

## Financial Management and Planning

### Assignment

#### MSc Industry 4.0 – Advanced Manufacturing

Module Code: ACPA7002

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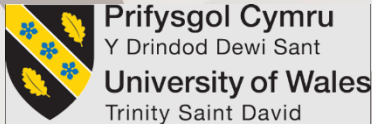
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# Hingston Quarry Wash Plant Relocation Project

A Pre-feasibility study





# Introduction

Hanson UK Hingston Quarry –  
Granit Stone Quarry

12Mt of reserve left at site

Produces 400Kt of stone per year -  
100mm to dust

Yearly turn over £800k+

Yearly profit £200k+

# Problem Statement

- The dust produced during the quarrying operations is not favorable in current form due to limited application and low selling price. Currently stands at 30% of produced volumes.
- Up until 2022 the dust produced that could not be sold had been stored on site, end of year 2021 stock count put volume at 180kt.
- In the P&L, the dust is a capped inventory at anything over 6 months sales volumes (6kt), capped price £1.75. Meaning any dust produced per month is deducted against the P&L – current cost is around £10k per month capping.
- If the dust can be sold or blended with another material, the site P&L will see a benefit from this and retain the capping value.
- As well as financial issues that are present, it also raises logistical and quarry workability issues.

# Dust Washing Solution

In 2022 the site began to reprocess the dust by washing it, which turns it into a useable and profitable sand product. The price increases from £2 to £7.60per t.

This allows for the freeing up of quarry space for material storage and further quarry development.

Washing is currently done using contract labor and machinery, during 2-3, 3-week campaigns per year.

# Washing Issues

The current washing process is carried out at the bed of the quarry due to geographical and site layout restrictions.

Location B is where the dust is washed.

Current location and routes are restricting access to 20+ years of reserve.

Also means holding water above quarrying level which is a safety concern.

Product must be hauled to storage locations shown to be sold.



This leads to considerable transportation movements of pre and post washed product via large dumper vehicles. This is particularly expensive when recent fuel price increases are considered.

Unwanted silt is produced as a by-product of the washing process that must be hauled long distance for disposal.

**Project Rationale** – Increase quarry life, reduce capped inventory, improve quarry safety and reduce operational costs.

# Current Washing Costs

Based on current process haulage requirements (10 haul routes in total) →

| Current Material Movement Information (Dumper)         |              |          |                          |                    |                          |                |                       |         | Avg dumper speed = 3.6 m/s |           |
|--------------------------------------------------------|--------------|----------|--------------------------|--------------------|--------------------------|----------------|-----------------------|---------|----------------------------|-----------|
| Route                                                  | Distance (m) | Time (s) | Elevation                | Pay Load (t)       | Fuel (litres) @ 19.7 l/h | Cost @ £1.50/l | No Cycles per day avg | Cost    |                            |           |
| X - B                                                  | 757          | 207      | 29m                      | 30                 | 1.14                     | 1.71           | 30                    | £51.23  |                            |           |
| B - Y                                                  | 832          | 266      | 26m                      | 30                 | 1.46                     | 2.19           | 20                    | £65.84  |                            |           |
| B - D                                                  | 551          | 153      | 26m                      | 30                 | 0.84                     | 1.26           | 5                     | £37.87  |                            |           |
| D - X                                                  | 250          | 70       | 5m                       | 0                  | 0.39                     | 0.58           | 5                     | £17.33  |                            |           |
| B - E                                                  | 525          | 146      | 19m                      | 30                 | 0.80                     | 1.20           | 5                     | £36.09  |                            |           |
| E - X                                                  | 402          | 112      | 18m                      | 0                  | 0.61                     | 0.92           | 5                     | £27.64  | Year                       |           |
| Total                                                  |              |          |                          |                    |                          |                |                       | £235.99 | £54,277.99                 |           |
| Current Material Movement Information (Loading Shovel) |              |          |                          |                    |                          |                |                       |         |                            |           |
| Task                                                   | Distance     | Time     | Fuel (litres) @ 18.8 l/h | Cost @ £1.50/l     | No Cycles per day avg    | Cost           |                       |         |                            |           |
| Load dumper (washed sand)                              | N/A          | 300      | 1.56                     | 2.34               | 30                       | £70.20         | Year                  |         |                            |           |
| Total                                                  |              |          |                          |                    |                          | £70.20         | £16,146.00            |         |                            |           |
| Current Material Movement Information (silt removal)   |              |          |                          |                    |                          |                |                       |         |                            |           |
| Route                                                  | Distance (m) | Time (s) | Elevation                | Pay Load (t)       | Fuel (litres) @ 19.7 l/h | Cost @ £1.50/l | No Cycles per day avg | Cost    |                            |           |
| B - F                                                  | 1100         | 306      | 71                       | 30                 | 1.68                     | £2.52          | 54                    | £136.13 | £272.25                    | wet       |
| F - B                                                  | 1100         | 306      | 71                       | 0                  | 1.68                     | £2.52          | 54                    | £136.13 |                            | £8,167.50 |
| F - G                                                  | 348          | 97       |                          | 30                 | 0.53                     | £0.80          | 108                   | £86.13  | £172.26                    | dry       |
| G - F                                                  | 348          | 97       |                          | 0                  | 0.53                     | £0.80          | 108                   | £86.13  |                            | £5,167.80 |
| Total                                                  |              |          |                          |                    |                          |                |                       | £444.51 |                            |           |
| Current Material Movement Information (Excavator)      |              |          |                          |                    |                          |                |                       |         |                            |           |
| Task                                                   | Distance     | Time     | Fuel (litres)            | Cost/hrs @ £1.50/l | Hours working (9)        | Cost           | Year                  |         |                            |           |
| Wet silt removal                                       | N/A          | N/A      | 30                       | 45                 | 9                        | £405.00        | £12,150.00            |         |                            |           |
| Dry silt removal                                       | N/A          | N/A      | 30                       | 45                 | 9                        | £405.00        | £10,125.00            |         |                            |           |
| Total                                                  |              |          |                          |                    |                          | £810.00        | £22,275.00            |         |                            |           |



| Total Cost of Washing Process (Current) |  |          |
|-----------------------------------------|--|----------|
| Hire                                    |  | £97,350  |
| Washing Charge                          |  | £231,000 |
| Fuel                                    |  | £106,034 |
| Total/year                              |  | £434,384 |

# Options

- 1) Stop reprocessing and leave dust stock build up:
  - Impact on P&L from stock capping of around £100k/year
  - Quarry life span shortened due to inaccessible reserves from stocked material and quarry lagoon
- 2) Continue processing at current location:
  - Quarry life span shortened due to inaccessible reserves under wash plant processing and stocking areas
  - Safety risk with water above quarrying level
  - Fuel costs for transportation high and will continue to climb for the foreseeable future
  - Multiple stock areas needed to allow year-round access to product. Collect trucks unable to enter quarry when raining due to poor conditions.
  - No immediate funding required; process costs absorbed in OpEx but climbing
- 3) Relocated washing process to top of quarry and install silt press:
  - Frees up access to quarry reserves
  - Eliminates water storage above quarrying level
  - Eliminates silt handling
  - Reduces capping by 20%
  - Reduces material haul distances
  - Year-round access for collect vehicles
  - CapEx funding required to repurposing of land at top of quarry

Option 1 - not feasible due to cost implications and immediate impact on quarry reserve accessibility.

Option 2 - not desirable due to quarry reserve and safety concerns, plus fuel costs.

Option 3 – proceed with feasibility to ascertain associated costs with relocation plan.

# Wash Plant Relocation Proposal

- Location moved to Point C in image
- Reduces haul routes to 4 from 10
- Removes silt hauling completely with addition of silt press now available due to location, contract cost increases to £5/t however
- This does completely remove the need for hire silt removal machinery
- Extends quarry life to 29 years in total
- Project implementation duration estimated at 6 months
- CapEx of £230k will be needed for machine and resource hire to repurpose land (plus 10% contingency):

2 x Dumper @£480/day – 5 days a week x 24 weeks = £115k  
 1 x Excavator @£810/day – 5 days a week x 24 weeks = £97k



| Current Material Movement Information (Dumper)         |              |          |           |                          |                          |                       |                       |         | Avg dumper speed = 3.6 m/s |
|--------------------------------------------------------|--------------|----------|-----------|--------------------------|--------------------------|-----------------------|-----------------------|---------|----------------------------|
| Route                                                  | Distance (m) | Time (s) | Elevation | Pay Load (t)             | Fuel (litres) @ 19.7 l/h | Cost @ £1.50/l        | No Cycles per day avg | Cost    |                            |
| X - C                                                  | 857          | 238      | 29m       | 30                       | 1.31                     | 1.96                  | 30                    | £58.92  |                            |
| C - Y                                                  | 912          | 253      | 30m       | 30                       | 1.39                     | 2.09                  | 20                    | £62.70  |                            |
| C - E                                                  | 670          | 186      | 26m       | 30                       | 1.02                     | 1.54                  | 5                     | £46.06  |                            |
| E - X                                                  | 402          | 112      | 5m        | 0                        | 0.61                     | 0.92                  | 5                     | £27.64  |                            |
| Total                                                  |              |          |           |                          |                          |                       |                       | £195.32 | Year £44,923.31            |
| Current Material Movement Information (Loading Shovel) |              |          |           |                          |                          |                       |                       |         |                            |
| Task                                                   | Distance     | Time     |           | Fuel (litres) @ 18.8 l/h | Cost @ £1.50/l           | No Cycles per day avg | Cost                  |         |                            |
| Load dumper (washed sand)                              | N/A          | 300      |           | 1.56                     | 2.34                     | 30                    | £70.20                | Year    |                            |
| Total                                                  |              |          |           |                          |                          |                       |                       | £70.20  | £16,146.00                 |

| Total Cost of Washing Process (Future) |          |
|----------------------------------------|----------|
| Hire                                   |          |
| Washing Charge                         | £350,000 |
| Fuel                                   | £61,069  |
| Total/year                             | £411,069 |

£23,315 per year saving in OpEx

# Cost Analysis

Key information:

Investment required - £230k (CapEx requirement due to value)

Project Duration 10 years (based on reserves if project did not go ahead)

After year 10 full financial benefit of quarry remaining operational would be seen to business (£200k+ profit/year currently)

Savings £23315 per year fuel and leasing

Reduces stock capping cost by £24k per year

Total savings/year - £47k

|                           |           |
|---------------------------|-----------|
| Payback                   | 4.9 Years |
| Net Present Value (NPV)   | £ 7,463   |
| Internal Rate Return      | 15.85%    |
| Profitability Index       | 1.03      |
| Benefit Cost Ratio        | 0.03      |
| Accounting Rate of Return | 21%       |

## Conclusion and recommendations

The strategic importance of the site and reserve that will be made available from relocation are clear

This proposal also shows the HSE benefit of the project plus OpEx savings. In reality, savings will increase overtime due increase in fuel costs and reduced haul routes.

Financial modelling gives good indication that on top of obvious strategic gains there will be a financial benefit over the project duration even if you isolated it as a case for justification

Any Questions?