Target Costing in Advanced TPM Paper

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Introduction:

In the JIPM TPM World-Class Awards critieria, the Manufacturer should be bale to measure the costs of all wastes, losses and inefficiencies from the stages of design to final product. The methodology is known to the world as Target Costing Management.

Target Costing (TC) helps companies plan for profitability. It helps Companies achieve the planned production cost of a new or existing Product at different stages including R&D Phase, the Prototyping Phase, the Procurement Phase, the Pre and Full Production Phase, etc.

About 70% of the costs of a Product are fixed by the time a Product passes the R&D stage. This means that the built-in costs of the Product can only be reduced subsequently in later versions. The other 30% are Production costs mainly consisting of Production-Controllable costs incurred as wastes, losses, inefficiencies and scrap during the processing activities.

So imagine R&D engineers at their drawing boards experimenting with various designs for value-added manufacturability and maintainability. **Imagine** Product Development Engineers testing out various combinations of processes, packaging, selection of various types of production machines, etc. **Imagine** Process Engineers, Maintenance Personnel, Production Personnel facing various challenges of reducing wastes, losses, machine problems, delays, quality issues, etc while managing the daily operations to achieve the Production outputs.

Imagine further that each of these above Employee Groups have the ability to know the financial impact on the final Product Cost of each and every possible Product decision that they are making through modeling and actual real-time cost reports. Imagine the strategic advantage Top Management then will have.

Imagine no more – Computerized Target Costing delivers all of the above. Read on….

Executive Summary:

Target Costing Management or TCM is a powerful costing management tool with a BIG difference as compared to Traditional Costing or Activity-Based Costing. The difference lie in the unique and highly precise TCM costing formulas which combines cost and a whole range of Engineering, manufacturing and operational indices numbering as many as 50 indices. It is a financial management tool to control and measure the performance of Manufacturing from the Planning, Design, Prototype and Production stages and involves external suppliers and vendors.

TCM must **NOT** be confused with the whole range of Lean and Improvement tools such as Design for Manufacturing, Design for Assembly, Quality Function deployment, Supplier Chain Management, Design of Experiments, Value Engineering, Value Stream mapping, 6-Sigma, TPM, JIT, 5S, JIT, Kanban, SMED, Heijenku (Production Leveling), SPC, etc. Whereas TCM measures the financial impact on the Product's final cost, the Lean and Improvement tools are the means of improvements on the Product itself. This is no small feat – consider for example a Product that takes 10 Process Steps to be completed. An improvement in Process Step 2 can have positive impact on the final Product Cost all the way up to the final Process Step 10. Similarly, any deterioration in say, Process 7 can result in cost increases involving the value added from all 6 preceding stages!!

The resulting implication is that TCM should not be done at the whole-Product level but at every Process stage of the Product's value chain. Every innovation, Kai'zen and improvement that in results in a better Design, Machine, Material or Method will then be measurable for its financial contribution at the specific Process Stage where the improvement impact is made. For example, a DFM innovation to a part of the Product results in 3 cost reductions. (A) A simpler and cheaper mold design. (B) Less production materials per piece Product and (C) higher process yield at Process 6 of 10 Processes. TCM will tell the predicted and actual cost reductions to the Product Price separately for (A), (B) and (C) and together at Process 6 and the final Process 10.

Because of the obvious complexities of such a costing methodology, it is obvious that any attempt to utilize TCM in the real-world environment must utilize the power of IT. Hence, the Lean Scoreboard which contain the TCM formulas.

The Target Costing Management (TCM) Technical Paper and Lean ScoreBoard software.

The LEAN ScoreBoard is a software solution that can make the implementation of Target Costing easier to deploy across the entire factory – from Marketing, R&D, Purchasing, Production and other support groups. It has standardized and structured TCM formats embedded to guide the User through all the critical detailed steps. Its tested TCM formulas for manufacturing and reports has been used for over 15 years in a reputable Japanese Corporation with almost 30 worldwide locations. These TCM reports can also be exported in excel format and further reprocessed and fine-tuned to whatever forms the User requires.

The history of TMC to promote Lean Behavior in Lean Manufacturing dates back to 1963 when Toyota Motors first used it in a form known as Genkaki-Kaku. Largely unknown outside Japan till the 80's, its basic objective to ensure profitability has proven over the years to be highly successful. Today more than 90% of all Japanese companies practice TCM. Up to 40% of USA companies are also said to practice TCM to some degree, but seldom achieving the same results. Perhaps the reason is in the details. TCM itself is quite a complex methodology requiring both precision in computations as well as in execution.

The LEAN ScoreBoard can be used for any process and products. Given the required costs and operational indices, the computations are all automated. It can be used by ANY manufacturer of any Products for enterprise-level Continuous Improvement for Product Cost-reduction from Design, Proto-typing to Production stages. It can be used as a standalone Application or integrated into the Company's ERP system.

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1. Definition of TCM

Target costing is an extremely powerful concept when properly utilized. TCM can be defined as a Price-Driven Cost Management system versus the typical Cost-Driven Management system. This is because the 'Target Cost' is derived from the formula

'Target Cost' = 'Target Selling Price' – 'Target profits'. (see Chart 1)

In short, target costing is defined as the essential measurement and control system of an all-out coordinated approach for achieving company-wide profit. Target costing can be viewed as a proactive approach to insuring that a desired profit is achieved in a project. While 70-80% of a Product's cost is said to be built-in during its design, often significant cost-reduction is still possible during the Prototype and Production stages as demonstrated by the Japanese Kai'zen experiences. Hence TCM covers ALL phases of a Product lifecycle from Design to Prototyping and the final Production.

Chart 1: Calculation of the Product TCM 'Target Cost'.

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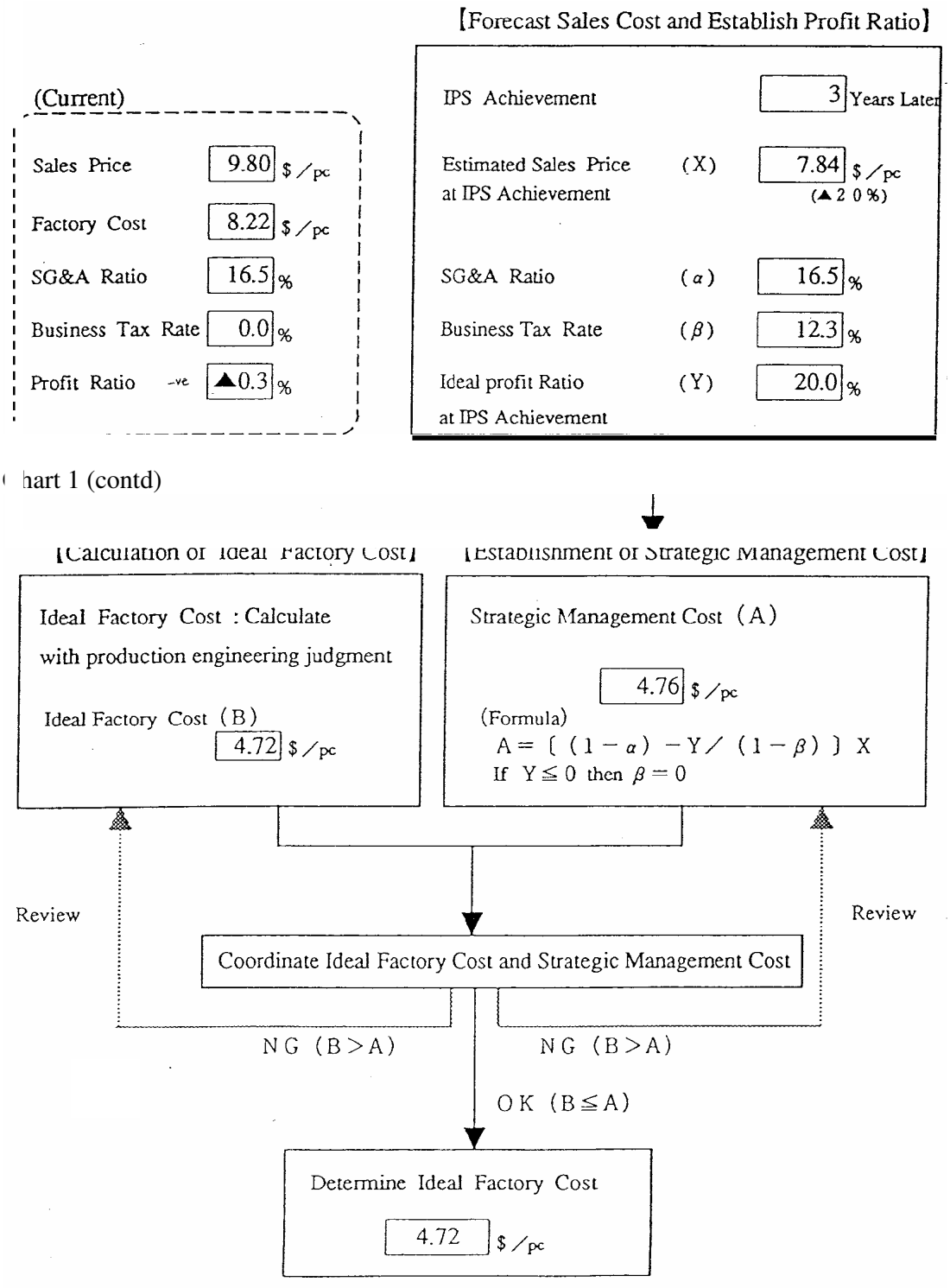


The value and power of TCM can be illustrated in a typical scenario such the below - which no doubt keeps repeating year after year in thousands of companies.

"The Managing Director of Manufacturer XYZ announced to his staff that their Total Product Cost has to go down 18% next 3 years in order to maintain their Profit Margin in view of the project erosion of Selling Price. He asked for all his Departmental Heads to submit plans so that the Company can achieve this 18% cost-reduction goal. As you suspected, the typical Company

would not have the detailed information on where the losses and opportunities lie, except for direct costs such as headcounts, Repair and Maintenance where cuts can be counter-productive.

On the other hand, many important technical / operational cost-reduction initiatives such as those listed below have no easy convertibility to COST.

- Reducing the scrap by improving the Process Yield %,
- Increasing the machine uptime by reducing breakdowns, setups, jams, etc…
- Reducing the material wastages in the Production processes.
- Improving efficiency of energy consumption in certain processes
- Improving the process flow and reducing the cycle time.

As a result, LEAN Projects planning are seldom specific enough in terms of meeting budget goals. They often continued to be expressed only in their relevant technical / operational measures. Their eventual impact on the cost-reduction goal is also seldom verifiable.

The use of the TCM will also enable manufacturers to ferret out the higher-hanging fruits that are usually not obvious otherwise. TCM is therefore designed as the single master measurement for all cost-reduction activities for a targeted Product – measuring each activity individually yet linking their financial impact on the Product factory Price together.. The two charts below contrasts the Traditional Cost Management approach with the TCM Approach.

Chart 2: Target Setting For A Product without TCM Approach

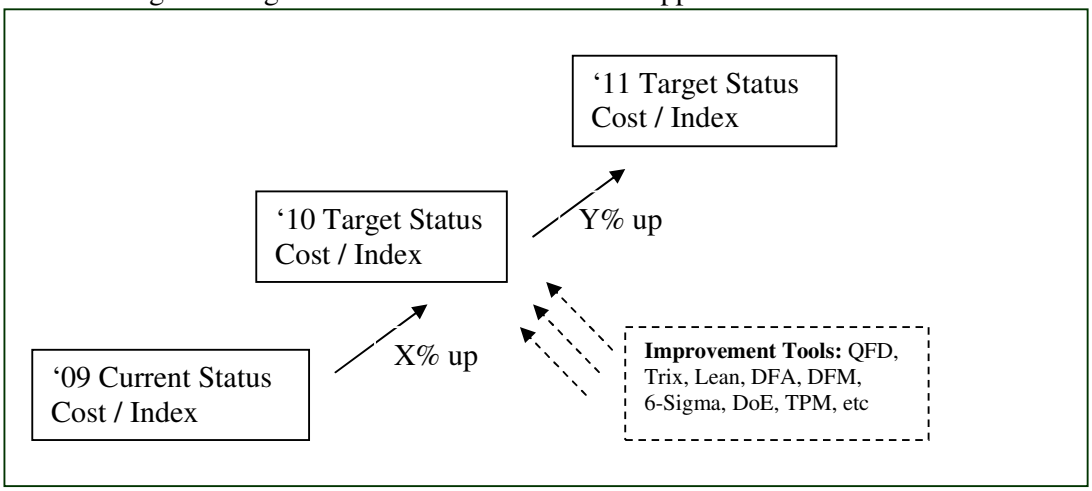
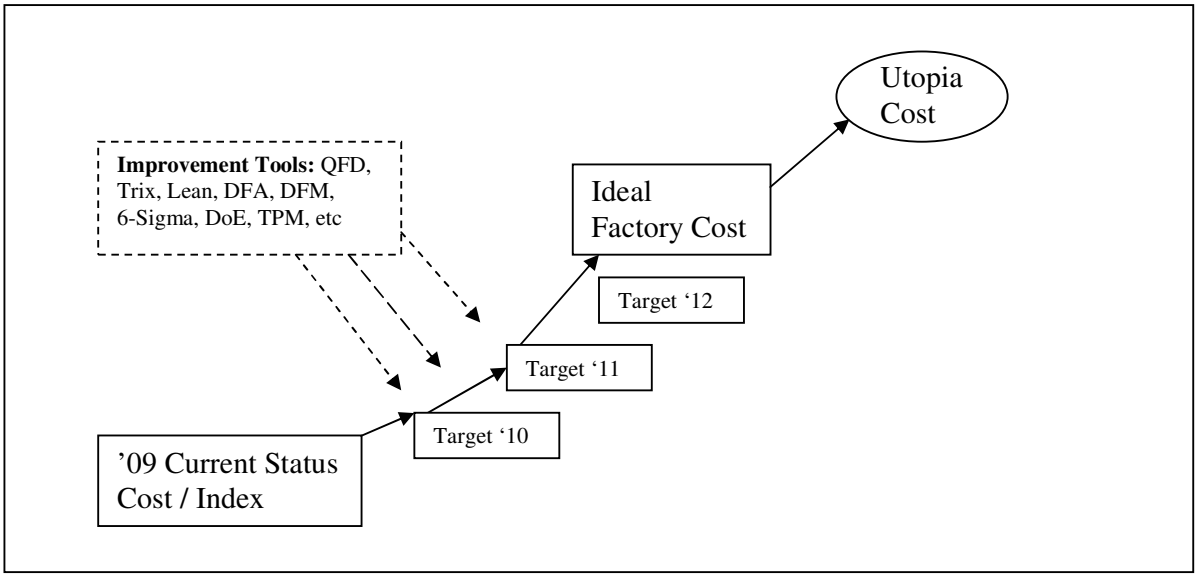


Chart 3: Target Setting For A Product By TCM Approach



Note: see below for the definitions of Ideal and Utopia Costs.

The 3 main steps in TCM.

There are 3 main Phases in establishing TCM for a Product.

(1) Cost Development.
(2) Target Development.
(3) Improvement Theme Development

2. Cost Development Explanation.

The purpose of this phase is to clarify what is the 'Current Cost/Index', 'Ideal Cost/Index' and the 'Utopia Cost/Index'. The indexes are manufacturing indices such as operational, technical and engineering measurements. These manufacturing indices are merged with the Product Costs using appropriate formulas so that there is a 1-1 translation between costs and each of these manufacturing indices. This translation is done for each and every Process Step and accumulated to get the final Product Cost known as the Product Factory Cost.

This comprehensive 1-1 translation between Costs and Manufacturing indices is the definitive quality of TCM and sets it apart from all other Costing Methodologies. In fact, it can be said that there is no known manufacturing index that cannot be converted into its equivalent cost under TCM. In other words, every manufacturing activity, event, waste, loss, delay or inefficiency of materials, machine, man and skills in the Production Process from Planning, Design to full Production can measured in cost. This is the secret power and advantage of TCM.

Concept Of Key Concept Points for Ideal.

The 'Ideal Cost/Index' is the lowest cost/Index of the Product possible if everything during the Product Planning, Design and Production stages utilizes the Most-Advanced-Technology-Available in terms of materials, machines, methods and skills. Knowing what the Ideal Cost/Index is is important to give realism to TCM. Usually, the general Industry is about 3 years, give or take 1 year, behind the latest

available technology in materials, machines, processing methods, etc. which is known as the "Key Concept Points". Hence the Ideal Cost/Index represents what is now possible in the real world. The gap between the Current Cost/index and the Ideal Cost/Index can be closed by implementing the "Key Concept Points". These Key Concept Points are searched out by keeping abreast of the latest development in your Industry and by bench-marking with the Best-In-Class.

Concept of Restrictive conditions For Utopia.

On the other hand, the 'Utopia Cost/Index' is the lowest possible cost/index of the Product if limitations on Technology, materials or legislation is eliminated and subject only to certain 'restrictive conditions' that are not likely to be resolved in the foreseeable future due to the limits of science, materials or political or moral concerns.

For Example in Wafer Fabrication, there would presumably be a physical limit to how thin the layers can get. That would be the Utopia Cost/Index representing a restrictive condition of the physical world. Another example would be reducing the number of days of Annual Plant Shutdown for overhaul maintenance where zero is not possible. The Utopia value for Annual Plant shutdown might be some very low level. The Utopia Cost/Index is always a better value than the Ideal Cost/index which in turn is always better than the Current Cost/Index. If this is true, then Continuous Improvement is a proven scientific theory!.

The purpose of Utopia Cost/Index is to give a long-term grasp, no matter how vague, of the possibilities for technology to grow in the respective areas as indicated by the nature of the Indices themselves. For example, if Current Yield is already 90%, the Ideal Yield is 95% and the Utopia Yield is 99%, this means that there is still much long-term Product cost reduction possible through re-design of processes, equipment or materials. Whereas if the Utopia Yield is only 96%, it means that in the near term, there is significant cost reduction to move from the Current of 90% to 95% by acquiring the available new technology, but once that is done, there appears to be little further opportunity.

Not To Be Piecemeal.

The Current Cost/Index development to establish the Ideal Cost/Index is NOT meant to be a selective exercise using the Pareto principle on high-impact opportunities only, BUT a complete listing of all elements in the Current Cost/Index against their Ideal Cost/Index. For some of these elements, the Current is already equal to the Ideal either because newer technology has not yet appeared or the latest technological advantage has already been taken.

The comprehensive nature of this exercise is meant to establish the Product Ideal Cost/Index as shown in Chart 3.

The actual calculations are, of course, very tedious requiring many man-days or even weeks to accomplish. Hence the advantage and time-saving benefit of the Lean ScoreBoard which can perform thousands of these calculations process-by-process to give the actual as well as modeled costs for simulation of what-ifs scenarios.

The long-term Ideal Cost/Index visibility is important for Management to do Product Strategizing. Perhaps, the Product might have to be moved out to a lower cost-base country after X number of years. Being able to see ahead is part of the competitive advantage.

Chart 4: Sample Illustration of Cost-Development to get the Current Cost/Index, the Ideal Cost/ Index and the Utopia cost/Index.

Ideal Target Development

Factory Cost

Item Type : VHS Video Cassette

Item Name : T-120HS

Mikumagawa Plant

			Current			Ideal			Utopia
					Cost Ratio			Cost Ratio	
Process Controllable Cost	Direct Labor Cost	Pre-Stage Dept.	51persons	0.086		28persons	0.026		Personnel Expenses = 0
		Molding Dept.	63persons	0.106		15persons	0.014		
		Assembling Dept.	168persons	0.283		32persons	0.030		
		Packaging Dept.	30persons	0.050		11persons	0.010		
		Total ($)	312persons	0.525	6.4%	85persons	0.080	1.7%	
	Direct Expenses	Pre-Stage Dept.		0.100			0.040		Absolute Minimum cost
		Molding Dept.		0.110			0.045		
		Assembling Dept.		0.032			0.015		
		Packaging Dept.		0.004			0.002		
		Total ($)		0.246	3.0%		0.102	2.2%	
	Production Material Yield Loss	Pre-Stage Dept.		0.134			0.075		Utilization = 100%
		Molding Dept.		0.174			0.095		
		Assembling Dept.		0.036			0.000		
		Packaging Dept.		0.007			0.003		
		Total ($)		0.351	4.3%		0.173	3.7%	
	Process Yield Loss	Pre-Stage Dept.	96.0%	0.138		99.5%	0.010		
		Molding Dept.	99.9%	0.007		99.9%	0.000		
		Assembling Dept.	98.4%	0.112		99.9%	0.000		
		Packaging Dept.	99.9%	0.006		99.9%	0.000		
		Total ($)		0.263	3.2%		0.010	2.0%	
	Production Overhead Cost	Pre-Stage Dept.		0.677			0.440		Absolute Minimum Cost
		Molding Dept.		0.470			0.253		
		Assembling Dept.		0.207			0.104		
		Packaging Dept.		0.069			0.015		
		Total ($)		1.423	17.3%		0.812	17.2%	
Processing Cost Total ($)				2.808	34.2%		1.177	24.9%	
Ideal Achievement Percentage				41.90%			100%		
Process Uncontrollable Cost	Direct Material Cost	Pre-Stage Dept.	0.001	1.499		0	1.053		Absolute Minimum cost
		Molding Dept.		0.515			0.350		
		Assembling Dept.	0.004	0.585		0.001	0.400		
		Packaging Dept.	0.001	0.766		0	0.540		
		Total ($)	0.006	3.365	41.0%	0.001	2.343	49.6%	
	Factory Overhead Cost	Pre-Stage Dept.		0.930			0.565		
		Molding Dept.		0.608			0.397		
		Assembling Dept.		0.423			0.213		
		Packaging Dept.		0.081			0.026		
		Total ($)		2.042	24.9%		1.201	25.4%	
		Pre-Stage Dept.		3.564	43.4%		2.209	46.7%	
		Molding Dept.		1.990	24.2%		1.154	24.4%	
		Assembling Dept.		1.678	20.4%		0.762	16.1%	
		Packaging Dept.		0.983	12.0%		0.596	12.6%	
		Factory Cost($)		8.215	100%		4.721	100%	
Ideal Achievement Percentage				57.5%			100%		
Sales		Sales Price($)		5			7.84		
		Sales Qty.		1,200,000			2,400,000		
(A) Gross Sales (K $)				11,760			18,820		
(B) Total Factory Cost(K $)				9,860			11,330		
(C) SG & A Expense(K $)				1,940			3,100		
(A)−(B)−(C) (K $)				▲40			4,380		
Business Tax (K $)				0			540		
Net Profit (K $)				▲40			3,840		
Profit Ratio (%)				▲0.3%			20.4%		

3. Target Development Explanation.

The purpose of this phase is to identify and plan exactly for the period concerned (perhaps 3 or 6 months or 1 year) whic... and how much of the Gaps between the

'Current Cost/Index' and the 'Ideal Cost/Index' is possible be closed within the said timeframe and given the availability of a certain resource in terms of budget, timeframe for the target cost achievement and the available skills.

Using the comprehensive TCM data established in Phase 2, (see Chart 4) it is now possible to know the impact of any and all possible improvements in Design, Materials, Machine or Production method in terms of the financial impact to the final cost of the Product. Some of these opportunities represent significant cost reductions if implemented. Many might be insignificant for the implementation effort and resources necessary to bring about the changes.

Target Development is about selecting improvement gaps between Current and Ideal that can be confidently closed within a given timeframe and with available resources and budgets in order to achieve the Profit Objective by achieving the Targeted Factory Product Cost.

Supposing the Selling Price is to be no more than $15.00 and a desired Profit of 30% is targeted, then the TCM Factory Target Cost must be $10.50 or lower. Further, if the Current Factory Cost of the Product is $11.50, then it is clear that a cost reduction of $1.00 is necessary to achieve the profit objective. In this Phase, the job is to select some Current/Ideal gaps that can be closed to attained the desired cost reduction. In TCM, the management can see what all the cost reduction opportunities are and plan exactly the most efficient and cheapest way to achieve the cost reduction.

Sometimes there is no combination of gaps that are possible to be closed to reach the Targeted Factory cost. This might be due to lack of budget to acquire newer technology, machines, material. Or the skills might not be available to execute the plans as in the Key Concept Points. Looked another way, this can be a very good and critical piece of information for the management concerned. Perhaps the competition has become too crowded. They would then have more time to plan for an exit and move on to some other more profitable Products.

4. Improvement Theme Development

This is the implementation and control phase of the selected Targets which if implemented successfully should lead to the achievement of the targeted cost reduction. The Administrators, Engineers, Production, Technical and related support personnel involved in the selected Cost Reductions are given the Technical Manufacturing Indices to work on together with the necessary resources.

These projects are called improvement "Themes" and are expressed in both Cost and their Manufacturing Indices. As the projects are implemented, TCM is able to reflect the improved trends in both Costs and Indices.

Again this is not possible with other Costing Methodologies. The Lean ScoreBoard automated the translation of Costs /Manufacturing indices and generates the TC reports at the touch of a button

Chart 5 above also includes a sample of selected Improvement Themes identified from amongst all the Ideal Cost/Index that will give a pre-determined cost-reduction to meet the Targeted Factory Product Cost.
Chart 5: A Sample Page showing the selected Improvement Plan to reach the targeted Factory Price.

Ideal Theme Development

Theme toward Ideal

Item Type : VHS Video Cassette
Item Name : T-120HS

Mikumagawa Plant

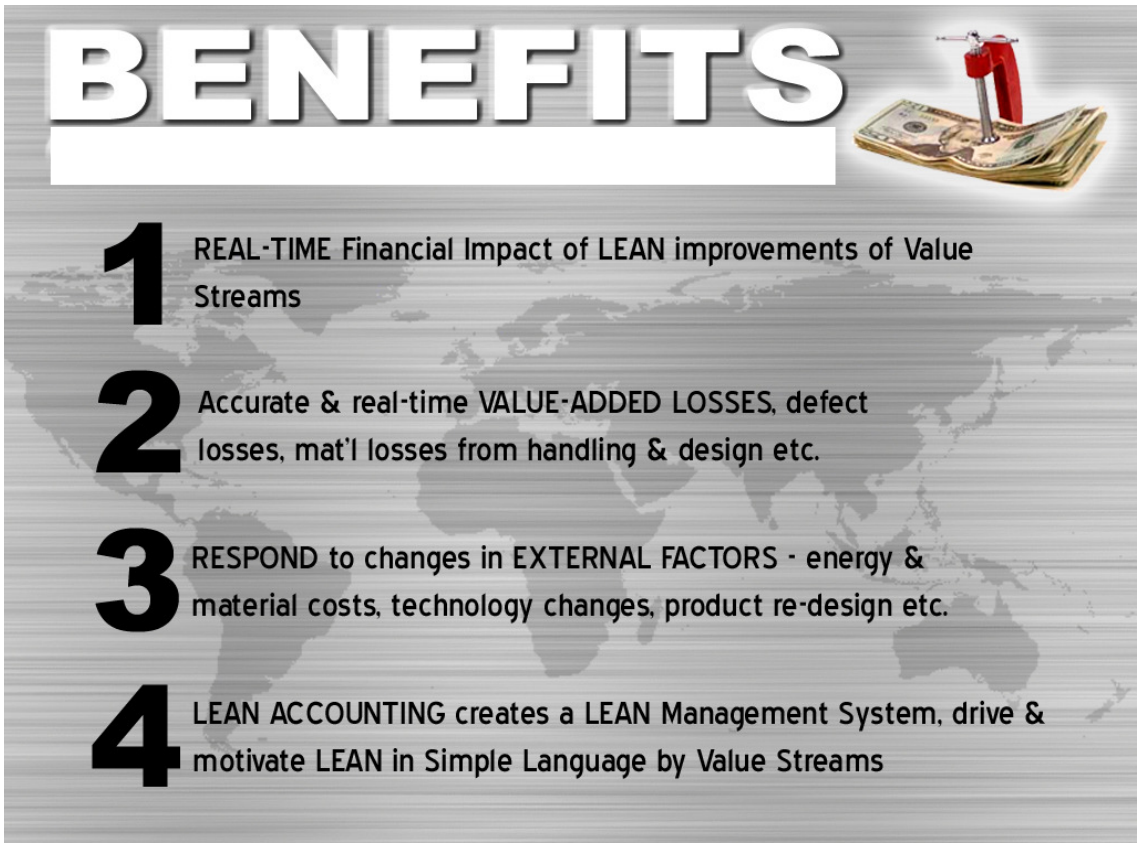
Dept.	No.	Main Purpose: Capacity	Utilization	Yield	Personnel	Material	Other	Theme	Target	Difficulty: 1 0.5year	2 1.0year	3 1.5year	4 2.0year	5 2.5year	Investment Cost ($)
Assembling process (2 Lines)	1	○						(V-CATS) Adjustment & modification for cycle improvement	2.64→2.00sec.					○	980,000
	2	○	○					(OCW) Improve equipment parts precision	Capacity (month) 1,145 → 1,545K			○			600,000
	3	○						(C-0) Improve material handling cycle	2.36→1.96sec.		○				220,000
	4		○		○			Improve individual section reliability	Machine utilization 84.4 →98%			○			550,000
	5		○		○			Checker stabilization	Line utilization 69.7→97%					○	100,000
	6		○	○				Improve CATS' parts precision	Departmental utilization 85.1 →98%				○		
	7		○	○				Clarify each parts receiving criteria	Total utilization 59.3→95%			○			
	8		○					CMT, CMP stabilization						○	150,000
	9			○	○			Review appearance inspection standard	Yield 98.6→99.9%				○		
	10				○			Cassette automatic insert machine		○					167,500
	11				○			Material handling automation of empty magazine			○				198,000
	12		○		○			Missing parts inspection Automation	168→32 persons				○		450,000
	13		○		○			Rejecting inferior goods from lines				○			100,000
	14				○			HF, FF automation						○	612,000
	15				○			GHS automation						○	869,800
	16					○		Change tape guide to plastic	Material cost ▲0.06 $	○					
	17					○		Change guide pole material	Material cost ▲0.03 $		○				
	18					○		Change reel spring form	Material cost ▲0.025 $		○				
	19		○			○		Change leader tape thickness	Design material yield 96.9 → 98%			○			
	20		○			○		Change splice tape thickness	Design material yield 93.6 → 98%			○			
	21					○		Price negotiation of clamp and pad	Material cost ▲0.02 $	○					
	22						○	Eliminate air leak		○					
													Total Cost		4,997,300

Notice in Chart 5, the level of difficulty of the Improvement Project based on the Key Concept Point and the amount of dollar investment required for each of the Improvement Project is stated. This enables a realistic assessment and allocation of budgets and resources in a planned and systematic manner. Doing so can make all the difference between a successful undertaking or a botched attempt later on.

Notice too that the targets indices are stated in specific quantitative terms. Though not shown here, each of the financial impact of these targets are already worked out in Charts 3 and 4. Being able to do so in both Costs/Indices does wonders for accountability, motivation and ownership of the teams concerned

5 The Lean ScoreBoard as a TCM Software solution.

The Lean ScoreBoard is TCM in a ready-to-use complete package. Its standardized format allows everyone involved to view and input their data via intranet or internet. It enables training and implementation to be easily carried out.



As an add-on Module to the existing Cost Accounting system or as a standalone application, the Lean ScoreBoard allows TCM to be implemented in phases or on selected Products only.

For more information on TC Training, Consulting & Project Implementation ,

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