CIRCULARITY IN INDUSTRY

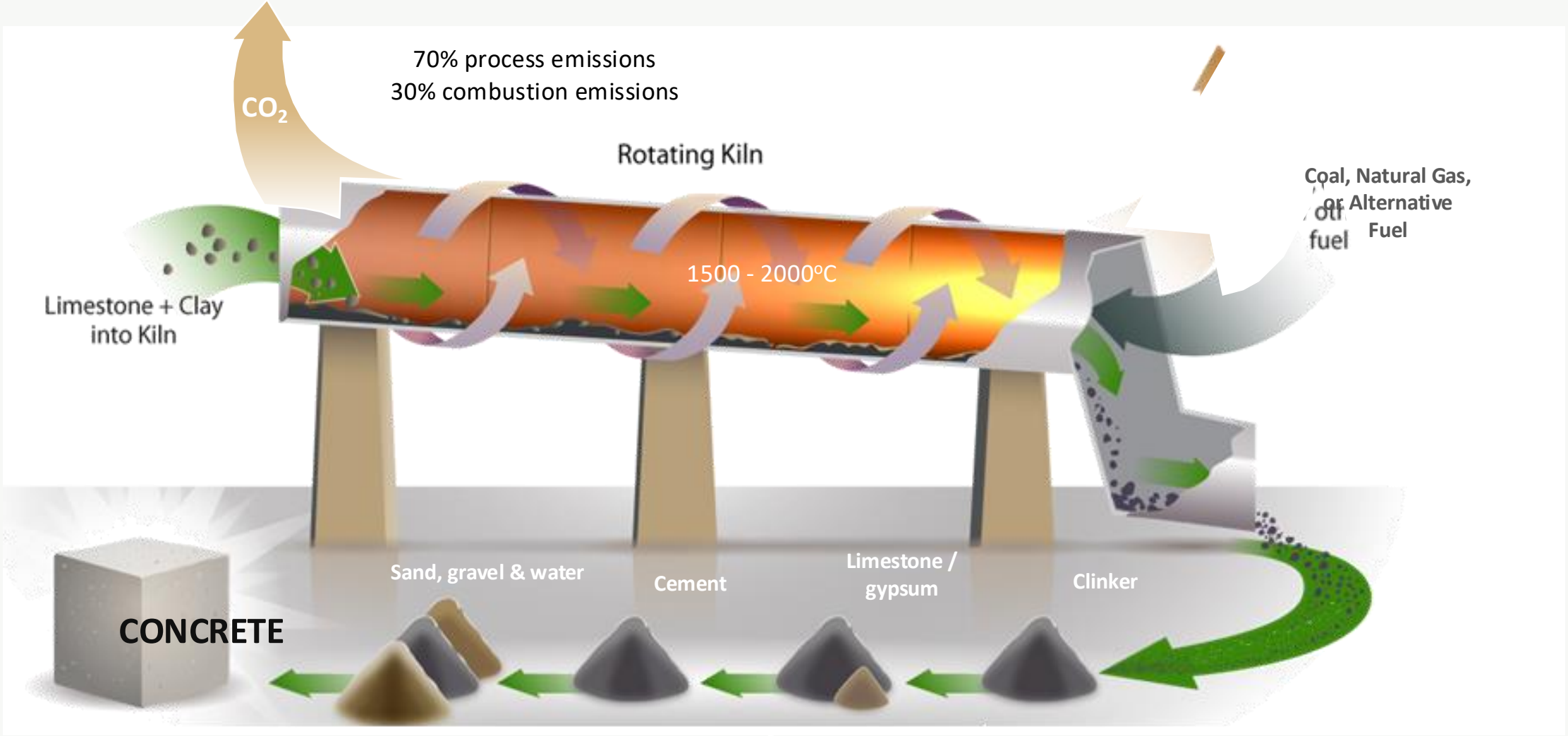
How cement co-processing can recover value, reduce landfill and support industrial decarbonisation

Rustam Punja | Alternative Fuels & Raw Materials
Heidelberg Materials Western Canada



Heidelberg Materials

How cement is made



Recycle first. Recover what remains.

Co-processing is not a substitute for prevention, reuse or recycling. It is a pathway for suitable residuals.



THE GAP

Some residuals cannot be practically recycled because of contamination, mixed composition, degradation or lack of a viable end market.

Co-processing recovers the remaining calorific and mineral value inside cement production instead of sending that value to landfill.

- Complementary to recycling
- Specification controlled
- Regulated pathway
- Measured results

Alternative Fuels

LCFs displace fossil fuels with waste products destined for landfill, and include: C&D waste, non-recyclable plastics, non-recyclable textiles and fabrics, tires, and more.

Raw Waste → Pre-processing → Finished Fuel



C&D Waste



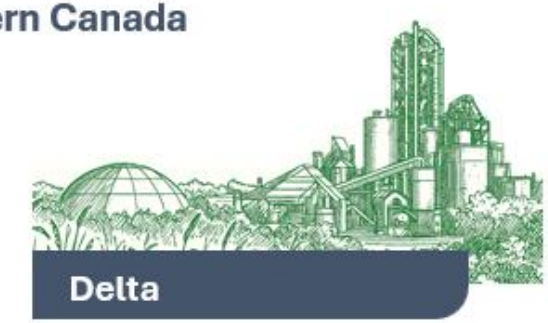
RDF

Heidelberg Co-Processing Western Canada



Edmonton

Co-processing facility commissioned in 2023. 100,000 tpy capacity.



Delta

RDF co-processing facility commissioned in 2015. Whole tires since 2005.

Benefits of co-processing waste:

- High temperature (> 1,500C), long residence time, turbulent mixing ensures complete destruction of organic compounds
- Alkaline environment
- Simultaneous mineral and energy recovery. No residual ash waste. 100% recovery.
- Built in core processes – integrated as part of cement production. Not a standalone treatment
- Efficient use of existing infrastructure – avoids need for new incineration or waste facilities
- Lower environmental impact – reduces landfill use, fossil fuel demand, and overall GHG emissions
- Supports circular economy – converts waste into valuable energy and raw materials

What is co-processing?

One industrial process simultaneously recovers thermal energy and mineral value.

1 PRE-CONDITION

1

Sort, shred and control moisture, size and contaminants.

2 FEED

2

Enclosed storage, screening, conveying and precise metering.

3 CO-PROCESS

3

Residual energy replaces part of conventional fuel in the kiln system.

4 MAKE CLINKER

4

Suitable mineral content becomes part of the clinker product.

Unlike standalone combustion, the cement kiln needs both heat and minerals. Co-processing uses both.

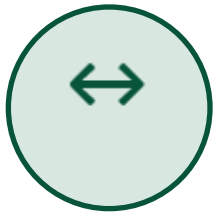
Why co-processing is beneficial

A circular solution has to work environmentally, technically and economically.



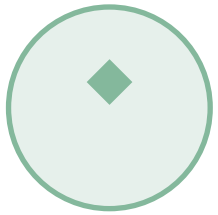
LANDFILL DIVERSION

Keep qualified residuals in productive use rather than disposal.



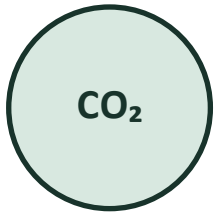
FOSSIL FUEL DISPLACEMENT

Replace a portion of coal or natural gas with residual energy.



MINERAL RECOVERY

Capture suitable mineral content in clinker rather than separate ash.



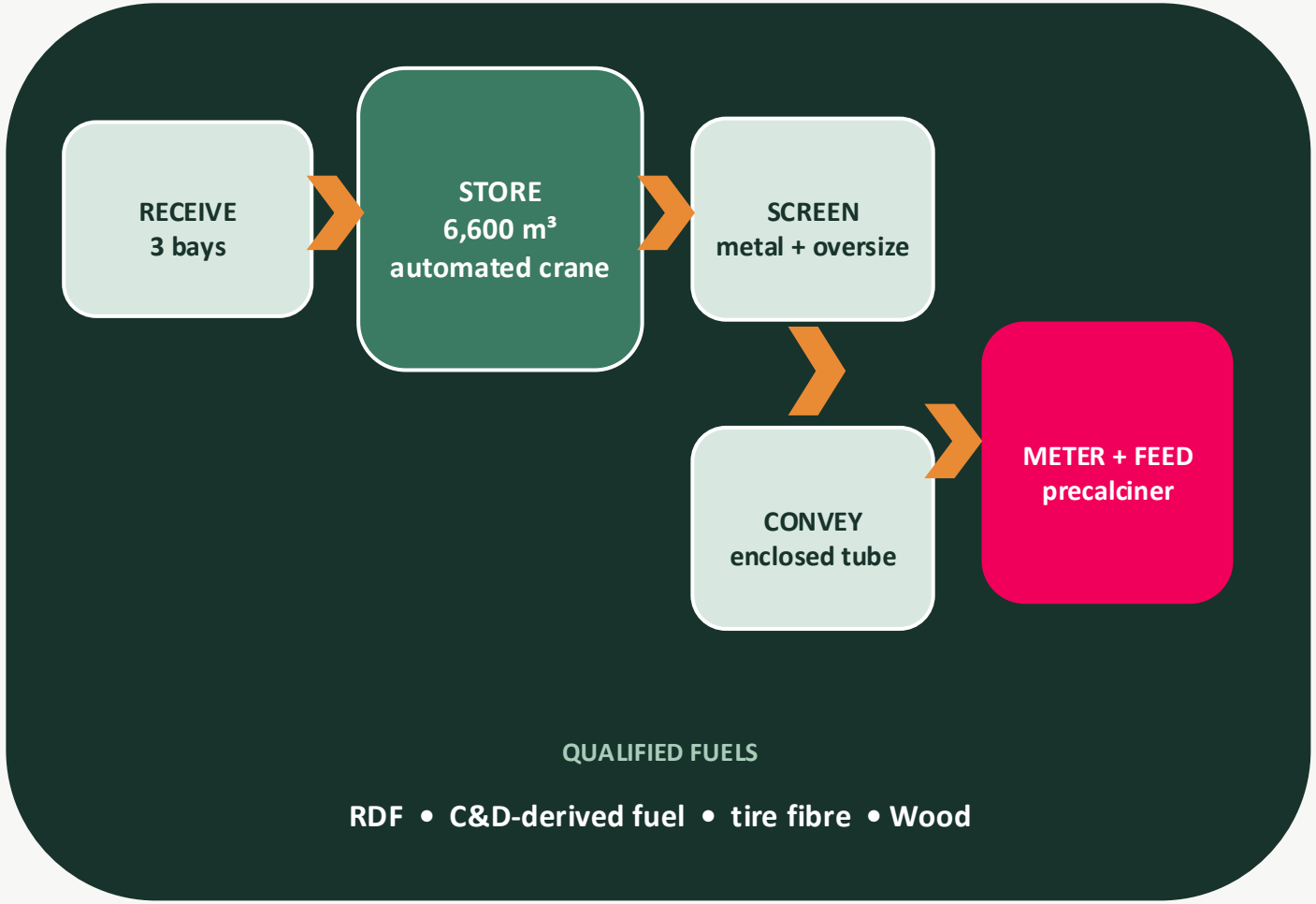
INDUSTRIAL DECARBONISATION

Reduce conventional fuel demand and support lower-carbon. Manufacturing. Biogenic Material Recovery reduces methane in landfills

The real circular advantage: use an existing, regulated industrial asset and measure diversion, substitution, emissions, quality and reliability.

Edmonton Cement Plant: an existing circularity asset

The plant has a purpose-built system to receive, store, prepare and feed alternative fuels into the calciner.



DESIGN INTENT

Up to 50%

fossil-fuel replacement capability

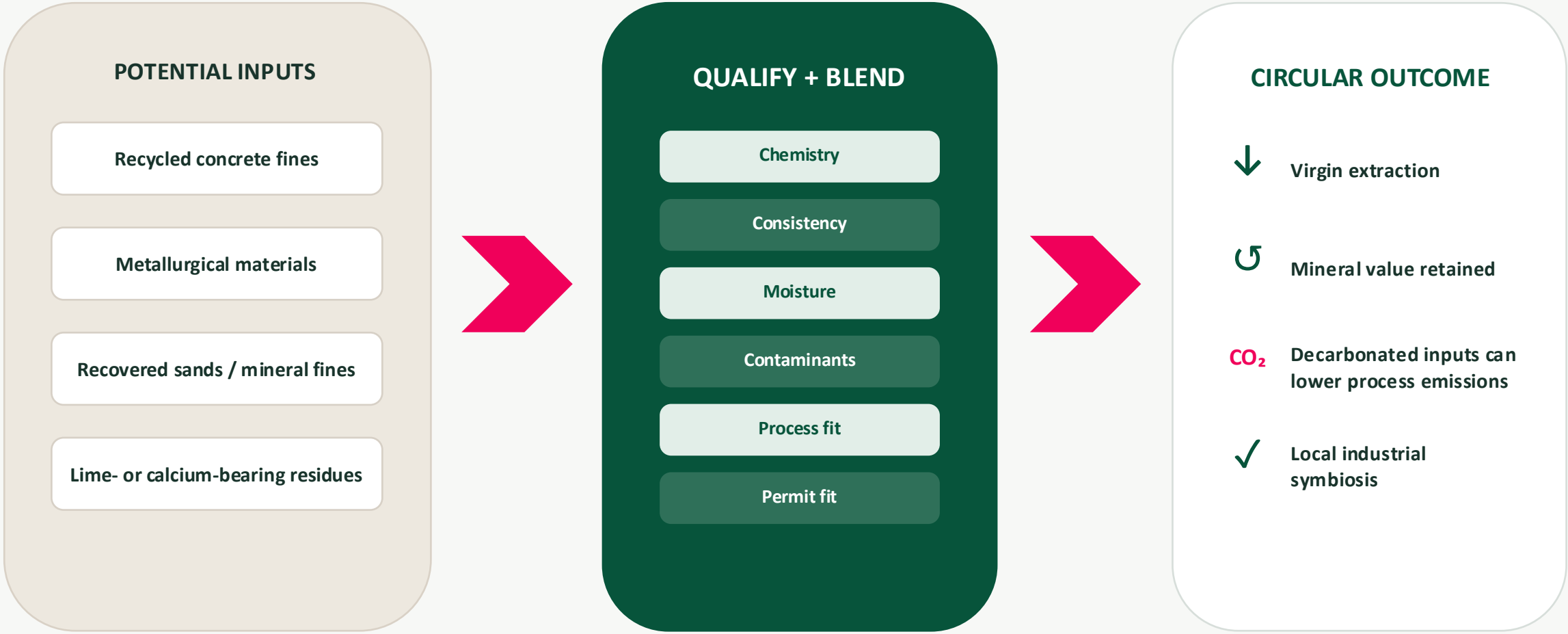
25 tph

design feed capacity

The system is the bridge. Reliable circularity still depends on fuel quality, processor capability, logistics and plant reliability.

Circularity is not only about fuel

Alternative raw materials can replace virgin minerals and keep industrial by-products in productive use.



What will it take to scale industrial circularity?

The technology exists. The harder work is building dependable systems around it.

1

QUALITY BEFORE VOLUME

Consistent size, moisture, chemistry and contamination control protect the kiln and the end market.

2

PARTNERS, NOT HAND-OFFS

Waste generators, processors, haulers, regulators and the cement plant must design the pathway together.

3

MARKETS + POLICY MATTER

Circular options struggle when disposal is easier and cheaper than recovery.

4

START SMALL, THEN SCALE

Characterize → lab test → controlled trial → pilot tonnes → long-term offtake.

RECYCLE FIRST. RECOVER WHAT REMAINS.

CALL TO ACTION: Bring us the difficult residuals. Together, we can determine what should be recycled, recovered or rejected.