ABSTRACT Acrylamide is a hazardous chemical formed during the high-temperature processing of starch-rich foods, showing significant public health risks due to its potential carcinogenic properties. Cooking at temperatures ≥120 ◦C, particularly in foods like potatoes, which are rich in asparagine and low in reducing sugars, promotes the formation of acrylamide in frying oil. This study explores the use of activated sugarcane bagasse (ASB) as an eco-friendly bio-adsorbent to reduce acrylamide levels in waste cooking oil previously used to fry French fries. Activated sugarcane bagasse was synthesized by treating sugarcane bagasse with alkali to enhance its adsorption capacity for impurities present in waste cooking oil. The material was thoroughly characterized using FTIR, XRD, and GC-FID analysis. The findings revealed elevated acrylamide concentrations in waste cooking oil after frying French fries. However, treatment with activated sugarcane bagasse led to a significant reduction in acrylamide levels by 41%, as well as a decrease in free fatty acids by 48.06% and peroxide values by 76.19%. These results demonstrate the potential of ASB as a highly effective and sustainable solution for mitigating acrylamide in fried food oils. This study presents an economical, efficient, and environmentally friendly approach for reducing acrylamide and other impurities in wasted cooking oil, making it a promising option for application in the food industry to enhance food safety and oil quality.