Is energy-efficient comminution doomed?

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The Coalition for Eco-Efficient Comminution

Vision

To accelerate implementation of energy-efficient comminution strategies through promotion of research, data and industry benefits

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Thanks to……

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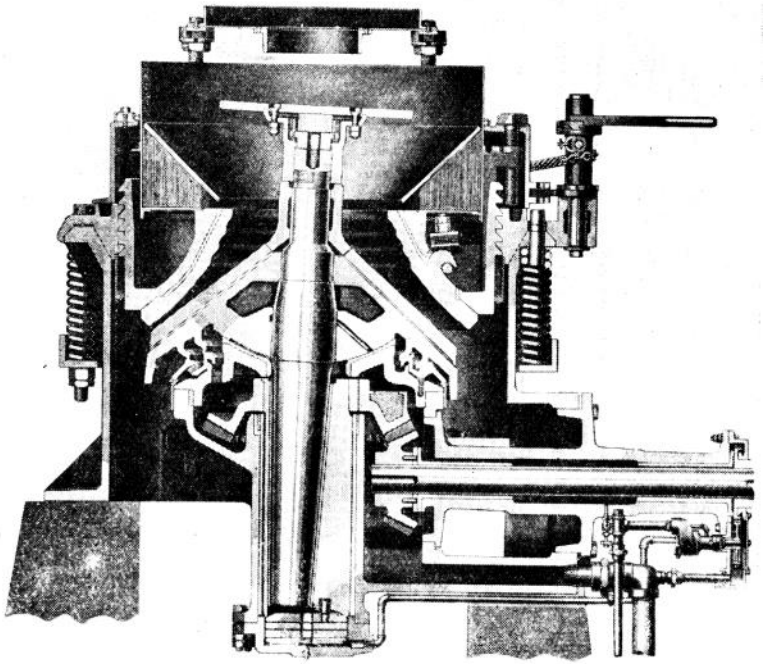
The march of innovation



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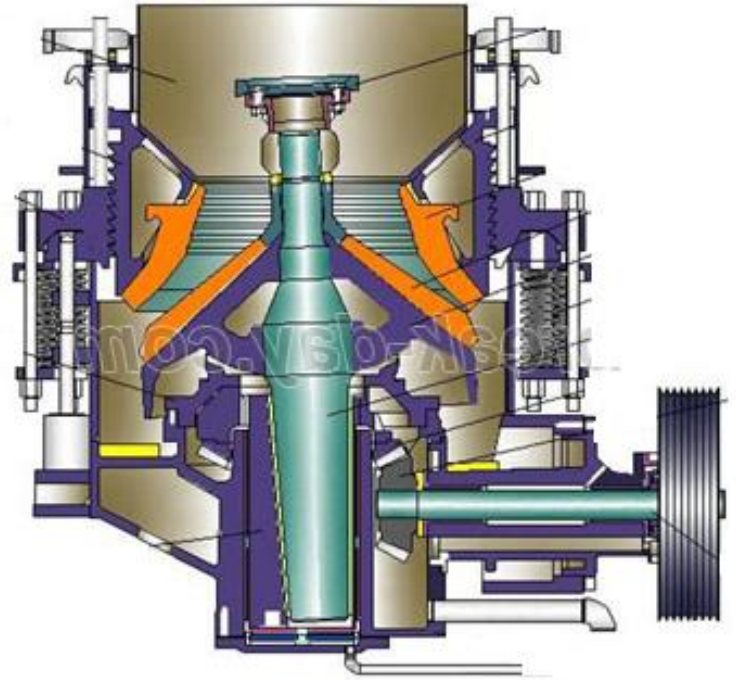


2014

Three key questions:

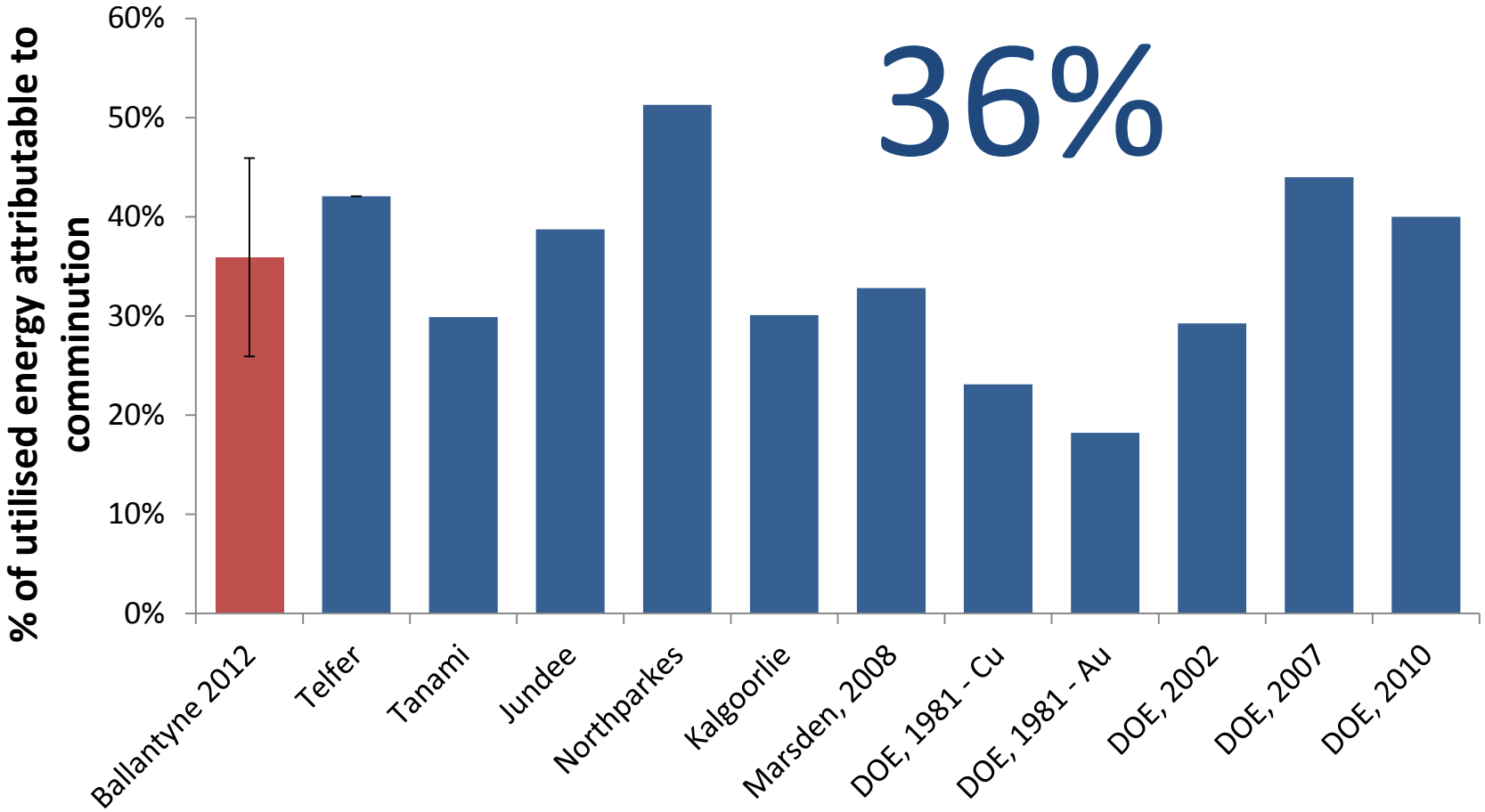
1. Do we care about reducing comminution energy consumption?
2. If so, can we do anything about it?
3. What will be the drivers for change?

Question 1:

Is comminution energy consumption important?

Q1A: Do we use a lot?

Comminution energy for copper and gold



Ballantyne, Powell, Tiang, 2012

Things are getting worse….

Citic Pacific AG mills, 40’, 26 MW (x 6)

Question 1:

Is comminution energy consumption important?

Q1A: Do we use a lot? Yes

Q1B: Do we care?

- Mining companies: Maybe
- Engineering companies: see mining cos.
- Equipment suppliers: see mining cos.
- Researchers: Yes

Question 1:

Is comminution energy consumption important?

Q1A: Do we use a lot? Yes

Q1B: Do we care?

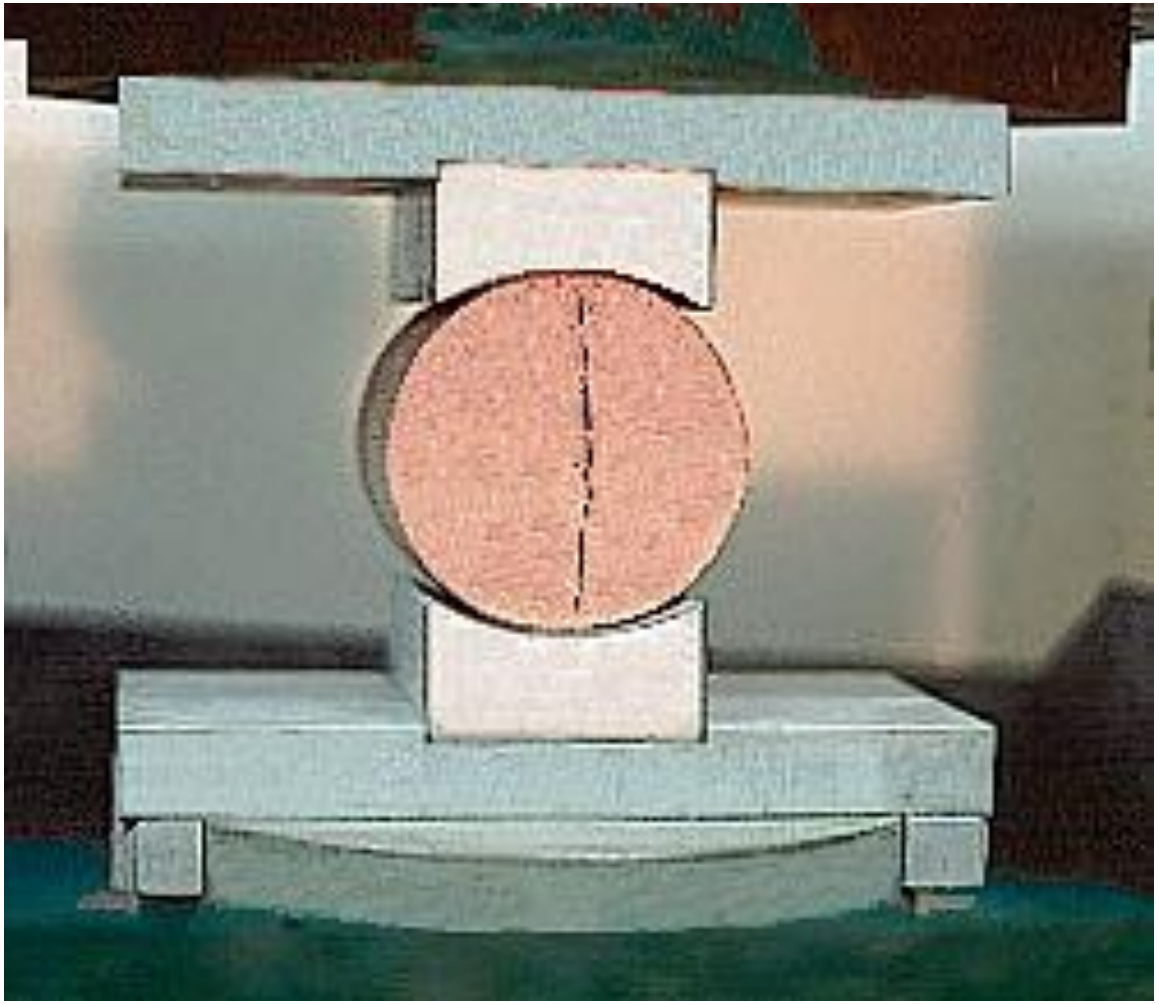
Comminution selection and design are driven by the required grind size, not energy consumption.

Tonnes are everything.

Question 2:

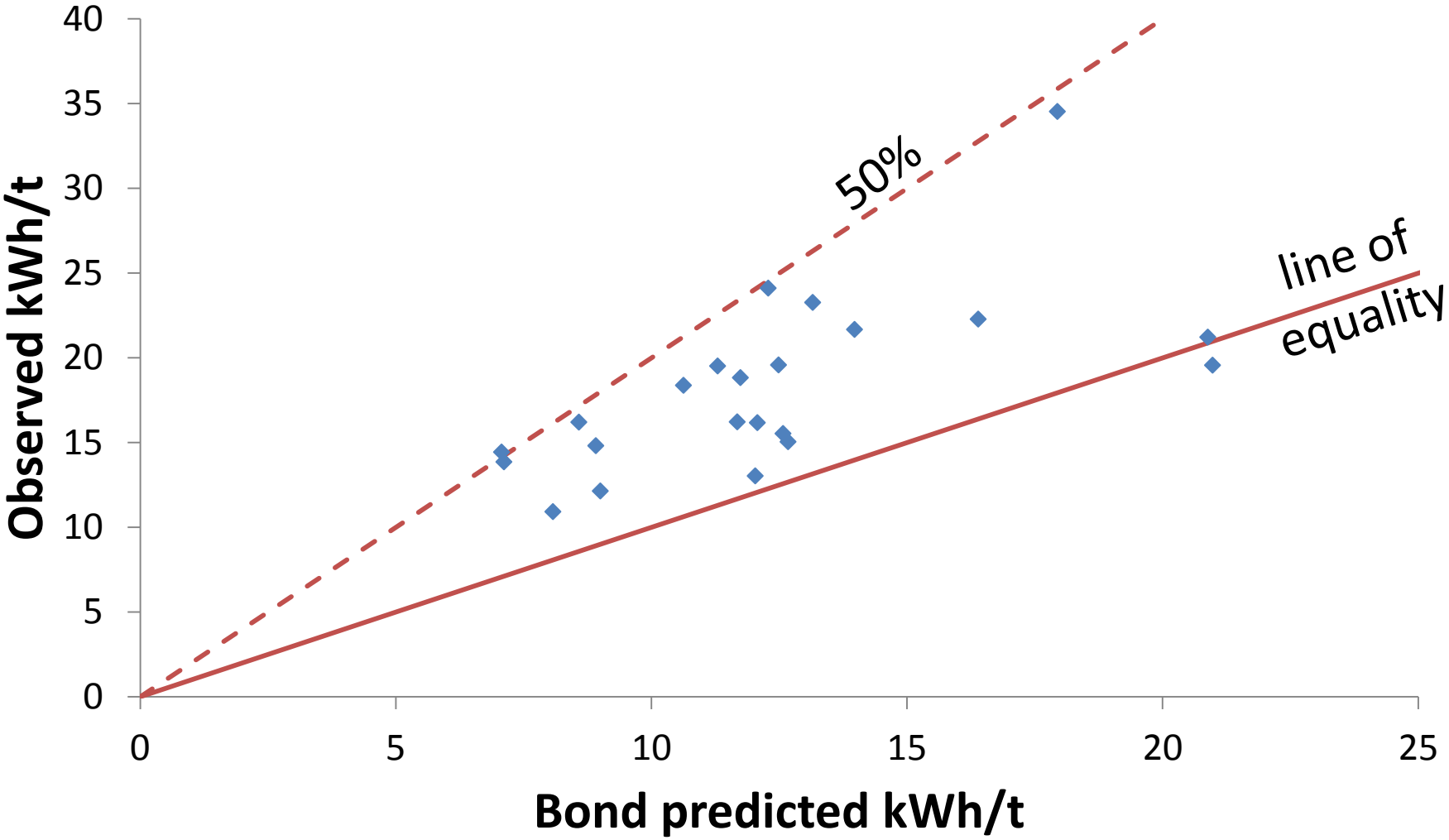
Can we reduce comminution energy consumption substantially?

The most energy-efficient way to fracture rock



High pressure grinding rolls

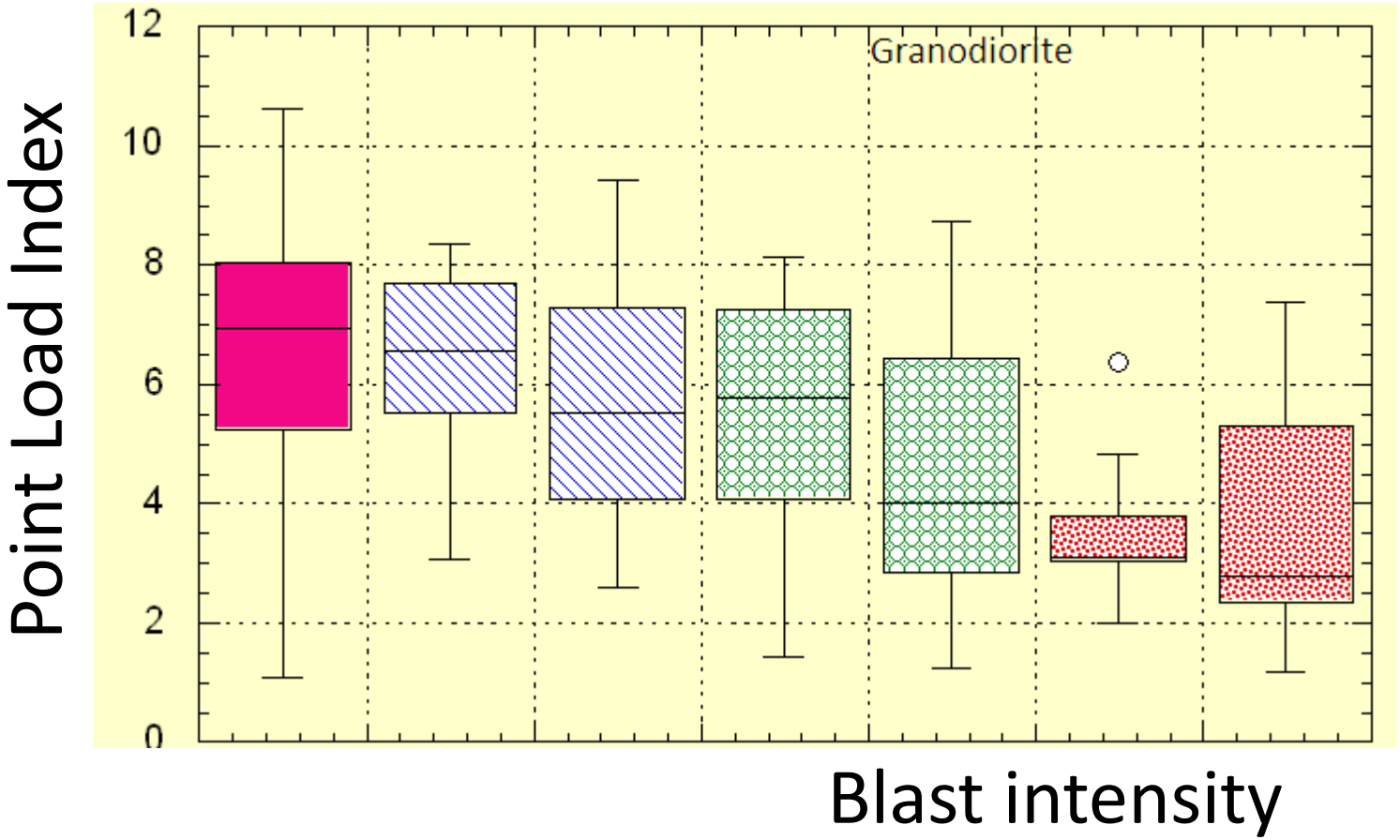
Bond Work Index efficiency



Grant Ballantyne, JKMRC

What have we learned in the last 20 years?

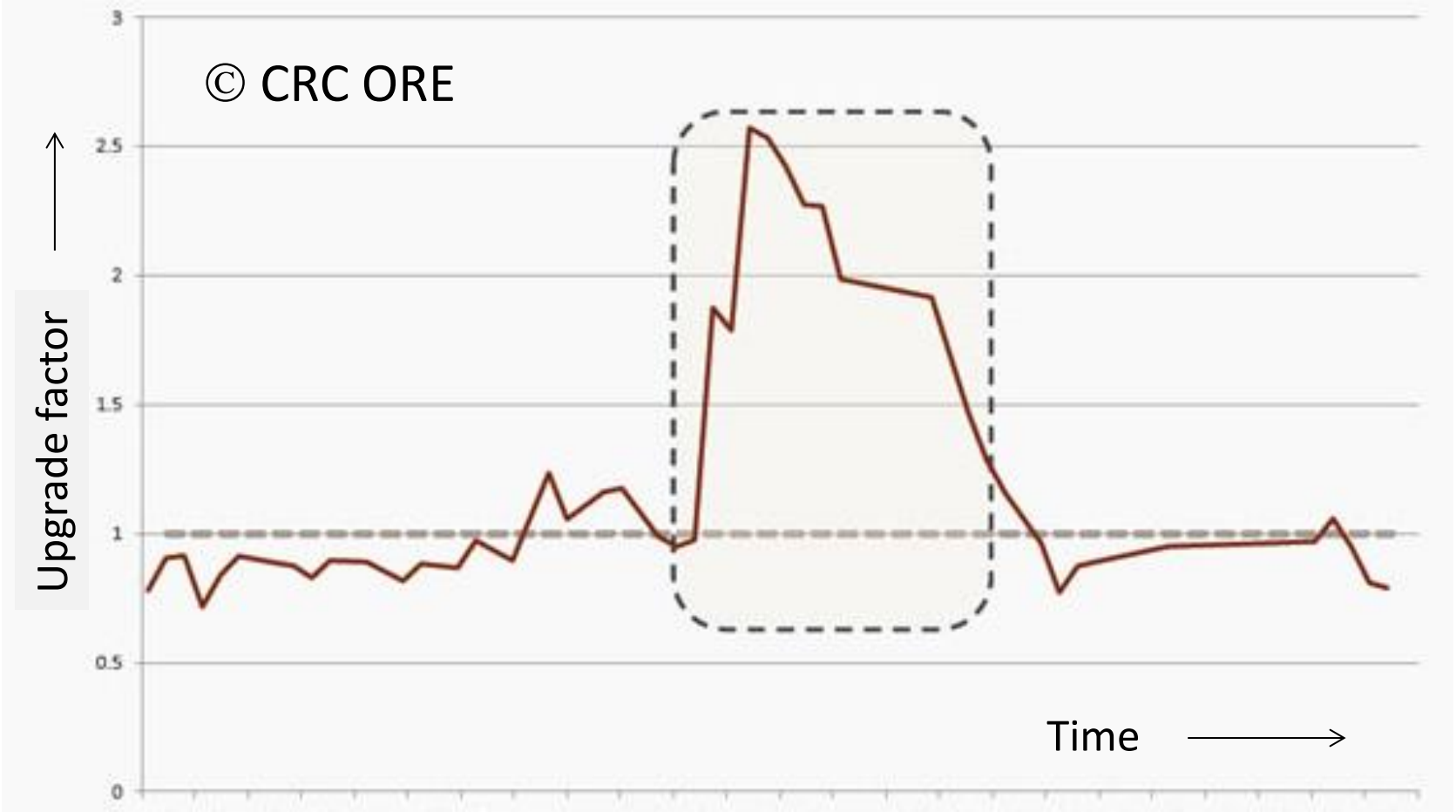
- Blasting can pre-weaken rock for grinding.



Simon Michaux, JKMRC

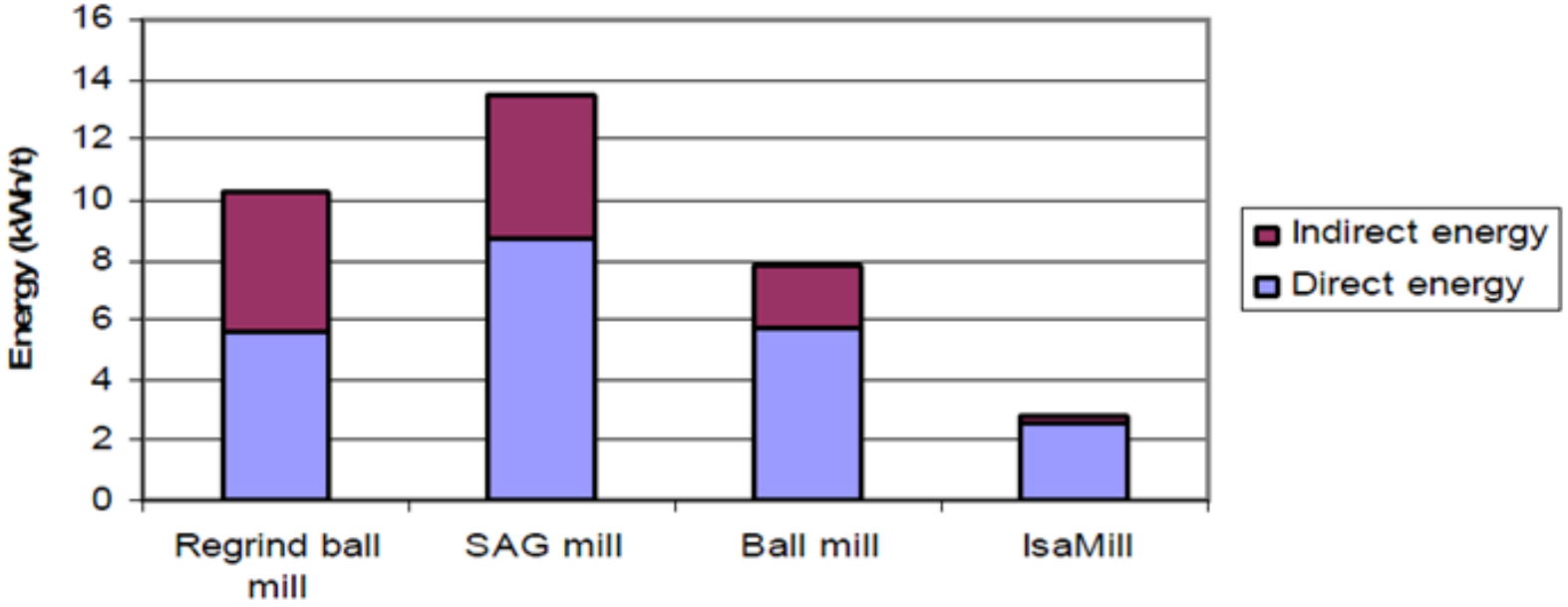
What have we learned in the last 20 years?

- Smart blasting and grade engineering® can reduce comminution energy



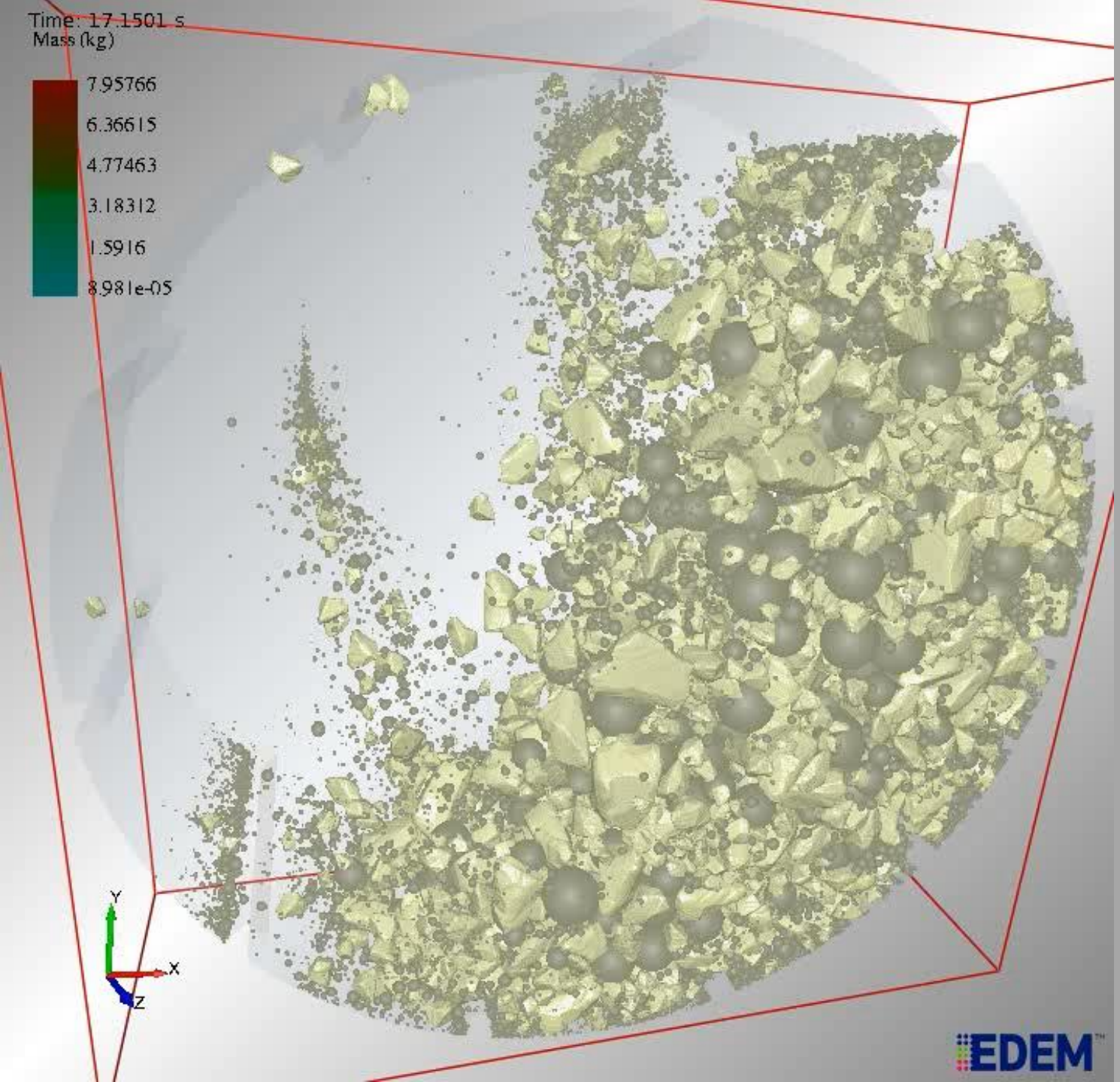
What have we learned in the last 20 years?

- Energy consumed in steel manufacture must be included.



Musa and Morrison, 2008; CSRP

Kumtor comminution circuit.



Nirmal Weerasekara, JKMRC

What have we learned in the last 20 years?

- The dominant breakage events in tumbling mills are low energy, not high energy.
- Accumulated damage from repeated impact is a significant factor in comminution efficiency.

What have we learned in the last 20 years?

- Fracture paths are dominated by material texture, not comminution method.
- Some mineral liberation is non-random.