SAFETY
as applied by Metso Minerals on mobile and stationary crushing and screening equipment

The 5th Atlantic Alliance Conference
September 25th 2008

metso minerals

Safety on MM mobile equipment
Content

- Our safety philosophy
- Safety standards
- New solutions available
- On going development

Safety on MM mobile equipment
Our safety philosophy

- Conformity with standards, directives and regulations - in all market areas we serve. This concerns:
  - the way we work
  - the products and services we deliver

- Functionality - safety equipment must
  - provide full protection
  - must be functional - not prevent the machine to be used for it's purpose or maintained

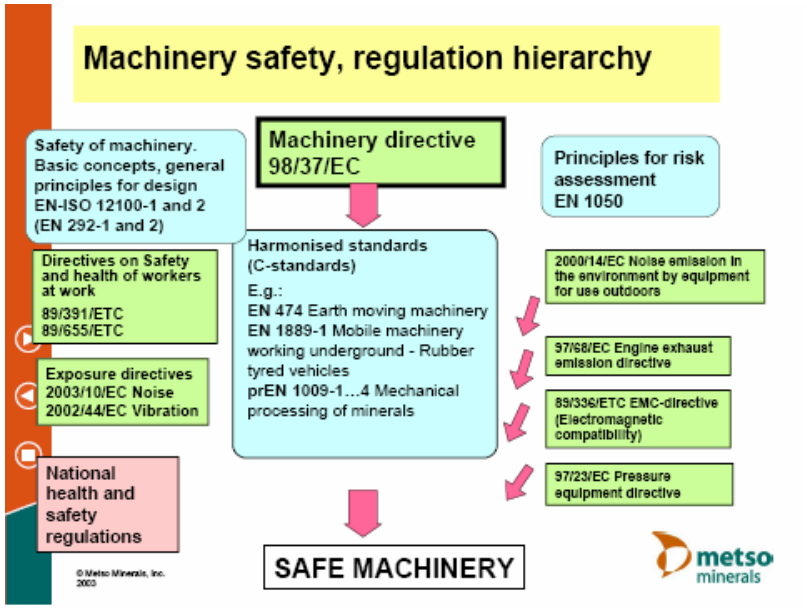
- Innovation
  - always search for ways to improve the safety - in details, and in larger scale

metso minerals

Safety on MM mobile equipment
Standards and directives - Current

•Still today, there is no safety standard specifically for mobile crushing and screening equiment

• General machine safety standards are applied - which is challenging sometimes



metso minerals

Safety on MM mobile equipment
Standards and directives - Coming

ISO/DIS 21873

Building construction machinery and equipment - Mobile crushers

- **Part 1 : Terms and definitions**
- **Part 2 : Safety requirements**

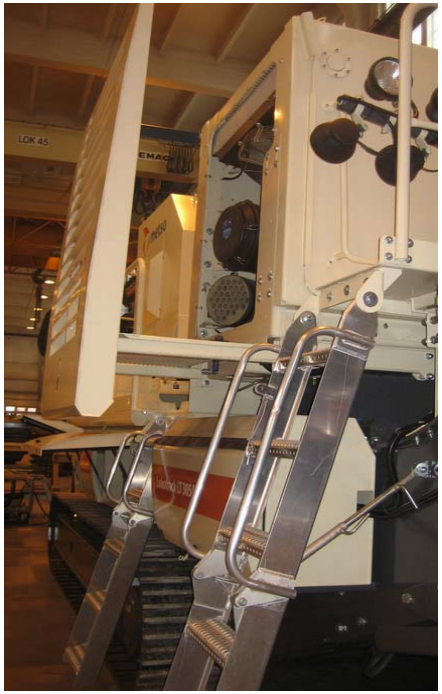
- The new ISO standard will standardize the safety related definitions and their interpretation
- Metso Minerals has been participating the work
- Approved as DIS* Early 2008
- To be published September 2009
- Scope Track and wheel mounted crushers
- ISO standards are applied globally
- This ISO standard is most likely to be published as European EN/ISO standard as such at a later date

*DIS - Draft International Standard

metso minerals

Safety on MM mobile equipment
Our safety philosophy - Innovation

Detail 1.
Hydraulic locking of the hopper walls
•Safety hazard eliminated



Detail 2.
Moving platform
•Safe and easy access to maintain the diesel engine and it's accessories

metso minerals

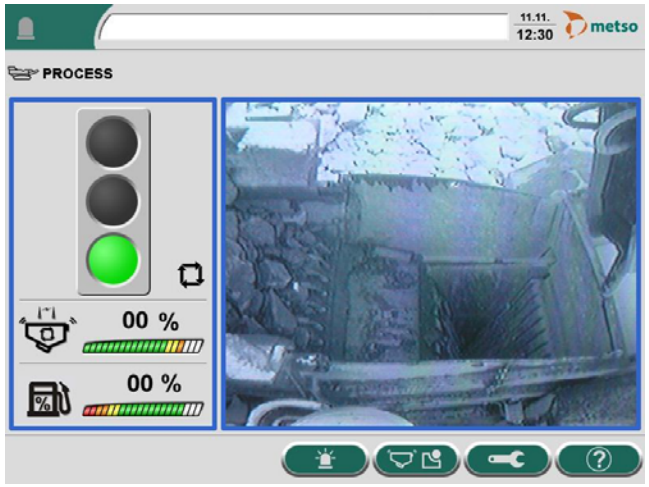
Safety on MM mobile equipment
New solutions available - IP Process Display

IP Process Display installed to the excavator cabin

Reduces the operator presence on the machine
=> improved working safety

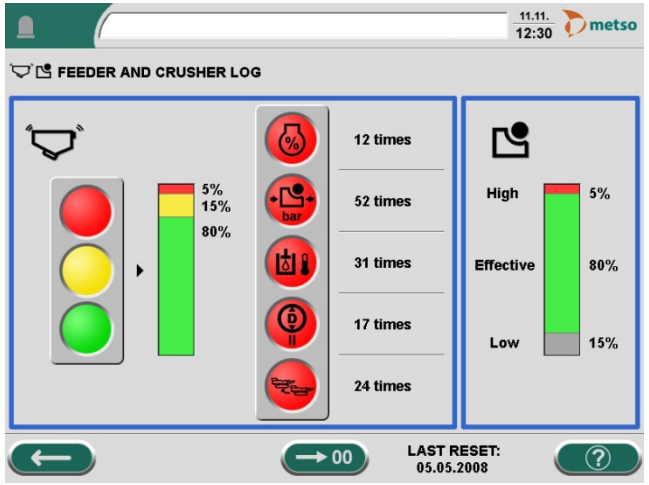
Helps the operator to run the machine steadily and constantly loaded
=> maximized capacity

Safety on MM mobile equipment
New solutions available - IP Process Display



Camera view

- Visual observing of the material flow
- Combined with remotely controlled hydraulic breaker, enables remote release of feed material blockage



Feeder and crusher log

- Feed instructions : more/wait/stop
- Feeder and crusher load history
- Event history

metso minerals

Safety on MM mobile equipment
New solutions available
High Pressure Dust Suppression System

Three Stage Lokotrack Plant
equipped with HPDS
- Water pressure 30 bar / 450 psi
- No of nozzles 20 pcs
- Water cons. 650 l/h / 170 gal/h

Benefits vs conventional
(4 bar / 60 psi) suppression system
- Fine water particles elimiminate dust much more efficiently
- Lower water consumption, as the conventional system would consume about 3000 l/h / 800 gal/h

metso minerals

Safety on MM mobile equipment
On going developments - Noise reduction

- Features - such as mufflers, noise insulated engine hoods, feed hopper rubber liners - have been part of MM offering for many years
- Further noise reduction is still required to improve working safety, and to get work permissions in urban areas
- Promising test results achieved with the mobile noise cover:
  - 4,2…4,5 dB(A) reduction

metso minerals

Atlantic Alliance - International Conference

NAM Systems Safe Operations Design Practices - Overview

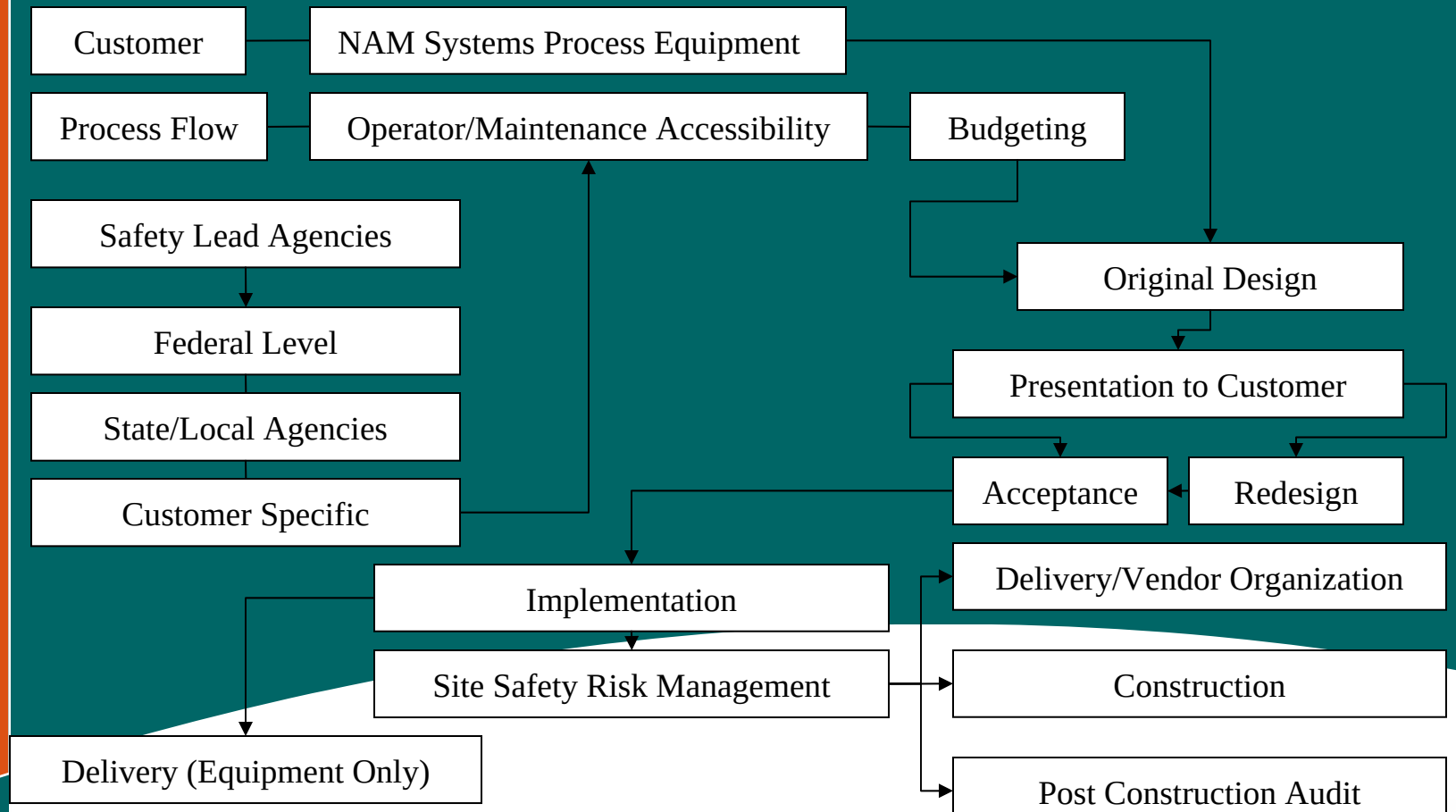
This presentation is to give the viewer a brief overview of what is entailed in the design and implementation of safe operating practices of process machinery.

The boundaries to make a safe and successful delivery of either a single piece of machinery or an entire turnkey system entails a myriad of factors. The single most important item, and the one that drives any item listed in the following pages is this tenant: A safe workday gets you home to your family every single night.

metso minerals

NAM Systems Safe Operations Design Practices - Workflow

The following workflow chart defines major considerations as they apply to safety implementation.



metso minerals

NAM Systems Safe Operations Design Practices – Considerations

Dust, noise and vibration must be kept in mind while designing the control system. The plant or equipment operator must keep alert and informed as to the processes that surround them.

An example of operator comfort to maintain these parameters are shown in the picture below.

Process Awareness

Visual Awareness

Dust Suppression

Climate Control

Noise Reduction

Process Controls

Vibration

This control structure is separated from the crushing tower foundation and electrical wiring is connected via flexible conduit between the two structures.

metso minerals

NAM Systems Safe Operations Design Practices – Lead Agency Considerations

On governmental levels, safe practices pertaining to mechanical and electrical controls have established and evolving guidelines. Customers will parallel or exceed these guidelines in some instances. Below is an example of some of those guidelines on NAM Systems conveyors.

Mechanical Guarding

Pinch Points

Pulleys

Electrical

Motor Disconnects

Emergency Stops

System Interlocks

Mechanical Guarding

Pulleys

Rotating Drives

Return Idlers

Walkways and Stairs

metso minerals

NAM Systems Safe Operations Design Practices – Implementation

Providing the equipment is sold by NAM System, risk management of the site at the onset of the project takes precedent. This management ensures the customer and all trades are well aware of the risks involved at the process. A customer's ongoing operations are almost always present and will be ongoing during construction. These photos show the value of planning.

metso minerals

NAM Systems Safe Operations Design Practices – Implementation (Cont'd)

The following photos detail the necessity of a clean work environment. Scope can take on any size and shape. Once a safe and clear working area is established, layout of equipment minimizes the risk of equipment and personnel interface during the initial stages of construction.

metso minerals

NAM Systems Safe Operations Design Practices – Implementation (Cont'd)

Once construction begins, an NAM Systems site manager continues their role of risk management by knowing his contractor tasks and paying strict attention to methods of safe work practices. The following construction photos are samplings of co-operation required between all parties involved in a project.

metso minerals

NAM Systems Safe Operations Design Practices – Implementation (Cont'd)

Although engineering endeavors to incorporate safe design in all aspects of the process, it is virtually impossible to mitigate those risks in the design phase. Therefore during construction and at the commissioning phase, audits are performed to ensure the spirit and intent of the lead agencies and customer. NAM Systems refuses to accept an unsafe work area and will discuss additional safe work practice options with customers during these audits. The photos reflect some of those additions.

Define and Mark Work Areas

Protect Workers

Define Mobile Equipment Access and Exit Work Points

Affix Hardware for Additional Handrail Stability

metso minerals

metso minerals