A key challenge for ammonia monitoring during nitrogen removal process is the extra cost and toxic reagent consuming. Herein the feasibility of current generated by an integrated microbial electrolysis cell (MEC) - nitrification reactor as an indicator of initial ammonia levels (NH3/NH4+) in wastewater was explored. In this loop system, ammonia was first oxidized to nitrate in the nitrification reactor, and then the effluent was introduced into the cathode of MEC where nitrate was reduced as electron acceptor. The correlation between current and ammonia concentration was first investigated with synthetic ammonia-rich wastewater. A good linear relationship (R2=0.9419) was observed between current (0.5130–3.906mA) and ammonia levels (0–62.1mg NH4+-N/L). Such linear relationship was always obtained regardless of the tested external power supply or wastewater pH. The external electrochemical cell was proved to be an effective pre-conditioning method to remove the disturbance from other possible electron acceptors. Finally, the integrated system was further tested with real waste streams and the results showed no significant difference (p>0.05) with measurements by conventional methods. This study, for the first time, demonstrated the potential application of the integrated MEC - nitrification system for ammonia monitoring in addition to water treatment.