Improving Material Flow in Australian Iron Ore Operations

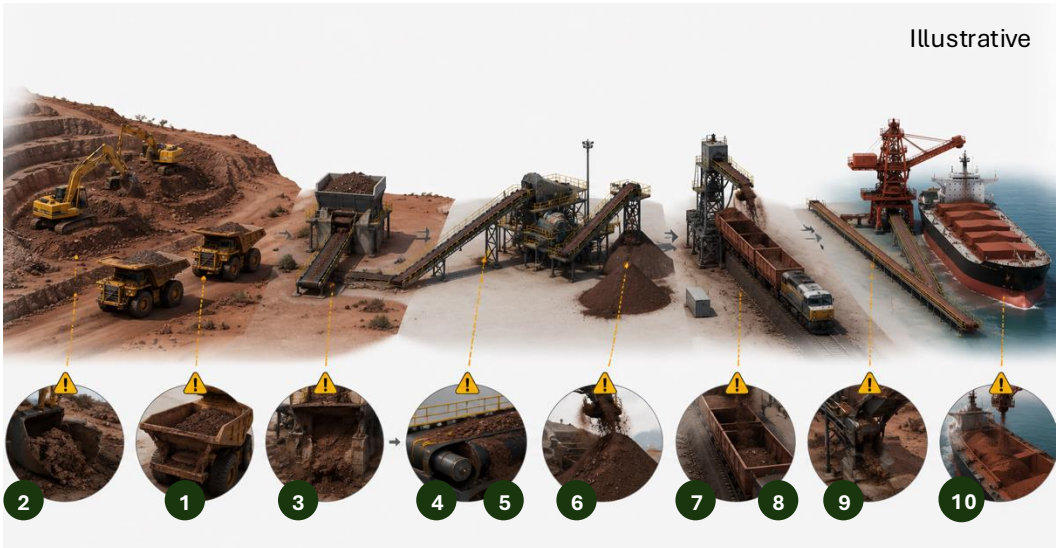
Reducing Carryback, Build-up and Flow Restrictions Across the Mine-to-Port System

1. Iron Ore Mining and Material Handling in Australia

Australia's iron ore industry is concentrated primarily in Western Australia's Pilbara region, where large-scale open-cut mines are connected to processing hubs, heavy-haul rail networks and export terminals. Hematite and magnetite are the principal iron ores. Hematite operations commonly use crushing, screening and blending to produce lump and fines products, while magnetite generally requires additional grinding and magnetic separation to produce concentrate.

2. Material Handling Challenges in Iron Ore Operations

Iron ore is often considered free-flowing, but its handling behaviour changes significantly with moisture, fines content, clay contamination, particle-size distribution and ore mineralogy. During wet weather or when handling fine and clay-rich material, adhesion and cohesion can increase rapidly. This can lead to material sticking inside truck trays, excavator buckets, ROM bins, crusher feed hoppers, transfer chutes, rail wagons and shiploading equipment.



The most relevant problem areas are:

1. Haul truck tray carryback
2. Excavator and shovel bucket build-up
3. ROM bin and crusher feed hopper build-up
4. Transfer chute build-up and blockage
5. Conveyor carryback and spillage
6. Stockpile and reclaimer chute build-up
7. Train load-out chute build-up
8. Rail wagon carryback
9. Car dumper and port transfer build-up
10. Shiploader chute build-up

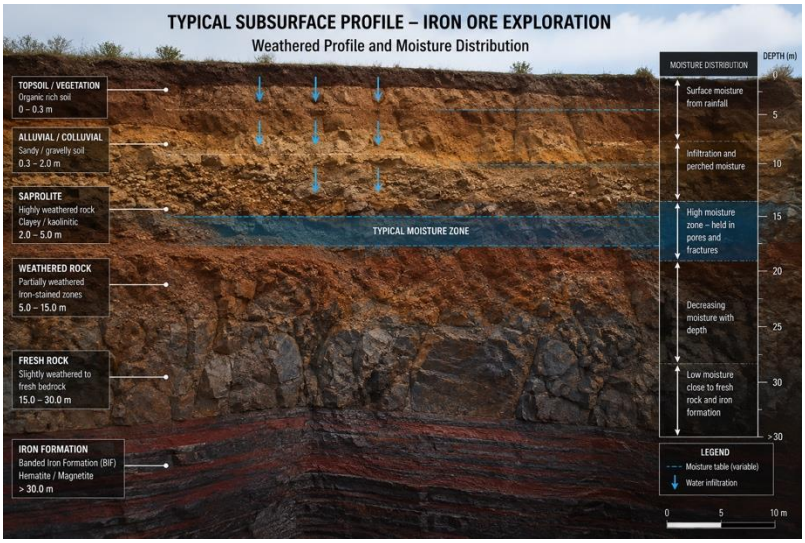
Every operation is different. That's why every ECORA solution is tailored to your equipment, material and operational objectives.

Why Does Build-up Occur in the Pilbara's Dry Climate?

3. If the Pilbara is Hot and Dry, Why Does Build-up Material Still Occur?

Many people assume that material build-up is only a wet-weather problem. However, in iron ore operations, build-up is often caused by a combination of **fines generation, residual moisture, clay contamination, surface roughness and material compaction** throughout the mining and processing cycle.

Illustrative



Even in the Pilbara's dry climate, moisture can be introduced through ore geology, groundwater, dust suppression systems, processing activities, rainfall events and stockpile management. When fine particles and moisture combine, they can create highly adhesive material that sticks to truck trays, transfer chutes, crushers, rail wagons and shiploading equipment. Once the first layer adheres to the surface, additional material progressively accumulates, creating build-up, carryback and flow restrictions.

Build-up progressively reduces the effective cross-sectional area of chutes and hoppers, restricts flow and changes the intended ore trajectory through transfer points. Typical consequences include chute blockages, feeder restrictions, belt mistracking, spillage, rail wagon carryback and inconsistent discharge. These conditions increase cleaning requirements, reduce equipment availability and can disturb the controlled blending of lump, fines and different ore grades.

Even relatively small restrictions can become material at Pilbara production scale. For example, major operations depend on continuously operating crushing, screening, conveyor, stockyard, rail and port systems, so a recurring blockage at one transfer point can affect the performance of the wider supply chain.

Iron Ore Fines + Residual Moisture + Clay Content + Surface Roughness + Material Compactation = Build-Up & Carryback

Iron ore build-up should not be treated as an unavoidable part of production. By reducing material adhesion at the surface, mining operations can improve discharge, protect equipment, reduce cleaning interventions and support more reliable material flow from the pit to the ship.

4. Engineering Approach to Improving Material Flow

ECORA is an engineered surface-conditioning solution designed to reduce the interaction between iron ore and equipment surfaces. The product penetrates microscopic surface irregularities and creates a thin release barrier that reduces the number and strength of adhesion points between the ore and the underlying steel, liner or other compatible substrate.

By treating the surface, ECORA supports more complete discharge and more consistent material flow . The purpose is not simply to make equipment easier to clean. The engineering objective is to reduce the formation of build-up at the source, helping operations achieve:

- More complete truck and wagon discharge
- Fewer chute and hopper restrictions
- Reduced manual and mechanical cleaning
- Higher equipment availability
- More consistent material flow
- Lower wear from scraping and aggressive cleaning
- Reduced potential for cross-contamination between ore campaigns
- Improved control of blending and product quality
- Lower operational and safety exposure during blockage removal

5. Practical Application in an Iron Ore Operation

A suitable iron ore case study could focus on a haul truck, excavator bucket, transfer chute or rail wagon experiencing persistent carryback. The baseline phase should document the retained material, cleaning frequency, discharge time, lost payload, equipment downtime and any operational intervention required to restore the asset.

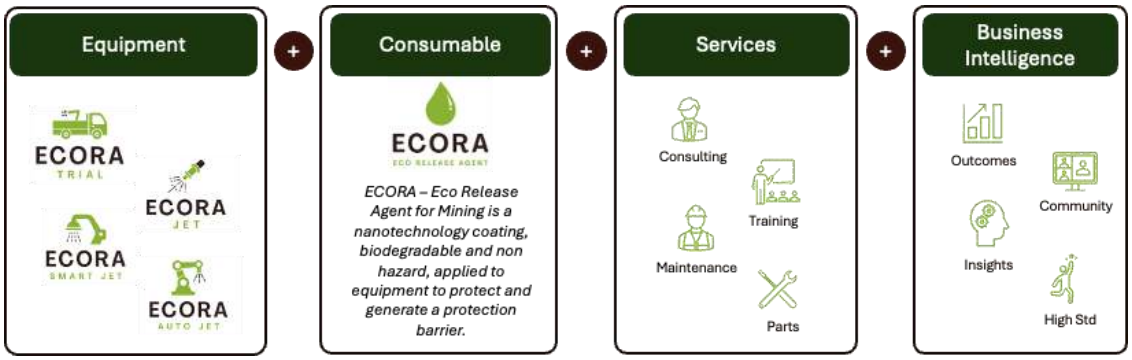
After the baseline is established, ECORA is applied to the selected internal surface using a controlled application protocol. The asset then returns to normal operation while the team records discharge performance, residual material, cleaning requirements, cycle time and consumable use over an agreed trial period.

The comparison should be based on measurable site data rather than visual observations alone. Depending on the application, suitable performance indicators may include:

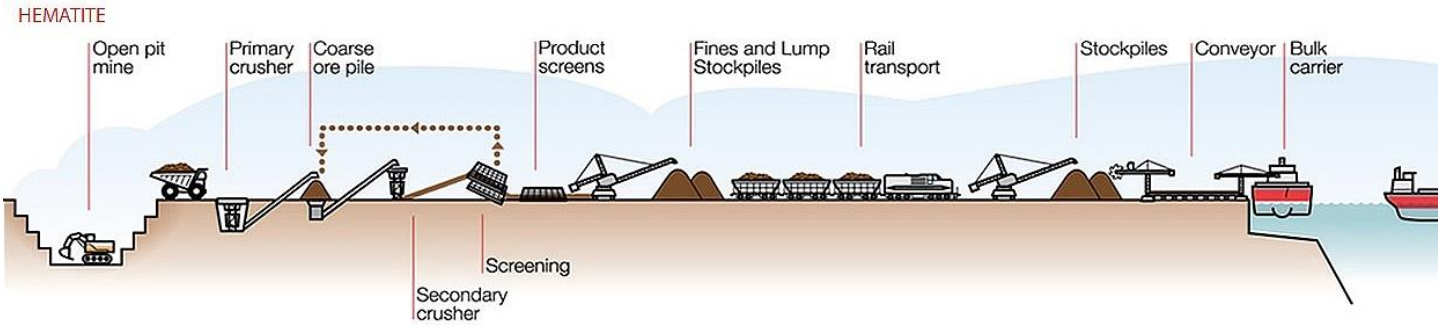
Application	Typical Measures
Haul trucks	Residual tonnes, complete discharge rate, cleaning frequency, cycle time
Excavator buckets	Bucket fill, release consistency, loading passes, cleaning downtime
Transfer chutes	Blockage frequency, restricted-flow events, clean-out hours, throughput
Rail wagons	Residual tonnes, unload time, manual cleaning and wagon availability
Port equipment	Transfer interruptions, chute cleaning, conveyor availability, shiploading rate

AT ECORA SOLUTIONS WE ARE OBSSESED TO SOLVE YOUR ISSUES WITH BUILD UP MATERIAL

Each of the four integrated components — equipment, consumables, services, and business intelligence - plays a critical role, and their combination delivers exceptional results. By aligning technology, eco-friendly release agent, automated application systems, expertise, and data, we ensure every solution is precisely tailored to each site's needs — driving performance, improving reliability, and achieving extraordinary outcomes.



ECORA SOLUTIONS IMPROVES THE MATERIAL FLOW IN YOUR MINE



BOOK YOUR TRIAL

LET'S MEASURE HOW MUCH ECORA CAN DO FOR YOUR OPERATION

At the end of the trial, ECORA provides a performance report comparing the baseline and treated periods, quantifying operational benefits and recommending the most suitable long-term application system, consumable rate, maintenance approach and monitoring plan.
Application is manual during an initial trial or delivered through portable, semi-automated or fully automated ECORA application systems. The application volume and frequency are adjusted according to the asset geometry, surface condition, ore characteristics, moisture level and operating cycle.

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ECORA Solutions