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Conveying vs. Trucking Economics For Medium Sized Applications

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Introduction

This paper shows how easy it is to perform fundamental economic evaluations of overland conveyor projects and summarizes rules of thumb that make doing the analysis faster.

Project engineers frequently miss the opportunity to perform a Net Present Value (NPV) analysis on their new overland conveyor projects because they don't understand how easy it is to do. People get stymied not knowing the magnitude of the variables to input. This paper demonstrates how easy it is to perform fundamental economic evaluations of overland conveyor projects and summarize the rule of thumb that makes doing the analysis faster. The reward is a deeper understanding of the project.

The variables that one needs to know are the trucking cost per ton, annual volume of material to move, conveying cost per ton, capital cost of the conveyor system, tax depreciation schedule for that conveyor system, corporate incremental income tax rate, and most importantly, the discount rate or required rate of return. Each one of these variables are difficult to nail exactly and they can be dynamic changing from year to year. Other variables also exist that have less impact on the NPV or rate of return such as project life, salvage value of the investment and inflation rate of the operating costs projected.

Doing a simple NPV of the difference between the trucking costs versus conveying cost will generate a yearly difference in operating cost that can be brought back to time zero for the capital amount, but only if the real conveyor capital cost is cheaper will the project be worth doing. After performing this analysis on many projects it becomes obvious, without even running the model, if the project will pay out sufficiently to warrant closer evaluation. In summary this is a valuable tool to utilize.

Purpose of Running Net Present Value on a New Project

We normally deal with midsized projects involving volumes of from **500,000 tons** per year to **3,000,000 tons** per year moving that material anywhere from **one to five miles**.

Running an NPV analysis will illustrate two important things:

1. The cumulative net cash flow of savings
2. The breakeven point where the conveyor is paid for when considering the time value of money.

After all, that is what all operating companies are shooting for – to optimize cash and operate in that zone of "after break even."

We routinely run a NPV on overland conveyor projects to see if the annual volumes and distances involved are large enough to pay out the capital required for a new conveyor system. We normally deal with midsized projects involving volumes of from 500,000 tons per year to 3,000,000 tons per year moving that material anywhere from one to five miles. These are typical project parameters for a utility moving waste to a landfill or a cement plant moving limestone from their quarry to the cement plant. <u>These types of projects are what this paper focuses on</u>.

We know quickly if the trucking operation cost will justify the capital cost of a conveyor system to replace it. We go through an interactive process to develop a model that projects net cash flow of the savings. People usually don't know where to start with this process but if you have the model available from previous analysis then it is simple to modify the values to start modeling any opportunity.

The modeling process forces the discovery of the true trucking costs per ton for the application being studied. <u>This paper focuses on the economic analysis itself and not on what the true trucking costs per ton are, even though we realize that trucking costs are important.</u> While this may sound like a cop-out we show what we assume for trucking costs but the ultimate assumption is that the operating company must know what their true trucking costs per ton are to make this analysis meaningful.

After running this model for several years on case after case it becomes pretty clear what the trucking costs per ton are and what the conveying costs per ton are.

Ground Rules of This Paper

As previously stated, this is not a paper about trucking cost per ton. That topic is so broad and complicated that to delve into it would be a mistake. Instead, we have shown a table that lists our assumptions for the trucking cost per ton for the real life case presented. Experience has shown that defining and showing accurate trucking cost is very difficult and sensitive, therefore the fast or complete answers tend to be elusive. Whatever the reasons we have found fast answers to be elusive. We have also found a staggering discrepancy of what people think their trucking cost is versus what it really is.

There are a number of good models that have been developed to predict trucking cost per ton. Some of these models are shown in the references. The University of North Dakota has developed a particularly detailed model that is accurate if you can put the right variable in. For most of the projects we have dealt with the trucks used are either 20 ton over the road haul trucks or 40 ton Euclid's.

In this case of a real life example the utility has been using 20 ton Over-The-Road haul trucks which cost $85.00 per hour to operate, including the driver. This cost is obviously debatable based on differences in driver compensation but has been verified. The biggest variable in terms of cost per ton is how many roundtrips this truck makes per hour i.e. how many tons per hour for the $85.00 cost. We have real life data that coincides with a calculation as follows:

Cost per Ton Calculation for 20 Ton Over the Road Truck

Terrain to destination	3 mile flat	2 mile elevated
Capacity (tons)	20	20
Hourly cost, all in	$85.00	$85.00
Tons per load for CCR waste	15	17.5
Percentage full assumption	75%	88%
One roundtrip per hour	$5.67	$4.86
Two roundtrips oer hour	$2.83	$2.43
Three roundtrips per hour	$1.89	$1.62
+10% for road maintenance & dust control costs		
One roundtrip per hour	$6.23	$5.34
Two roundtrips per hour	$3.12	$2.67
Three roundtrips per hour	$2.08	$1.78

Ballpark Estimate of Cost per Foot for Conveyor System Starting Point

Conveyor Type	Conventional	Pipe Conveyor
Design & supply cost	$700	$1,000
Civil works	$250	$250
Mechanical installation	$350	$350
Electrical installation	$200	$200
Total Cost per Foot	$1,500	$1,800

If the haul distance is short and direct then the cost per ton is much lower. If the distance is long and indirect then the number of roundtrips per hour is reduced, sometimes to one trip per hour and the cost per ton is much higher. These are easy to calculate but the ancillary costs are much harder to get a handle on. Some ancillary costs include dust control and rain runoff control.

The process we undertake after estimating the trucking cost per ton or simply obtaining this cost from the client is to model the system over a set project life. We have to make some assumptions to get this process started.

For example, we need to estimate the capital cost of a conveyor. For that we use cost per foot to get into the ballpark on cost.

We do not consider working capital for spare parts at this stage as part of the cost. We use educated guesses to increase or decrease this cost per foot based on the topography and difficulty of the route, long crossing costs if any, and or connecting conveyors and equipment. Without making these assumptions, starting the analysis is very difficult.

Real Life Example of NPV Analysis – Utility Landfill Conveyor

This case is representative of many utility landfill projects moving ash. It has a volume of 3,000,000 tons per year of coal combustion residues. This is in the high end of tons per year of coal ash to expect from a coal fired plant. This equates to 8,200 tons per day to move. The plant has a flat topography as well as the road to the landfill and a 3 mile distance from the plant to the landfill.

At the landfill some delicate maneuvering is necessary to find the best location for dumping and this can be time consuming during inclement weathe. Trucks ony move ash during daylight hours, assumed to be 10 hours per day. Plants utilize different types of trucks - mostly 20 ton dump transports but also some 40 ton trucks. We assumed two roundtrips per hour or $3.12 per ton based on local observations.

Conveying vs. Trucking Economics For Medium Sized Applications

Conveyor Operating Cost per Ton Assumption

OPTIMISTIC			
Conveyor Type	Conventional	Pipe Conveyor	
Power cost	$0.055	$0.066	Assumes 1000 kW for conventional & 5 cents per kWH
Maintenance	$0.067	$0.067	Assumes $200,000 per year for maint. expenses
Operating labor	$0.058	$0.058	Assumes 1 man at total burdened cost of $175K/yr.
Outage inspection	$0.010	$0.010	Assumes yearly inspection costs of $30,000
Total Cost per Ton	$0.190	$0.201	All costs divided by 3,000,000 tons per year of volume

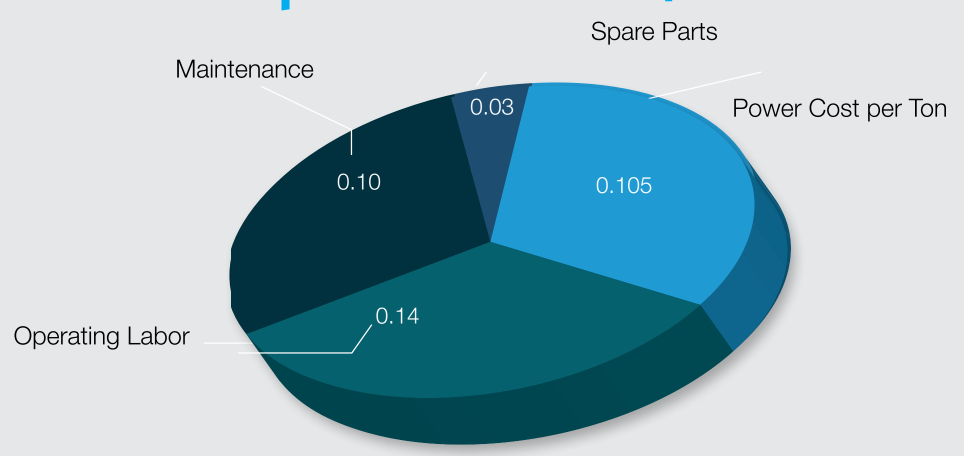
CONSERVATIVE			
Conveyor Type	Conventional	Pipe Conveyor	
Power cost	$0.088	$0.105	Assumes 1000 kW for conventional & 8 cents per kWH
Maintenance	$0.100	$0.100	Assumes $250,000 per year for maint. expenses
Operating labor	$0.140	$0.140	Assumes 2 men at total burdened cost of $175K/yr. x 2
Outage inspection	$0.030	$0.030	Assumes yearly inspection costs of $75,000
Total Cost per Ton	$0.358	$0.375	All costs divided by 2,500,000 tons per year of volume

In this case the material transport will be done by pipe conveyor because they don't want to spill any ash either on the way to the landfill or on the return and the required curve radii are short in some cases. The all-in cost for a pipe conveyor of three miles in length would be $28,512,000. This includes design and supply, civil works and installation.

This number is based on the table in Figure 2. The operating costs assumed for the overland conveyors are shown on page 6. This cost is slightly different for a curved trough conveyor and a pipe conveyor. The power needed for the pipe conveyor is about 40% more.

Operating Costs for Conveyor

Total Cost per Ton = $.375



The operating costs for this pipe conveyor would be $.201 per ton starting in year 1. As with trucking costs we inflate the costs at 3% per year to recognize the affects of inflation. The inflation rate is obviously a variable that companies may differ on. This results in a projection of the difference in operating costs as follows over a ten year period:

	No. of Years	1	2	3	4	5	6	7	8	9	10
	Volume (tons per year)	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
1.	Trucking cost per ton (+3% inflation)	$3.12	$3.21	$3.31	$3.41	$3.51	$3.62	$3.73	$3.84	$3.95	$4.07
	Operating costs	$9,360,000	$9,640,800	$9,930,024	$10,227,925	$10,534,762	$10,850,805	$11,176,329	$11,511,619	$11,856,968	$12,212,677
2.	Conveyor costs per ton (+3% inflation)	$0.20	$0.21	$0.21	$0.22	$0.23	$0.23	$0.24	$0.25	$0.25	$0.26
	Operating costs	$603,000	$621,090	$639,723	$658,914	$678,682	$699,042	$720,014	$741,614	$763,862	$786,778
	Difference in operating costs	$8,757,000	$9,019,710	$9,290,301	$9,569,010	$9,856,081	$10,151,763	$10,456,316	$10,770,005	$11,093,106	$11,425,899
	Cumulative difference in cost	$8,757,000	$17,776,710	$27,067,011	$36,636,022	$46,492,102	$56,643,865	$67,100,181	$77,870,187	$88,963,292	$100,389,191

This projection of the difference in operating costs shows that the cumulative savings in conveying versus trucking by year 10 would be $100,000,000. This illustrates rather dramatically that the conveyor case is worth at least investigating further. By performing a NPV analysis some real life costs will be applied to these gross savings. Two big items are income taxes on the savings and a discount rate to bring the savings back to time zero from a future year. These conservative factors reduce the time zero total savings.

If you assume that the rule of thumb capital cost is accurate for the initial projection then the total cost is $28,512,000. We need to calculate a yearly tax depreciation amount based on this capital cost. A simple way to do this is to assume a 15 year straight line depreciation schedule. This will result in a tax depreciation amount of $28,512,000/15 = $1,900,800/yr. It should be noted that the capital investment may be broken down into different asset depreciable life classes. Some assets may be eligible for accelerated depreciation and any operator will want to take advantage of this accelerated depreciation.

If we assume an incremental income tax rate of 28% for the corporation then we can project the following NPV. We are showing only seven years of the projection for clarity. (The entire 10 year projection is included in on page 9.)

	No. of Years	1	2	3	4	5	6	7
	Volume (tons per year)	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
1.	Trucking cost per ton (+3% inflation)	$3.12	$3.21	$3.31	$3.41	$3.51	$3.62	$3.73
	Operating costs	$9,360,000	$9,640,800	$9,930,024	$10,227,925	$10,534,762	$10,850,805	$11,176,329
2.	Conveyor costs per ton (+3% inflation)	$0.20	$0.21	$0.21	$0.22	$0.23	$0.23	$0.24
	Operating costs	$603,000	$621,090	$639,723	$658,914	$678,682	$699,042	$720,014
	Difference in operating costs	$8,757,000	$9,019,710	$9,290,301	$9,569,010	$9,856,081	$10,151,763	$10,456,316
	Cumulative difference in cost	$8,757,000	$17,776,710	$27,067,011	$36,636,022	$46,492,102	$56,643,865	$67,100,181
	Tax depreciation available	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800
	Taxable income (after depreciation)	$6,856,200	$7,118,910	$7,389,501	$7,668,210	$7,955,281	$8,250,963	$8,555,516
	Income Tax @ 28%	$1,919,736	$1,993,295	$2,069,060	$2,147,099	$2,227,479	$2,310,270	$2,395,544
	Net savings after taxes (net cash flow)	$6,837,264	$7,026,415	$7,221,241	$7,421,911	$7,628,602	$7,841,493	$8,060,771
	Cumulative net cash flow	$6,837,264	$13,863,679	$21,084,920	$28,506,832	$36,135,434	$43,976,927	$52,037,699
	10 year NPV using 8% discount factor		$51,175,161					
	10 year NPV using 12% discount factor		$42,749,595					
	10 year NPV using 20% discount factor		$31,269,752					

What the projection shows is that the project savings must pay approximately $2,000,000 per year in income taxes that the corporation will theoretically pay on incremental net income i.e. taxable income. To calculate a net cash flow these taxes must be subtracted from the gross savings. This results in a NPV of $51,175,161 using an 8% discount factor or rate of return.

The NPV's for three different discount factors are shown ranging from the $51,175,161 down to $31,269,752. If you assume that the capital investment must achieve a 20% rate of return then you can only afford to spend $31,269,752 in capital. We roughly estimated a capital cost of $28,512,000 so it would appear that the project can return a higher rate than 20% on the capital invested. At this point it would be appropriate to fine tune the capital investment.

But we can run an IRR calculation on the investment to see what the true rate of return on capital would be and that is:

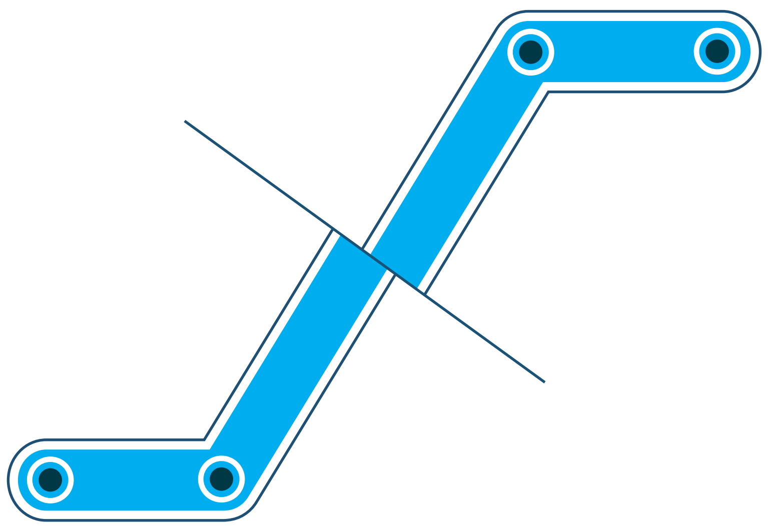
	No. of Years	1	2	3	4	5	6	7
	Volume (tons per yr.)	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
1.	Trucking cost per ton (+3% inflation)	$3.12	$3.21	$3.31	$3.41	$3.51	$3.62	$3.73
	Operating costs	$9,360,000	$9,640,800	$9,930,024	$10,227,925	$10,534,762	$10,850,805	$11,176,329
2.	Conveyor costs per ton (+3% inflation)	$0.20	$0.21	$0.21	$0.22	$0.23	$0.23	$0.24
	Operating costs	$603,000	$621,090	$639,723	$658,914	$678,682	$699,042	$720,014
	Difference in operating costs	$8,757,000	$9,019,710	$9,290,301	$9,569,010	$9,856,081	$10,151,763	$10,456,316
	Cumulative difference in cost	$8,757,000	$17,776,710	$27,067,011	$36,636,022	$46,492,102	$56,643,865	$67,100,181
	Tax depreciation available	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800
	Taxable income (after depreciation)	$6,856,200	$7,118,910	$7,389,501	$7,668,210	$7,955,281	$8,250,963	$8,555,516
	Income Tax @ 28%	$1,919,736	$1,993,295	$2,069,060	$2,147,099	$2,227,479	$2,310,270	$2,395,544
	Net savings after taxes (net cash flow)	$6,837,264	$7,026,415	$7,221,241	$7,421,911	$7,628,602	$7,841,493	$8,060,771
	Cumulative net cash flow	$6,837,264	$13,863,679	$21,084,920	$28,506,832	$36,135,434	$43,976,927	$52,037,699
	Yearly returns from $28,512,000 capital investement (10 yr project life)							
		$6,837,264	$7,026,415	$7,221,241	$7,421,911	$7,628,602	$7,841,493	$8,060,771

Resulting actual IRR: 22.7%

> The preliminary conclusion of this projection is that 3MM tons per year of volume merits the use of the most efficient method of transport to the landfill.

This shows that the actual IRR would be 22.7% on the capital investment of $28,512,000. This is for a ten year project life. For a 20 year project life the rate of return would be 26.4%. But it would be obvious that even if the operator were thinking of operating this project for at least 20 years that the project does not need to assume a 20 year life to enhance the project's return.

The preliminary conclusion of this projection is that 3MM tons per year of volume merits the use of the most efficient method of transport to the landfill. The costs to move this amount of material are enormous. The preliminary projection of the difference between trucking and conveying cost appears to save a huge amount of operating cost over time, many times the value of the conveyor. It would appear to be able to achieve a return on capital higher than 20% which is spectacular. Not many projects are this robust. But this also shows that you need exceptional savings to pay out a capital investment at a nice rate of return.



Breakeven Point

The breakeven point is easy to calculate. The following figure shows that the project will generate cumulative net cash flow of $28,500,000 equal to the capital investment by the end of year 4. By running separate NPV's for different length projections from an 8 year projection down to a 4 year projection we can find the year in which the discounted NPV crosses over the $28,512,000 threshold.

That will occur somewhere between year 4 and year 5. It is closer to year 5. This shows that the discounting of the cash flows adds one year to the breakeven point. The breakeven of gross cash flow is at the end of year 4 and the breakeven with discounted cash flows is at the end of year 5. But even more importantly, after year 5 the project will be generating $7.8MM per year in extra net cash flow for the company.

No. of Years	1	2	3	4	5	6	7
Volume (tons per year)	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Trucking cost per ton (+3% inflation)	$3.12	$3.21	$3.31	$3.41	$3.51	$3.62	$3.73
1. Operating costs	$9,360,000	$9,640,800	$9,930,024	$10,227,925	$10,534,762	$10,850,805	$11,176,329
Conveyor costs per ton (+3% inflation)	$0.20	$0.21	$0.21	$0.22	$0.23	$0.23	$0.24
2. Operating costs	$603,000	$621,090	$639,723	$658,914	$678,682	$699,042	$720,014
Difference in operating costs	$8,757,000	$9,019,710	$9,290,301	$9,569,010	$9,856,081	$10,151,763	$10,456,316
Cumulative difference in cost	$8,757,000	$17,776,710	$27,067,011	$36,636,022	$46,492,102	$56,643,865	$67,100,181
Tax depreciation available	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800	$1,900,800
Taxable income (after depreciation)	$6,856,200	$7,118,910	$7,389,501	$7,668,210	$7,955,281	$8,250,963	$8,555,516
Income Tax @ 28%	$1,919,736	$1,993,295	$2,069,060	$2,147,099	$2,227,479	$2,310,270	$2,395,544
Net savings after taxes (net cash flow)	$6,837,264	$7,026,415	$7,221,241	$7,421,911	$7,628,602	$7,841,493	$8,060,771
Cumulative net cash flow	$6,837,264	$13,863,679	$21,084,920	$28,506,832	$36,135,434	$43,976,927	$52,037,699
8 year NPV using 8% discount factor		$42,856,358					
7 year NPV using 8% discount factor		$38,379,351					
6 year NPV using 8% discount factor		$33,675,968					
5 year NPV using 8% discount factor		$28,734,497					
4 year NPV using 8% discount factor		$23,542,599					

Time zero Capital investment = $28,512,000

At this point in the analysis we would normally fine tune the variables. For this project, that meant examining the future capital requirements of the conveyor system and the working capital for spare parts to keep on hand. It was assumed that we would need a belt replacement in year 9 for this analysis. To be fair, the capital cost of the belt for this project should be shown in year 9 and penalize the savings accordingly. Additionally, the cost of spare parts should be reflected in the time zero capital requirements. For this example we have added $780,000 to the total capital cost of $28,512,000 to make the total capital investment $29,292,000.

We also put a $250,000 capital cost of additional spare parts into the stream at year 5 and increased the project life to 15 years because it is more or less certain the project will be run for that length of time. Some of the assets were also split into an accelerated depreciation life schedule while leaving some at the 15 year straight line level. In the final run we used a discount factor of 12% which represents a slight premium over the 8% cost of capital discount rate. This additional 4% in the rate covers some additional risk. The final economic projection is shown below with all these variables added. We assumed a $15,000,000 salvage value at the end of year 15 to be complete.

No. of Years	1	2	3	4	5	6	7	8	9	10
Volume (tons per year)	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Trucking cost per ton (+3% inflation)	$3.12	$3.21	$3.31	$3.41	$3.51	$3.62	$3.73	$3.84	$3.95	$4.07
1. Operating costs	$9,360,000	$9,640,800	$9,930,024	$10,227,925	$10,534,762	$10,850,805	$11,176,329	$11,511,619	$11,856,968	$12,212,677
Conveyor costs per ton (+3% inflation)	$0.20	$0.21	$0.21	$0.22	$0.23	$0.23	$0.24	$0.25	$0.25	$0.26
2. Operating costs	$603,000	$621,090	$639,723	$658,914	$678,682	$699,042	$720,014	$741,614	$763,862	$786,778
Difference in operating costs	$8,757,000	$9,019,710	$9,290,301	$9,569,010	$9,856,081	$10,151,763	$10,456,316	$10,770,005	$11,093,106	$11,425,899
Cumulative difference in cost	$8,757,000	$17,776,710	$27,067,011	$36,636,022	$46,492,102	$56,643,865	$67,100,181	$77,870,187	$88,963,292	$100,389,191
Accelerated depreciation	$814,629	$814,629	$814,629	$814,629	$814,629	$814,629	$814,629			
Normal depreciation	$1,520,640	$1,520,640	$1,520,640	$1,520,640	$1,520,640	$1,520,640	$1,520,640	$1,520,640	$1,520,640	$1,520,640
Taxable income (after depreciation)	$6,421,731	$6,684,441	$6,955,033	$7,233,742	$7,520,812	$7,816,494	$8,121,047	$9,249,365	$9,572,466	$9,905,259
Income Tax @ 28%	$1,798,085	$1,871,644	$1,947,409	$2,025,448	$2,105,827	$2,188,618	$2,273,893	$2,589,822	$2,680,290	$2,773,472
Net Savings after taxes (net cash flow)	$6,958,915	$7,148,066	$7,342,892	$7,543,563	$7,750,253	$7,963,145	$8,182,423	$8,180,183	$8,412,815	$8,652,426
Future Capital additions required					-$250,000				-$3,000,000	
Revised Net Cash Flow Stream	$6,958,915	$7,148,066	$7,342,892	$7,543,563	$7,500,253	$7,963,145	$8,182,423	$8,180,183	$5,412,815	$8,652,426
15 year NPV at 12% discount rate:	$52,832,835									

Final Rate of Return Calculation

No. of Years	0	1	2	3	4	5	6	7	8	9
Total capital investment	($29,292,000)	$6,958,915	$7,148,066	$7,342,892	$7,543,563	$7,500,253	$7,963,145	$8,182,423	$8,180,183	$5,412,815
Salvage Value										
Total cash flow including salvage	($29,292,000)	$6,958,915	$7,148,066	$7,342,892	$7,543,563	$7,500,253	$7,963,145	$8,182,423	$8,180,183	$5,412,815

15 year NPV (12% discount): $57,327,693

Final IRR recognizing entire net cash flow stream: 25.2%

Total cumulative net cash flow excluding salvage value: $92,708,256

Belt replacement assumed here - $3,000,000

Other Considerations

The economic analysis provides meaningful numbers to gauge the profitability of the project compared to the company's true cost of capital. But there are other considerations that should be part of the decision tree. They may not be as important as cash flow but they are worth considering. These include:

- Minimizing the carbon footprint of the transport over time,
- Making the project sustainable by lowering dust emissions and road maintenance,
- Improving plant safety and congestion,
- Assuming the responsibility to operate and maintain the conveyor system.

The benefits of conveying versus trucking are mostly obvious. By reducing the burning of diesel fuel in the engines of the trucks there is an overall savings of energy. The conveyor will utilize electrical energy through using electric motors instead. This savings is dramatic and what makes the economic value possible.

In a large transport operation that moves 3MM tons per year of waste to a landfill there are many extraneous costs that can be eliminated such as dust suppression. In this particular plant they have a full time dust suppression truck adding water to the roads to keep dust down. But some dust obviously is generated despite that. With the conveyor system the dust is minimized.

Reducing the number of trucks and drivers also improves the plant congestion and improves the overall safety of the plant. Any plant manager is going to appreciate having fewer independent drivers on the site.

Finally, on the flip side, by installing an overland conveyor the operator assumes responsibility to operate and maintain the conveyor system. We assumed in our operating cost projections that a certain number of people will be assigned directly to the conveyor and their costs would be shown as part of the conveyor operating costs along with a certain level of necessary maintenance.

Summary

We realize that tabulating the results in spreadsheet form above can be tedious but the important point to remember is that once you develop the base model that reflects your own company's cost of capital and income tax rate and your accounting department's calculation of the tax depreciation benefit of the capital investment you can run unlimited sensitivity cases until the sensitivity of the project to each variable becomes crystal clear.

The example shown in this paper was a simple example of using the NPV calculation. The key points to understand are the following:

The obvious things to run sensitivity analysis on are the volume, the costs, the tax rates, and the project life in years. Most obvious of course is the return or discount rate. This is the variable that management has to decide on and pick. And should be done with some strategic basis.

- It is easy to build a model that reflects the operating companies cost of capital and tax structure so that new projects can be quickly analyzed,
- The model quantifies the returns on certain volumes and illustrates what volume is profitable to convey,
- Use of the model routinely will illustrate which variables have the most impact on the project.

Whether you are a mining company, a cement company or a utility management,
there is a fiduciary obligation to understand the attractiveness of the capital investment.

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