Safety standards as applied by Metso Minerals on mobile equipment

Advantages, experiences and future developments

4th Atlantic Alliance Conference
April 20th 2007
Safety standards as applied by Metso Minerals on mobile equipment

• Experience
• Standards and how we work
• Examples
• The future
The first crusher manufactured by Lokomo Oy in 1921

Metso Minerals ‘Cornerstone’
Companies for crushing and screening equipment:
• Nordberg, USA
• Bergeaud, France
• Svedala, Sweden
• Lokomo, Finland
Mobile plants and safety… is there a conflict?

• Mobility and transportability require certain compactness

• Different solutions required when compared to fixed plants

• No conflict… call it a challenge!
Case 1. Return roller protection

Chiapas, Mexico - 1992
• Locally built cone crusher plant

Return roller

Water hose
5 minutes later...
First Lokotrack (LT125) delivered to a UK quarry in 1988

Return roller covers - ‘self cleaning’ solid plate type
Return roller cover
Box type, made out of mesh

• Good protection
• Does not stay clean
=> gets removed
Return roller cover
Model ‘Gatling’

- Good protection
- Keeps clean
- Difficult to assemble
  => will not be re-assembled after some maintenance
Return roller cover
Current design
- simple and functional
Case 2: 
Crusher inspection door

Warning sign
Tool required for opening
Case 2.
Crusher inspection door
Requirement:
- limit switch to stop the plant when the door is opened
The lesson is:

• The safety equipment
  • must provide full protection
  • must fulfill the standards
  AND
  • must be practical and reliable
  • must not prevent the machine to be used for its actual purpose
  • must not prevent maintenance

Device which has been removed or by-passed is more dangerous than one which was not there originally
=> ”illusion of safety”
Machinery safety, regulation hierarchy

Machinery directive
98/37/EC

Safety of machinery. Basic concepts, general principles for design EN-ISO 12100-1 and 2 (EN 292-1 and 2)

Harmonised standards (C-standards)
E.g.: EN 474 Earth moving machinery
EN 1889-1 Mobile machinery working underground - Rubber tyred vehicles
prEN 1009-1…4 Mechanical processing of minerals

Directives on Safety and health of workers at work
89/391/ETC
89/655/ETC

Exposure directives
2003/10/EC Noise
2002/44/EC Vibration

National health and safety regulations

Principles for risk assessment
EN 1050

2000/14/EC Noise emission in the environment by equipment for use outdoors

97/68/EC Engine exhaust emission directive

89/336/ETC EMC-directive (Electromagnetic compatibility)

97/23/EC Pressure equipment directive

SAFE MACHINERY

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Machine type specific standards under work
Also for mobile crushers and screens

CEN Technical Committee (TC) 151 has proposed the following standards:
- prEN 1009-1: Feeding, crushing, milling, sizing and sorting machines for mechanical processing of minerals and similar solid materials - Safety - Part 1: Common requirements for single machines and processing plant
- prEN 1009-2: Feeding, crushing, milling, sizing and sorting machines for mechanical processing of minerals and similar solid materials - Safety - Part 2: Feeding machinery
- prEN 1009-3: Feeding, crushing, milling, sizing and sorting machines for mechanical processing of minerals and similar solid materials - Safety - Part 3: Crushing and milling machinery
- prEN 1009-4: Feeding, crushing, milling, sizing and sorting machines for mechanical processing of minerals and similar solid materials - Safety - Part 4: Sorting and sizing machines
  • to be decided soon..

ISO Technical committee 195 has proposed the following standards:
- ISO/CD 21873.2: Building construction machinery and equipment - Mobile crushers - Terminology and commercial specifications
- ISO/WD 21873-2: Building construction machinery and equipment - Mobile crushers - Part 2: Safety requirements
  • 1st draft ready spring 2006
MM Mobile equipment engineering

Safety manager’s key responsibilities:

• Training of engineering personnel
• Participating product development projects
  • risk analysis
  • risk assessments
• Follow and participate standardization

All engineering changes always are subject to a safety review:
• Does this change have effect on safety?
Machine directive 98/3/EY
Pos 1.2 Control system - Start from one place only
Machine directive 98/3/EY
Pos 1.2 Control system - Safety stops

Emergency switch

Conveyor stop wires
Machine directive 98/3/EY
Pos 1.3 Mechanical safety hazard - Structural or component failure

Structural strength - FEM analysis
High quality components

High technical reliability provides:
• decreased safety risk due to failure
• decreased safety risk when making repair
...and more up-time
Machine directive 98/3/EY
Pos 1.3 Mechanical safety hazard - Falling objects
Jaw crusher cavity safety gate & Warning signs
Machine directive 98/3/EY
Pos 1.3 Mechanical safety hazard - Moving parts
Hydraulic folding and locking of feed hopper walls
=> No need for manual work => HAZARD ELIMINATED
Machine directive 98/3/EY
Pos 1.3 Mechanical safety hazard - Moving parts
Flywheel and belt cover
- Opening requires a tool (as required in Pos.4)
Machine directive 98/3/EY
Pos 1.5 Other safety hazard - High temperature
Exhaust pipe cover
Machine directive 98/3/EY
Pos 1.5 Other safety hazard - Fire
Engine compartment fire extinguisher - Option
Machine directive 98/3/EY
Pos 1.5 Other safety hazard - Noise
Noise insulated engine cover and muffler
Feed hopper rubber lining
Machine directive 98/3/EY
Pos 1.5 Other safety hazard - Dust
Dust encapsulation
High pressure water suppression system
Machine directive 98/3/EY
Pos 1.6 Maintenance - accessibility to service points
Stairs and platforms - Engine unit
Machine directive 98/3/EY
Pos 1.6 Maintenance - accessibility to service points
Stairs and platforms - Vibrating scalper
Machine directive 98/3/EY
Pos 1.6 Maintenance - accessibility to service points
Drainage points - Engine unit     Grease nipples - Belt conveyor
Machine directive 98/3/EY
Pos 1.6 Maintenance - Safety lockout
Future developments

1. Improved dust and noise control systems
2. Improved remote control systems

- Control and monitoring of 1-5 machines
- Data download
- Several cameras
- Remote hydraulic breaker control

Wireless display in the excavator cabin

- Camera link
- Unit data (CAN - link)

LT 105

Connection cable

LT 200 HP

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THANK YOU!

…and safe crushing!