The wind tunnel proves its value too in optimising the aerodynamics of elite sports men and women.

Celebrating the wind tunnel – and its future

The TNO wind tunnel in Apeldoorn is twenty-five years old. It has already celebrated with a symposium that concerned not only past achievements but more particularly the future of wind tunnel research. Like a more modern wind tunnel that can offer much more, especially for climate research.

The wind tunnel is still in great demand, with a constant stream of assignments each year. The tunnel measures the distribution of pollution in the air, wind hindrance in the built environment and wind load on special building structures, among other things. It also provides insight into the precipitation of smoke on ship decks and on helicopter landing pads in windy conditions. An extended special study from about 20 years ago focused on vortexes in the mountainous area where a new airport for Hong Kong was planned. Another striking application is the optimisation of aerodynamics for top sportsmen and women.

'Forty per cent of the wind tunnel research relates to air pollution: the spread of particulate matter and NO_2 on roads, in new neighbourhoods and districts, tunnel mouths and the effects of noise barriers,' says Professor Peter Builtjes, scientific researcher for air quality and climate change, and professor at the Freie Universität in Berlin. 'The wind tunnel is a valuable research tool often used in combination with calculation models. The current wind tunnel is mostly suitable for studies of the built and natural environment.'

Reality is simulated and measured at scale in the tunnel. The Apeldoorn tunnel is relatively large: three by two by twenty metres. The research there is largely for the Dutch market and has been fully utilised for years. It may be getting on in years but it can certainly perform well for a few more yet. Still, a time will come when it has to be replaced.

CLIMATE MODELS

'TNO has expressed its desire for a new wind tunnel, one whose floor can be cooled and heated so that specific atmospheric conditions can be simulated. That will require an investment of millions of euros that will generate entirely new research options, also in respect of climate change,' Builtjes adds. This will mean that readings can be made in all kinds of wind conditions as well as in stable weather, with little wind and a cold ground. This enables a low boundary layer and maximum air pollution. Convection flows in the air can also be measured when the ground is warm and the airflow rises.

Builtjes: 'This will create a unique facility within Europe whereby not only applied but also scientific research will be possible, offering new possibilities for other research institutions and universities. Current boundary layer research, which is mainly performed in, for instance, a water tank in Delft, can then be carried out in airflow conditions, which is much more true to life. Current climate models can also be upgraded and allow better research into aspects like the city as a heat island and the effects of global warming on this.'

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