Robotic Parking Systems Facilitates Eco-Friendly Parking with GE Digital's HMI/SCADA Solution

Matching the theme of GE's a commitment to invest in innovative solutions to solve environmental challenges, Robotic Parking Systems Inc., has developed automated car parking facilities that double the storage capacity of a conventional multi-story car park. CIMPLICITY, part of the HMI/SCADA suite from GE Digital, is used to provide overall control and monitoring of the automated parking process.

Per car park space, the automated parking and retrieval systems typically offer savings of between 30% and 40% in terms of development costs, and savings of between 30% and 40% in running costs due to the savings in volume of over 50%.

A recent example of Robotic Parking Systems design is a 765 car free-standing system in Dubai, United Arab Emirates, next to the Ibn Battuta shopping mall. The garage serves the adjacent shops, as well as an office complex and a hotel. With a footprint of 76m x 30m, the car park has seven levels which take up just 18m in height. A second planned installation in Dubai comprises a 1,200 capacity underground car park below two tower blocks in the financial center. The 1,200 spaces are located within a 92m x 36m footprint on nine levels within a depth of 22m.

"With the control and monitoring software, the PLCs and servo systems all coming from one source, GE Digital Platforms, this one-stop-shop offers many advantages."

Constantin Haag, COO, Robotic Parking Systems, Inc.
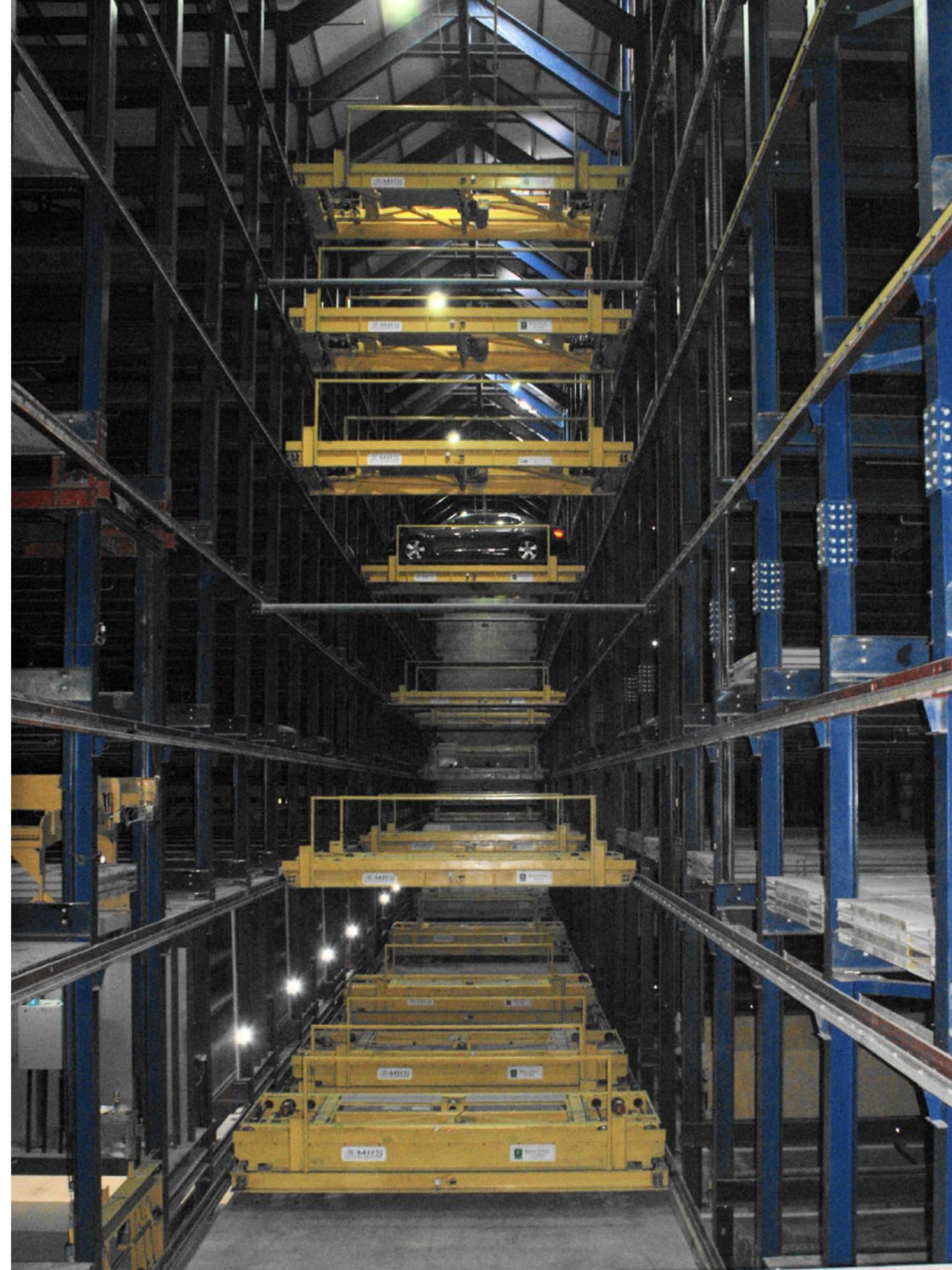
Quick and easy

For the driver, the parking of the vehicle is simple. The driver simply drives onto a pallet at the ground floor entrance of the facility and leaves the vehicle just as if it were being parked by a valet. The driver swipes a card and the automated system does the rest. The door closes, the pallet is transported under computer control via various horizontal and vertical conveyors and lifts until the car is parked in a permanent position.

When returning to the ground floor exit at the Ibn Battuta car park, the driver first stops at a kiosk and follows simple instructions before swiping the card again. The system informs the car owner on flatbed screens which gate to go to for the car. Retrieval by the system takes approximately 1 to 2.5 minutes on average, with the car then ready to drive away.

The automated parking systems designed by Robotic Parking Systems offer complete flexibility in design. They may be incorporated above ground or underground, inside a building, under a building, or even at the top of a building. The façade can match that of the surrounding buildings. There are no ramps, no high ceilings, and no space either side of the car for occupants to exit, therefore generating a large savings in space.

The best applications of the technology are in areas with limited space, expensive land, or high demand for parking. This would include urban sites, office and commercial buildings, retail and entertainment sites, hotels and residential development projects, hospitals, airports, and more. Irregular shaped ground sites can be developed as well.

Eco-friendly

The Robotic Parking Systems offer eco-friendly advantages during operation on a number of fronts. For example, the production of pollutants to manipulate a car into a space in a conventional multi-story car park is completely avoided.

As well as maximizing parking capacity, the park operator achieves considerable savings in terms of operating costs. A parking unit is typically operated by one operator. Lighting and ventilation requirements are minimized, maintenance and cleaning of a typical concrete infrastructure is eliminated, and insurance claims are drastically reduced. In all, operating savings of between 30% and 40% are typical.

For certification that a building is environmentally responsible and profitable under the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, the Robotic Parking Systems design already qualifies the new parking facility for up to 16 points out of the 35 needed to achieve certification.
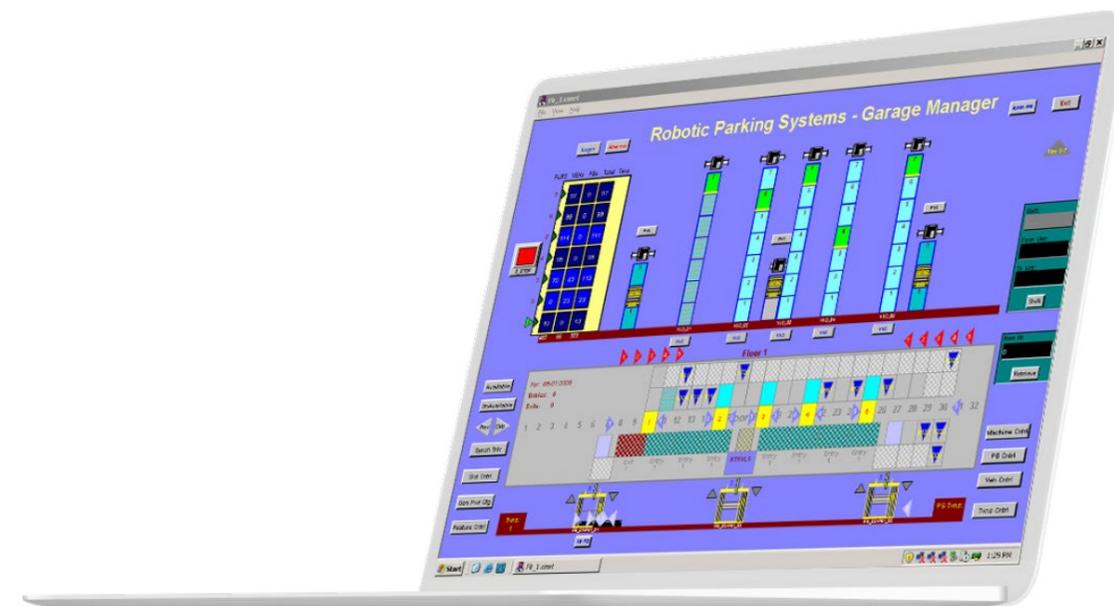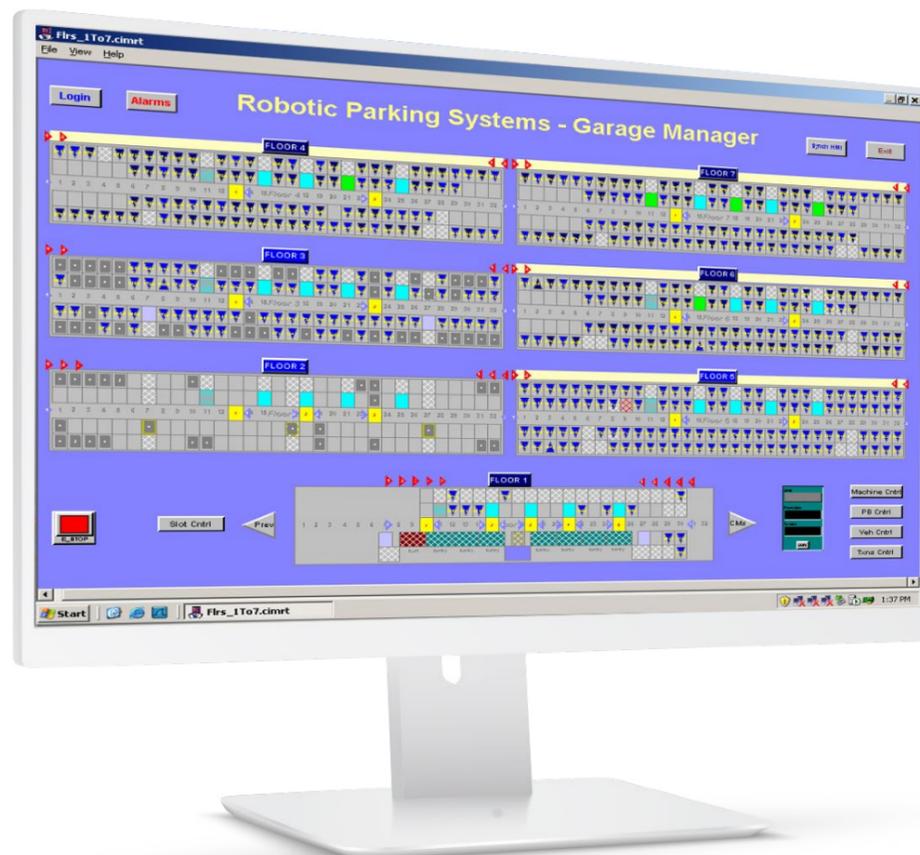
System operation

The Robotic Automated Parking Software (RAPS) system developed by Robotic Parking Systems is an intelligent process control system that optimizes the operation of the garage by constantly monitoring and intelligently controlling every aspect of the operation.

The operator in the main control room can access the system with an HMI screen, which is connected by an Ethernet link to the main server running CIMPLICITY software.

This server monitors and controls the whole system using GE 90–30 PLCs to interface with GE servo systems which maneuver the parking pallets that convey each car to and from its automatically allocated parking position. The Ibn Battuta installation comprises 60 PLCs with approximately 35,000 points of control.

GE servo motors move the vehicles at speeds up to 2 meters per second, positioning them with 1 to 3 mm accuracy. Since most of the driving servo motors actually move considerable distances with the pallets, conveyors and lifts, RF communications are used between the PLCs and its motors rather than cables. In real-time, RAPS tracks the status of all the equipment and can notify personnel of alarm conditions via the main control monitor or via a pager. The control room operator can drill down through HMI screens to resolve the issue.

Gerhard Haag, founder and President of Robotic Parking Systems, commented, "We have had excellent support from GE right from our start up. In the RAPS system, there are around 50 different HMI screens which proved easy to develop in CIMPLICITY."

Preventative maintenance

Every component in the automated infrastructure is monitored and recorded by CIMPLICITY for maintenance purposes. When certain thresholds of usage are approached, the need for maintenance or replacement is flagged on a separate preventative maintenance HMI screen so that the work can be planned and carried out before problems arise.

Data is continuously archived, including CCTV images of all cars entering and exiting the facility. CIMPLICITY captures data that can be accessed via a LAN or Internet link using a browser. Built-in security ensures that only authorized personnel can query the system. Data is also exported to the Building Management System to provide information, such as the number of vehicles in the building and the processing of credit cards. A historical data analyzer can access historical data and provide trending and graphical reports.

To ensure maximum system availability, extensive control and monitoring equipment redundancy is built-in, including duplication of servers, HMIs, and PLCs on separate networks. The computers will switch over automatically in the event of a fault, and an emergency stand-by power generator will take over in the event of a power outage. Should there be a catastrophic failure of the computer system, there is a manual override facility. The servo systems that move the pallets also work in pairs, with one system capable of driving the whole load in th event that one fails.

Benefits

- Storage capacity doubled
- Vehicles are moved at speeds up to 2 meters per second and positioned with 1 mm accuracy
- Development costs reduced by up to 40%
- Operating costs reduced by up to 40%
- Extensive in-built redundancy
- Flexible above or below ground location
- Up to 16 points towards LEED certification
- System access via the web

Safety and flexibility

The system also offers high levels of security and safety. Personal safety issues inside a conventional multi-story park, including traffic accidents and threats such as robbery, are avoided since the driver and passengers never enter the building. Automated parking also avoids theft of belongings from within the vehicle as well as chips and scratches that might be caused by other car users in the confined space of a conventional garage.

Robotic Parking Systems operate a full turnkey operation. Each new installation is manufactured and installed by Robotic Parking Systems. The internal infrastructure of pallets, lifts, and carriers is produced by the parent company, Robotic Parking Systems Inc., in Florida, and shipped to the site. For the Dubai car park, the local establishment, Robotic Systems FZE—Dubai, designed the local components and subcontracted the 'skin' and installed and commissioned the infrastructure.

Haag added, "With the control and monitoring software, the PLCs and servo systems all coming from one source, GE Digital, this one-stop-shop offers many advantages. Also GE Digital's GlobalCare Service reassures customers of spare parts and service availability anywhere in the world."

About GE

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