

# ***SOLAR PANELS-BASED ELECTRICAL ENERGY CONVERSION AS A BATTERY POWER SUPPLY FOR RIVER GARBAGE CLEANING ROBOT BOATS***

Salsabila Liandra Putri, S.K.M., M.K.K.K. (*Thesis Supervisor*)

Bayu Wira Hadwi Kurniawan

*Study Program of Mechatronics Engineering Technology Majoring in  
Engineering Jember State Polytechnic*

## ***ABSTRACT***

*River pollution due to indiscriminate waste disposal is a serious environmental problem in Indonesia. This study analyzes the effect of solar panel usage on battery charging efficiency in a remote-controlled river waste cleaning robot boat. The system integrates a 30 Wp polycrystalline solar panel, a PWM Solar Charge Controller (SCC), a 3S 20 Ah lithium-ion battery, and a DC-DC step-down module. Results show that the solar panel produced a maximum power of 35.724 W with an average conversion efficiency of 17.72%. The battery was fully charged in 3.75 hours using two charging phases (CC and CV), supplying an average power of 19.50 W for 2 hours of operation with a theoretical capacity of 12.19 hours. The solar panel slowed voltage drop with a maximum difference of 1.06 V compared to the condition without panels. Energy balance analysis indicated a surplus of 54.30 Wh/day from a total production of 132.30 Wh/day against a demand of 78.00 Wh/day, confirming this system as a viable and environmentally friendly independent energy solution.*

***Keywords:*** *Solar panels, energy conversion, lithium-ion batteries, river cleaning robot, solar charge controller*