

## FEATURE

# Tour de force

A sudden breakdown of the Eiffel Tower's lifts, electricity or plumbing systems would severely dent its takings. But a maintenance management system helps keep it up and running

**Rhys Lewis**

Few buildings represent a city, and indeed an entire country, as the Eiffel Tower denotes Paris and France. As the most visited attraction in the most visited city in the world, the iconic 324-metre structure is used as a symbol for the nation from guidebooks to Olympic bids, and no Hollywood movie based in Paris is complete without a view of the Tower from a garret window.

With 19,000 tourists eager to ascend the Tower every day of the year, it's vital to the city's reputation, as well as to its coffers, that the 120-year old edifice is always open for business. An electrical fire in July 2003 made headlines worldwide, and although it was brought under control within half an hour and there were no injuries, la Société d'Exploitation de la Tour Eiffel (SETE), the company that manages the Tower, is doing all it can to avoid a repeat of the incident.

## High stakes

Of the 18,000 mechanical parts and 10,000 tonnes of metal that make up the Tower, by far the most important are the four lifts that carry visitors from the pillars of the Tower up to the second floor, and the two elevators that take tourists from the second tier up to the third level.

With 19th century foresight, engineer Gustave Eiffel included four lifts so that even if three were out of order, tourists would still be able to ascend the Tower and enjoy the view over Paris. But with the west pillar's elevator being renovated, at least two of the three lifts must be operational to meet the Tower's incredible demand. Admissions alone brought in €50.9m in 2007, and it's clear that the elevators – four electric, two hydraulic and all using essen-



A 15-month painting project, involving 60 tonnes of paint and 25 workers, is all logged in the CMMS

tially the same designs as the 1889 originals – are vital to SETE's operations.

"The lifts are the cash register for the Tower. Gustave Eiffel knew this, and if we had no lifts we'd have only 10 per cent of the visitors. But they do need maintenance," says Yves Camaret, technical director of SETE.

"As soon as there's a lift breakdown, we start losing money. There's pressure from management and there's a loss of prestige for the Tower, for Paris and for France if visitors have to queue for two hours."

Prevention being better than cure, SETE tendered for a computerised maintenance management system (CMMS) and chose CARL Master from Lyon-based CARL Software. The aim of the installation was to log replacement parts, optimise stock supply, analyse breakdowns to schedule preventative maintenance, manage maintenance contracts and give the Tower's employees the ability to report faults as quickly as possible to speed up resolution.

The first task was to put the Tower's replacement parts stock in order, and convert the disparate Excel files that listed stock inventory into an orderly database. The fact that the stock was distributed around 44 stockrooms on and around the Tower, all broken down by the type of equipment they housed, was the first problem, and putting it all on order was key to starting work on the CMMS back-end. CARL and SETE engineers first had to work out how to assign a code for each piece of inventory, before matching up each piece with whichever of the Tower's 250 parts and service suppliers was responsible for it. This process also involved a major physical clean-up of the Tower's stockrooms.

Once the stock was organised, from April 2006, all maintenance and purchasing was recorded in CARL Master in order to seed the system with valuable data – ultimately, the CMMS is designed to track which components are being replaced most often and balance the price and the physical size of these parts to keep costs down and use storage space more efficiently.

All tasks were logged, from the changing of a lightbulb (no small task when you consider that 100 different types of lamp are required for various applications) to the unblocking of drains (a common chore thanks to the pickpockets who dump emptied stolen wallets into the toilets), and the amount of time it took to fix any failures was recorded. Tasks that took longer and that had the most impact on the operations of the Tower were given higher priority.

The tower also has to meet strict safety standards, although as it has only three floors, not those usually associated with high buildings. Its 800 heat sensors and sprinkler systems were linked to CARL Master, as were the 100 security cameras, 500

fuse boxes and the anti-flooding systems in the basements of the four pillars – with each pillar housing independent electricity subsystems, a flood could put a lift out of commission for months at a time.

The switch from recording maintenance in log-books to using the CMMS brings all this information together. Not only can CARL Master alert the appropriate engineers when maintenance is due or new components need to be placed on order, it can also produce a report detailing all essential maintenance for SETE management and external health and safety authorities, in a format that they require.

## Shared resource

In September 2007 the CARL Master interface was opened up to staff, so that any of the Tower's 68 workers can make a maintenance request direct from their PC.

"We took a good look at user screens and adapted the system to their needs and their particular vocabulary," says Jérôme Plisson, sales engineer at CARL Software.

Once a request is submitted, CARL Master routes it to the specific maintenance service, be it one of the 50 in-house technicians, or one of the external service providers such as Otis, which manages the top-floor lifts, computing managers SDEL Imtec or the contractors who manage the heating and air conditioning in the first floor's restaurants and conference centres.

As well as training staff in the use of the system, SETE had to convince the notoriously powerful French trade unions that the installation would benefit employees.

"Implementation wasn't easy – the technicians felt threatened by the systems but we did enough communications with the employees and their unions to explain how the systems would improve matters. But it did take time," admits Jacques Barrière, head of electricity systems at SETE.

The benefits of CARL Master are becoming clear as the ratio of cost-efficient preventative maintenance to time-sensitive remedial maintenance continues to rise.

"Before we started on this project, we had no idea what the preventative-to-remedial ratio was," says Barrière. "It's now 45:55 in favour of remedial repair, but our aim is to have as much preventative maintenance as possible."

For the lifts, the ratio is much higher, with 95 per cent of the maintenance work on the top-floor lifts being the preventative

kind, and all five currently operational lifts enjoying 99.1 per cent availability.

CARL Master is also helping to increase the amount of predictive maintenance performed on the Tower. By logging how often a critical component is changed, the system can prevent sudden breakdown by prompting technicians to change an item before it breaks.

"If you know something will last 3000 hours," says Camaret, "you change it after 2500. Yes, it means you have to buy the new part more often, but the effect on our operations of that part breaking down suddenly would make it much more costly."

As of July 2009, the CMMS is optimising maintenance schedules and fully managing resources. The current painting project, for instance, is being wholly managed by the system. The tower is repainted with 60 tonnes of paint every seven years. A workforce of 25 painters takes around 15 months to complete the job, secured by 50km of lifelines and using 1500 brushes. All these details are fed into the CMMS, which in turn ensures that a minimum of manpower and paint is wasted, and that the job is completed to the highest security standards using well-maintained safety equipment.

Such work guarantees the future of the Tower, which was only supposed to stand for 20 years until the advent of radio communications meant that its role as a giant aerial made it a vital part of Paris's infrastructure.

The future of CARL's association with the Tower also seems secure. The company's latest product, CARL Source, is a browser-based solution that is easier to customise in-house. A migration from CARL Master is a medium-term possibility for SETE, although Barrière is reluctant to upgrade for the sake of it. "We don't want to upset the technicians if it's not necessary," he says,

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and as the software will be supported until 2018, that seems a sound policy.

"We are now at a good working pace with CARL Master, and we are looking at scheduling tasks using Microsoft Project."

As for CARL Software, which produces versions of Source for factory facilities, healthcare bodies and transport corporations as well as the property management edition that SETE uses, and has customers that include the New York City subway, L'Oreal, France Telecom and the Eiffel Company's latest landmark, the 343-metre-high Millau Viaduct, working with SETE was – prestige apart – just another project.

"To us the Tower is just another building with lighting, electricity, water and public visitors," says CARL's Plisson.

"But it is open all year round, and that's why maintenance management is so important." ●

