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# Magic Roundabouts

*Roundabouts have come a long way since the early days of simple traffic circles. Highways Magazine talks to Milton Carrasco, president and CEO of Transportation Software specialists Transoft Solutions about the latest developments.*

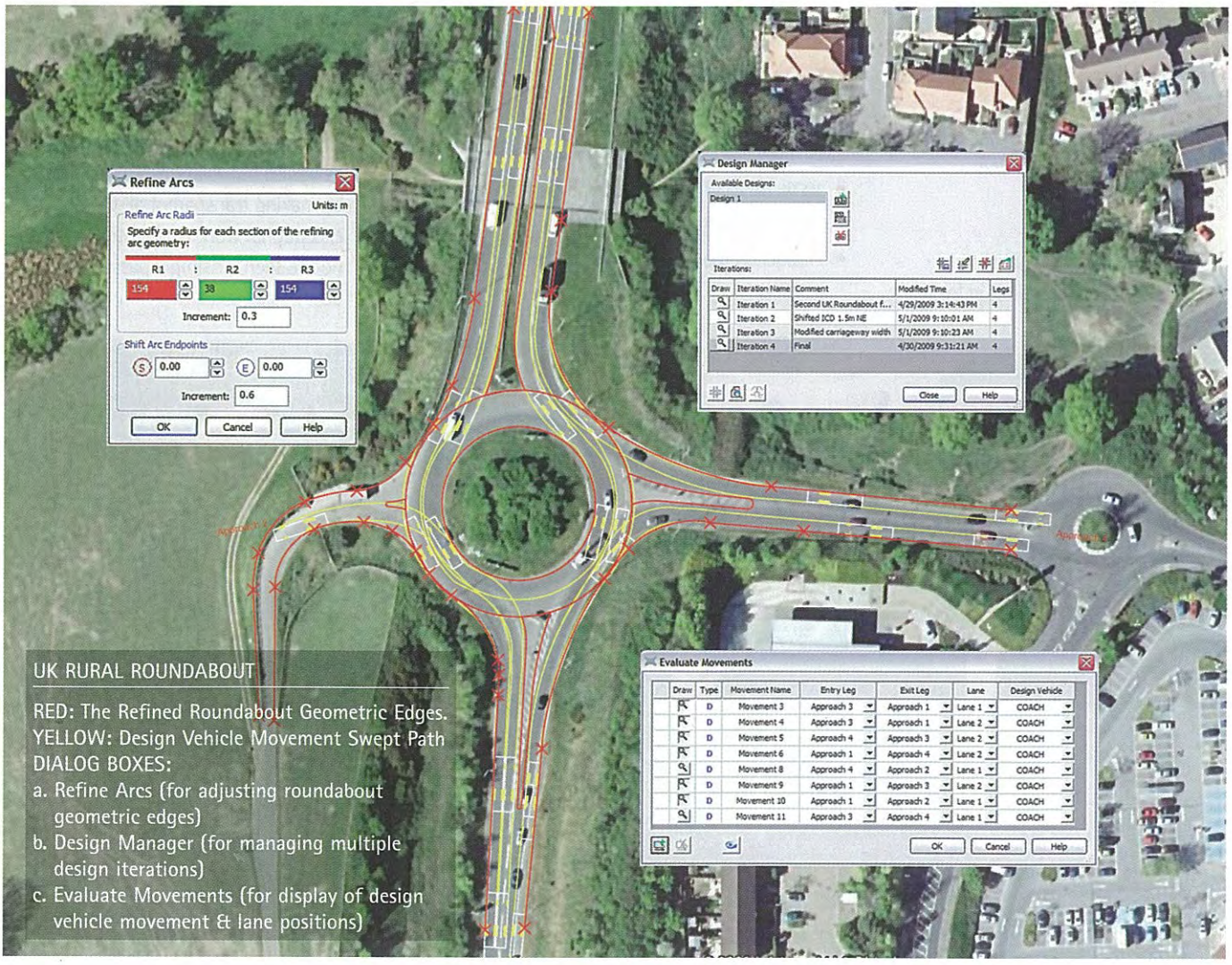
**"That compares a modern PC with the ENIAC computer from 1946," says Carrasco as he talks about the operational performance of modern, well- designed roundabouts to that of early traffic circles. "However, the emphasis is most certainly on good design and roundabout designers are the current victims of that success."**

Carrasco's expert team of civil engineers and computer scientists is launching TORUS software, claiming it as a revolutionary approach to roundabout design. "Transportation engineers demand a more holistic and dynamic solution," notes Carrasco.

"Our leadership position with AutoTURN Vehicle Simulation gives us the ideal platform. TORUS unlocks the latent potential for improved design. It is the result of over six man years of development."

Drivers either love or hate them. Well-designed roundabouts have proven a very public friendly (albeit retrospectively), planning flexible and strategically effective tool in the highway planner's armoury.

Significant improvements in road safety, traffic management and environmental issues are well documented. Clearly not a panacea to all highway intersection situations,




UK RURAL ROUNDABOUT

RED: The Refined Roundabout Geometric Edges.
YELLOW: Design Vehicle Movement Swept Path
DIALOG BOXES:
a. Refine Arcs (for adjusting roundabout geometric edges)
b. Design Manager (for managing multiple design iterations)
c. Evaluate Movements (for display of design vehicle movement & lane positions)

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their success has built a surge of momentum and anticipation for increased usage, on an international scale.

But success breeds pressure. Pressure on highways planners everywhere, not only for more, but also, better performing, roundabout designs. Productivity in the design process, and performance in operation, are the state of the art issues in the expanding world of roundabout design.

Expectations are very high and the task daunting. Facing no shortage of official standard construction specifications, mounting experience, accumulated expertise and dedicated technical specialisation, all backed by a host of individual computational software tools, roundabout planners are expected to deliver the very highest quality solutions, first time, and against demanding timescales.

Carrasco says: "The actual process of roundabout design is under the microscope. Performance quality remains the up-front objective but design cost effectiveness and productivity are very real backroom issues."

Roundabout design is very complex, individual case specific, multi faceted and time consuming. It combines the full spectrum of civil and traffic engineering CAD documentation, data management and computation. Critically important is the delicate balance of the relationships between, and within, these elements.

Surprisingly, for this PC age, many crucial areas are still covered manually. Refinements of designs running into dozens of iterations are inherent, each minor change carrying with it the potential for major impact. No small wonder that key influences, such as individual vehicle characteristics, are often generalised to help manage the load. Under-specification and over-specification are the classic dangers, but design time and cost weigh heavily.

Traffic analysis software aids such as Aracady, Rodel, Sidra and Kreisel have been available for many years and focus on specific tasks. Software dedicated to the holistic and dynamic management of roundabout design and addressing both design enhancement and design productivity, is new.

Transoft's TORUS module is underpinned by their widely acclaimed Transoft AutoTURN vehicle simulation software featuring a comprehensive Standard Design Vehicle Library. "Accurate information on design vehicle swept path movement, potential speed, sight-lines etc., is fundamental to enhancing roundabout design," confirms Carrasco, "from the very start of the design process, it must be placed in full context with other design elements and objectives. Often it is introduced at a late stage, invalidating designs and forcing costly, time consuming re-work."

Transoft's TORUS allows the transportation engineer to consider in a single step the aspects of roundabout planning, traffic operations and safety, for both single and multi-lane roundabouts. This minimises design iterations and delivers the optimum sizing and location with huge increases in productivity. At the same time, safety and operational benefits derived from key design principles are maximised. The process is totally dynamic using instant feedback on design vehicle movement, fastest path analysis, driver sight line evaluation and version management to generate the footprint of the roundabout based on accurate and valid vehicle movement characteristics.

The TORUS Design Manager feature permits the saving, recalling and comparing of multiple design iterations within a single drawing, automatically documenting the entire design process and providing an invaluable reference archive (see graphics).

The TORUS Roundabout Generation feature utilises the full compliment of controls to edit, update, display and manage designs dynamically, presenting and managing design modifications and their impact to the traffic engineer as they are made. Comparison and analysis of designs is facilitated in real-time providing instant feedback on the advantages

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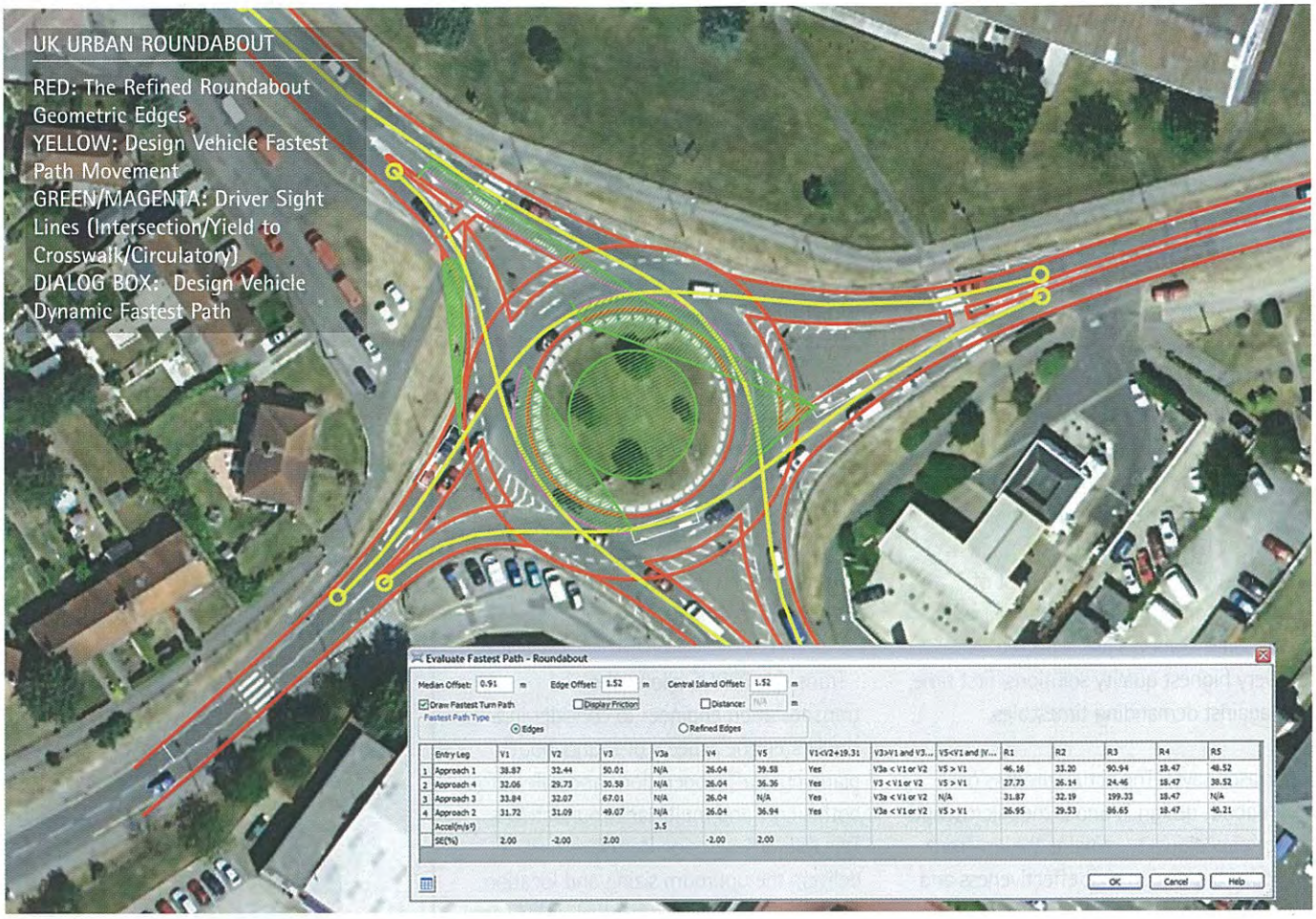


and disadvantages of different designs (see graphics).

Actual case feedback on the use of TORUS is strong. At CTQ Consultants Ltd of Kelowna, B.C., Canada, TORUS is used in an AUTOCAD environment. "We first used the TORUS software in a roadway improvement project in the main area of the District of Summerland, B.C.," confirms CTQ's Dave Cullen. "The project included developing a preferred roundabout option in each of two locations of the main roadways. One of the two locations had existing physical constraints that limited the size of the roundabout. The other had more physical room but different vehicle size requirements.

At both locations there were various classifications of roadways intersecting at various angles. District staff requested several scenarios in concept form to assist them in determining property acquisition requirements versus vehicle size. TORUS allowed us to fully represent these scenarios in an expedient manner."

CTQ staff report time savings amounting to "days" in pre-design development time in this project alone. The software also assisted in producing public presentation documents based on the turning movements required for semi-trucks and city buses. CTQ has also used the TORUS software in Request For Proposal documents for road design. "In addition to allowing us to inject and illustrate our roadway design experience and expertise, we can overlay graphics of concept level roundabout configurations on orthophotos of the agency's project location. Once the basic design parameters are known these graphics can usually be developed in under an hour." notes Cullen.

Chris Trboyevich, P.E. Associate at SRF Consulting Group, Inc. Minneapolis USA reports, "TORUS lets us study the various modifications of the conceptual design very quickly. We invest the time saved into enhancing roundabout designs. It provides confidence that the design will deliver optimal performance when the project progresses to plan development."

Carrasco summarised: "There are limitations for when the roundabout makes sense and when other intersections are the right answer. For the most part, in suburban and rural areas, the modern roundabout is the best solution hands down.These amount to between 50% and 75% of intersections. Just think of the huge economic and environmental benefits they will bring, including, perhaps, reduced insurance premiums - now that is something everyone can relate to!"