



Assessing Manufacturing Capital Investments in the Global Market

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Abstract

Manufacturing activities are becoming more global because of the need for manufacturers to be closer either to the sources of raw materials or the markets of the manufactured products or both. Oftentimes, the sources of both raw materials and products markets are located in foreign countries. Thus, as a consequence of the rapid expansion of global economic activities some universities in the United States are now requiring their incoming freshmen to take a course in foreign language before graduation. Therefore, it is appropriate to introduce students in a manufacturing engineering technology program to the tools that they may need to evaluate manufacturing projects in the global manufacturing market. These projects may have inherent risks or uncertainties emanating from political instabilities in the countries where the projects are located, or from unproven technologies (such as deep-sea drilling of crude oil), or from the shortage of skilled labor. Traditionally, capital projects with uncertainties have been evaluated using tools such as the net present value (NPV) capital asset pricing model coupled with sensitivity, break-even, or cash-flow scenario analyses. These tools mainly examine the variability in projected cash flows of projects with uncertainties. Alternatively, with adjusted net present value (ANPV) capital asset pricing model, each cash flow stream in a project is assigned an expected rate-of-return that is commensurate with the risks of the cash flow. This allows for the decoupling of individual cash flow stream (e.g., capital outlays, revenue, taxes) and their subsequent proper evaluation rather than use a single rate-of-return as is done in the traditional net present value (NPV) model. In this study, ANPV was used to evaluate the economic viability of a plastics plant in a foreign country and the results compared with those of the net present value (NPV) model.

The primary intent of this study was to introduce manufacturing engineering technology students to capital investment analyses of manufacturing ventures in the international arena. To assess if this goal was achieved, a survey was given at the beginning and at the end of the course to assess students' learning outcomes. The result of this study will be presented at the conference.

Introduction

In recent times one is cognizant of increased global activities in the manufacturing sector of the U.S. economy as some companies moved parts or all of their operations off-shore for various economic reasons. Similarly, the U.S. has also seen within its borders the increased presence of foreign companies such as Toyota, Honda, and Hyundai. An example of a product that illustrates the globalization of manufacturing activities is the Chrysler's PT Cruiser, which was designed in Germany, manufactured in Mexico, and sold in the US. Given this scenario, it seemed appropriate in a manufacturing engineering technology program at a Midwestern State University to introduce to its students, a tool for analyzing capital investments in a global manufacturing arena.

In this study students were assigned a project to create a plastics company that would manufacture disposable plastics knives, forks, and spoons to be sold to retailers like Wal-Mart. Using the costs of establishing the company (investment costs), costs of manufactured goods, taxes, and depreciation of fixed assets, they determined the NPV of the project. The decision rule for NPV is to accept any project with a positive NPV and to reject projects with negative NPVs. One is indifferent to projects with NPV=0. ANPV was subsequently used to evaluate the same project to see if a different financial decision could be reached with respect to the financial viability of the project.

Theory

According to modern finance theory, four steps are usually encountered in evaluating a capital investment opportunity. These are

- (1) Forecast a project's expected incremental after-tax cash flows;
- (2) Assess the project's risk;
- (3) Estimate the opportunity cost of capital, that is, the interest rate of equivalent-risk investments traded in the capital market;
- (4) Calculate the Net Present Value (NPV) using the discounted cash-flow formula.

NPV has been described as the present value of future cash flows minus the purchase price (investment costs).¹ NPV is a central tool in discounted cash flow analysis and is a standard method for using the time value of money to appraise long-term projects.¹ Mathematically, NPV can be expressed as follows:

$$NPV_0 = \sum_{t=1}^{\infty} \frac{E(X_t - I_t)}{[1 + E(R)]^t} \quad (1)$$

where

- NPV_0 = net present value of a project
- $E(X_t)$ = expected cash flow in period t
- $E(R)$ = expected rate of return required by investors
- $E(I_t)$ = expected investment expenditure in period t
- $E(X_t - I_t)$ = expected net cash flow in period t

One of the major difficulties in using equation (1) resides estimating the required rate of return, $E(R)$. The solution to this problem is provided by the Capital Asset Pricing Model (CAPM), which describes the relationship between risk and expected return in an efficient market. Developed in the 1960s by Jack Treynor, William Sharpe, and John Lintner², CAPM captures in a single statement, the concept that investors expect to be rewarded for undertaking risky projects over riskless projects. In other words, investors are only willing to undertake risky projects if they are compensated with risk premia. CAPM is expressed as

$$E(\tilde{R}_i) = R_F + \beta_i [E(\tilde{R}_M) - R_F] \quad (2)$$

$$\beta_i = \frac{Cov(\tilde{R}_i, \tilde{R}_M)}{Var(\tilde{R}_M)}$$

where β_i = the relative volatility coefficient of the project i with respect to the market portfolio of projects.
 R_F = the risk-free rate of return for the period from $t-1$ to t .
 $E(R_i)$ = expected return on project i for the period from $t-1$ to t .
 $E(R_M)$ = expected return on the market portfolio M ;
Tildes (\sim) are used to denote random variables

Equation (1) is based on the assumption that the Value Additivity Principle (VAP) holds. VAP states that the sum of the parts is always equal to the whole. VAP allows us to adjust different cash flows under independent risk assumptions, and sum the results to obtain the total value of the project. Using VAP, Lessard³ developed the Adjusted Net Present Value (ANPV) model for evaluating foreign and domestic projects. Lessard's ANPV model builds on the work of Myers⁴, who developed the Adjusted Present Value approach for evaluating projects in a world of imperfect capital markets where the interactions between financings and investment decisions must be considered to reasonably estimate the value of projects. ANPV can be expressed as

$$ANPV = \text{Capital Outlay} - \left[\sum_{t=0}^T \frac{I_t}{(1 + E(R_{1t}))^t} \right] + \text{Gross Revenue} \left[\sum_{t=1}^T \frac{R_t}{(1 + E(R_{2t}))^t} \right]$$

$$+ \text{Operating Expenses} - \left[\sum_{t=1}^T \frac{OP_t}{(1 + E(R_{3t}))^t} \right] + \text{Depreciation Tax Shields} \left[\sum_{t=1}^T \frac{DEP_t}{(1 + E(R_{4t}))^t} \right] \quad (3)$$

$$+ \text{Taxes} - \left[\sum_{t=1}^T \frac{Taxes_t}{(1 + E(R_{5t}))^t} \right]$$

The negative signs represent cash outflow while the positive signs represent cash inflow. The expected rates of return, $E(R_{1t})$ to $E(R_{5t})$, can be different from each other depending on the risk premium associated with each cash flow.

Class Project

Students created a fictitious plastics manufacturing company that manufactured disposable plastics knives, forks, and spoons, which were packaged in a box containing 16 of each item. These products were sold to retailers such as Wal-Mart and Target. To make these products, the company had to invest in land, building, plastics injection molding machines, auxiliary plastics processing equipment, injection molds, and plastics raw materials (resins). Provisions were made for the personnel required to successfully run the manufacturing operation. All the costs establishing and operating the company are shown in appendix A. The corporate tax rate used in this study was 35%.

Estimating the expected rate of return required by investors, $E(R)$

In estimating the expected rate of return, the assumption was made that the company could be located in either the US or a Latin American country such as Peru. For the US option, the risk free rate of return, R_F was 6%, the market rate of return, R_M , was 10% (S&P 500),⁵ the unlevered beta, β , for the company was 1.29.⁶ This is beta value for the diversified chemical industry, which is a close substitute for the plastics company's beta value. Substituting these values in equation (2) yields an expected rate of return of 11.2% for the plastics company.

$$E(R_{US}) = 6\% + 1.29(10\% - 6\%) = 11.2\%$$

Estimating the $E(R)$ for Peru with equation (2) seemed a bit more difficult because of sparse financial data to determine the Peruvian market rate of return, $R_{M(Peru)}$. However, based on Peru's bond rating, it was determined the Peru country risk premium relative to the US was 4%.⁷ Therefore, the rate of return for the Peruvian option was estimated to be 15.2% (11.2% + 4%).

Discussion of Results

Net Present Value (NPV)

In using equation (1) to estimate the net present value (NPV) of the plastics company based on its expected net cash flow, it was arbitrarily assumed that the life of the company was 15 years given that most chemical companies have an average gestation period of 20 years. For the US option the NPV was \$4.6 million (see appendix A) while for the Peru option it was \$2.5 million (appendix B). According to the decision rule of NPV, the plastics company would be profitable in both countries. However, it is worth higher if it is located in the US because of the country risk associated with locating the company in Peru. Nevertheless, it should be noted that there are many factors such as foreign exchange risk and labor wages that play important roles in evaluating the financial viability of a company. This study has considered only the country risk factor to illustrate the concepts of risk and risk premium associated with capital investment.

Adjusted Net Present Value (ANPV)

With ANPV, a project could be evaluated by examining the risk associated with each cash flow stream. For instance, if the investors were from the US and the plant was located in the US or Peru, but all the products made by the company were sold in Peru. Then the revenue cash flow would be subjected to the country risk, therefore, the revenue cash flow would be discounted using 15.2% rate of return while all the other cash flow streams would be discounted at 11.2%. With this scenario, the ANPV would be -\$7.7 million (appendix C). The NPV decision rule would suggest that the project not be undertaken because its net present worth was negative. On the other hand, if the financing sources were Peruvian and the products manufactured in Peru but sold in the US market, then all the cash flow streams would discounted at 15.2% while in revenue cash flow would be discounted at 11.2% because the revenue was realized in US. Given this scenario, the ANPV would be \$14.8 million (appendix D) and NPV decision rule would suggest undertaking the project because of its positive value. It should be noted that in both scenarios, transportation costs were not considered since it would have the same effect on the

project assuming the products were sold on F.O.B. (freight-on-board) basis. That is, the manufacturer of the products had the responsibility of shipping the products to a receiving port.

Assessing Students Learning Outcomes

Before the project was introduced to the students, the students were asked to describe in their own words their understanding of (1) time value of money, (2) interest rate, and (3) what interest rates measure? Following the completion of the project, students were again asked to describe their understanding of the same concepts. Table I shows the results of the survey, which indicates that students had a highly improved understanding of the concepts of money than they did of the concepts of risk and risk premium even though their understanding of the latter improved by 33%.

Table I. Survey of Investment Concepts

Concept	Before	After	Difference
Time Value of Money	8%	100%	+ 92%
Interest Rate	0%	33%	+ 33%
What Interest Rates Measure?	0%	33%	+ 33%

Conclusion

This study describes the use of a project to introduce students in a manufacturing engineering technology program the concepts of evaluating capital investments in the international manufacturing arena. These concepts include the time value of money, risk, and risk premium, which are embedded in the net present value (NPV) and adjusted net present value (ANPV) formulae for evaluating capital projects in domestic and foreign countries. This study showed that students understanding of these concepts improved after completing the project. Also, this study showed how to successfully integrate technical and financial tools in an engineering technology program.

Acknowledgment

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Appendix A
Injection Molding Enterprise - NPV

	Year	0	1	2	3	4	5	6	7	
Revenue	Parts Produced	0	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	Parts Sold	0	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	Inventory	0	0	0	0	0	0	0	0	
	Total Revenue	\$0.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	
Equipment Costs	Mold Costs									
	Machine Costs									
	Auxiliary Equipment Costs	\$407,756.00								
	Total Equipment Costs	\$5,466,956.00								
Construction Costs	Land Cost									
	Building Cost									
	Total Construction Costs	\$2,811,285.00								
Annual Costs	Utilities		\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	
	Wages		\$1,036,400.00	\$1,088,220.00	\$1,142,631.00	\$1,199,762.55	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	
	Material		\$3,505,451.62	\$3,610,615.17	\$3,718,933.63	\$3,830,501.63	\$3,945,416.68	\$4,063,779.18	\$4,185,692.56	
	Logistics		\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	
	Scrap		\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	
	Depreciation		\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	
	Total Annual Cost	\$0.00	\$6,303,626.76	\$6,460,610.31	\$6,623,339.77	\$6,792,039.33	\$6,966,942.50	\$7,085,305.00	\$7,207,218.38	
	Profit		-\$8,278,241.00	\$2,996,373.24	\$2,839,389.69	\$2,676,660.23	\$2,507,960.67	\$2,333,057.50	\$2,214,695.00	\$2,092,781.62
	Taxes		\$0.00	\$1,048,730.63	\$993,786.39	\$936,831.08	\$877,786.24	\$816,570.12	\$775,143.25	\$732,473.57
	Net Profit		-\$8,278,241.00	\$1,947,642.60	\$1,845,603.30	\$1,739,829.15	\$1,630,174.44	\$1,516,487.37	\$1,439,551.75	\$1,360,308.05
Depr Tax Sh			\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	
Profit			\$2,071,038.44	\$1,779,924.89	\$1,523,727.29	\$1,298,543.66	\$1,100,891.90	\$949,319.66	\$816,014.29	
	Net Profit Value (@ year 0)	-\$8,278,241.00								

Appendices

Appendix B
Injection Molding Enterprise - NPV

	Year	0	1	2	3	4	5	6	7
Revenue	Parts Produced	0	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
	Parts Sold	0	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
	Inventory	0	0	0	0	0	0	0	0
	Total Revenue	\$0.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00
Equipment Costs	Mold Costs	\$1,459,200.00							
	Machine Costs	\$3,600,000.00							
	Auxiliary Equipment Costs	\$407,756.00							
	Total Equipment Costs	\$5,466,956.00							
Construction Costs	Land Cost	\$750,000.00							
	Building Cost	\$2,061,285.00							
	Total Construction Costs	\$2,811,285.00							
Annual Costs	Utilities		\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54
	Wages		\$1,036,400.00	\$1,088,220.00	\$1,142,631.00	\$1,199,762.55	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68
	Material		\$3,505,451.62	\$3,610,615.17	\$3,718,933.63	\$3,830,501.63	\$3,945,416.68	\$4,063,779.18	\$4,185,692.56
	Logistics		\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00
	Scrap		\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00
	Depreciation		\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60
	Total Annual Cost	\$0.00	\$6,303,626.76	\$6,460,610.31	\$6,623,339.77	\$6,792,039.33	\$6,966,942.50	\$7,085,305.00	\$7,207,218.38
Profit	Profit	-\$8,278,241.00	\$2,996,373.24	\$2,839,389.69	\$2,676,660.23	\$2,507,960.67	\$2,333,057.50	\$2,214,695.00	\$2,092,781.62
	Taxes	\$0.00	\$1,048,730.63	\$993,786.39	\$936,831.08	\$877,786.24	\$816,570.12	\$775,143.25	\$732,473.57
	Net Profit	-\$8,278,241.00	\$1,947,642.60	\$1,845,603.30	\$1,739,829.15	\$1,630,174.44	\$1,516,487.37	\$1,439,551.75	\$1,360,308.05
	Depr. Tax Sh		\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14
	Net Profit Value (@ year 0)	-\$8,278,241.00	\$1,999,127.38	\$1,658,464.93	\$1,370,453.08	\$1,127,368.22	\$922,584.63	\$767,938.29	\$637,182.62

Appendix B
Injection Molding Enterprise - NPV

	8	9	10	11	12	13	14	15	NPV
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	0	0	0	0	0	0	0	0	
	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	
	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	
	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	
	\$4,311,263.34	\$4,440,601.24	\$4,573,819.27	\$4,711,033.85	\$4,852,364.87	\$4,997,935.81	\$5,147,873.89	\$5,302,310.10	
	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	
	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	
	\$546,695.60	\$546,695.60	\$546,695.60						
	\$7,332,789.15	\$7,462,127.05	\$7,595,345.09	\$7,185,864.07	\$7,327,195.09	\$7,472,766.03	\$7,622,704.11	\$7,777,140.32	
	\$1,967,210.85	\$1,837,872.95	\$1,704,654.91	\$2,114,135.93	\$1,972,804.91	\$1,827,233.97	\$1,677,295.89	\$1,522,859.68	
	\$688,523.80	\$643,255.53	\$596,629.22	\$739,947.58	\$690,481.72	\$639,531.89	\$587,053.56	\$533,000.89	
	\$1,278,687.05	\$1,194,617.41	\$1,108,025.69	\$1,374,188.35	\$1,282,323.19	\$1,187,702.08	\$1,090,242.33	\$989,858.79	
	\$355,352.14	\$355,352.14	\$355,352.14						
	\$526,796.20	\$433,761.35	\$355,493.51	\$289,780.39	\$234,729.54	\$188,723.20	\$150,379.40	\$118,518.48	\$2,503,060.22

Appendix C
Injection Molding Enterprise - ANPV

	Year	0	1	2	3	4	5	6	7	
Revenue	Parts Produced	0	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	Parts Sold	0	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	Inventory	0	0	0	0	0	0	0	0	
	Total Revenue	\$0.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00
Equipment Costs	NPV Rev		\$8,072,916.67	\$7,007,740.16	\$6,083,107.78	\$5,280,475.50	\$4,583,746.10	\$3,978,946.26	\$3,453,946.41	
	Mold Costs	\$1,459,200.00								
	Machine Costs	\$3,600,000.00								
	Auxiliary Equip Costs	\$407,756.00								
Construction Costs	Total Equip Costs	\$5,466,956.00								
	Land Cost	\$750,000.00								
	Building Cost	\$2,061,285.00								
	Total Const Costs	\$2,811,285.00								
Annual Costs	Utilities		\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	
	Wages		\$1,036,400.00	\$1,088,220.00	\$1,142,631.00	\$1,199,762.55	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	
	Material		\$3,505,451.62	\$3,610,615.17	\$3,718,933.63	\$3,830,501.63	\$3,945,416.68	\$4,063,779.18	\$4,185,692.56	
	Logistics		\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	
	Scrap		\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	
	Depreciation		\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	\$546,695.60	
	Total Annual Cost	\$0.00	\$6,303,626.76	\$6,460,610.31	\$6,623,339.77	\$6,792,039.33	\$6,966,942.50	\$7,085,305.00	\$7,207,218.38	
	NPV TACost		\$5,668,729.10	\$5,224,731.44	\$4,816,845.01	\$4,442,025.45	\$4,097,493.66	\$3,747,398.05	\$3,427,947.57	
	Profit		-\$8,278,241.00	\$2,996,373.24	\$2,839,389.69	\$2,676,660.23	\$2,507,960.67	\$2,333,057.50	\$2,214,695.00	\$2,092,781.62
	Taxes		\$0.00	\$1,048,730.63	\$993,786.39	\$936,831.08	\$877,786.24	\$816,570.12	\$775,143.25	\$732,473.57
NPV Taxes		\$943,103.09	\$803,680.57	\$681,313.40	\$574,076.30	\$480,252.41	\$409,971.10	\$348,384.20		
Profit	Net Profit		\$1,947,642.60	\$1,845,603.30	\$1,739,829.15	\$1,630,174.44	\$1,516,487.37	\$1,439,551.75	\$1,360,308.05	
	Depr Tax Sh		\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	\$355,352.14	
	NPV DeprTS		\$319,561.28	\$287,375.25	\$258,430.98	\$232,401.96	\$208,994.57	\$187,944.76	\$169,015.07	
	Net Profit Value (@ year 0)		-\$8,278,241.00	\$2,071,038.44	\$1,779,924.89	\$1,523,727.29	\$1,298,543.66	\$1,100,891.90	\$949,319.66	\$816,014.29
ANPV		-\$8,278,241.00	\$1,780,645.75	\$1,266,703.40	\$843,380.35	\$496,775.71	\$214,994.60	\$9,521.87	-\$153,370.29	

Appendix C
Injection Molding Enterprise - ANPV

	8	9	10	11	12	13	14	15	ANPV
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	0	0	0	0	0	0	0	0	
\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	
\$2,998,217.37	\$2,602,619.24	\$2,259,218.09	\$1,961,126.82	\$1,702,367.03	\$1,477,749.16	\$1,282,768.37	\$1,113,514.21		
\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	
\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	
\$4,311,263.34	\$4,440,601.24	\$4,573,819.27	\$4,711,033.85	\$4,852,364.87	\$4,997,935.81	\$5,147,873.89	\$5,302,310.10		
\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	
\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	
\$546,695.60	\$546,695.60	\$546,695.60							
\$7,332,789.15	\$7,462,127.05	\$7,595,345.09	\$7,185,864.07	\$7,327,195.09	\$7,472,766.03	\$7,622,704.11	\$7,777,140.32		
\$3,136,396.06	\$2,870,248.87	\$2,627,239.34	\$2,235,251.21	\$2,049,652.84	\$1,879,832.49	\$1,724,415.99	\$1,582,151.71		
\$1,967,210.85	\$1,837,872.95	\$1,704,654.91	\$2,114,135.93	\$1,972,804.91	\$1,827,233.97	\$1,677,295.89	\$1,522,859.68		
\$688,523.80	\$643,255.53	\$596,629.22	\$739,947.58	\$690,481.72	\$639,531.89	\$587,053.56	\$533,000.89		
\$294,496.85	\$247,423.21	\$206,374.79	\$230,169.77	\$193,150.01	\$160,879.23	\$132,803.86	\$108,431.66		
\$1,278,687.05	\$1,194,617.41	\$1,108,025.69	\$1,374,188.35	\$1,282,323.19	\$1,187,702.08	\$1,090,242.33	\$989,858.79		
\$355,352.14	\$355,352.14	\$355,352.14							
\$151,991.97	\$136,683.42	\$122,916.75	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
\$698,914.69	\$596,183.68	\$506,184.22	\$427,458.15	\$358,707.16	\$298,775.71	\$246,635.74	\$201,373.09		\$4,595,451.57
-\$280,683.57	-\$378,369.41	-\$451,479.29	-\$504,294.16	-\$540,435.82	-\$562,962.56	-\$574,451.48	-\$577,069.17		-\$7,689,335.07

Appendix D
Injection Molding Enterprise - ANPV

	8	9	10	11	12	13	14	15	ANPV
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	
	0	0	0	0	0	0	0	0	
\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	\$9,300,000.00	
\$3,977,815.64	\$3,577,172.33	\$3,216,881.60	\$2,892,879.13	\$2,601,510.01	\$2,339,487.42	\$2,103,855.59	\$1,891,956.47		
\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	\$192,079.54	
\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	\$1,259,750.68	
\$4,311,263.34	\$4,440,601.24	\$4,573,819.27	\$4,711,033.85	\$4,852,364.87	\$4,997,935.81	\$5,147,873.89	\$5,302,310.10		
\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	\$930,000.00	
\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	\$93,000.00	
\$546,695.60	\$546,695.60	\$546,695.60							
\$7,332,789.15	\$7,462,127.05	\$7,595,345.09	\$7,185,864.07	\$7,327,195.09	\$7,472,766.03	\$7,622,704.11	\$7,777,140.32		
\$2,364,010.30	\$2,088,287.69	\$1,845,111.94	\$1,515,310.83	\$1,341,244.66	\$1,187,405.77	\$1,051,415.45	\$931,178.09		
\$1,967,210.85	\$1,837,872.95	\$1,704,654.91	\$2,114,135.93	\$1,972,804.91	\$1,827,233.97	\$1,677,295.89	\$1,522,859.68		
\$688,523.80	\$643,255.53	\$596,629.22	\$739,947.58	\$690,481.72	\$639,531.89	\$587,053.56	\$533,000.89		
\$221,972.47	\$180,016.05	\$144,937.15	\$156,035.60	\$126,392.83	\$101,620.18	\$80,973.52	\$63,817.64		
\$1,278,687.05	\$1,194,617.41	\$1,108,025.69	\$1,374,188.35	\$1,282,323.19	\$1,187,702.08	\$1,090,242.33	\$989,858.79		
\$355,352.14	\$355,352.14	\$355,352.14							
\$114,561.61	\$99,445.84	\$86,324.51		\$0.00		\$0.00	\$0.00		
\$698,914.69	\$596,183.68	\$506,184.22	\$427,458.15	\$358,707.16	\$298,775.71	\$246,635.74	\$201,373.09		\$4,595,451.57
\$1,506,394.47	\$1,408,314.44	\$1,313,157.02	\$1,221,532.71	\$1,133,872.52	\$1,050,461.46	\$971,466.62	\$896,960.74		\$14,787,846.86