyres and Rims Design Philosophy**" (http://mirmgate.com/tires_and_rims.asp) thereby allowing OEMs and their design engineers to establish industry approaches in making working with and around earthmover tyres and rims safer.

Conclusions

TYREgate is utilising industry endorsed online MIRMgate portal to facilitate sharing of information and common learnings based on industry experience.

TYREgate allows tyre maintenance and tyre manager personnel, OEMs, and the mining industry in general to access causal factor information and recommendations which will assist in creating safer and more reliable management strategies and organisations.

TYREgate establishment is funded by the ACARP. TYREgate project team would like to acknowledge the ACARP for the opportunity given to develop and implement TYREgate.

Because of its innovative approach and detailed recommendations, the authors believe that this project, and others building on the project's demonstrated methodology, will assist EMESRT and Original Equipment Manufacturers (OEMs), and industry at large to achieve their goals of a safer, injury free workplace.

A key point of TYREgate establishment is that it will form the pilot for like projects towards creation of reliable data banks that could be of assistance across a range of design or safety projects.