

## FINAL ASSESSMENT OF PTV VISWALK

Amsterdam Central Station is a historic building located on an artificial island in the city centre and is the busiest station in The Netherlands. Due to the need to expand the capacity of the station and the construction of the new North-South metro line and a new bus station, ProRail, NS Poort and the City of Amsterdam are jointly undertaking major construction works on the station island. In order to verify the acceptability of the flow of passengers, ProRail has commissioned a study using PTV Viswalk, a pedestrian simulation software by PTV.



In 1889 the Amsterdam Central Station was opened to the public and at that time approximately 200 trains arrived at and departed from the main station every day. Today more than 80 trains operate during the two morning peak hours resulting in 46,500 people arriving, leaving and passing through the station. With a total of 250,000 visitors per day, the morning peak hour comprises 20% of the daily total.

In 2013, excellent regional train connections (North-South line), the new bus terminal and a direct link to Paris with the TGV, the French high-speed-train, will broaden Amsterdam's range of mobility services. An increase by approximately 50,000 visitors to 300,000 people is expected by next year.

Several construction projects are ongoing to enhance the station and accommodate the increased passenger numbers.

To this end, ProRail, the Dutch infrastructure manager, together with NS Poort is planning to enlarge the eastern passenger tunnel, to renovate the central station hall, to create two new pedestrian underpasses and to create parking facilities for 10,000 bicycles. The correlated construction of these facilities will have an impact on the current passenger routes. VIALIS, the Dutch PTV partner and specialist in traffic solutions in the Netherlands, has advised ProRail on this evaluation process: To assess the pedestrian routes efficiently during the construction period, the company has opted for PTV Viswalk, a software tool specifically designed for pedestrian simulation.

It is the first major project planned with PTV Viswalk. The tool was launched by the German software provider PTV in autumn 2011.

### WARM-UP PHASE FOR PTV VISWALK

"We have already used the simulation software PTV Vissim for projects of this magnitude," says Willem Mak, Senior Traffic Engineer at VIALIS. "However, the combination of PTV Viswalk and PTV Vissim is new." Therefore, VIALIS has created several smaller partial models.

In doing so, the company was able to assess the impact of route choice, pedestrian ingress/egress flows and other parameters. "Due to our experience gained from completing several smaller pilot projects we decided to plan shorter origin-destination routes from the trains to the destinations and vice versa, which decreased simulation time significantly," Mak explains. Usually, projects of this magnitude do not always run smoothly during the simulation runs. VIALIS was able to quickly solve software-related issues via

PTV's helpdesk. However, the lack of validated high quality data caused a major problem. "Together with our client ProRail, we conducted additional pedestrian counts," Mak says. This was particularly useful for the route choice between two stairways. The data obtained from these counts enabled the planners to calibrate the chosen route sections more effectively.

### DEMAND FOR PEDESTRIAN-SPECIFIC SOLUTION

Why should one take the risk to use a completely new product for a project of this size? "There is definitely a demand for pedestrian modelling in the field of infrastructure planning," says Willem Mak. "ProRail approached us when they were searching for a system that could accurately predict the effects of large flows through an historic building with many architectural obstacles."

In combination with PTV Vissim this tool develops unique multimodal capabilities and perfectly simulates the interaction between pedestrians and vehicles. Dwell time as well as journey and waiting time can thus be analysed, including the assessment of alternative routes.

"Around 250,000 people pass through Amsterdam's Central Station each day. PTV Viswalk is the ideal tool for the simulation of huge crowd movements," states Willem Mak. One of its special features is dynamic routing. Usually, both drivers and pedestrians want to get to their destination as quickly as possible. The quickest route is often very similar to the shortest route. However, there are situations where this

"rule" does not apply - the simplest of which is when a large group of pedestrians is doing a u-turn, for example. The "detour", i.e. the larger radius, is then expected to be the faster solution. PTV Viswalk includes both the shortest and quickest route in the simulation, either as an alternative or a combination, and therefore allows users to realistically simulate pedestrian behaviour.

### THE SCIENTIFIC APPROACH

The interaction of pedestrians can be described by means of the Social Force Model: pedestrian movements that are affected by different physical and social forces are modelled inspired by Newton Dynamics. One of the forces is the driving force: Pedestrians move purposefully as a rule, meaning they walk at a desired speed toward their destination. Various elements influence them and prevent them from exactly taking the desired route or walking at the desired speed. In this context, pedestrians always maintain a kind of safety distance or personal space, not only to other pedestrians but also to obstacles, buildings or streets. This distance usually gets shorter with an increasing number of pedestrians, or if they are in a hurry. PTV Viswalk is based on the Social Force model.

### IMPRESSIVE RESULTS

The first step was to simulate the current situation at Amsterdam's Central Station by developing a pedestrian model. "The very first simulation run provided excellent results," Mak says. "ProRail immediately acknowledged the advantages of this model and was impressed by the good visualisa-

tion." The statistical output also showed outstanding results: The data on the level of services for the stairways, the pedestrian underpass and the platforms was extremely useful for discussing the range of possible solutions to mitigate the impact of construction activities.



In combination with PTV Vissim the pedestrian simulation software PTV Viswalk develops unique multimodal capabilities and perfectly simulates the interaction between pedestrians and vehicles.

"As PTV Viswalk combines both visualisation and statistics, users can easily understand what is happening in the model," Mak comments. Therefore, VIALIS was able to show the impact on the pedestrian flow for several operational changes such as rerouting trains to other platforms, for example. "Our client was aware of the risks associated with the use of new software tools," Mak reveals. Nevertheless, ProRail opted for PTV Viswalk and they were impressed by the results: "That's exactly what we wanted!"

As a result PTV Viswalk continues to support the next phases of the construction of Amsterdam Central Station