

'Next Green Cracker Version Will Cut Emissions By 50%'

The next version of green crackers will reduce emissions by 50%, improving substantially on the current ones, CSIR-National Environmental Engineering Research Institute (NEERI) chief scientist Dr Krupadam Joshua Roditotta told Ipsita Pati on Thursday. Roditotta, who is leading the research for firecracker formulations that reduce the pollution burden, explains how emission reductions are achieved and says a study is being planned to study the contribution of firecrackers in Delhi's air quality. Excerpts:

■ What makes a cracker 'green' and how are emissions reduced?

Currently, green firecrackers (in the market) are those that emit 30% less pollution than conventional ones. When we developed them in 2019, conventional firecrackers were our reference point. The science lies in combustion-control. A firecracker's burning is a solid-phase combustion process, unlike the fuel-air combustion in a car engine. In solid combustion, maintaining the right ratio between fuel and oxidant is difficult, which leads to high pollution loads. We optimised this ratio, which is the oxygen requirement for burning, to ensure cleaner combustion. Temperature also matters. Conventional crackers burn at around 650°C. We increased this to above 1,000°C, which improves combustion and lowers particulate emissions. We also added materials like zeolites as well as polymer-based and inorganic additives that improve combustion efficiency and help particulates settle quickly. These steps together brought down emissions by about 30% initially, and now we are achieving reductions up to 50%.

■ So, crackers with 50% reduction in emissions are also being designed?

Yes, experiments are on. In lab tests, some samples are already showing better reductions, but we're still validating the results. For now, we can say we've comfortably



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achieved around 50% emission reduction.

■ What is the certification process for green crackers?

NEERI is an R&D organisation, not an approving authority. We develop formulations and transfer them to licensed firework manufacturers through a registration process. Because fireworks are explosives, only those with a valid PESO (Petroleum and Explosives Safety Organisation) manufacturing licence can be registered with us. Once a manufacturer registers with NEERI, they use our formulations to produce crackers and send samples to us for emission testing — both particulate and gaseous. Based on our test report, they approach PESO for manufacturing approval.

■ The NEERI website lists more than 1,400 registered manufacturers. Can they also produce conventional crackers?

NEERI registration is not a licence. It only means we've given them our green formulations. The PESO licence regulates their manufacturing and distribution. Once they are registered and licensed, they are expected to produce only green crackers. Conventional ones are illegal.

■ Does NEERI share this registration data with pollution boards?

The registration data we issue is subject to PESO licensing. PESO is the enforcement authority responsible for (overseeing) manufacturing, distribution and use of firecrackers, not the pollution control boards.

■ Could sellers be misusing NEERI, CSIR logos to pass off regular crackers as green? How can authenticity be verified?

This is the job of regulatory agencies. According to Supreme Court's order, manufacturers must develop their own product-specific QR codes. These should include two details — the NEERI registration and the PESO licence. Scanning the QR code will confirm whether a cracker is genuinely green. NEERI itself does not issue logos or barcodes. We only maintain and publish the list of registered manufacturers on our website, which is also shared with enforcement agencies.

■ Are you working on reducing noise levels too, apart from emissions?

Yes, we are working on both fronts. Some series firecrackers (ladi) can reach 160–170 decibels, while the limit prescribed is 125 decibels. We're developing scientific methods to bring this down. We expect to have ladi products within 125 decibels by next year.

■ Is NEERI working with state govts on monitoring of green cracker use?

Central Pollution Control Board (CPCB) has approached us for studies on air quality, especially to understand the contribution of firecrackers to overall pollution in cities like Delhi. We currently lack data on what percentage of air pollution comes from firecrackers versus other sources like stubble burning. We're planning source-attribution studies in collaboration with CPCB later this year to quantify those contributions.