Engineer A R Mohammad Parvez Mazumder

Battery-Operated Three-Wheelers of Bangladesh: Environmental and Grid Strains Perspective

Battery-operated three-wheelers, commonly known as auto-rickshaws and easy bikes, have become a widespread mode of public transport across Bangladesh. These provide an affordable commuting option for millions of citizens, while serving as a vital source of livelihood for drivers and garage operators. However, their rapid expansion without structured regulatory oversight has introduced severe strain on the country's electrical grid and public infrastructure, including the environment. An estimated 5-8 million such vehicles currently operating nationwide consume roughly 5% or more of Bangladesh's total daily electricity generation.

The three-wheelers mostly use deep-cycle lead-acid batteries. Most of these vehicles use valve-regulated lead-acid (VRLA) types, while very few newer models and upgrades use lithium-ion alternatives.

The vast majority of the estimated 4-6 million three-wheelers run on lead-acid battery packs, which are typically 48-volt or 60-volt systems. Emerging options and modern upgrades utilize lithium-ion packs offering a longer lifespan and faster charging times. However, lithium-ion options

represent a smaller market share due to high prices. Lead-acid batteries generally last 12-24 months, whereas lithium-ion alternatives can last 3-5 years with proper maintenance. Drivers frequently purchase trusted domestic and foreign brands like Hamko, Eastern, Rimso, Rahimafrooz, and Kijo.

In Bangladesh, the three-wheelers do not use a single large 48-volt or 60-volt battery unit. Instead, these run on a series connection of standard 12-volt lead-acid batteries. A typical deep-cycle tubular or VRLA battery (also known as a sealed lead-acid (SLA) battery) used in these three-wheelers (at 100-130 ampere-hour capacity) weighs approximately 30-38 kg per 12-volt unit. In standard lead-acid batteries, pure metallic lead and lead compounds account for about 60-65% of the total battery weight (with the rest being electrolyte liquid and plastic casings).

Battery	Number of 12-volt Units	Weight	Lead Content (Lead and Lead Compounds)	Lead-acid Electrolyte Solution
48-volt	04 Batteries	120-150 kg	70-95 kg	35-45 kg
60-volt	05 Batteries	150-190 kg	90-120 kg	45-60 kg

Used lead-acid batteries in Bangladesh rarely go to formal landfills because lead holds high commercial value. Instead, informal scrap dealers buy these old batteries, smash the plastic casings, open and dump the toxic sulfuric acid directly onto surrounding soil and into local water bodies. They then melt the lead plates over open-fire pits without any safety equipment or pollution filters. According to reports by the Daily Star, Bangladesh generates nearly 4,80,000 tons of lead-acid battery waste every year, with these three-wheelers accounting for over 60% of this local battery