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Programme: MSc International Innovation Management

Module code: ACPA 7002

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Assignment: Capital Project Appraisal Presentation

# Business report

## Overview

This proposal is to replace our current deliveries of gas cylinders with on-site generators.

Production, final test, product development, and engineering labs all rely on the daily use of analytical grade clean air and nitrogen.

These are required for testing of our products, cleaning of sorbent sampling tubes, running analytical applications, and testing new methods.

Our current solution is to purchase the gases in cylinders that are delivered weekly. However, in recent months all departments have experience significant disruptions due to the gases running out. Especially over a weekend when staff are not on-site to be able to swap the cylinders over.

When a gas runs out unexpectantly, this causes the analytical instrument to stop operating and risks damaging the products. Therefore, staff are now reluctant to operate their systems overnight or over the weekend. Which has led to lost working hours, lost capacity, and additional personnel time.

Therefore, this proposal assesses replacement of both the air and nitrogen cylinders with on-site gas generators. This solution will make the cylinders fully redundant., whilst enabling 100% up time for all departments as they will no longer face loss in supply.

By removing the need for cylinders, we will also reduce our GHG emissions from their deliveries and reduce our training requirements for safe manual handling and installation of the cylinders.

The generators will have enough capacity for future expansion without further investment needed. Therefore, any increased demand will already be covered.

Also, the analytical grade of the gases produced from the generators are as good if not better than those currently delivered.

In addition, in terms of productivity, we will gain over night operation as well as less risk of having to re-run analytical sequences.

Markes already have the infrastructure in place. The generators will be installed onto the gas lines that are already in use from the cylinders. They can be positioned in the fallow area (storage area), therefore no disruption to any department.

Installation and operator training only requires 2-days, and the generators can be delivered prebuilt on a 1m x 1m skid. This can take place over a weekend, so we will require access to our site as well as the selected operating personnel being available.

## Cost of investment and estimated savings

Current usage and cost of cylinders (12 months) is £48,439 per year which includes gas, delivery, cylinder rental, and environmental surcharge.

Purchasing of all hardware (including installation) has been quoted at £115,961, and we have calculated an annual estimated running cost of £7,177. Therefore, the initial investment will be **£123,138.**

Given that the cylinders become fully redundant, the annual running cost is a saving of **£41,262.**

Life span of the project is 5-years as this is typically when customers look to upgrade their generators to the newer, more efficient technology.

# Rational – the financial models

## Payback period

Payback period is a simple tool for the initial assessment of a project. Generally seen as a screening tool, it provides a quick calculation on "the time taken for an initial investment to be repaid out of the net cash inflows from a project" (Atrill & McLaney, 2017). Therefore, a shorter payback period is more attractive to businesses and means that the project is more likely to proceed.

However, it does not consider the future value of money or long-term cash flows.

Markes international generally have a payback period criterion of ≤5 years. However, this can be adjusted depending on the level of investment as well as the scope of the project.

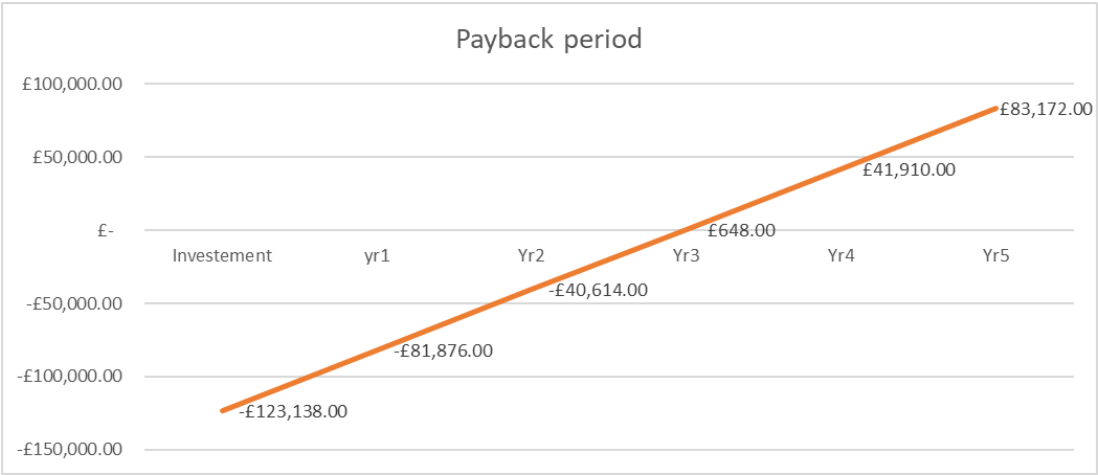
The calculation required:

Payback period = the last year with negative cash flow + (the final amount of cash flow at the end of that year / cash flow during next year)

| | Investment | yr1 | Yr2 | Yr3 | Yr4 | Yr5 |
|---|---|---|---|---|---|---|
| Present value | -£123,138 | £41,262 | £41,262 | £41,262 | £41,262 | £41,262 |
| Cumulative cash flow | -£123,138 | -£81,876 | -£40,614 | £648 | £41,910 | £83,172 |

Payback period = 2 + (£40,614 / £41,262) = 2.984 years

Just over 2 years and 11 months.




## Net Present Value (NPV)

Net present value is a method that includes all cash inflows and outflows whilst applying a discounted rate that takes into consideration the future time value of money (TVM).

This is important because future money less valuable due to inflation that erodes its buying power (Gallo, 2014)

The discounted rate, also known as Weighted average cost of Capital (WACC), is "the average rate of return a company is expected to pay to all its shareholders, including debt holders, equity shareholders, and preferred equity shareholders" (Vaidya, n.d.)

An investment must have a positive NPV for it to progress as this demonstrates that the investment will add value to the organisation.

Markes international uses a discount rate of 8%

Utilizing excel, the NPV is calculated at **£41,609**. Therefore, this is an investment that will add considerable value.

*Note*, when calculating manually, the NPV is equal to **£41,621**. Although similar, this value differs as the denominators are not to the same number of decimal places as those used in excel.

| | Investment | yr1 | Yr2 | Yr3 | Yr4 | Yr5 |
|---|---|---|---|---|---|---|
| Present value | -£123,138 | £41,262 | £41,262 | £41,262 | £41,262 | £41,262 |
| Discount Rate (WACC) | 8% | | | | | |
| Denominator | 1.000 | 0.926 | 0.857 | 0.794 | 0.735 | 0.681 |
| Future value (present value x denominator) | -£123,138 | £38,209 | £35,362 | £32,762 | £30,328 | £28,099 |
| NPV (sum of future value over 5 years) | £41,621 | | | | | |

## Internal Rate of Return (IRR)

Internal rate of return is "a discount rate that makes the net present value of all cash flows equal to zero" (Fernando, 2023)

It essentially is looking for the breakeven point and tells you how much interest can be applied until the project has 0 net present value. A higher IRR is desirable as this will have less risk of reaching 0 NPV should interest rate fluctuate.

Manual calculation if IRR is tedious, however, a formular is readily available in excel.

Using this formular and the present values of the investment and 5-year inflow, IRR is equal to **20.1%**

Therefore, this investment will retain a positive net present value up until 20.1% interest rate.

In addition to the manual calculation being difficult to perform, another weakness of this method is that is does not allow for a comparison between different size projects. Although companies may use this method to compare the potential rates of annual return over time for multiple project (Fernando, 2023), it completely ignores the scale of each investment (Atrill & McLaney, 2017). Therefore, one must always take into consideration the wider implications, such as which project will generate the most wealth.

## Profitability index (PI)

Profitability index calculates the ratio between the sum of the future values from expected cash flow and the cost of investment.

The higher the PI ratio the more attractive a project is perceived, which helps with ranking multiple projects. Those with a value greater than 1.0 is deemed good and should be progressed, whereas any that are less than 1.0 should be rejected. This is because a PI of less than 1.0 suggests that the projects present value is less than the initial investment (Chen, 2023).

As with all methods, this comes with its own drawbacks. Chen, explains that PI also disregards the size of projects. "Therefore, projects with larger cash inflows may result in lower profitability index calculations because their profit margins are not as high."

Formular required for profitability index is:

PI = PV of future cash flows / initial investment

PV Future cash flow over 5 years = £164,759

Investment = £123,138

Profitability index = 164,759/123,138 = **1.338**

| | Investment | yr1 | Yr2 | Yr3 | Yr4 | Yr5 |
|---|---|---|---|---|---|---|
| Future value | -£123,138 | £38,209 | £35,362 | £32,762 | £30,328 | £28,099 |

Given that this result is greater than 1.0, it provides further justification for investment.

An alternative to profitability index is benefit-cost ratio which takes the overall NPV (calculated earlier as £41,609) and divides that by the investment.

Benefit-Cost Ratio (BCR) = NPV / Initial outlay = 41,609/123,138 = **0.338**

With this method, any ration greater than 0 should be progressed.

Both of these methods proved a measure of the expected profitability per £ of investment, therefore either can be used with the same outcome.

## Accounting Rate of Return (ARR)

This method of investment appraisal looks at the average annual operating profit that will be generated over the average investment as a percentage over the projects lifetime.

$$\text{ARR} = \frac{\text{Average annual operating profit}}{\text{Average investment to earn that profit}} \times 100\%$$

(Atrill & McLaney, 2017)

ARR is commonly used when multiple projects are being considered so that their expected rate of return can be compared. The higher the ARR the more money is expected to be earned per pound invested per year. (CFI Team, 2019)

Some companies will have a minimum ARR percentage, which if the project is equal to or greater than then it will likely progress. However, if it is lower than the minimum ARR the project will likely be rejected.

Although this investment is not being compared to another, the ARR has been calculated at 63.41%, based on a residual value of £7,000 from the initial £123,138 investment.

As such, the investment is expected to earn 63.4p per £1 invested per year.

| | |
|---|---|
| Average annual profits | £41,262 |
| Residual value | £7,000 |
| Depreciation | £116,138 |
| Average investment<br>(123,138 + 7,000)/2 | £65,069 |
| **ARR**<br>**(41,262 / 65,069) x 100** | **63.41%** |

## Funding options

It is expected that this investment will be self-funded given the considerable annual savings and operation will be required on-site.

Gas generator suppliers do not offer a paid for service, however, the identified supplier are willing to partner with Markes in joint marketing of their products alongside our Multi-Gas enabled range of thermal desorption instruments.

With this they will offer extended payment options and on-going service support for the life of the products.

A knowledge transfer partnership would not be suitable for this type of investment as this requirement does not include an innovation idea, but rather an update to current practices with an off-the-shelf solution readily available.

## Conclusions and recommendations

In conclusion, replacing purchased cylinders of analytical gas with on-site generators will:

- Provide year-on-year savings of £41,262 based on current costs.
- Increase productivity as multiple departments can operate over night and weekends whilst personnel are off site.
- Future-proof for expansion as the generators will have capacity for increased use.
- Remove weekly deliveries, thus reducing GHG emissions.
- Reduce health and safety training required for manual handling and installation of cylinders.

It is recommended that installation of the generators should take place within the fallow area to prevent any moving of equipment in any department. This installation and training should occur over a weekend or during planned factory shutdown to prevent disruption to on-going work.

# References

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