



ENGINEERING TECHNOLOGY FOR LONG TERM SUSTAINABILITY AND PROFIT

Carefully planned capital investment in an operation will improve the efficiency and effective running of a quarry to increase profit in the long term. The best opportunities to invest capital in long term assets exist at the low point of the economic cycle .

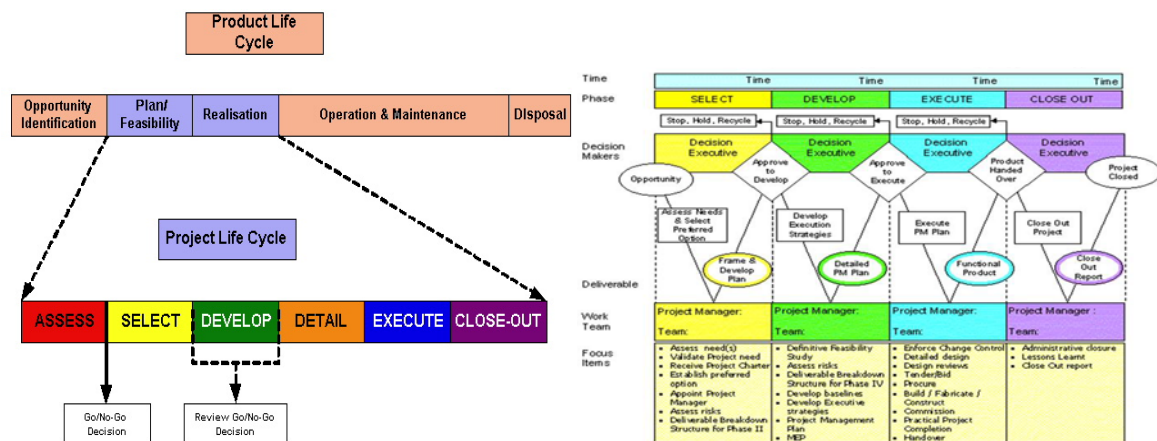
We have all heard the story about the CEO who delivered record returns over his 4 year term. He then handed the business to a new CEO, to whom it soon became painfully apparent that there was no investment in resources, plant and equipment. The operation required significant capital to overhaul, resulting in the business losing its competitive edge.

It has become increasingly evident in many quarry operations that there is insufficient expenditure on capital works programs to improve efficiency and effectiveness of the business. All too often, capital is only approved to upgrade dilapidated plant to accommodate a new sales opportunity. The general 'If it ain't broke, don't fix it' attitude has reigned supreme.

An effective capital investment plan will involve carefully planned timing of maintenance to plant and equipment, which ideally should take place when there is less demand on production. The objective is to maximise profit generation during the good times whilst developing a sustainable, low-cost base to remain competitive during the leaner times. Quarries have this opportunity as their resource bases often have a 20-40 year sustainability.

Planning Cycles

All projects have a life cycle where plant or equipment has a finite life from the time that it is put into service until it is disposed. Once an opportunity has been identified, a project plan is instigated and once this is executed, it follows on into the operation and maintenance through to final disposal.

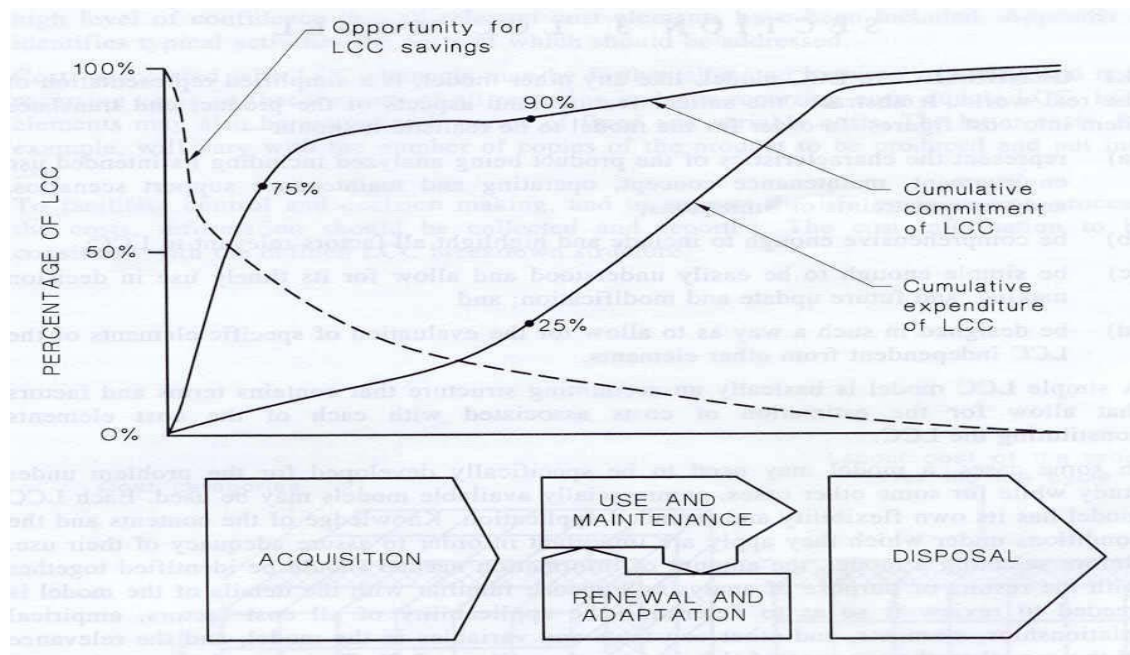


As can be seen in the above diagram, the product life cycle is made up of a sub-set which is the project life cycle. This is the capital acquisition and installation.

Project Cycle

Within the product cycle is the project cycle. The key is planning and adopting technological advancements and following a good project cycle regime. The chart shown above is a typical flow chart used by many of the large mining organisations to map out their planning process for small to medium projects. Firstly, identify the objectives with the key stakeholders. This usually starts with an opportunity with several options which need to be assessed and the scope and basic plan determined. Then a business case is developed through conceptual studies. If the plan is able to achieve all its goals then this should be progressed to a full feasibility study. Throughout this process, it is important that all key stakeholders are engaged in the process and this will lead to delivery of a quality functional solution.

Cost Commitment



The above graph shows a typical Lifecycle Cost Commitment. The process in the initial planning up to the installation and commissioning of the equipment is where the greatest potential lies to influence the total cost and the greatest returns over the project life. As a typical number for large rotating machinery, it is said that initial capital cost for the acquisition and installation is approximately 25% of the total cost but this is dependent on choices made during the acquisition process. The lifecycle cost includes everything from acquisition, installation, operation, maintenance, conversion and/or decommissioning.

Total Lifecycle Costs

One of the biggest pitfalls of any acquisition is the total cost of the ownership. The initial cost can be far smaller than the total outlay and is very dependent on those initial planning stages where the project planning and feasibility is correctly assessed.

Lifecycle cost analysis was originally developed by the American Military back in the seventies and eighties and has since been taken on board by Australian petrochem industries and large industrial and mining companies in the last 10 years. Focus of the lifecycle cost analysis has not only covered the labour, parts and spares and energy inputs but also the unavailability of the equipment due to failures, maintenance, etc., which can be looked at as the reliability factor. For large projects, such as the acquisition of a fighter aeroplane, or a gas module for an offshore platform, the detailed analysis is complex and is normally calculated through software specifically designed for these industries. However, for most projects undertaken in the quarrying industry, careful analysis of the fundamental factors in the initial planning stages is normally all that is required to deliver a successful project.

The technology available today in both equipment and instrumentation has the ability to fine tune a processing plant to give a high degree of efficiency in the output of the product, as well as improve the quality of the product. On top of this, improvements can be made to increase the availability of the processing plant and the total throughput. However, new technology needs to be engineered into the operation to gain the highest benefit from the improvement.

Operational Costs

- Corrective maintenance, labour and spare parts
- Preventative maintenance, labour and spare parts
- Energy consumption
- Insurance costs
- Deferred production
- Hazard and liability costs
- Warranty costs
- Loss of image and prestige

All of these have a direct correlation to the improvement of profit in the business. The improvement of the quality can be difficult to substantiate but in this current economic environment, holding onto or gaining of a customer through the improvement of quality will always be beneficial to the bottom line. In a lot of operations the fixed cost component for the product is a high proportion of the total cost so small improvements in efficiency and throughput have large influence on the cost of production.

There are many examples of new technology that have greatly increased the efficiency of a process plant's operation, such as automatic adjustment in cone crushers, high frequency screens for dewatering, extendable arm stacker conveyors, fluid classifiers, high efficiency slurry pumps, just to name a few. The installation of any of this equipment needs to be undertaken with a firm understanding of the implications of its impact on the process mass balance, electrical capacity and other process services.

It is also important to look at existing plants and audit the system for bottlenecks, inefficiencies and problem areas. In many older plants the original design for the system is not consistent with the current running conditions and there may be modifications that are reducing the overall performance of the plant from meeting its optimum performance. In many cases small changes can make significant differences to the bottom line, as can be seen in the following example.

Cost to Profit Example

A simple example is a plant running at 100TPH for 50hrs per day and 70% availability produces 3,500 TPday and produces a product that sells for \$12/tonne and has \$6/t fixed costs, \$4/t variable costs resulting in a profit of \$2/t.

If there were improvements made to give a marginal increase of 3% to the availability and a throughput of 5% and, to keep the example simple, assume that improvements were made to the power efficiency to keep the fixed costs the same at higher tonnage.

The plant would now run at 105TPH, for the same amount at 50hrs per day, 73% availability and produce 3832.5TPday.

The fixed cost is still \$21,000, but the variable cost, because of the increase in throughput, is now \$15,330, but with the increased throughput there is an increased profit of 26% and, hence there is a gain in the stock. This is a large gain for a small change and can be achieved through small changes that are as simple as increasing the throughput by the removal of a bottleneck and increasing the availability by an audit of the root cause of plant downtime.

Conclusion

Planning and feasibility through to execution of an acquisition for a capital project is extremely important to the lifecycle cost. Essentially, the future profit of the project is defined in these initial stages.

Once the scope of the project opportunity is fully defined, that project commitments are agreed upon to achieve performance, time and cost goals. Planning and scheduling of such goals is required if these commitments are to be achieved. To ensure the concepts and techniques meet the project standards, an experienced management team is required to customise the plan.

MSP Engineering, previously known as McSweeney Partners Pty Ltd, has 40 years of experience in conducting this type of work for both the quarrying industry and the mining industry, developing small to medium projects throughout Australia and overseas. They are a Western Australian based resource development consultancy specialising in the evaluation, engineering design and construction of mineral processing facilities.

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