

>> OLD DOG NEW TRICKS...

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At 41, John Kocan isn't really an old dog, but he does have some new tricks. He performs these tricks daily while designing roadways using state-of-the-art software programs.

These programs also help to design better and safer intersections, maximize space available in urban areas and provide immediate visualization of vehicle maneuverability. Ever more demanding, clients like the result because they can easily visualize the design possibilities.

As Principal Senior Technician for SNC-Lavalin in their Montreal, Quebec, Canada offices, John has been using software from Transoft Solutions for over ten years. He started using AutoTURN in 1995 and GuidSIGN in 1997. These software packages have only been available since 1991 (Version 1.0 for AutoCAD; Version 2.0 in 1992 for MicroStation) for AutoTURN and 1993, for GuidSIGN (Version 1.0). This makes John one of the more experienced users in Canada.

John uses sleight of hand with other software too, such as INROADS and AUTOCAD. Or, John's group works with specialist companies to produce videos of 3D simulations to show clients how a project would look upon completion. Without these tools, John might have said that he had bitten off more than he could chew. But, this old dog continues to learn new tricks as software matures.

With this highly respected firm for 18 years, John is responsible for all design, inter-agency liaison and for coordination of the Montreal offices. While he uses a variety of software, John especially enjoys pulling AutoTURN software from his bag of tricks to design complex road systems and associated signage to meet the high standards of SNC-Lavalin clients.

"Every time that I design a road," says John, "and when it requires to have the best design possible, AutoTURN is always one of my tools."

The client, in this case, is Transport Quebec (the Ministry of Transportation for the

province of Quebec). The ministry recently secured SNC-Lavalin to design and re-build provincial road #132, approximately 35 kilometres (22 miles) southwest of Montreal, between the towns of Delson and Candiac.

This re-build is a smaller project than was originally envisioned. In 2003, SNC-Lavalin was given the mandate to build Highway #30 in the corridor of provincial road #132 to address heavy traffic congestion in the area. Eight travel lanes were to be built over 9 kilometres (5.5 miles), with 2 service roads, 7 overpasses and fifteen on- and off-ramps. The project was projected to cost \$270 million (Cdn.).

The following year, following an election and a change in government, the project was stopped due to the sensitivities of residents to noise and vibration in the communities of Candiac, Delson and Ste. Catherine. The new government still had the problem of chronic traffic congestion in the area, so a compromise was reached. Provincial road #132 would be re-built at a projected cost of \$40 million.

Like pulling a rabbit out of one's chapeau, constructing a series of major roads and related infrastructure in an existing corridor is always a daunting task. With this project, many of the engineering challenges faced involved maintaining high traffic volumes and circulation through existing intersections.

The project involved designing and building temporary and permanent roads that are capable of carrying up to 60,000 vehicles per day. The temporary roads to be designed and built for use during the construction phase were approximately 5 kilometres of road with 6 travel lanes, temporary intersections and service roads. These roads have since been demolished, prior to construction of the permanent roadways.

The permanent roadways would have to accommodate 6 lanes, 2 service roads, 6 ramps and 3 intersections over a total length of 7 kilometres. Two bridges were also required: one over a stream and one for a



Canadian National Railway right-of-way. Of course, the corridor also accommodates major municipal services and public utilities that had to be temporarily re-located, then incorporated into the final design.

60,000 vehicles per day (or Average Daily Traffic) is a sizable volume of vehicles. Typically, these counts represent all four legs of an intersection or, in the case of a provincial road like #132, volumes of vehicles traveling in both directions throughout the 24 hour period (perhaps 30,000 in each direction for a total of 60,000 vpd).

But, the scenario is complicated somewhat by the fact that a high proportion of this volume is truck traffic, due in part to the close proximity of a neighbouring industrial park. For the simulations, John used TST. This is a type of tractor-trailer used in Transport Quebec specifications, which is basically equivalent to the WB-19TAC. The minor difference is the length of the tractor, as the TST cockpit is slightly longer. While AutoTURN has a fleet of various standard vehicle types available for selection by the designer, the TST was not one of them. "I had to create that type of vehicle, but it was easy to do using version 4.2 of AutoTURN. It is so easy and user-friendly."

Like most old dogs, John cannot help reminiscing: "I remember in 1997 when we designed Magnola (a magnesium plant in Quebec) and I had to create a caterpillar mining truck -- type 793C. It was not that easy back then but the software performed pretty well."



The TST vehicle was used for the simulations because that type of truck has the largest turning radius. More importantly, Transport Quebec specifies that this vehicle be used as the "worst case" scenario. John notes that a professional truck driver in one of the "biggest of the big rigs" can easily make these turns, even on one of the tricky multiple turning lanes that were incorporated into the design of the off-ramps.

GuidSIGN, a software program that automates the design of highway and roadway signs, played an integral role in the project. The ministry stipulates that this product be used for provincial road projects because of its high quality, cost-effectiveness and flexibility. In fact, ministry staff have, in the past, requested certain features to be included in GuidSIGN software to meet their specifications.

The U.S. Department of Transportation's Manual on Uniform Traffic Control Devices (MUTCD) contains standards for traffic control devices that regulate, warn and guide road users on roadways in all fifty states. Traffic control devices optimize traffic performance, promote uniformity and improve safety.

A user simply selects a panel style from the standard library of MUTCD styles, then adds details such as text, route markers or other elements. The software automatically ensures that the correct fonts are used, text strings are spaced appropriately, border widths and symbols conform to federal or regional standards while meeting or surpassing industry specifications.

"We are using GuidSIGN for all the panels that we design for Quebec roads. It is the best product for the money. The software has improved a lot since 1997."

So has the doctrine. Engineering design in general has evolved rapidly through the use of software and technology, fundamentally changing the way work is done. Where 20 designers were once used to analyze,

design, draft, re-draft and produce as-built drawings, 6 SNC-Lavalin staff are now assigned to complete the design work. Where time-consuming field tests with traffic cones were once used to confirm geometrics, an animated simulation is played.

With the Provincial road #132 project, 20,000 man hours were saved and the project was completed twice as fast.

And a better, more usable product is the result. Instead of sending bulky rolls of drawings to clients, designers now send animated simulations. Where the drawings had to have templates physically applied with some degree of human error, the simulations show precisely how a select type of vehicle will maneuver along a hypothetical roadway. The viewer need only "freeze" a particular layer to see details such as the movement of trucks, buses or cars.

Every year, software companies contact John to advise of the launch of a new version of software. SNC-Lavalin want their employees to remain on the cutting edge to satisfy their clients, so software is purchased regularly. The combination of regular purchases of expensive software packages and the need for individual site licenses increase costs significantly. For example, of ten designers working on projects, seven require four different software packages. With one of the leading packages costing \$17,000 (Cdn), it is easy to see why companies like SNC-Lavalin insist on investing in only the finest software.

Of course, the software and any improvements to it are redundant until those improvements are learned. So, John and his staff must "go back to school again. Most of the software orientation courses last a day to a week."

"It gives us a chance to do more projects and deliver them on time."

Talking to John, one gets the immediate impression that he thoroughly enjoys what

he does, working with the software tools that he uses. "They are beautiful tools to play with," says John.

John sees the use of continually improving software as one of the biggest influences on civil design in future. He feels that civil engineering will continue to improve because software performance will improve - making it easier for both users and clients to understand. Armed with this knowledge, clients will be harder to satisfy and will be more demanding.

"The world today is going very fast and it's getting smaller. Technology has improved so much over the last 20 years and software performs so well. Sometimes, it's scares me to see how fast everything is moving!"

Another highway project, #25 east of Montreal, may proceed in the coming months. John hopes that SNC-Lavalin is again selected to complete the design work. This will provide another stage for this not-so-old dog to perform even newer tricks.

Craig Van Alstyne
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