



VE in the process industries of Canada

Mining, metal transformation, and other sweet projects

Content

- Which sectors use VE
- What moment is best
- VE job plan used
- Some results

Size of the mining industry

- In 2010, statistics for the exploration, deposit appraisal, and mine complex development work phases were compiled
- 877 active companies/project operators (often active in more than one province or territory). An 8% increase over 2009
- All-time record \$14.4 billion in total investment, or a 40% increase over the 2009 high of \$10.3 billion
- But, 2014 sees a reduction of all

Users

- Alcoa
- De Beers
- Glencore
 - CE Zinc, Canadian electrolytic zinc
- IOCC,
 - Iron Ore Company of Canada
- Mosaic
- Rio Tinto:
 - QIT, Quebec Iron and titanium
 - Alcan
 - Roughrider Uranium project

Metals and minerals involved

- Iron
- Titanium
- Diamonds
- Aluminum
- Potash
- Cadmium
- Manganese
- Uranium
- Nickel
- Copper

Topics analyzed

- Exploration
- Mining
- Extraction
- Treatment of metals and minerals: crushing, conditioning
- Smelting and refining: powders, flakes, dust, ingots...
- Semi-fabricated products (rods, sheets, billets, chemicals...)
- Transportation: train, boat, conveyors
- Waste management
- Site restoration
- Site living quarters
- Safety
- Environmental issues: water treatment, roads...

Timing of VE sessions

- Very early in process
 - Needs analysis: function analysis with performance criteria
- Concept
 - Value analysis of a few concepts: to choose the concept with the best value
- Design of complex systems
 - Value analysis of solutions at various stages

VE job plan used

- Typical job plan
- Great care to pick the right persons
- Identify carefully which steps need to be done:
 - i.e.: **Function analysis only when at high level**
- Make sure you have an efficient co-facilitator

Size of projects

- Minimum of 100 000\$
- Up to 350 000 000\$ and more, like \$1 billion
- Larger projects separated in smaller sections

Example 1 – Concept phase

Exploration project in northern Canada

- Main shaft
- Galleries
- Water treatment plant
- Site lodging
- Roads
- Technical buildings

Some results

- Before VE cost estimated at \$320 million
- VE session:
 - 2,5 days, 21 persons
 - 39 proposals out of 203 ideas
- After VE:
 - Cost avoidance of 36% with a reduction of the level of satisfaction of the needs of 3%
 - Value = Satisfaction of the needs / cost

Example 2 – Detail engineering phase

- New smelter
- New technology
- High truck circulation
- Safety issues not solved

Some results

- Before VE, problem was operations and safety at the smelter
- VE session:
 - 1,5 day, 10 persons
 - 15 proposals out of 57 ideas
- After VE:
 - Safer operations
 - New travel routes for trucks
 - Less interaction with pedestrians

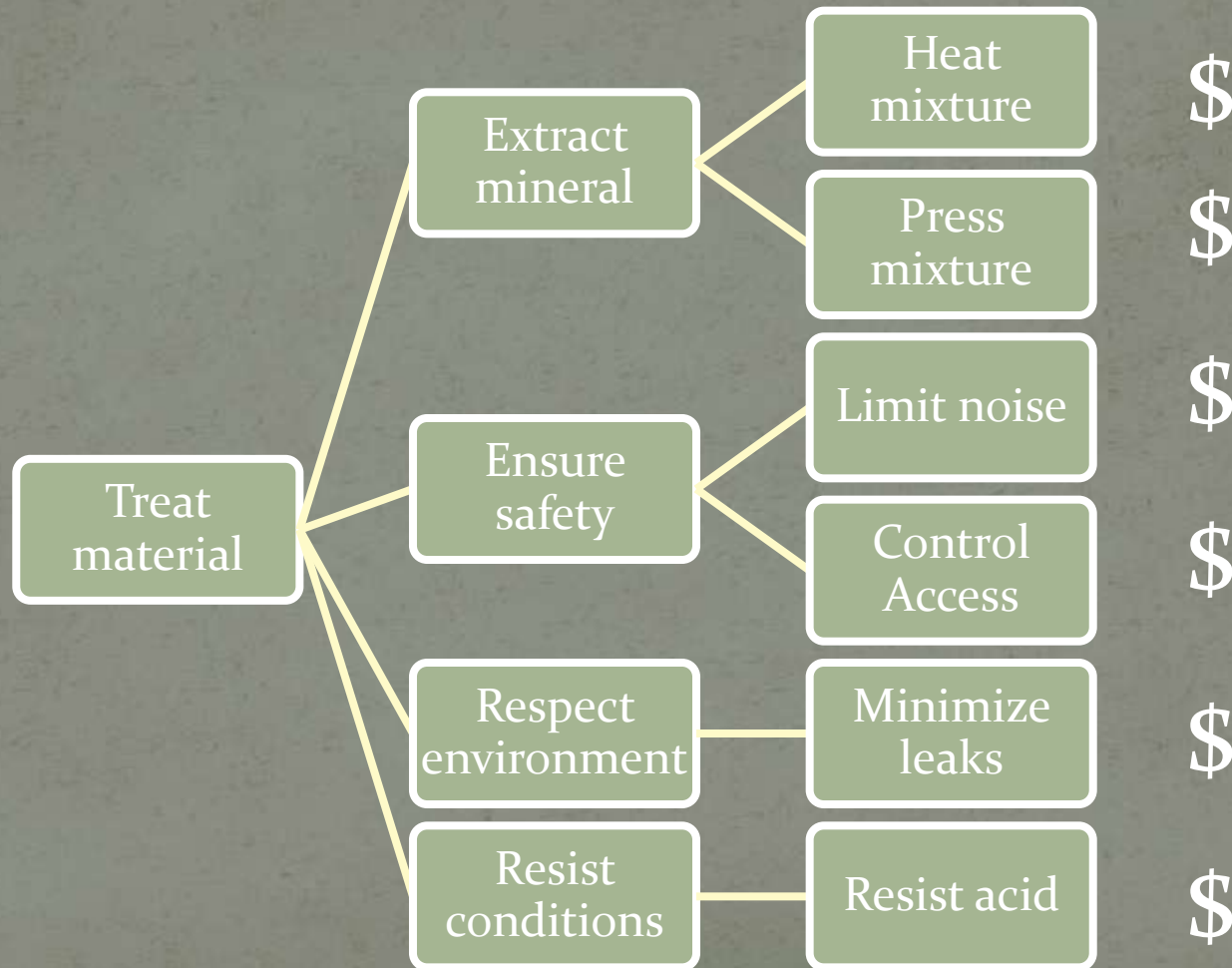
Example 3- Concept phase

- Restarting an existing plant closed for years
- New equipment to attach to existing equipment
- Operations to be looked at
- Cost of project twice as high as expected by client

Some results

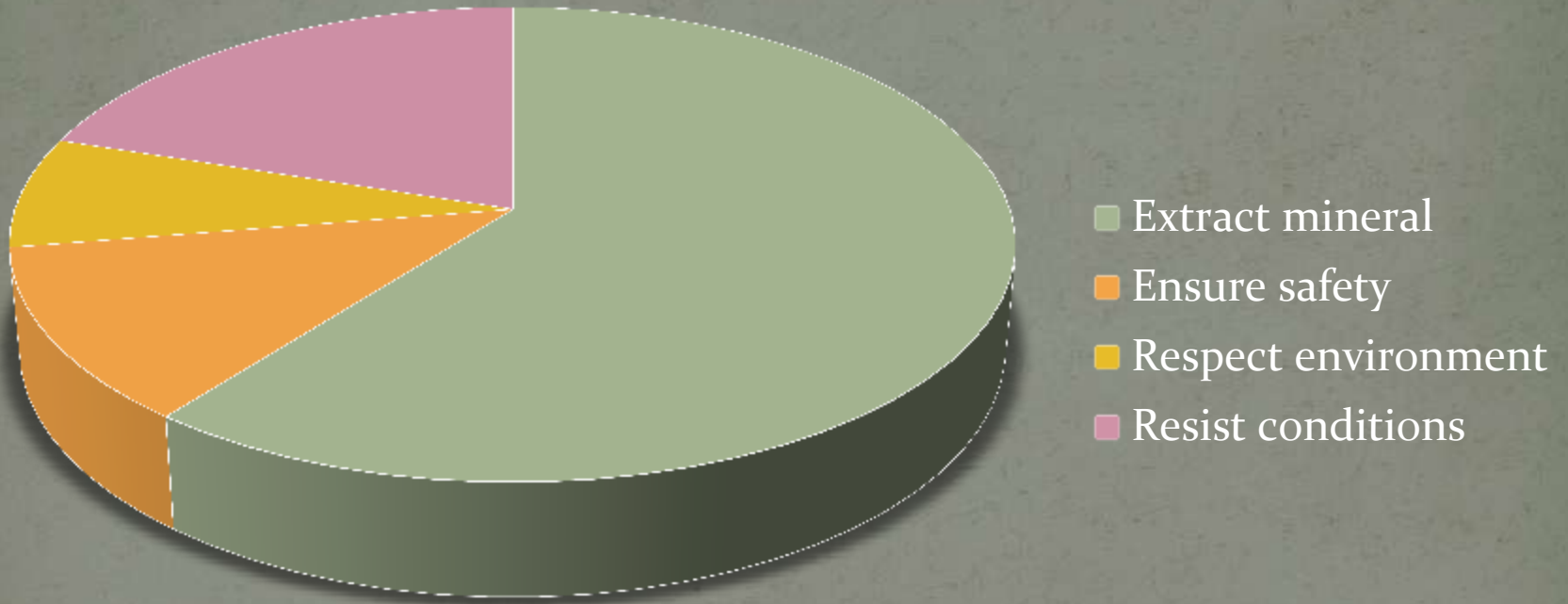
- Before VE cost estimated at \$75 million.
- VE session:
 - 2 days, 15 persons
 - 18 proposals out of 63 ideas
- After VE:
 - Cost avoidance of \$4 million, not enough to allow the project to move forward, until the cost of the ore would increase to a specific level
 - That happens sometimes! ☹️

Example 4– Detail eng. process



Cost distribution

Treat material



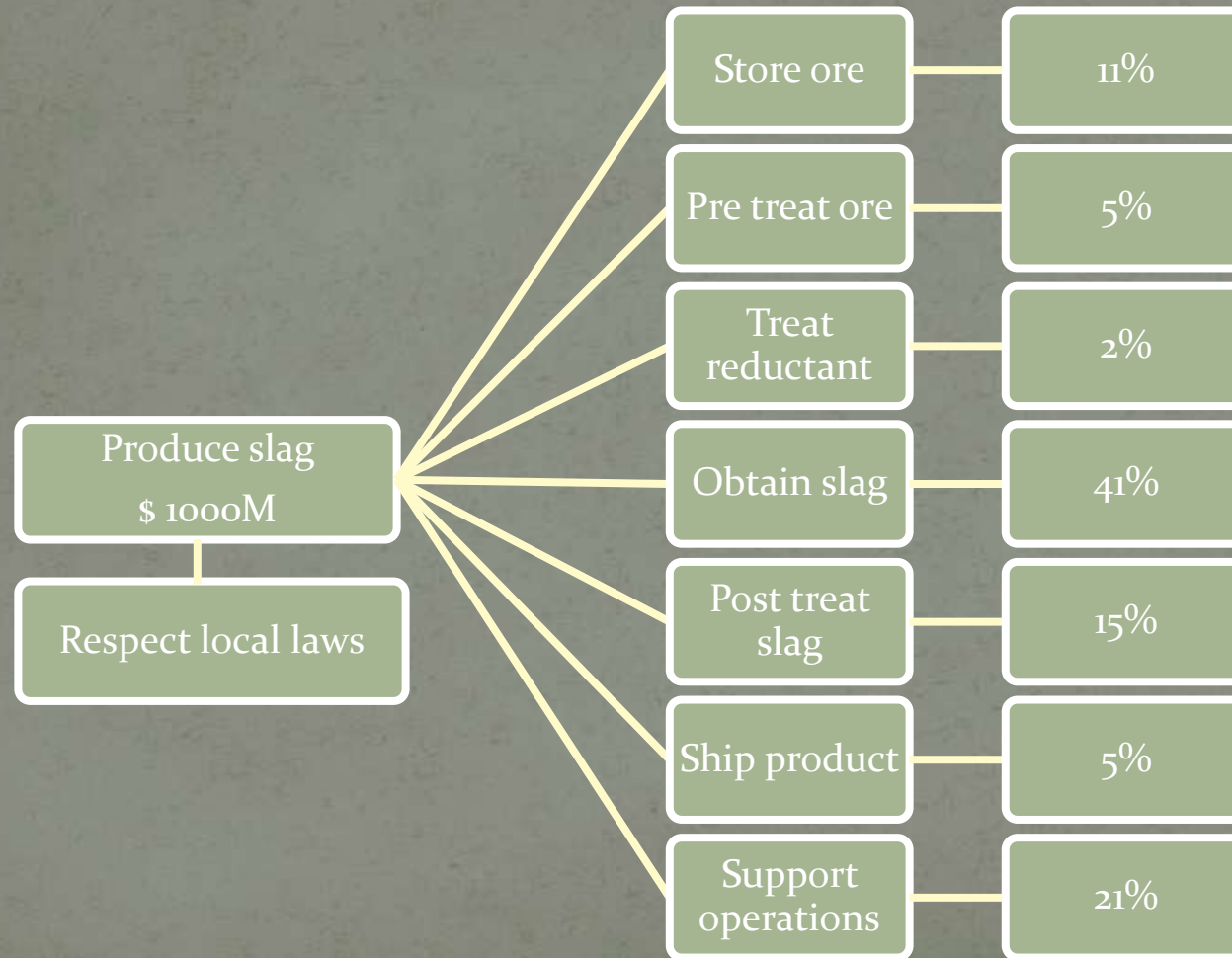
Some results

- Before VE, dangerous situations arose regularly
- VE session:
 - 3 days, 7 persons
 - 9 proposals
- After VE:
 - Cost reduction of \$160 000 per year
 - Cost of implementing proposal at \$107 300
 - Payback period 8 months
 - Reduction in dangerous situations
 - Bonus: Increase in productivity 😊

Example 5 – New smelter

- Somewhere around the globe
- Very early in the process
- No solution in mind yet
- First workshop: focus on needs analysis
- The best experts you can find in the world

Functional diagram of project



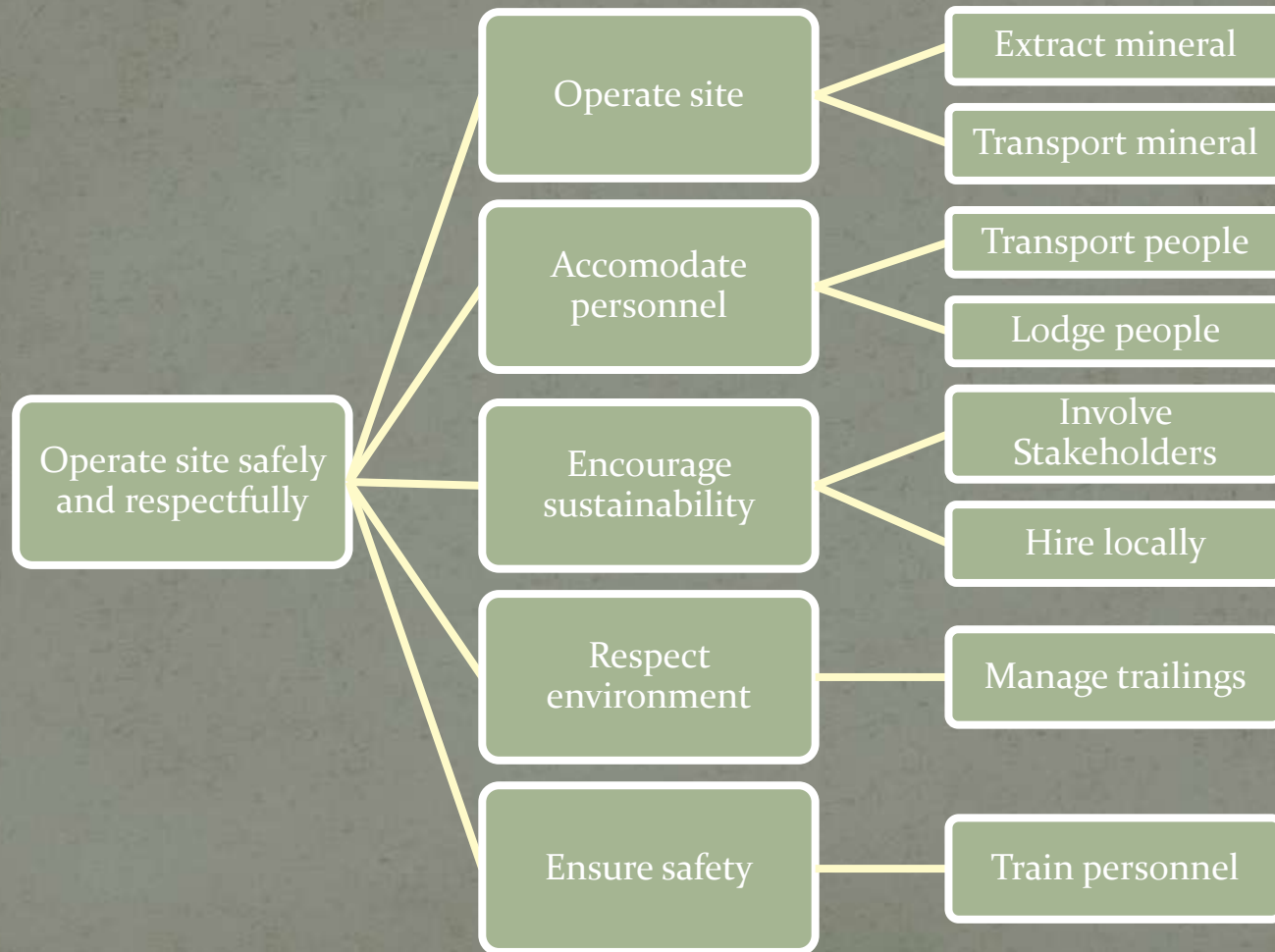
Results

- Budget was set for each sub project
- Responsibility was set
- Schedule was set
- Interactions between sub projects was identified

Example 6 – New mine

- The best experts around the table
- 3 days work
- High level look at project
- Business needs not technical needs

Example – New mine





Conclusion

- VE is essential to the success of projects, big or small
- VE in the process industry