Cost of Quality - The Payback

By Jim McConchie

A recent survey commissioned by the American Society for Quality Control (ASQC) found that eight of ten executives surveyed thought their cost of quality was 10% or less of their gross sales. Experts, including the Big Six CPA firms however, calculate that a typical company's cost of quality to be between 20 to 40 percent of gross sales!

The cost of quality is the combined costs of Prevention, Appraisal and Failure. Said another way, the Cost of Quality is the dollar cost of making sure customers are satisfied -- and the consequences when they aren't.

Today, more and more corporate customers are demanding that supplied parts be certified as meeting their specifications, and that proof of quality systems must be available before contracts are signed.

In addition, Just In Time (JIT) manufacturing has demanded that the component parts are up to customer specification as they are delivered directly to the assembly line from the supplier and no stock is held for inspection. Hence, if the components are defective the whole assembly line stops -- an expensive proposition.

By forcing the supplier to apply Quality Control and only supply good components, no Inbound Inspection is required, which is an additional saving for the customer. The customer must recognize this fact and be prepared to pay a bit more for the product, but the differential is far less than the cost of Inbound Inspection.

Hence either through demand or self preservation, an investment in Quality Control is inevitable for all companies who wish to stay in business. Investing in quality in the form of training, equipment and personnel is the only sure path to survival in the very aggressive, competitive market that the economy has created.

Careful thought and planning is required before purchasing new Quality Control equipment. With the introduction of Computer Assisted Quality (CAQ) only measuring instruments with digital output can be interfaced with CAQ. Any future purchases should include the slightly more expensive digital output instruments (micrometers, verniers, etc.) since they are easier to use and can be connected to a data collection device for use in Statistical Process Control (SPC).

It is not only the customer who benefits from increased awareness of Quality Assurance. To improve Quality is to improve Productivity. The net result of an investment in Quality is:

1. Increased Profitability

2. Reduced Manufacturing Costs

3. Increased Competitiveness

4. Increased Job Satisfaction

5. Reduced Staff Turnover

The costs of failure, on the other hand, are divided into internal failures and external failures. Internal failures include:

1. Material Scrap 6. Lengthy Reviews

2. Rework 7. Overruns

3. Lost Production Time 8. Worker Grievances

4. Order Changes 9. Rush Delivery Costs

5. Overtime 10. Excess Inventory

External failures include:

1. Customer Dissatisfaction

2. Confusion

3. Warranty Repairs and Labor

4. Late Charges

5. Lost Business

6. Product Failure in the Field

7. Customers Not Served

The costs of Quality Control can be divided up into Prevention Costs and Appraisal Costs. Prevention Costs are the costs of preventing failures from happening in the first place and include:

I.. Design Reviews

2. Preventative Maintenance

3. Specification Reviews

4. Test and Inspection Equipment

5. Quality Training

6. Prototype Process Development

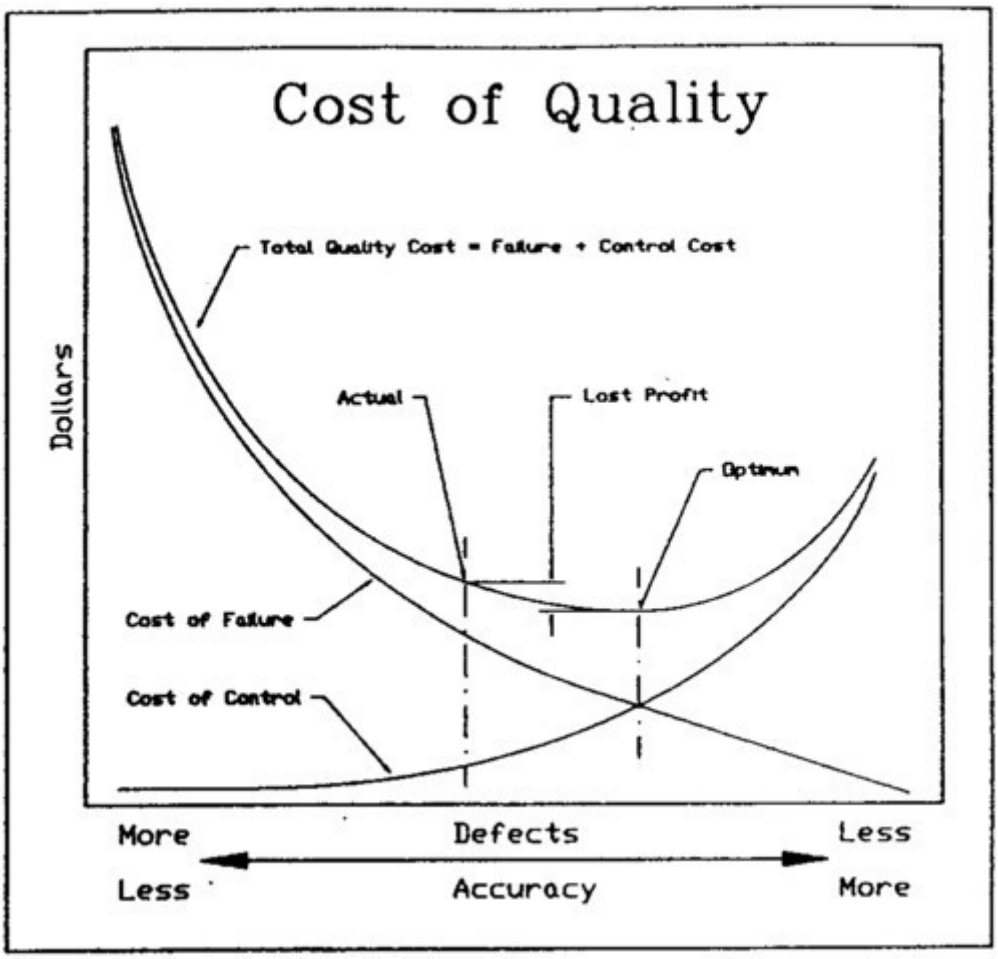
Appraisal costs are the costs of determining whether specifications are being met and include:

1. Data Collection

2. Inspection

3. Quality Control

Total Quality Costs can be graphed as shown.



The costs of failures is extremely high when little or no Quality Control is practiced. As Quality Control is introduced, the costs of failure decreases and the costs of control increases, but at a lesser rate.

It is uneconomical to spend excessive amounts of money on Quality Inspection Control to reduce the costs of failure to zero. A level of failure will have to be accepted which at least guarantees that only products in specification are sent onto the end-user, whether that end-user is the final customer or the next stage in production.

The cost of failures will then be internal in the form of material wastage or lost time (which should be obvious to management), and not external such as customer dissatisfaction which is much more difficult to rectify and far more detrimental to the company's future.

However, as the operator of the next operation in the process can also be considered an INTERNAL CUSTOMER, employee morale and confidence in management is negatively affected as these failures persist.

CASE STUDY. Accord Industries in the 1980's

The proof of all the above is in the following case study of Accord Industries Ltd., based in New Zealand.

Accord Industries Ltd., are contract Production Engineers running twenty eight single spindle automatic lathes, three sliding head automatic lathes, three CNC lathes, and one CNC Machining Center. Secondary equipment comprises a total of thirty-two milling machines, drills, tappers, capstan lathes and presses. Their staff level at the time was thirty-nine.

The company's policy back in 1985 was that the engineering drawing was the minimum quality standard and that the first two products produced off each bar be checked to the drawing. If they were not up to standard, adjust the machine and continue.

Rejects were then sorted out and reworked if possible or scrapped. Conventional measuring instruments were used and the process was predominantly set to allow for tool wear, i.e. near to extremes of tolerance. There was no inspection as the set-up man was responsible for the quality on his machine.

In the first quarter of 1986, a major customer advised the directors of Accord that unless their quality was improved Accord would lose the business of that customer. This warning was heeded and the directors discussed the problem with the staff as a whole and decided on a course of action to improve the overall quality of product produced.

The first and most effective action was to ensure that the first part inspections (100% inspection of one component) were carried out and recorded and unless that product met the specification, the process did not commence full production. The set-up people and operators were still ultimately responsible for the quality of the product.

It took a while for the set-up men to adapt to this scrutiny, but marked reduction in credits was achieved and the company retained the business. The spin off was that all of Accord's customers were now benefiting and Accord's reputation for quality products was spreading.

By 1987, the directors were well aware of the savings that Quality Improvement could achieve. Through meetings with the management they set up a plan of staff training, starting with the managers and supervisors. Investigations into SPC were also commenced. There was not a lot of equipment readily available in stock in New Zealand, so the Technical Director went to the Quality/ Expo Time Show in Chicago, USA in April 1988 looking for systems and ideas.

A program for introducing SPC into the plant was formulated. The Manukau Polytechnic was commissioned to prepare a weekly training course for ALL employees over a six week period. This course covered: Quality Awareness, How to Achieve Quality, Normal Distribution, Control Charts and Computer Aided SPC.

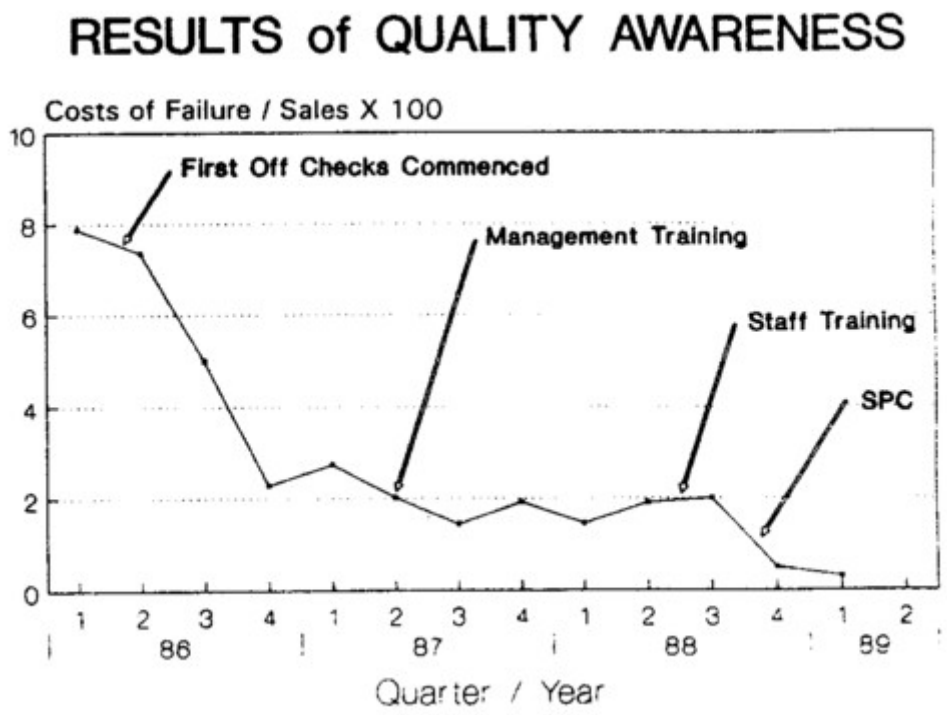
The SPC system selected for Accord was the Paul Hertzler & Co., Inc. QA/S system. This SPC system was installed and data entry commenced. A quality auditor was appointed and the staff advised of his authority. A line of command was established to ensure that the corrective actions required were implemented.

It took only a few months for the set-up men to accept the fact that the data collected was a true record of the process and that corrections requested did in fact improve the process. This led to a closer working relationship between the auditor and the set-up men in achieving tighter processes.

The data collected was analysed and the machine capabilities noted. This assists the production control people in their planning as they now know which machines are capable to make tightly tolerated products and don't have to shuffle the machine loadings after the machine has been set and found to be incapable. The analysis also highlighted which machines needed maintenance or rebuilding.

At first, data was entered through one computer in the Quality Control office, but this sampling technique led to delays as the overloaded staff tried to keep up with the data. To overcome this, Real-time data collection terminals on the shop floor were installed to allow direct loading of the data during production. The auditor now monitors the data from his own terminal in the Quality Control office and concentrates on the first part checks.

The graph below shows the effect that SPC and Quality Awareness has had on Accord Industries and the huge reduction in the Cost of Failure.



Controller's Overview: Profitability of Quality

Very few general ledger systems and even fewer cost accounting departments support a comprehensive Cost of Quality system, so let's deal with it conceptually.

Assume that losses amounting to 10% of sales are attributable solely to failure costs. In a company with sales of $ 10,000,000, 100 employees, and a 12% pretax income to sales ratio, these failure costs are $ 1,000,000. With a 10 times improvement in quality, (through the means described in the article) failure costs could be $100,000 In an improved environment. Many progressive companies are achieving this level of improvement through use of these practices.

The costs of 10 x improvement would include a purchase of software, hiring a consultant to identify hidden costs, stepping up internal inspection efforts, and retraining of employees, among others.

Year 1.

Existing Failure Costs	$1,000,000
Projected Failure Costs	100,000
Profit Opportunity	900,000
Costs of Improvement:	
Software Purchase (amortisable)	25,000
Hardware Purchases (depreciable)	50,000
Additional Quality Employees:	
1x Industrial Engineer	50,000
1x Quality Control	45,000
Consultant Retainer	60,000
Retraining Opportunity Time	
100 employees @ 3 days	
@ $20.00/hour	48,000
Management Implementation Time	
5 VPs @ 5 days @ $50.00/hr	10,000
Total Costs of Improvement	288,000
Net Pre-Tax Profit Opportunity*	$612,000

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This company could increase their pre-tax return on sales by more than 48% by addressing cost of quality issues.

Obviously, 10 times improvement does not occur in Year 1, but can occur by the and of Year 2. If 50% of the f allure costs are reduced in the first year, the quality initiatives are still profitable in Year 1. Additionally, some of the costs are nonrecurring in Year 2, such as the training of employees.

*This example excludes perhaps the largest result of improved quality and productivity: increased competitiveness and resulting sales. It also excludes the benefit in future years of such a program.