Submission No 209

INQUIRY INTO IMPACT OF THE WESTCONNEX PROJECT

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NSW Parliment inquiry into the Impact of the WestConnex project

WestConnex: Future air pollution reduction opportunities.

To the members of the NSW Parliament,

I understand many of the submissions to this inquiry will be focused on perceived negative impacts of the WestConnex project. In contrast this submission is to highlight opportunities the WestConnex project potentially offers for reducing air pollution in Sydney.

The WestConnex project seeks to ease congestion and reduce transport times by tunnelling new road transport corridors beneath Sydney. Current tunnel design involves unfiltered exhaust stacks that will reduce pollution concentration within the tunnels and at tunnel portals. By ejecting tunnel gases high above the ground these stacks will disperse and dilute pollution over a wide area which is intended to keep concentrations at ground level within current standards.

With taking so much traffic underground comes the opportunity to remove much of the air pollution created by vehicles using those tunnels from Sydney's air, by adding filtration technology to the exhaust stacks. However current filtration technologies have numerous limitations, leading to high costs associated with power, maintenance and waste disposal.

This submission proposes that a plan to allow for future more cost effective scrubber/filtration technologies to be more easily incorporated into WestConnex exhaust stacks, and encourage that technology to be developed. This submission also gives an example of a possible scrubber technology not yet in use, to demonstrate the possibilities for improved technologies. Finally this submission proposes design changes to the current proposed exhaust stacks to allow the easier future addition of scrubbers and a possible process for developing new scrubber technologies to fit within the design envelop set aside.

Current scrubber / filtration technologies.
A large number of road tunnels in other nations have already incorporated scrubber technologies. These include Japan, Italy, Norway, Spain, South Korea and even Vietnam. But technologies in use significantly increase costs over dilution and dispersion from unfiltered stacks.

ESP or electrostatic precipitation of particulates is a common filtration technology, but has high power requirements, primarily due to aerodynamic losses. Filtration area is also large to minimise pressure drop over the filter, with 300 m/s air flow requiring a filter around 50 m2.

NO_2 absorption technology is more rarely used. It is even more bulky than ESP particle filtration (150 m2 frontal area for flow of 300 m/s) and has high costs associated with maintaining and regenerating absorption chemicals.

Mechanical particle filtration is most often used as pre-filtration prior to ESP, as complete scrubbing with mechanical filters requires regular cleaning or replacement of filters.

Current filtration and scrubbing technologies are bulky and significantly increase operating costs for both power and maintenance compared to dilution and dispersion of tunnel exhaust through unfiltered stacks. But technology is always improving, and the opportunity to incorporate future technological advances into the WestConnex stacks should not be missed.

Possible future technologies.
Technology is always improving, and the large number of road tunnels in use around the world means that future improvements in high volume filtration technologies is certain. What is uncertain is the exact form that technology will take. Proposals have even included biological filtration or photo-catalytic tunnel surfaces. What is available tomorrow will be better than current technology, and WestConnex has the opportunity not just to allow for inclusion of future technologies, but actively encourage their development.

To demonstrate how it is be possible to improve on current filtration, a design concept has been included in this submission. Figure 1 shows a redesign of a wet venturi scrubber, that would remove almost all particulate emissions from exhaust flow with minimum power, maintenance and water requirements.

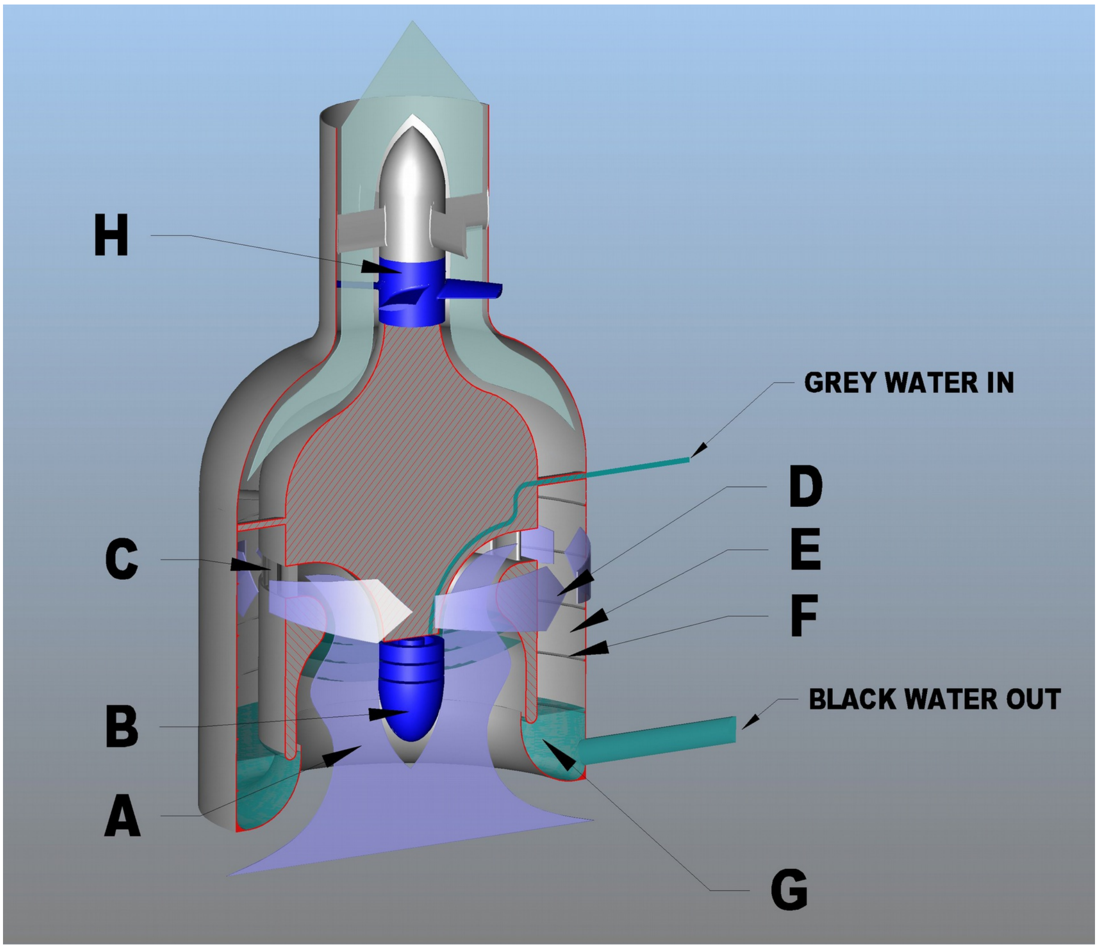

Figure 1.

Scrubber concept operation: Contaminated air is drawn into the spray zone (A). The air then passes past a multi-layer 12,000 RPM disk sprayer (B) where it mixes with water droplets as fine as 10 microns. The use of the disk sprayer improves on conventional wet venturi scrubbers by eliminating hydraulic nozzle sprays with their high power requirements, their need for clean water, and provides a finer mist. The mist and air then pass through the venturi ring (C) where turbulent mixing ensures all particulates are captured by water droplets. The ventruri ring design improves on conventional round rod designs by also imparting centrifugal rotation to the air. The rotating air (D) spins contaminated water to the collection wall (E) were spiral vanes (F) deliver it to the collection gutter (G). Scrubbed air is then vertically ejected by fan (H). Contaminated water is removed from the gutter to a settling tank where neutralisation and sludge removal can occur. Grey water can then be returned to the disk sprayer for reuse. Make-up water requirements would only need to cover evaporation and that lost in sludge removal.

This concept is not offered as an immediate solution, but rather to demonstrate that it is possible to improve existing scrubber technologies to reduce power and water requirements, and that they could be retrofitted in a vertical shaft. If a suitable space is left clear in the design of WestConnex exhaust stacks, future designers could work to that engineering envelop.

Submission proposals.

1. That a suitable space be intentionally left in WestConnex stack design, preferably ahead of fans for the possible inclusion of future scrubber technologies. This space would be initially traversed by standard ducting, but should have allowance for maintenance of future possible plant and equipment, including scrubber module swap-out.

2. That plans of the available space (design envelop) and other details of the stack design including flow rates be made open source to universities etc.

3. That the 51% purchaser of WestConnex (presumably Transurban) agree to match funds with the NSW government to establish a grant system to encourage university/industry collaborative research projects, to design and test scrubber technology to work within the empty design envelop left in the exhaust stack design.

Conclusion.

Available scrubber technology at this time may not provide a cost competitive solution to meeting air quality requirements compared to unfiltered exhaust stacks diluting and dispersing tunnel gases. But future technology could be able to exploit the WestConnex tunnels to improve Sydney's overall air quality. By intentionally setting aside space in the exhaust stack design and directly funding research and development for future scrubber technology to work within that space, the opportunity available for future reductions in air pollution can be best exploited.

Yours sincerely,

Mr. K. Hartmann