At RMIT University in Melbourne, researchers in the School of Aerospace, Mechanical and Manufacturing Engineering (SAMME) use ANSYS software to understand how airborne particles affect the long-term health of humans.

“When environmental toxicity is involved, it’s not viable to conduct experimentation with human subjects,” notes Dr. Kiao Inthavong, a senior research fellow leading these studies. “Our team uses ANSYS CFD (computational fluid dynamics) to complement animal models and laboratory bioassays as we seek to establish a proven linkage between respiratory health problems and the inhalability, deposition patterns and pathological effects of airborne particles. Ultimately, we hope our studies will lead to a new tool that helps to predict an increased risk of lung disease under certain environmental conditions.”

At RMIT, ANSYS software has been used to develop, for the first time, an integrated CFD simulation that combines the three aspects of contaminant exposure: a three-dimensional room, a human occupant with realistic facial features and an internal nasal-trachea airway.

The SAMME research team uses ANSYS Fluent CFD software to evaluate how external airflow patterns impact the transport of particles indoors. This discrete particle tracking model allows researchers to identify the upstream locations of inhaled particles, proving valuable insight into which contaminant sources are likely to be inhaled.

Flow and particle visualization are post-processed in ANSYS CFD-Post, which shows the fate of each individual inhaled particle inside the respiratory airway — as well as correlating each particle back to its contaminant source.

“Our studies with ANSYS software have an enormous potential to reduce occupational lung disease by establishing a fundamental linkage between nanoparticle exposure and health risks,” says Inthavong. “Not only can this improve the health of millions of people worldwide, but it can also reduce the socio-economic costs associated with lung disease.”
Professor Jiyuan Tu, deputy head of research and innovation at RMIT, emphasizes the importance of the university’s campus-wide license in placing ANSYS technology into the hands of leading researchers such as Inthavong.

“Academic staff, research fellows and students at RMIT have benefited greatly from RMIT’s campus-wide ANSYS license,” says Tu. “Not only can we run a large class, a CFD lab or a tutorial at different campuses to support our teaching efforts — but we have also made it affordable for our researchers to use ANSYS software for their testing and investigation.”

Tu notes that the university’s ANSYS license bundle has significantly increased the number of final-year undergraduate research projects, as well as opened up new topics for post-graduate researchers. It has positively impacted the quality of hands-on learning in large undergraduate classes.

“Our third-year thermal-fluids course typically includes around 250 students,” notes Tu. “After these students have been exposed to ANSYS software for the visualization of dynamic processes such as fluid flow and heat transfer, they are excited and stimulated. Half of these students will either enroll in another advanced CFD course or undertake a final project using ANSYS software. ANSYS makes it easy for them to engage in and become enthusiastic about very complex topics.”

In addition, Tu reports that the broad exposure to ANSYS products enabled by the campus-wide license is viewed as extremely valuable by RMIT alums who work as engineers. “The feedback from our graduates who have been working in industry — and are using ANSYS software now in their careers — has been extremely positive,” Tu says. “In fact, they have recommended that we make our advanced CFD course using ANSYS software a compulsory class in the future.”