Second-generation product development

- Electronic queuing device for theme parks
- Designed to withstand extreme abuse
- Backwards compatibility with other system hardware
- Reduced component count
- Evolved product aesthetics
- FEA used to develop casework
- Resin cast prototypes from Viper SLA masters
- Test programme to check performance against specification
- Liaison with the client and suppliers to ensure a smooth transition into production

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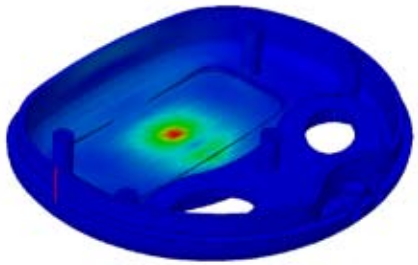

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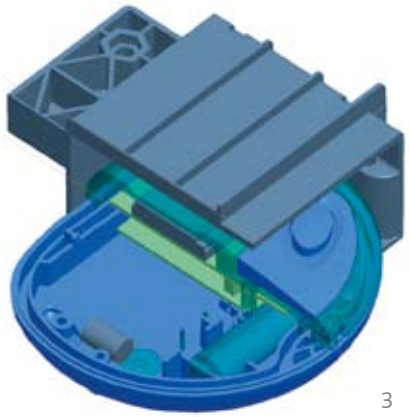

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DCA's client manufactures and markets Q-bot, an innovative product that allows theme park customers to queue electronically. The advantage of the system is that you no longer have to experience the frustration of standing in long queues for busy rides. The system uses infrared communication between the Q-bot and the ride control point and also radio communication to inform a customer when it is time to report to the pre-booked ride. The system generates revenue by charging visitors to the theme park a daily rental for the use of the service.

The original product, whilst successful in many respects, was not proving to be durable enough – it experienced failures due to impact and water ingress. In everyday use Q-bots are not treated with respect; they are dropped from roller coasters, knocked against walls, immersed in water and, if in the hands of children, are often used as if they are conkers. DCA were tasked with designing a much more durable and water resistant product based around the existing electronic componentry, battery charging pods and visual identity.

Before the project began in earnest, DCA and Lo-Q agreed on a demanding specification for the second-generation product, which included a requirement for a drop performance of 2m onto concrete and immersion in water up to 3m deep. Initial ideas focussed on reducing the number of parts and producing an efficient and cost effective method of sealing the casework whilst allowing virtually all components to be replaceable in the event of failure. With the aid of COSMOS finite element analysis, DCA designed the mouldings to withstand severe impacts and protect the internal componentry from equally severe shock loads. Materials were also carefully selected and tested; a specific grade of polycarbonate was the final choice. DCA also sourced a supplier for the elastomer keypad, which is designed to be manufactured in one piece with a self-adhesive watertight sealing face.

Aesthetically, DCA kept to the original form but updated it with the use of translucent materials and two shot moulding technology to apply, cost effectively, Lo-Q's colours and to provide improved tactile qualities.

Having first CAD modelled all the parts in SolidWorks, DCA then produced fully functional prototypes. The case halves and keypad were resin vacuum cast in materials with properties similar to the production intent materials. An agreed test programme was then implemented, the results of which proved that the performance comfortably exceeded the specification requirements; the prototypes remained watertight to a depth of 4m and survived repeated drops from 3.5m on to concrete without suffering structural failure. The test results gave both DCA and Lo-Q the confidence to proceed to production.

Production tooling was carried out in the USA and DCA liaised with the supplier and Lo-Q throughout the tooling phase to ensure that minor modifications and tooling errors were corrected and the need for design refinements identified and implemented before the start of volume manufacture.

"DCA was tasked with redesigning the Q-bot case to withstand the majority of this abuse, whilst preserving the form factor of the case. With the aid of FEA and physical testing of the prototypes, DCA produced a design that achieved these requirements. The ruggedized Q-bots are now in use in a number of theme parks in the USA."
Chris Butler, Senior Design Engineer, Lo-Q plc

1. Typical damage to the original product
2. FEA study
3. New Q-bot in the existing battery charging pod
4. Resin cast prototype part