

Get More Operating Profit and Stop Problems by Setting Tighter Quality Standards

Abstract: Adopting the business strategy of intentionally tightening process and work quality standards will drive operating profits higher. You get most operating profits when process and work quality variables are sitting on their optimal cost points. The Taguchi Loss Functions of your operation show the connection between your operating costs and your process and work quality.

Keywords: Taguchi Loss Function, quality verses cost, Quality Cost Function

In the 1960's Japanese business statistician Genichi Taguchi developed the Taguchi Loss Function. It is a concept describing the lost value to organizations and society when a system or process is not run at optimum performance. Figure 1 shows a depiction of the Taguchi Loss Function.

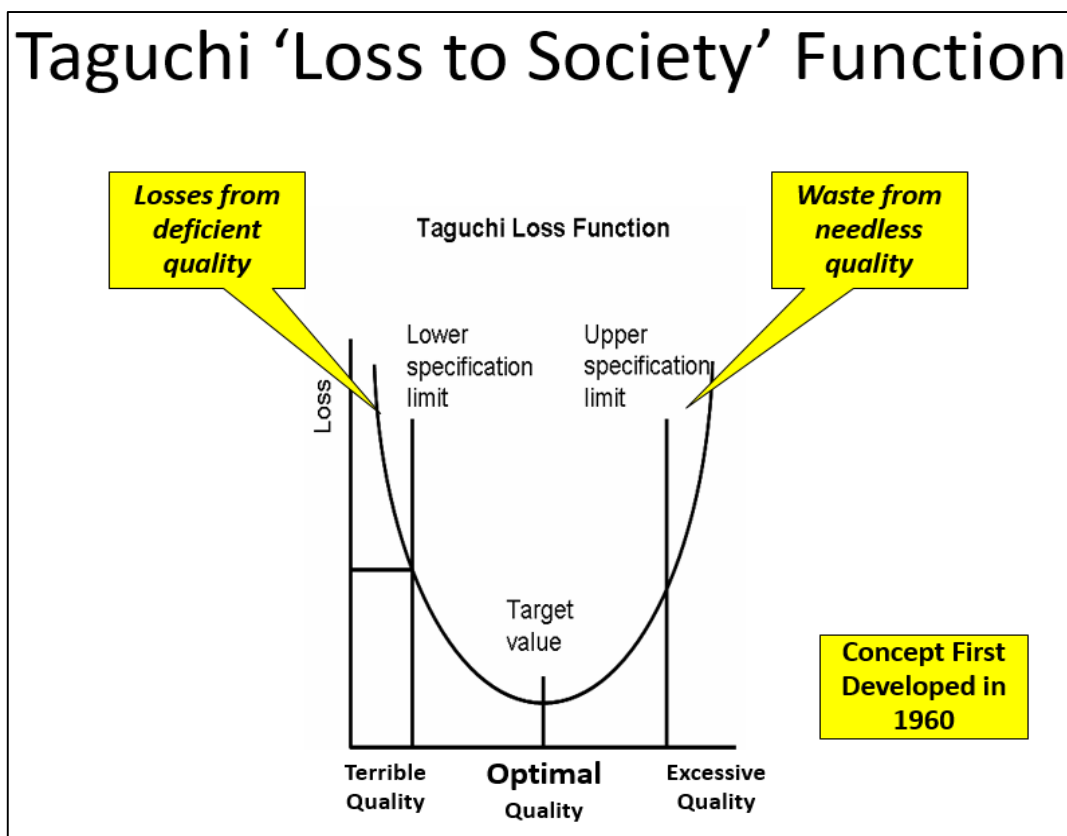


Figure 1 Taguchi Loss Function

When you achieve optimal quality in a process or work task, you automatically get the least possible future losses from it. The least wasteful and maximum profit-making outcome of any activity can be described by the optimised region of its Taguchi Loss Function.

The sensitivity of process and work performance to the accuracy and precision of method and task variables, such as dimensions of parts, accuracy of assembly, composition of a material, product condition after processing, etc., cause variation. Their influence can be determined and reduced by experiment to discover which factors impact the most upon final product and job performance. This is the basis of the concept of Robust Design. A Robust Design is one that maintains its performance, reliability and other valued measures despite variations in inputs and environment. A robust manufacturing process, similarly, is one that minimises the effects of input variations upon the

relevant merit measures of the product, by controlling those that would otherwise cause the most problems¹.

The shape of loss functions varies. In one case the form might be a tight parabola, and for a different situation the loss function may be generous and allow a wide range of values for a variable without affecting the cost. Figure 2 shows examples of such loss function shapes.

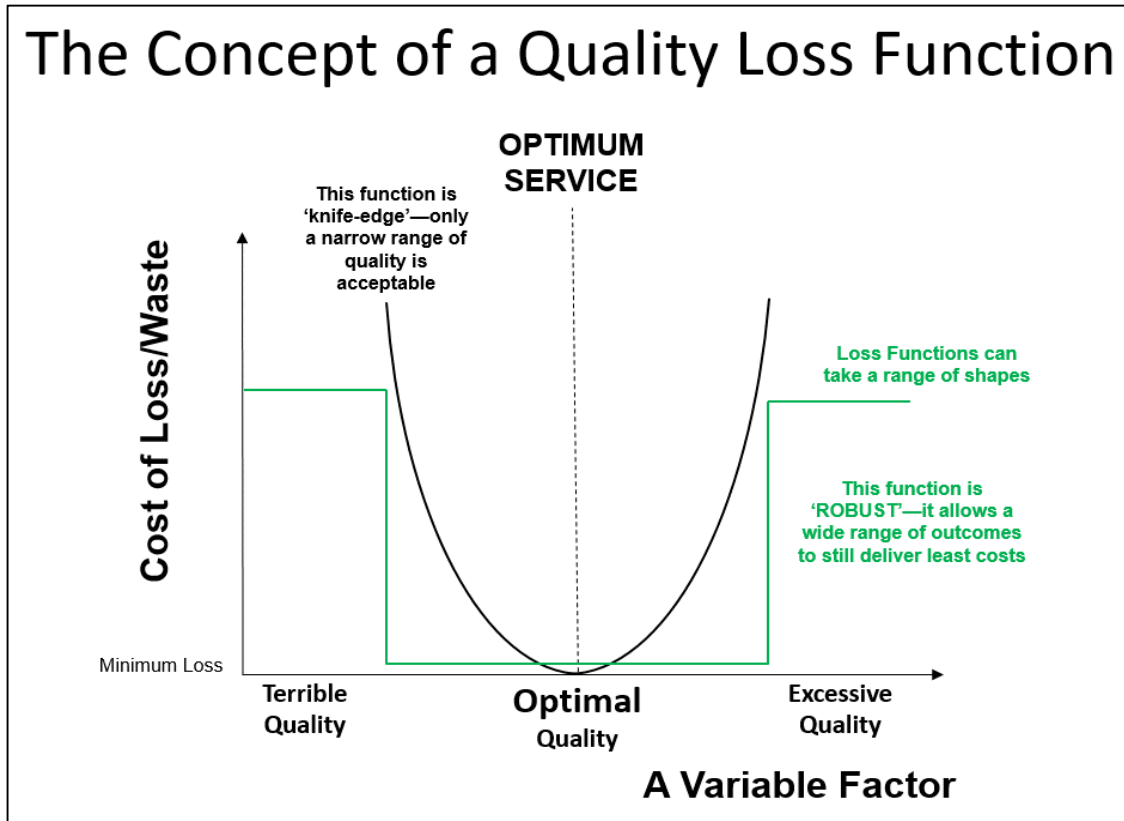


Figure 2 Quality Loss Function Shapes

In an ideal world you would run factorial experiments² to identify the shape of your cost functions. Quality variable verses cost functions tell us the effect on the profitability of an operation when the value of variables change.

You would collect cost information verses factor values on the multiple variables that impact your operation’s production and business processes. From the data you then plot charts and graphs of the cost functions and identify the optimal points for each of the variables. It would be a business imperative to change your operating procedures to ensure that your company’s processes were always run so that the key variables stayed right on their optimal profit performance.

Figure 3 shows quality loss functions of annual maintenance expenditure verses vibration levels of three machine types. The quality variable is vibration velocity. The plots show that the maintenance cost worsen rapidly as machine vibration gets higher. When a quality variable is optimal its consequential operating profit is maximized. It’s clear from the plots in Figure 3 that to get maximum operating profit, turbine vibration below 0.5 mm/s is vital, and for the other machine types velocities below 1.5 mm/s is best.

¹ David Sherwin, “Introduction to the Uses and Methods of Reliability Engineering with Particular Reference to Enterprise Asset Management and Maintenance,” presentation, Perth, Western Australia, 2007

² Factorial experiments are a statistical technique to identify the impact of changing multiple variables, also called factors, on the value of another variable.

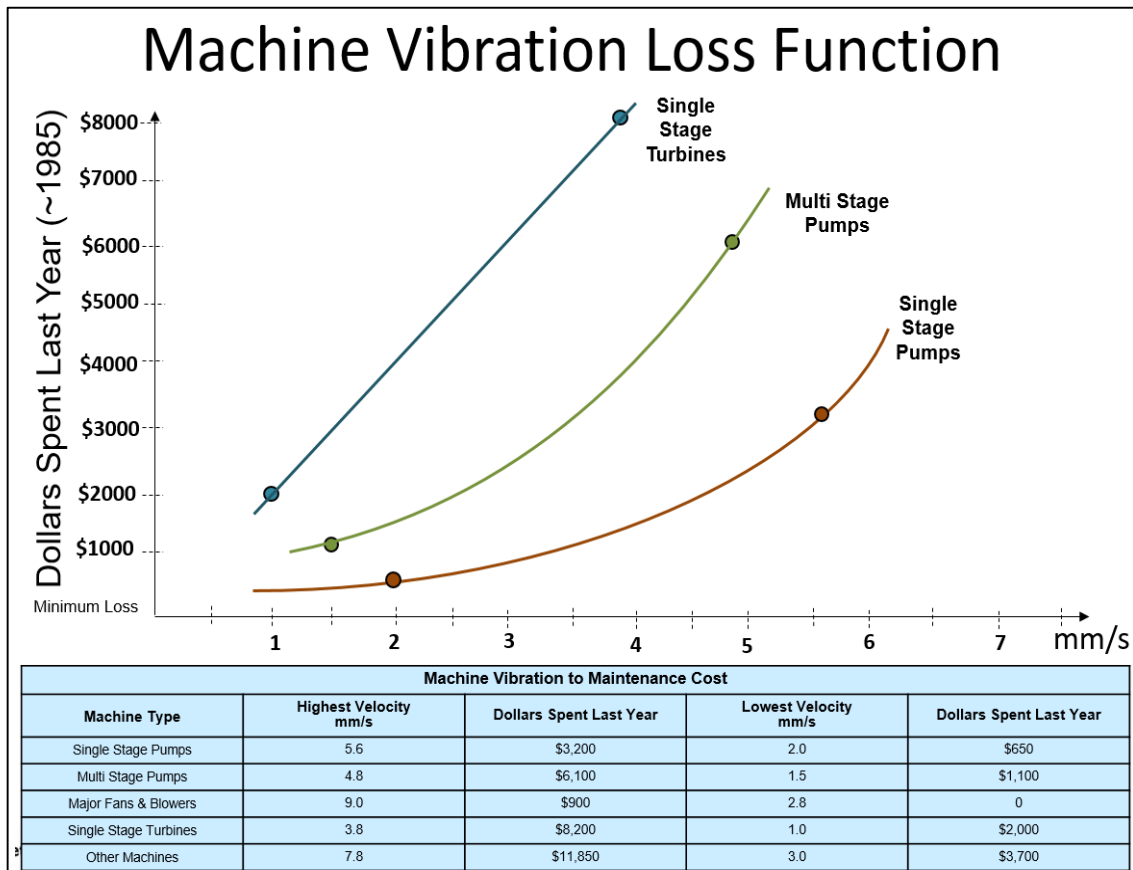


Figure 3 Loss Functions from Machine Vibration

Knowing that in order to get lower operating costs you need to reduce variability of a parameter to optimum values, there is a clear business case to proactively introduce finer quality standards for your processes and their associated work tasks. By achieving tighter quality standards centred on the optimum point, the Taguchi Loss Function advises that you will also lower your future costs.

The strategy of identifying the optimal outcome of a variable and setting it as the target to be achieved in your standard operating procedures and maintenance procedures forces innovation and continual improvement towards optimizing your operating profits.

It's in the greatest interest of your business to experiment to find the variables that influence the operating profit, and to then change the organization's processes and work practices to move results to the location on the loss curves where the variables are at their optimal costs.

When doing maintenance work get your maintainers to deliver finer quality workmanship by intentionally setting demanding equipment reliability standards. When production costs are too high, intentionally set more demanding process quality standards to drive costs lower, sure in the knowledge that the reduction in variation will consequently lower your operating costs.

All the very best to you,

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