



**Centre for electric vehicle experimentation in Quebec**  
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**Project Ni-CAD Peugeot 106 Electric**  
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**Technical Report:**

**To analyze the results of the regeneration of Nickel-Cadmium (Ni-CAD) battery bank of batteries using the DUO-REGEN Technologies Method and Additives & Machinery**

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## **Introduction**

One of the Peugeot model # 106 electric vehicles owned by the municipality of Sainte-Jerome, Quebec, Canada had an autonomy problem, making the vehicle unusable. The vehicle barely was able to attain a distance of 25 km. The limitation of the electronic power manifested itself as soon as it was started and put to use (the decreasing capacity to supply current) and a complete charge was not attainable (bad absorption). The vehicle is equipped with a 120 Vdc Ni-cad batteries. A 20 Saft STM 5-100 MRE (6 volts nominal) in series with 100 Ah rated capacity at c/3.

## **Placing in Context**

The present study was to determine the efficiency of a bank of Ni-CAD batteries after a regeneration using the method and products supplied by Duo-Regen Technologies, LLC. Normally, the total replacement of the bank of batteries would be advocated and recommended under these situations.

The Duo-Regen Technologies, LLC personnel proposed to guide us through the necessary steps to recondition and restore, back in good shape the bank of batteries. The method consisted of a series of stages, which intervened discharging and recharging cycles during which the addition of additives were added differently by steps. To accomplish this, a DUO-REGEN universal manual de-sulphater /charger, manually adjustable both in tension (V) and in current (A) along with 3 concentrated additives were put at our disposal.

## **Hypothesis**

The bank of batteries according the initial vehicle's specifications should normally have a life corresponding to 100,000km. The loss of capacity manifested itself at 25,000km. The possible causes of this issue could be several:

- Repeated charging, without previously having discharged sufficiently enough or not at all the bank of batteries (memory effect) = a depression of tension and courant.
- The malfunctioning of the charging system
- The malfunctioning of the cooling system belonging to the bank of batteries
- One or more battery cells corroded and damaged (lack of water, internal breakage...)
- Bad internal electrical contact due to excessive crystal-clear and oxydation

## **Presentation of the Results**

- A significant augmentation/increase of the capacity of the battery bank was registered after the treatment according to the DUO-REGEN concept. During the last test, the battery displayed a capacity of 85 Ah from the 50 Ah displayed at the start. The initial battery capacity (news battery) is 100 Ah.
- An autonomy of 60km (without pulse) was well noted the 20<sup>th</sup> and 21<sup>st</sup> of December 2005. New vehicle in same condition make 68 km.
- The bank of batteries (120V) now displays a rate of charge of 100% after a charging cycle without any abnormal increase in temperature.
- The display of the lowest level of the bank of batteries is 20% and the electronic limitation of power initializes at 20% like it is supposed to do normally.

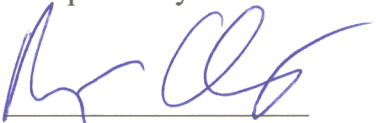
## **Evaluation of the new capacity**

- Individual 36V battery: Discharge # 5, test Ah at 1.9 ohms = 19A at 36V nominal  
4.5Hrs at 19A = 85.5 Ah at C/5
- Batteries separated in 2 of 36V sections: discharge # 5, test Ah at 1.9 ohms = 19A  
at 36V nominal  
4.5Hrs at 19A = 85.5 Ah at C/5

## **Conclusion**

It was demonstrated and registered that right from the onset the regeneration method of the Ni-CAD bank of batteries by the DUO-REGEN method functions.

This demonstration allows us to state that it is possible to bring back to life a bank of batteries having lost its capacity and thus becoming unusable to a more than acceptable level of performance. A continued follow-up, will allow to well determine and evaluate the efficiency of this electro-chemical method that has allowed us to recover this bank of 20 batteries that was prioritized to indisputably (fatally) destined to the junkyard and to be replaced by a brand new bank of batteries.



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