Eco-Thread Technology: Transforming Waste Plastic Bottles to Laundry Ropes and Baskets

Opoku, Victoria (School: Kosofe Senior College Ketu)
Okpara, Joshua (School: Kosofe Senior College Ketu)

91% of waste plastic bottles are not recycled in Nigeria and many other developing countries, driving a global environmental crisis. This project focuses on transforming waste plastic bottles into durable laundry ropes and baskets using eco-thread technology through innovative mechanical cold recycling. Waste plastic bottles were collected from streets, cleaned, and shredded into strips, 0.003m to 0.005m thickness. The shredded plastic strips were straightened, smoothed with tension, and twisted tightly to create laundry ropes; the strips were woven using a manual weaving machine and shaped into baskets. Tensile stress, load-bearing capacity, drop and water resistance tests were used to determine the durability and compare produced items with market alternatives. The effect of our techniques on the environment was determined by calculating the percentage of waste conversion rate. Data were analyzed using descriptive statistics and an independent-samples t-test. Findings showed high durability: average tensile stress of 46.8MPa and 81.00kg load-bearing capacity for rope, and an average 69.00kg load-bearing capacity for basket. Water absorption was <1% for rope and <5% for basket, indicating strong performance. Drop test and load-bearing capacity results showed that produced baskets and ropes demonstrated higher durability than market alternatives ,$t = 4.72$, df (8), $p < 0.001$. Waste conversion rates of 95.5% for ropes and 97.05% for baskets strongly indicate that if this project is adopted and amplified, plastic pollution will be reduced, thereby supporting environmental sustainability. The study demonstrates that mechanical recycling under mild conditions can yield durable products, protect the environment from plastic pollution and boost the circular economy.

Awards Won: