E20 by 2020: Hold your breath!

Ramya Natarajan, CSTEP

25th March, 2019

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The World Health Organization's global air pollution database reveals that India has 14 of the 15 most polluted cities in the world. Vehicular emissions significantly contribute to the deteriorating air quality in our cities. Primary pollutants include chronic respiratory irritants like particulate matter (PM); poisonous gases like carbon monoxide (CO); carcinogens like benzene, other volatile organic compounds (VOCs), and hydrocarbons (HCs); and precursors to secondary PM and ground-level ozone, such as nitrogen oxides (NOX).

One of the steps taken by the Government of India towards directly reducing vehicular pollution is introducing ethanol-blending mandates. Peer-reviewed studies indicate that ethanol-blended fuels can directly and considerably reduce harmful vehicular exhausts (compared with pure petrol). Both CO and HC exhaust emissions decrease by about 13 per cent for E10 (10 per cent ethanol) blends and 24 per cent for E20 (20 per cent ethanol) blends, compared with E0 (pure petrol). Benzene, a carcinogenic VOC, also decreases by almost 7 per cent in E10 blends and up to 40 per cent in E20 blends. PM2.5, a major contributor to air pollution in India, reduces by approximately 25 per cent with E20. In addition to reducing carcinogenic fumes and particulate emissions that hinder regular alveolar functioning, ethanol blending may decrease the production of secondary pollutants.

While most of the primary pollutants in tailpipe exhausts definitely and consistently decrease upon ethanol blending, the results reported for NOX emissions are quite ambiguous (with large variations, depending on test conditions). Furthermore, studies have shown an exponential increase in acetaldehyde emissions with ethanol blends. However, the amount of acetaldehyde in E0 is so negligible that an 'exponential' increase is not substantial in absolute terms.

Focussing on the effects of ethanol-blended fuels solely on tailpipe exhausts paints just half the picture. The secondary effects of these emissions on total air quality — and their correlation with local air chemistry and meteorological conditions — should also be considered. For example, VOCs and NOX emissions can lead to the formation of ground-level ozone. However, in Brazil, lowered NOX emissions through ethanol fuels led to an *increase* in ozone levels. So, the effect of primary pollutants on secondary pollutant formation depends on conditions specific to the area of interest.

Dispersion modelling, one of the standard techniques to study such secondary effects, should be undertaken in India to determine the overall impact of ethanol blending on local air quality. E10 and E20 blends can also be introduced in select small cities in India, as part of a pilot study. The air pollution levels can be monitored for a year to determine the net effect of ethanol fuels on air quality. A deeper understanding of the potential of ethanol-blended fuels to form ozone (and other secondary pollutants like PM) in the Indian scenario will help make and implement effective policies towards ethanol blending.

Ethanol also acts as an octane enhancer to substitute toxic aromatic boosters. No significant changes are required in the existing vehicular infrastructure to accommodate up to E20 blends. The National Policy on Biofuels 2018 sets an ethanol-blending target of E20 by 2030. However, if the dispersion modelling results for India look promising for ethanol fuels, policymakers could push for an ambitious 'E20 by 2020' mandate. Considering that our current blending rates are below 3 per cent due to the lack of ethanol availability, the country could consider imports to supplement domestic deficits. An ambitious, and yet pragmatic, action plan is necessary to move ahead with this programme. With our current air quality in such dire straits, it is essential to remember that each baby step counts.

[Kavya Shah, intern at Center for Study of Science, Technology & Policy also contributed to this piece]

About Ramya Natarajan

Ramya is a Senior Research Engineer at CSTEP. She has also worked as a researcher at Indiana University, Bloomington, and Energy Research Institute, Singapore