





with different polarities to a battery with 12V and 36 A by means of flexible connecting wires.

The anode or sacrificed electrode (aluminum sheet) was connected to the cathode of the battery and the cathode (inox electrode) was connected to the anode of the battery.

The initial experiments were made by utilizing only tap water or tCG water. In the next experiments chemical dosing was applied using the following chemicals: Water A: 316 mg/L NaOH (sodium hydroxide addition); Water (B): 310 mg/L NH<sub>4</sub>OH (ammonium hydroxide addition) and Water (C): 270mg/L CaO (lime addition). In all experiments in the sedimentation tank a detention time was applied varying from 45 minutes to 2.00 hours.

## Results

Table 1 shows the water quality of tap water from the reticulation system of Campina Grande, Paraíba State, Brazil. Table 2 shows the theoretical results of lime softening process applied to tCG tap water. Theoretical results after conditioning application; i.e. lime-soda softening are shown in Table 3. The values were obtained by applying the STASOFT software [8], for terrestrial waters. These values can also be obtained 7111(7n69(va)-5(l)1(711 21(b)11(t)29)5(b)11(t)-6(a)9

TDS( mg/L)

reduction produces an increase in hydroxyl ions. Oxidation/ transformation unit of the reactor furnishes a continuous current of low voltage which circulates between the electrodes and, thus, propitiates the electrolysis.

### Electrolytical softening

Generalities: The electrolysis process was applied to soften the hard water from the reticulation system of Campina Grande, Paraíba, Brazil. This water, here termed tCG, has the following chemical classification: "Low ionic strength water (Ionic strength calculated by using Langelier Equation given by  $I=0,5* 10^{-5}TDS$  where TDS is in mg/L), chloride concentration adequate for public use but showing corrosiveness ( $Cl^- > 50mg/L$ ) and with predominance of permanent hardness or noncarbonated hardness".

The electrolytic station is showed in Figure 2 and is described as follows: A reactor of two liters was used in which was immersed an electrolyte cell made with two steel electrodes and two aluminum electrodes. Both had an area of 50 cm<sup>2</sup>, a thickness of 2 mm and are 0.5 cm far from each other. In the corner of the electrodes a 3 mm hole was made located 1 cm on the edges of the electrode. The end of a rigid wire was isolated in the small side of the electrode. This wire had 1.5 mm diameter and its length was 20 cm. eight isolating spaces were made to ensure a good distance between the electrodes. They were interlinked



