The JTC's Experience In Cutting Customer's Complaints On Lift Services In Its Industrial And Office Buildings By Installing A Supervisory Control System (SCS)

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ABSTRACT

In 1994, JTC called a contract to install a Supervisory and Control System (SCS) for 68 blocks of its industrial buildings in Singapore. The system then was a state of art design based on a "open system" concept using Programmable Logic Controller (PLC) with automatic telephone dial up facility. To date, about 2650 mechanical and electrical equipment including 400 lifts in JTC's industrial and office buildings are monitored and controlled by this SCS system. The system has many unique function and features including wireless access, verification logic and fault tracking software for successful operation of the SCS system. The SCS system has since cut the numbers of complaints from JTC's customers on lift breakdowns by as much as 50%.

1. INTRODUCTION

JTC Corporation owns and operates more than 90 high-rise industrial factories and offices with a total floor area of more than 1.0 million sq. metres in Singapore. Its management function includes operation and maintenance of all the essential mechanical and electrical service like electricity and water supply, lifts, fire alarm and pumps. In the past, JTC Corporation depended on its tenants in the buildings to make a report or to complaint about breakdowns in the essential services. In this manual reporting system, the tenants were given a telephone number to call when there were services breakdowns. The person on the other line would then relay this message to the various services departments who would in turn, send maintenance crew to attend the breakdowns. This manual reporting system often aggravates the problem and gave

rise to more complaints because it was slow. Also, the system was unreliable at times, very often misused and definitely, unproductive in term of service performance.

2. PILOT PROJECT

Unsatisfied with the shortcoming of the manual reporting system, JTC Corporation started a pilot project in 1991 to explore the feasibility of installing a tele-monitoring system that could monitor the status of the operation of M&E facilities in an industrial building from JTC Corporation's headquarter at the Jurong Town Hall.

This pilot system laid the foundation for the present system which was then state of the art design based on "open system" concept using PLCs that not only saves operation cost for JTC but also improves the maintenance service level and makes our customers happy.

The current system, progressively installed since 1993 and in full operation in 1999, is not only able to perform basic monitoring functions but also able to track efficiently the response and repair time taken by the maintenance crew to rectify a breakdown.

Altogether, about 2650 mechanical and electrical equipment including 400 lifts in JTC's industrial and office buildings are monitored and controlled by this SCS system now.

3. CAPABILITIES OF SCS

The SCS system developed by JTC Corporation focuses on monitoring the operation of essential M&E facilities and services and the attendance of services breakdown by the maintenance crews. This has improved the maintenance service level of JTC Corporation. The SCS was designed to perform the following functions:

a. To monitor the operational status of the essential M&E facilities and services
b. To track and monitor the response time of maintenance crew
c. To control selected functions of M&E facilities
d. To verify, test and track the performance of M&E facilities
e. To diagnose faults to expedite decisions on repair
f. To pre-empt the occurrence of some common faults
g. To inform and receive feedback from the maintenance crew and contractors on breakdowns

4. RESULTS AND BENEFITS

The SCS system allows JTC to be notified of faults before the tenants' and customers' realized them; this improved customer satisfaction.

Comparing the Manual System, JTC found that SCS system helped to reduce the numbers of customers' complaints by as much as 50% (see Chart 1) based on figure obtained from a third-party operator managing the Essential Service Center (ESC).

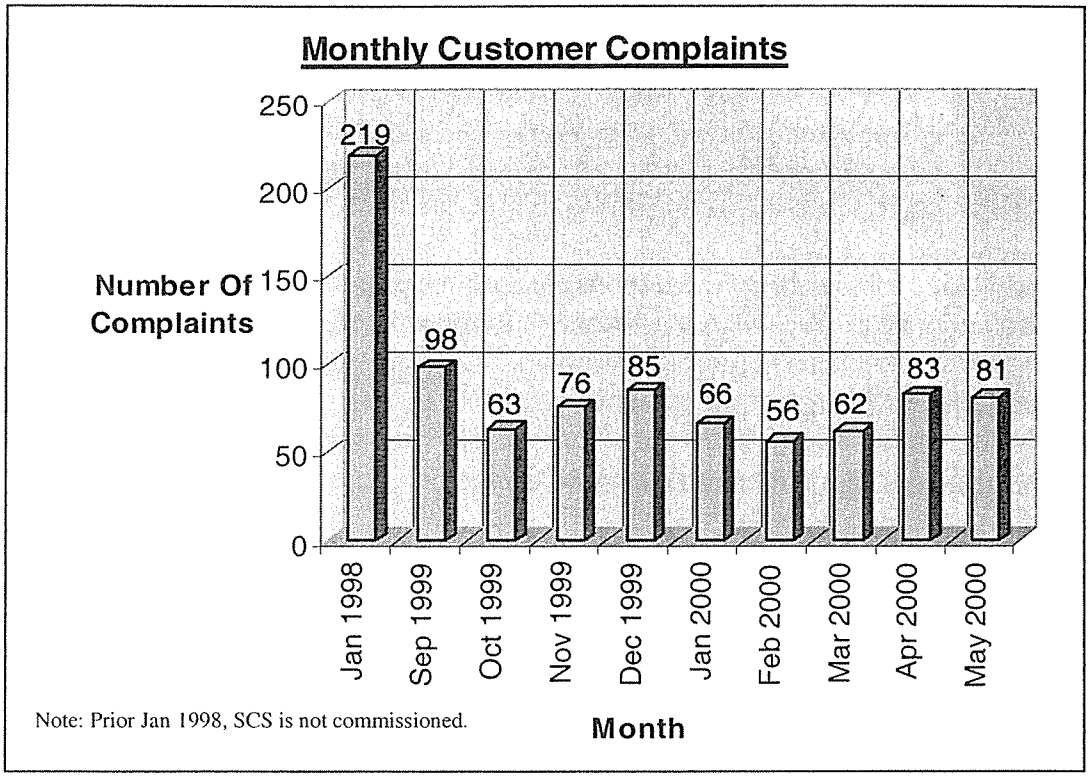

Chart 1: Monthly Customer Complaints recorded by ESC.

Also, on one occasion, we stopped the operation of the SCS system for about 12 days in order to move the Control Center from one location to another location. We recorded a 3-fold increase in the number of customers' complaints from about 2.5 to 7.5 complaints per day as shown in Chart 2.

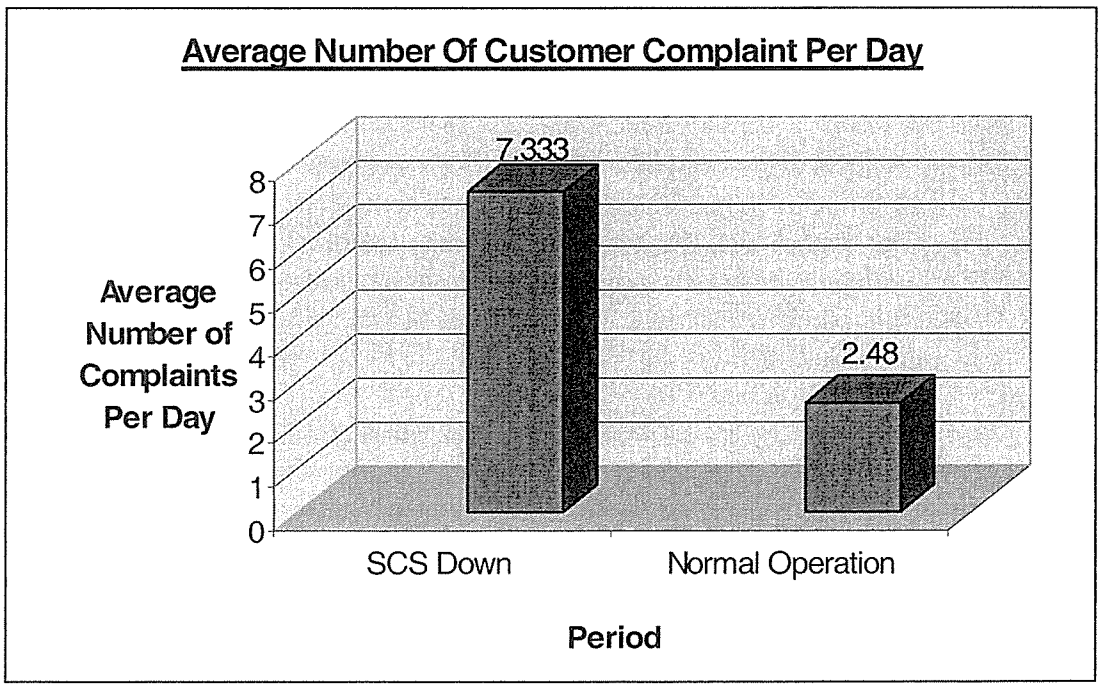

Chart 2: Average number of Customer Complaints per day when SCS was down for shifting to new Central Station.

We were convinced that SCS system reduced the number of customers' complaints and drove our customer satisfaction index to a new echelon.

5. EXPERIENCE IN BUILDING THE TURN-KEY SCS SYSTEM

We would like to share three key lessons that we have learned when we designed and built the SCS system. These three lessons are in the area of:

- Open Concept Design
- Expectation of Staff / Management of Contractor
- Staff Training

5.1 Open concept design

Before calling the tender to build the present SCS system, JTC tried out a small system that made use of remote terminal units (RTUs) for the local units in the factories. Such RTU set-up was used by many establishments in Singapore in the 80s and early 90s. The teams after some trial runs did not follow up to implement that system for island-wide implementation because the team found that such system had many limitations. It was not flexible. It cost a lot when we asked the vendor to change something. We decided to go and find the next better system.

In 1994, JTC proceeded to call the present system that used PLCs for the local units as well as the concentrator units that communicate with the central processors and the local units. This open system, never used for Tele-monitoring application in Singapore, was considered the state of art at that time.

Many people thought it was extravagant to use PLCs because it was a more expensive option but it turned out to be a blessing when we recently expand the present system to cover the monitoring of an additional of 20 industrial blocks. We found that we were able to call a public tender for the expansion work and were surprised to find 5 tenderers responded some with lower bids than the vendor who supplied and built the original system.

We believe the cost saving we get through competitive bidding tender exercise has already offset the additional cost we have invested in the more expensive option.

Lesson Learnt: - The team learned that it would always pay to go for an open system eventhough the open system may be an expensive option in today's platform. Open system will allow the owner more flexibility and save installation cost when it comes to expanding the system to cover more areas in the future.

5.2 Expectation of staff / Management of contractor

The tender was called with an expectation that the Contractor was able to complete the entire project within a period of forty months and the project was divided into 3 phases. Phase 1 was a test for the Contractor involving installation work for 2 blocks of factory; phase 2 would start after the Contractor had successfully completed phase 1 and so on.

The teams (JTC's and the Contractor's team) met construction problem when they were completing the phase 1 work. Many site works could not complete in time either because there was lack of proper understanding between the various working parties or the site was not ready for installation because the teams could not get permission to shut down services to retrofit the sensors etc.

As the work proceeded, the teams found also implementation and design problems. First, the teams found the response time of the system not acceptable; the system took more than 60 seconds to get a response with the remote station; after that, the teams found the system generating a lot of false calls and unidentified calls when the teams compared the recorded calls against the actual calls. Users began to loose confidence in using the system. Working pressure was mounting at times where JTC's supervising staff and the Contractor's technical staff were arguing and pointing fingers at each other. The high attrition rate of technical staff in JTC and the Contractor's firm further aggravated the situation. Our record showed that a total of 8 project managers had changed hands during the entire project. The teams found co-ordination problems whenever a project manager left because there were no proper handing over procedures administered.

At around the time when we called the tender, there was an emphasis to use information technology for our projects; as a result, we incorporated in our tender the installation of some non-essential but good to have items such as the remote control electronic messaging system to inform tenants about status of the maintenance work, remote camera surveillance system and other fancy stuffs. There were problems for the Contractor to deliver these work satisfactorily because these work, being not an essential part of work, were left to be carried out almost at the end of the contract. By then, technology had changed and it was found not cost effective to carry out using the original technology specified in the contract; as a result, some of these work had to be deducted from the contract at the end of the project with some displeasure and emotional feelings between JTC's and the Contractor's staff.

Lesson learnt: - The teams learned that it would pay to specify that the Contractor shall carry out the work according to an industry standard like ISO 9000. Work shall be documented properly so that they can be handed over from one Project Manager to the next smoothly.

The teams also learned that it would not pay to specify non-essential and good to have items in the contract. Should this be specified for some reason, it would be good to have the work executed before new technology takes over and make items obsolete for implementation.

5.3 Staff Training

For JTC to be fully self-sustained, we have called for a comprehensive training package to train our staff in the tender. This would allow our staff to operate and maintain the SCS system without relying too much on the contractor.

However, for some reasons, we did not have a proper set up for the maintenance and operation of the SCS system even after we had completed the SCS system. We relied on existing maintenance staff to fill up the gap while we fine-tuned the working of the SCS system. We were of the view that we were in no hurry to get special group of people because we specified that during the defect liability period, the Contractor would be responsible for the maintenance and operation work.

This working arrangement had some far-reaching implications as we proceeded to train our staff. We found that our existing maintenance staff who were nominated and sent for the training was not properly equipped with the basic pre-requisites. Many of them went through the training course because their managers enrolled them. It did not appear to them that they would have to operate the system after the training. Most of them took the training as a good to know thing. As a result, they did not pick up the required necessary skills.

When this group of maintenance staff were put to operate the system after the end of the defect liability period, we found that we faced operational problems. Site installations were not properly maintained and often misused. We even faced problem performing simple function like backing up data from the SCS Data Bank System. We ended up paying a premium always whenever there is an operational or maintenance problem. .

Lessons Learnt: - The team realised that we should not be too complacent in carrying out our work, thinking that we could rely on existing maintenance team to fill the gap of manpower problems. Having a proper and special operation and maintenance team is important for successful operation of the SCS system. This team should come on board as soon as possible; preferably, at the beginning of the project. This will enable them to pick up the system design and hand-on knowledge. We can thus save a lot premium charged by the Contractor. The right people must be chosen for the training. A test at the end of the training must be conducted. A certification by contractor for qualified participants must be given out also. This is to ensure that the training is fruitful and the staff is capable of operating and maintaining the system. Maintenance procedures, expectation and results should be clearly spelled out in the original tender.

6. IMPROVEMENT IN LIFT BREAKDOWN RATE

For the period between 1998 and 2001 and after the successful implementation of the SCS in 1999, we recorded that the overall technical lift breakdown rate for the 450 lifts in JTC's industrial building has improved from **0.23** per lift per month in 1998 to

0.13 per lift per month in 2000. The breakdown figures between the period reviewed is as shown in the following figure (chart 3):

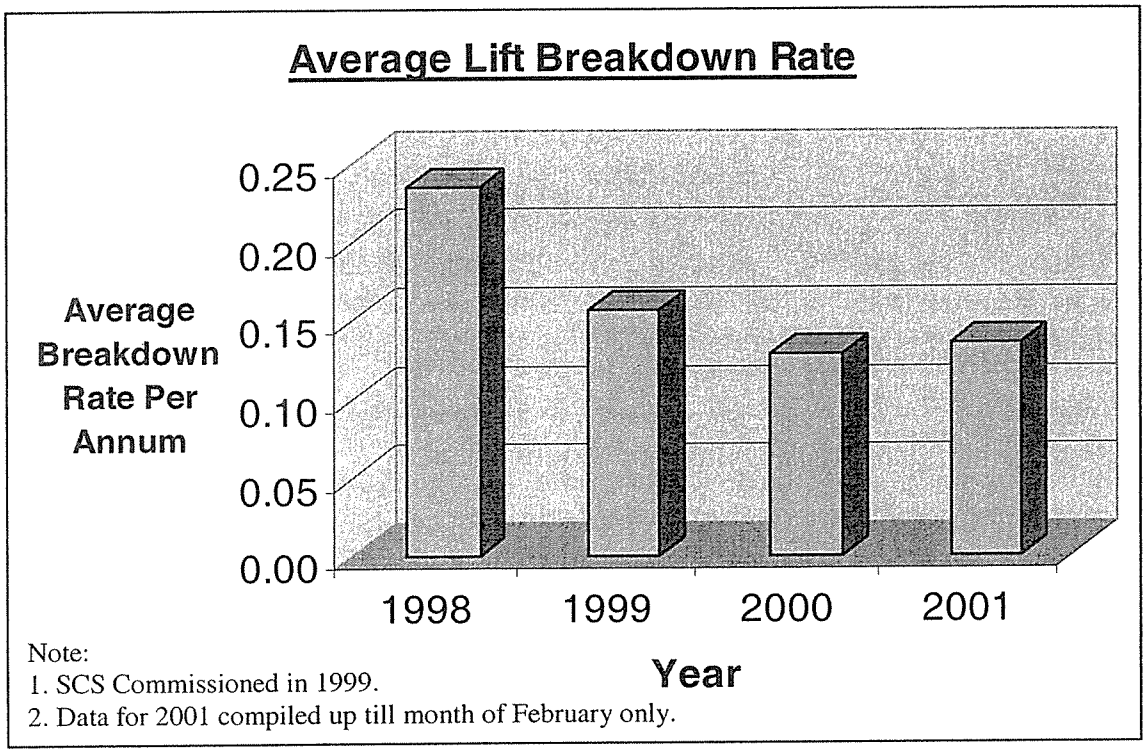

Chart 3: Average lift breakdown rate for approximately 400 Lifts operated by JTC.

The improvement in the lift breakdown rate in JTC's lifts cannot be all credited to the use of the SCS system because between the period reviewed, JTC replaced 200 lifts, which did not perform up the required standard. Also, there was always demand for lift companies to perform better every year.

Nonetheless, we were of the view that the use of SCS contributed also to the reduction of lift breakdown rate. This is because the JTC's maintenance team had used SCS system to:

a) Supply lift breakdown information readily on-line thus enabling the team to come to decision quickly as to which lift they should replace,

b) Provide data to analyse lift breakdown details so that corrective actions could be taken quickly to minimise similar faults repeated many times before a proper repair could be taken. Repeated faults were found to be common for certain brands of lifts.

c) Monitor lift performance as well as technician's work so that maintenance supervisors can better and effectively make use of limited manpower and resources and pay more attention to servicing those problematic lifts so as to reduce lift breakdown rate.

7. DISCUSSION AND FUTURE OUTLOOK

Our SCS is designed based on the Open Systems concept and we have demonstrated in our recent tender that we were not tied down by the vendor who designed, supplied and installed the system. Also, software developed under open systems is usually well structured to facilitate maintenance. They can also be upgraded and integrated easily.

Since our SCS system uses ordinary public telephone lines, it can be used not only within Singapore but also outside Singapore as long as there is a touch-tone public telephone lines available for communication. Presently for our SCS system, we can remotely monitor and control any M&E equipment anywhere in the World by installing just a PLC in any building.

We always view our SCS system as an effective tool we can use in many applications and works in our industrial operation and development.

Currently, we are investigating to use SCS as a tool in the following projects: -

a. Lift Traffic Study
b. Lift Breakdown Pre-empting
c. Automated Toilet Monitoring and Maintenance
d. Licensing and testing Electrical Installation

8. CONCLUSION

JTC has successfully completed the installation of a SCS system that can help JTC to monitor 2650 essential M&E equipment including 400 lifts in all its industrial buildings in Singapore.

The SCS system helped JTC cut the numbers of complaints from JTC's customers on lift breakdowns by as much as 50%.

This paper shared the results and some of the experiences that we have gone through in implementing the SCS system.

Biographical details

Tan Sing Ong is presently the Director of Engineering Planning Group in JTC; Before that, Mr. Tan was heading the Mechanical and Electrical Department which was responsible for the design and installation of the mechanical and electrical equipment in JTC's industrial and business park development. Mr. Tan was also a Director of JTCI (Singapore) Pte Ltd, which had carried out many engineering consultancy works in Singapore and abroad. Mr. Tan graduated from Auckland University of New Zealand with an honors and master degree in electrical engineering. He worked in HDB before he joined JTC in 1977. He also worked in private sectors in Kuala Lumpur. He has about 30 years of engineering working experience.

Pang Yee Ean has about 7 years' of working experience. He started his career as an Electrical Engineer in M&E department of JTC and then a Manger in charge of service planning in JTC's Customer Service Group. Now he has a special appointment and is responsible for the setting up the first multi-million dollar Internet portal in JTC to serve JTC's customers. Mr. Pang was awarded a scholarship by JTC and obtained a degree in Electrical & Electronic Engineering. He has also a MBA from National University of Singapore.

Johnson Tan Hock Hai started his engineering career in JTC in 1999. One of his first jobs in JTC was to assist the M&E department to take over, complete and commission the Supervisory Control System. He was later assigned to be the Project Manager for the project. He is currently the Consultant for the JTC Property Support Group on R&D projects relating to Building Automation and Facilities Management. Mr. Johnson has a diploma in Electronic and Computer Engineering and an honors degree in Electrical Engineering from Nanyang Technological University of Singapore.