



## Data Science Career Track

### Monalco Mining Case Study Overview

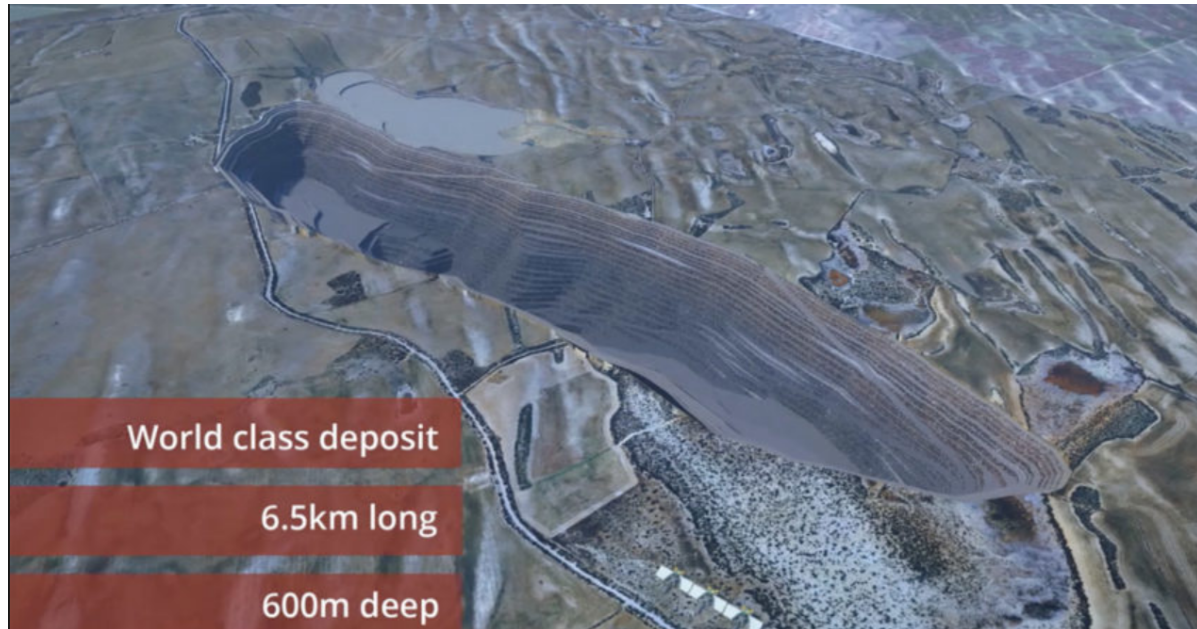
---

#### Monalco Mining Case Study

Monalco Mining is one of the world's largest iron ore mining companies in the world and has offices located across the globe. Its exploration efforts have revealed significant iron resources in the Bass-Shingle Basin in Western Australia. Demand for iron has been increasing around the world and market prices have **ramped up significantly to \$110 per ton of iron ore**. To accommodate market demand, **Monalco, along with many other mining organizations**, has invested heavily in operating technologies such as ore-crushers and has poured money into maintenance to maximize production of iron ore. However, with the increased market supply, which is rapidly overtaking demand, **prices have now shifted downwards, averaging \$55/ton**. In response to worsening market conditions, the management team at Monalco has decided to focus on streamlining costs, particularly maintenance expenditure, to limit the impact this has on the business' profitability<sup>1</sup>.

---

<sup>1</sup> Profit is a financial benefit that is realized when the amount of revenue gained from a business activity exceeds the expenses, costs, and taxes needed to sustain the activity. **Profit is calculated as total revenue minus total expenses. Expenses can then be broken down into Fixed and Variable Costs.**



As a budding data scientist on the Insights & Analytics (IA) team, it is critical that you know how to clearly structure a problem and break it down into manageable parts. You will achieve this by creating a Problem Statement Worksheet (PSW) to clearly define the scope and goal of the project. Your work will be used by your team lead, Chris, to steer the direction the team undertakes to resolve the current spending issue Monalco is facing.

Additionally, the completion of these deliverables will serve to reinforce the concepts you have learned throughout the Problem Identification unit and further emphasize the value of these tools. Your team lead, Chris, has forwarded you emails with additional information gathered by the maintenance subject matter experts, Tara and Bruce, to help with the project.

---

**From:** "Hui, Chris" <Chris.Hui@Monalco.com>

**Sent:** Tuesday, May 10, 4:32 AM

**Subject:** URGENT: Ore Crushing Maintenance Expenditure Reduction Targets

I had a meeting with both Tara and Bruce with respect to management's **push to further reduce our maintenance costs**. Bruce analyzed a number of records which highlighted **HUGE discrepancies** in our Year-on-Year spending patterns for a number of our assets – **primarily our ore crushers**.



As you know, we purchased these ore crushers as part of Monalco's Capital Expenditure<sup>2</sup> (CAPEX) enhancement initiative when ore prices for iron averaged ~ \$110/ton. With recent prices hovering around \$55/ton, and our operating break-even<sup>3</sup> hovering around \$50/ton, this is cutting too close for comfort. **Long story short, we are going to need to exhibit spending discipline and reduce operating costs until they are back to acceptable levels.**

Tara and Bruce have done some initial leg work in the email below where they have highlighted the overall expenditure costs we have incurred for ore crushers as well as a high-level list of stakeholders who we may need to consult. I don't have the time to complete the Problem Statement Worksheets, Value Driver Trees or Issue Trees – I'll leave this to you to wrap up. No doubt, since you're fresh from training, the structured frameworks you've learned will be fresh in your mind.

Let's catch up tomorrow at 7:00 AM at the Hyatt Regency; you can debrief me on your findings and walk through the information you have aggregated. Remember – we have to be very clear regarding how we are approaching this. I don't have the technical chops you all have so you'll need to boil it down for me into a process I can understand.

Looking forward to touching base tomorrow!

BR,

Chris

---

Sent from the iPhone of Chris Hui

---

**From:** "Banner, Bruce" <BBanner@Monalco.com>

**Sent:** Tuesday, May 10, 6:30 AM

**Subject:** Data Request – Work Orders for Bass-Shingle

I assume you've heard from Chris about where we're at.

It's pretty obvious that at a breakeven of \$50/ton, we are in trouble if we can't cut our costs to a sustainable level to handle these lower prices. I told Chris a while back we

---

<sup>2</sup> Capital Expenditure (CAPEX) refers to the capital or money that is spent to acquire, upgrade and maintain physical assets such as property, buildings, industrial plant, technology or equipment.

<sup>3</sup> The **operating breakeven** point for a business is the point at which sales revenue covers all of the fixed costs and variable costs but produces no profit for the business. A fixed cost is a cost that does not change for business based on the number of units produced. A variable cost on the other hand, varies based on the number of units produced.



need to scale back on our annual maintenance expenditure of \$30M for the ore crushers – it's just not sustainable. Looking at the Original Equipment Manufacturer (OEM) guide, **they are meant to be maintained every three (3) years – not every year like we're currently doing!**

I've been doing some further digging and the figures aren't pretty.

Tara will be able to give you further information if you need, I've pasted the notes she provided below.

- Work Orders for the last year indicate we **spent \$30M for 2018 on ore crusher maintenance with this forecast to rise to \$45M for 2019**
- Wear is a key concern we need to take note of; we've been operating beyond the limits of the equipment for a while and it's eating into our profit margins (i.e. **maintenance logs are indicating 'excess wear'<sup>4</sup> is responsible for at least 80% of our work requests.** In other words, we have used our equipment far more than what was expected by the manufacturer)
- Back of the envelope calculations indicate **if we're able to shave off ~ %20 worth of costs over the year w.r.t ore crusher maintenance, this will be enough of a buffer to weather future downward shifts in pricing.**
- We'll have to note that even if we want to cut down our maintenance events, we're likely going to face **resistance from the reliability engineering team;** additionally, we can't cut more than the recommended OEM limit of **one maintenance event at every 50,000 tons of iron ore processed.**
- Initial stakeholders we are going to have involve will be the following: Chanel Adams – Reliability Engineer, Jonas Richards – Asset Integrity Manager, Bruce Banner – Maintenance SME, Jane Steere - Principal Maintenance, Fargo Williams – Change Manager, Tara Starr - Maintenance SME

---

**From:** "Starr, Tara" <TStarr@Monalco.com>

**Sent:** Tuesday, May 10, 5:10 AM

**Subject:** Data Mapping

This is just an FYI but I've mapped out a high-level view of what the data flows might look like. We care largely about where the key information for the equipment is stored.

---

<sup>4</sup> Excess Wear refers to the amount of 'wear' a normal asset goes through in its life. However, due to increased usage of the asset, we are 'wearing' the asset away at a higher rate than normal.

I've listed below what we care about.

**With respect to maintenance cost reductions, we would probably want to focus on getting information from:**

1. Data Historian - This includes information on how many tonnes of Iron Ore we have processed with the ore crushers.
2. Ellipse - This includes information on the old work orders that used to be raised for our equipment, before our upgrade to SAP.
3. SAP - This is the most up-to-date information source on our equipment logs and work order requests that have been raised for maintenance work for our ore crushers and other pieces of equipment

Additional systems which might be worth considering are:

1. T3000 DCS – Sends raw streaming data on vibrations, temperature, and the humidity of the ore crushed to Data Historian
2. Ore Crusher System - This includes a high-level process map outlining how the Ore Crusher System works for individual ore crusher models.

Cheers,  
Tara

