Case 31
Freeflight Superdisc

Freeflight Superdiscs has earned a 10% market share for its version of the ever-popular Frisbee. But demand for their product has stabilized in the mature phase of its life cycle, and they are now considering cost-reduction strategies to increase their profits.

The equipment used in one stage of Freeflight's manufacturing process is on its last legs. Three options have been identified for its replacement. The first option, A, is a modernized version of its current equipment and is a relatively labor-intensive approach. The second option, B, replaces the operator with computerized controls. Option B has higher capital and maintenance costs and lower labor costs. The third option, C, adds computerized controls to another process and interconnects the controls, so that waste heat from the other process can replace the natural gas currently used in this process. This option also requires connecting the two processes with insulated pipes and a heat circulating system to salvage the waste heat.

Option A and the current process require a full-time operator (annual cost of $27,000), as well as $3000 annually for operations and maintenance and $13,000 for energy. The machinery itself costs $20,000 and is expected to have no salvage value whenever it is disposed of. With an overhaul every fifth year (at a cost of $8000) the equipment should last 20 years.

Option B reduces the labor cost to $11,000 annually, but the overhead and maintenance increases to $9000 annually. The energy costs are unchanged at $13,000 annually. The cost of the equipment and controls increases to $75,000, but it still has no salvage value whenever it is disposed of. The equipment should still last 20 years, but the cost of the 5-year overhaul increases to $17,000.

Option C reduces the annual energy cost to zero, but the operations and maintenance (O&M) and labor costs increase slightly to $10,000 and $12,000 respectively. The additional controls and piping bring the total system cost to $170,000, and the 5-year overhaul costs to $25,000. The system life and salvage pattern are unchanged.

If the process will be used for at least 5 years and possibly 20 years, and the rate of return is between 6% and 20%, which process should be chosen? Which sources of uncertainty are most likely to change your recommendation as compared with a base case of 10 years and 10%?

The wholesale price index (WPI) is expected to average 6%, and energy prices are expected to inflate at 9%, while labor costs (direct and O&M) due to productivity improvements are expected to inflate at only 4%. Overhaul costs are split between parts and labor and are thus expected to inflate at 5%.

Options

1. Analyze the problem after taxes. Consider after-tax rates of return between 3% and 12%, with a base case of 6%. For estimating taxes, use 5-year straight-line depreciation and assume a combined federal and state tax rate of 40%.

2. Rather than using a straight-line approximation use the relevant 5-year depreciation schedule.

3. Simplify the problem by ignoring inflation.

Suggestions to the Student

1. The financing of the project does not have to be explicitly treated. As a result, only the differential inflation due to energy and labor price trends must be considered. This differential inflation represents a geometric gradient, and it is combined with the minimum attractive rate of return in an equivalent discount rate.

    The rate for labor is?

    The rate for energy is?

2. Overhauls occur infrequently, so they are easier to deal with individually. Replacements and salvage values can also be treated individually. Write the cash-flow equations for the PW of Option A, Option B, and Option C.

3. By equating the PWs of each option, it is possible to calculate breakeven values for A vs. B, B vs. C, and A vs. C. Each value for the life of the equipment will produce a value for the rate of return for each comparison. This comparison can be done three ways:
   - The easiest way is to pick a combination of life and discount rate, and then to calculate the three present worths. This can be tabulated.
   - The second approach is to pick a base case for each value, and then vary the other value to calculate PWs for A, B, and C. This can be tabulated or plotted (for an example, see Figure 1 in Chapter 2).
   - The third approach is to write the three comparison equations. When plotted on a graph of life vs. rate of return, these curves will divide the graph into areas. For each area, an option will be preferred.