



SURFACE MOUNT TECHNOLOGY AT CHROMALOX INSTRUMENTS AND CONTROL CORPORATION

EMGT 6225 CASE STUDY GROUP – 11

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INTRODUCTION –

Industrial process controllers, monitors, industrial and military control panels are major manufacturing products by Chromalox Instruments and Controls, centered in LaVergne, Tennessee. The industry detects that, over the previous two years, the number of sales of industrial and military control panels has been steadily increasing ; nonetheless, sales of controllers are expected to stay stable from several years. Customers are willing to pay a higher cost for controllers since they are the most profitable of the product lines as there are no other competitors. The firm chooses to promote a 1/16 DIN controller that is in high demand in the electronics sector. Previously, Chromalox produced 1/4 DIN controllers, which were double the size of 1/16 DIN controllers. Chromalox management feels that they can increase their sales by being the first manufacturers to introduce a 1/16 DIN. It is designed to be installed into a 48X48 mm cut out. SMT (Surface Mount Technology) is used to create significantly smaller product to maintain the desired quality. SMT is a printed circuit board (PCB) assembly process which uses components designed with soldering pads/short leads. SMT can reduce the board size significantly. The feasibility and profitability of undertaking this new design needs to be evaluated. Based on purchasing the necessary equipment to provide in-house capability or by subcontracting the assembly, the project will be evaluated.

ANALYSIS –

From the data given in the case study , the assembly cost , volume and sales of printed circuit boards (PCB's) are given. We then calculated working capital and total working we have assessed from the given data using the Formulas : *Working Capital = Total Volume x Assembly Cost ; Total*

Working Capital = (Total assembly cost of that year) x (Volume of that year) – (Total worth cost of previous year) . For in-house production with initial cost of \$115,000 and working capital ‘\$0’ , it has costs like material cost (30%) , labor cost (6%) , overhead cost (24%) including selling administration & engineering cost (21%) of the sales revenue. Sales revenue is calculated by multiplying the number of units sold with the unit price. We can determine the Before Tax Cash Flows (BTCF) using the information provided in the table, which are the sum of the working capital, initial cost , revenue, and total costs. PV function from the excel gives us the present worth (PW) we will be calculating for in-house and subcontracting alternatives . This PV function goes with the syntax =PV(rate, nper, pmt, [fv], [type]). We then obtain the present worth (PW) of in-house production to be \$193,103.68 and for subcontracting alternative to be \$144,002.84. According to the circumstances, the Minimum Attractive Rate of Return (MARR) is determined at 20%. The internal rate of return (IRR) is calculated using the syntax =IRR (values, [guess]) and we have obtained the IRR’s of in-house production alternative and subcontracting alternative as 68.83% , 55.49% respectively , which are greater than the given MARR proving both to be economically attractive. Because the in-house option has a higher present value within the specified horizon, it is chosen to optimize the economic value. The in-house option offers a greater IRR than the subcontracting option in this scenario.

Year	Working Capital	Unit Sold	PCB	Unit Cost	Total Cost	Unit Price	Revenue	Initial Cost	Material Cost	Labor	SA&E	OH	LV.CC	BTCF	PW & IRR	
0	0	0	0	0	0	0	0	115000	0	0	0	0	0	-115000	193103.68	IN-HOUSE
1	0	2000	8000	0	0	175	350000		105000	21000	73500	84000	0	66500	68.63%	
2	0	3000	12000	0	0	161	483000		144900	28980	101430	115920	0	91770		
3	0	3000	12000	0	0	148.12	444360		133308	26661.6	93315.6	106646.4	0	84428.4		
4	0	4000	16000	0	0	136.2704	545081.6		163524.48	32704.896	114467.136	130819.6	0	103565.504	Present Worth: 193103.68	
5	0	4000	16000	0	0	125.368768	501475.072		150442.5216	30088.50432	105309.7651	120354	0	95280.26368	IRR: 68.63%	
6	0	4000	16000	0	0	115.339267	461357.0662		138407.1199	27681.42397	96884.98391	110725.7	0	87657.84259		
7	0	4000	16000	0	0	106.112125	424448.5009		127334.5503	25466.91006	89134.1852	101867.6	0	80645.21518		
0	80000	0	0	0	0	0	0	0	0	0	0	0	0	-80000	144002.84	SUB-CONTRACTING
1	28000	2000	8000	10	80000	175	350000	2500	181475	10500	73500	42000	1600	10425	55%	
2	0	3000	12000	9	108000	161	483000		239423.1	14490	101430	57960	2160	67536.9		
3	28000	3000	12000	9	108000	148.12	444360		220269.252	13330.8	93315.6	53323.2	2160	33961.148	Present Worth: 144002.84	
4	0	4000	16000	8.5	136000	136.2704	545081.6		263928.5107	16352.448	114467.136	65409.79	2720	82203.71328	IRR: 55%	
5	0	4000	16000	8.5	136000	125.368768	501475.072		242814.2299	15044.25216	105309.7651	60177.01	2720	75409.81622		
6	0	4000	16000	8.5	136000	115.339267	461357.0662		223389.0915	13840.71199	96884.98391	55362.85	2720	69159.43092		
7	-136000	4000	16000	8.5	136000	106.112125	424448.5009		205517.9642	12733.45503	89134.1852	50933.82	2720	199409.0764		

Figure 1 EXCEL CALCULATIONS

Few non-economic parameters are thought to be important to examine while deciding on the best alternative , these include energy utility , transportation and human resources . Transportation factor impacts the subcontractor firm as , sending and receiving supplies and chips

might have an impact on the subcontractor's alternative cost, which Chromalox must consider. Electricity utility may become a critical aspect in large corporations. Due to engaging another organization, utility is a minor metric for subcontracting options. Purchasing new equipment and increasing manufacturing capacity, on the other hand, results in increased utility demand. As a result, in an in-house alternative, the utility should be included for cost projection. Human resources (HR) is an important aspect of every project. Mismanaging human resources and employees may result in economic problems , financial difficulties and down graph in their potential.

CONCLUSION –

In the first part of the case study, the primary objective is to evaluate the profitability to select an alternative for the assembly of 1/16 DIN circuit board. With given two alternatives if it should be done in-house or sub-contracting assembly , we have used present worth analysis across planned horizon obtain the optimum alternative. According to the calculations , although both the alternatives are economically viable , the in-house production alternative should be the best option as it has greater present worth than the subcontracting alternative.