'Smart' quality control system saves CitiPower and Powercor $6 million

By Peter Mills, CEO, Compliance Master International

Geoff Barby Manager Risk Management, CitiPower and Powercor

A "smarter" approach to quality control

In an industry first, a new "smarter' approach to quality control saved Victorian electricity utility CitiPower and Powercor an estimated $6 million in avoided costs and auditing work for its 1.2 million smart-meter rollout.

For the first time, this new scientific auditing and inspection system, developed by Melbourne firm Compliance Master International (CMI), enabled CitiPower and Powercor to accurately assess and control its rollout risks within specified limits.

Conforming to world best acceptance sampling methods (ISO 2859.1) the CMI designed system was able to accurately assess whether large job-lots of installed smart-meters exceeded a number of user- specified quality limits.

This simple, yet highly objective approach to quality control enabled CitiPower and Powercor to save millions of dollars in avoided project delays and ongoing operational costs by returning "unacceptable" job-lots to the responsible contractor for rework.

Significant savings were also achieved by the solution's ability to take a contractor's compliance history into consideration when determining its level of auditing rigour.

THE SMART METER CHALLENGE

In 2007, the State government of Victoria, Australia, announced the rollout of new smart-meters for all electricity customers by the end December 2013. CitiPower and Powercor had the task of installing 1.2 million meters; over half this total.

It was a high risk undertaking, made harder by the new technology, tight regulatory deadlines and the high level of public scrutiny surrounding possible health and safety side-effects.

One of the major risks for CitiPower and Powercor was ensuring each smart-meter was installed in accordance with industry technical and safety standards.

Compliance with prescribed standards would ensure minimal risk to the public and the additional 250 external contractors needed to install its new smart-meters. High compliance would also help reduce project delays, rework, regulatory costs and customer complaints.

Given the high risks of poor quality, CitiPower and Powercor would have liked to inspect every smart-meter installation before it was accepted into service, but the sheer volume, not to mention the cost, of this approach was impractical. A more affordable alternative to 100% inspection was required.

DEVELOPING A SUCCESSFUL SCIENTIFIC APPROACH

Given the scale of the project, CitiPower and Powercor needed to ensure effective audit resource allocation to achieve best results for money.

Up until this time the industry standard approach was to audit a fixed percentage of all installed assets (i.e. 5%), but this non-scientific approach was not capable of providing the consistent accuracy needed to control quality levels.

In its search for a world-best-practice system CitiPower and Powercor engaged Compliance Master International (CMI), which specialises in scientific auditing and inspection systems.

At the heart of CMI's final design was a unique software-aided solution that utilised international Acceptance Sampling with Switching (ISO 2859.1) methods to accurately determine whether large individual job-lots of smart-meters, installed by CitiPower and Powercor's contractors, achieved a series of quality targets.

THE SMART RISK MONITORING AND CONTROL SOLUTION

One of the key benefits behind the selection of this solution was the defensibility of its proven scientific sampling methods; especially when it came to rejecting job-lots that failed to achieve the company's quality targets.

Another key benefit was its ability to focus the utility's limited auditing resources on its areas of highest risk-exposure; i.e. risk-based auditing.

To achieve this outcome, it was first necessary to separate internal and external installation quality requirements into three risk categories; Critical, High and Moderate. Refer to following table.

Each risk category was then assigned an Acceptance Quality Limit (AQL); i.e. Total number of allowable installation non-compliances per 100 smart-meter installations.

i) Good - no evidence previous performance was better or poorer that the prescribed AQLs.

ii) Poor - evidence previous performance is consistently poorer than the prescribed AQLs.

iii) Excellent - evidence previous compliance performance is consistently better than the prescribed AQLs.

This information was then used by the software to calculate the optimum sample-size for each audit; i.e. in general, the better the performance rating the lower the sample-size.

Over subsequent audits, a series of algorithms were used to analyse each contractor's compliance performance and, where necessary, automatically "switch" their performance rating.

This new dynamic approach to quality auditing not only ensured the utility's limited auditing resources were always focused on its two highest areas potential risk exposure; i.e. high risk quality requirements and poor contractor performance, it also eliminated the possibility of costly over and under auditing

It also provided CitiPower and Powercor management a highly objective and defensible tool for benchmarking contractor performance and enforcing quality control actions.

Example: Smart-meter Installation Requirements and Quality Targets

Job Type	Quality Requirements	Risk Category	AQL*
Smart-Meter Installation	No live metal parts	Critical	0.00
	No exposed cables	High	1.00
	Site left in tidy condition	Moderate	6.50

** Total number of allowable non-compliances per 100 smart-meter installations*

Under this system, only job-lots assessed as achieving or doing better than the specified AQLs would be "accepted" into service. All others job-lots would be "rejected" and returned to the responsible contractor for rework and eventual reinspection.

The next step involved assigning each contractor a performance ratings based on their previous compliance history.

About acceptance sampling

Acceptance sampling is a proven risk-based quality control methodology that uses statistical methods to determine whether large batches or lots of continuously produced items (products, activities, data, etc.) have exceeded one or more acceptance quality limits (AQL).

There are many types of acceptance sampling, but arguably the easiest and most popular version is Acceptance Sampling by Attributes, which is published by Standards Bodies worldwide; i.e. ISO 2859.1 AS1199.1, BS 6001:1, DIN 40080, IS2500:1, NF06-022, etc.

Acceptance Sampling can provide a highly reliable alternative to 100%; especially where;

- *Inspection is expensive*
- *Inspection is destructive*
- *Lot sizes are high*
- *Compliance history is good*
- *Non-compliance risk is high*

The biggest advantage Acceptance Sampling has over non-scientific methods is the accuracy of the audit result is known. This makes it possible for organisations to base important quality control decisions on audit outcomes with known levels of assurance.

For the first time an Acceptance Sampling based quality control system enabled CitiPower and Powercor to include a series of enforceable quality performance targets into its service provider contracts.

It also enabled a series of standard risk-based quality controls to be implemented following each audit.

OBJECTIVE QUALITY CONTROL

Possible Audit Outputs vs. Standardised Quality Controls

Audit Outputs	Standard Quality Controls
Critical (Risk Category) non-compliance identified	• Immediately reject job-lot. • Withhold payment for rejected job-lot. • Suspend contractor until full root-cause analysis carried out and cause(s) of non-compliance are identified and corrected.
One or more AQL's exceeded	• Reject job-lot and advise responsible contractor accordingly. • Withhold payment for rejected job-lot until responsible contractor undertakes rework and it successfully passes reinspection.
AQLs not exceeded but non-compliances identified	• Details of non-compliance to be forwarded to responsible contractor for evaluation, correction and reinspection

At the completion of each audit the system would analyse the "total number of non-compliances" for each risk category.

Depending on the audit outcome a series of standard quality control actions were implemented; refer to adjacent table.

This highly objective quality control approach not only aligned quality risks and their control actions, it also helped generate continuous improvement by placing the responsibility for quality delivery where it truly belonged; with the contractors.

OUTCOMES IN PRACTICE

SYSTEM EFFECTIVENESS

At the project's conclusion (31st December 2013) approximately 245 job-lots had been audited by this new "smart" quality control system.

Over this period 41 job-lots (29 per cent) were assessed as exceeding one or more of the utility's specified AQLs. These job-lots were subsequently "rejected" and returned to the responsible contractor for rework.

Interestingly, there were three clear spikes in job-lot rejections over the course of the project; refer to above graph.

Period 2 rejections were due to an influx of inexperienced meter-installers.

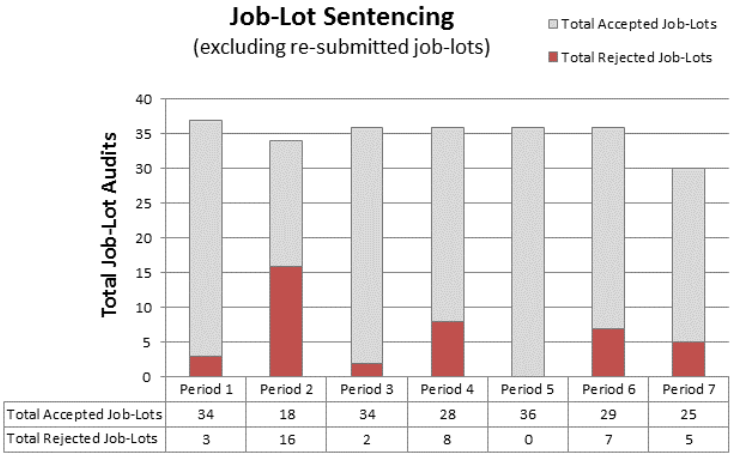
Period 4 rejections resulted from a change in compliance category for one particular quality requirement (cable tightness); i.e. Medium to Critical.

Period 6, and to a less extent Period 7 rejections were attributed to an exodus of experienced meter-installers towards the end of the project

On the basis of the above results, it is reasonable to assume that without this rigorous quality control system in place, 41 job-lots of unacceptable smart-meter installations would have been accepted into service.

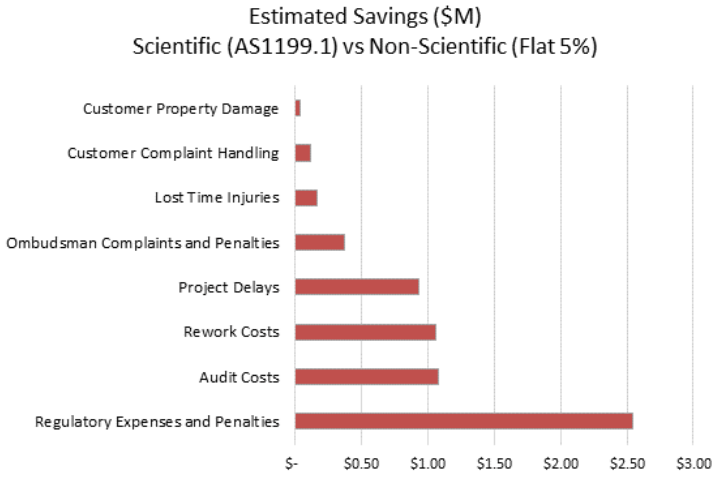
In all likelihood, without this level of effective quality control these smart-meter installations would have gone on to create major project delays and additional short and long-term costs.

As it was, these types of undesirable events were largely avoided through the system's ability to quickly identify and control unacceptable smart-meter installations before they were accepted into service.



OUTCOMES IN PRACTICE

SYSTEM EFFICIENCY



The short and long-term savings to CitiPower and Powercor of this more effective and efficient approach to quality control is estimated to be in the order of $6.0m; refer to the above graph.

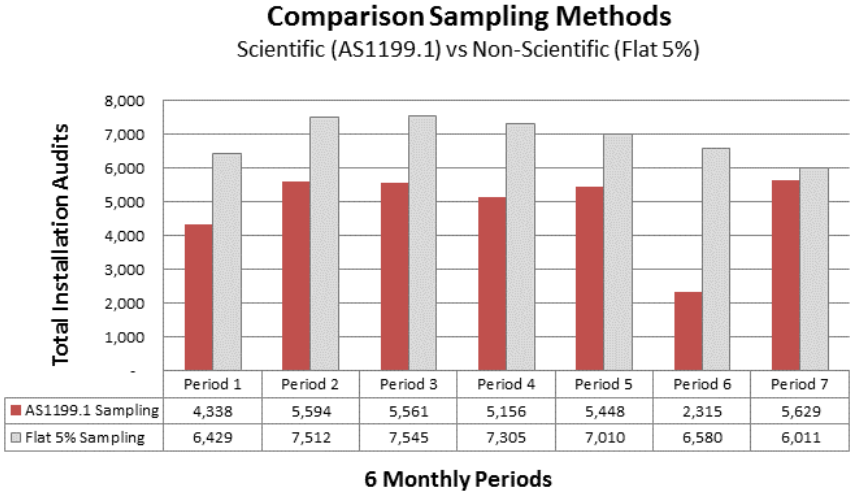
Direct and indirect savings include;

- Reduced property damage
- Fewer lost time injuries
- Fewer customer complaints
- Reduced project delays
- Reduced rework
- Reduced auditing work
- Lower regulatory costs

The basis of the $1m saving in direct auditing work is highlighted in the following graph which compares the total number of installations audited over the life of the project using compared to what would have been the case using the utility's previous fixed 5% sampling approach.

The main reason behind this reduction was the system's ability to vary sample-size requirements in line with changes to contractor's compliance performance.

Even though audit rates started off slightly higher than 5% at the start of the project, the benefits of this more efficient system were demonstrated soon after with an overall 30% reduction in total installation audits by the end of the project; i.e. 14,000 fewer installations.



Why scientific quality control makes sense

The relevance of this more rigorous approach to compliance auditing and inspection comes in demonstrating that a carefully designed system based on proven scientific sampling methods can provide much better quality control outcomes than traditional rule-of-thumb methods, and, surpassingly to many, at a much lower cost.

Previous implementations of acceptance sampling systems have required a large investment in resources and time to design suitable systems. This has largely restricted their use to larger organisations.

With the advent of computer-based systems the barriers-to-entry have been significantly lowered; especially for smaller and medium sized companies.

There are also clear financial and assurance benefits knowing your auditing system will always strike the optimum balance between your auditing costs and quality risks.

When applied to large projects and contractor quality control further productivity gains can be realised by linking improvement actions with performance incentives and penalties.

Acceptance sampling also has the advantage of making an organisation's response to unacceptable product and service quality far more efficient and less prone to variation and error.

This highly rigorous approach to quality control adds new meaning to the old adage – "what doesn't get measured, doesn't get controlled".

CITIPOWER & POWERCOR

CitiPower and Powercor Australia are two of Victoria's five privately owned electricity distribution businesses. CitiPower and Powercor Australia are owned by Cheung Kong Group and Spark Infrastructure.

CitiPower supplies electricity to more than 310,000 distribution customers in Melbourne's CBD and inner suburbs. The company's primary role is the management of its 'poles and wires' network, and proudly operates among the most reliable urban and rural electricity networks in Australia.

Powercor Australia is Victoria's largest electricity distributor, which supplies electricity to regional and rural centres in central and western Victoria, and Melbourne's outer western suburbs. Powercor services approximately 700,000 distribution customers, and operates successful non-regulated businesses.

www.powercor.com .au
www.citipower.com.au

COMPLIANCE MASTER INTERNATIONAL

Compliance Master International provides compliance assessment and control software solutions and consulting services to organisations worldwide. Its core focus is risk monitoring and auditing control system that enable organisations to more effectively manage their quality and compliance processes. The company operates internationally from its base in Melbourne, Australia.

www.compliance-master.com