Microalgae have the ability to utilize nutrients from wastewater and use it for biomass production. The effluent from a biogas process was tested as a nutrient source for blue-green microalga Arthrospira platensis cultivation and compared with conventional synthetic medium. Cultivation was carried out in four different concentrations of industrial process water (25, 50, 75, and 100%). The biomass was then harvested by microfiltration, and centrifugation followed by freeze drying. Variations in biomass composition were studied, in order to investigate effects of industrial process water on A. platensis over 30 days of cultivation. Applied harvesting techniques were evaluated for their effect on physiochemical properties of the biomass. Arthrospira platensis was able to grow in all tested wastewater concentrations except 100%, however, increase of wastewater concentration in medium resulted in a decreased growth rate. Partial substitution of synthetic Zarrouk medium with 25% of wastewater showed no adverse effect on chemical composition of the biomass including high protein content (45–58% dry weight) and favorable fatty acid composition (42–45% PUFAs of total fatty acids). Evaluation by optical microscopy showed that microfiltration caused cell rupture at the moderate level while centrifugation had more severe effect on A. platensis. Effect of centrifugal forces and shear stress on A. platensis cells was confirmed by detecting lower lipid content in samples after applying both microfiltration and centrifugation due to cell content leakage.