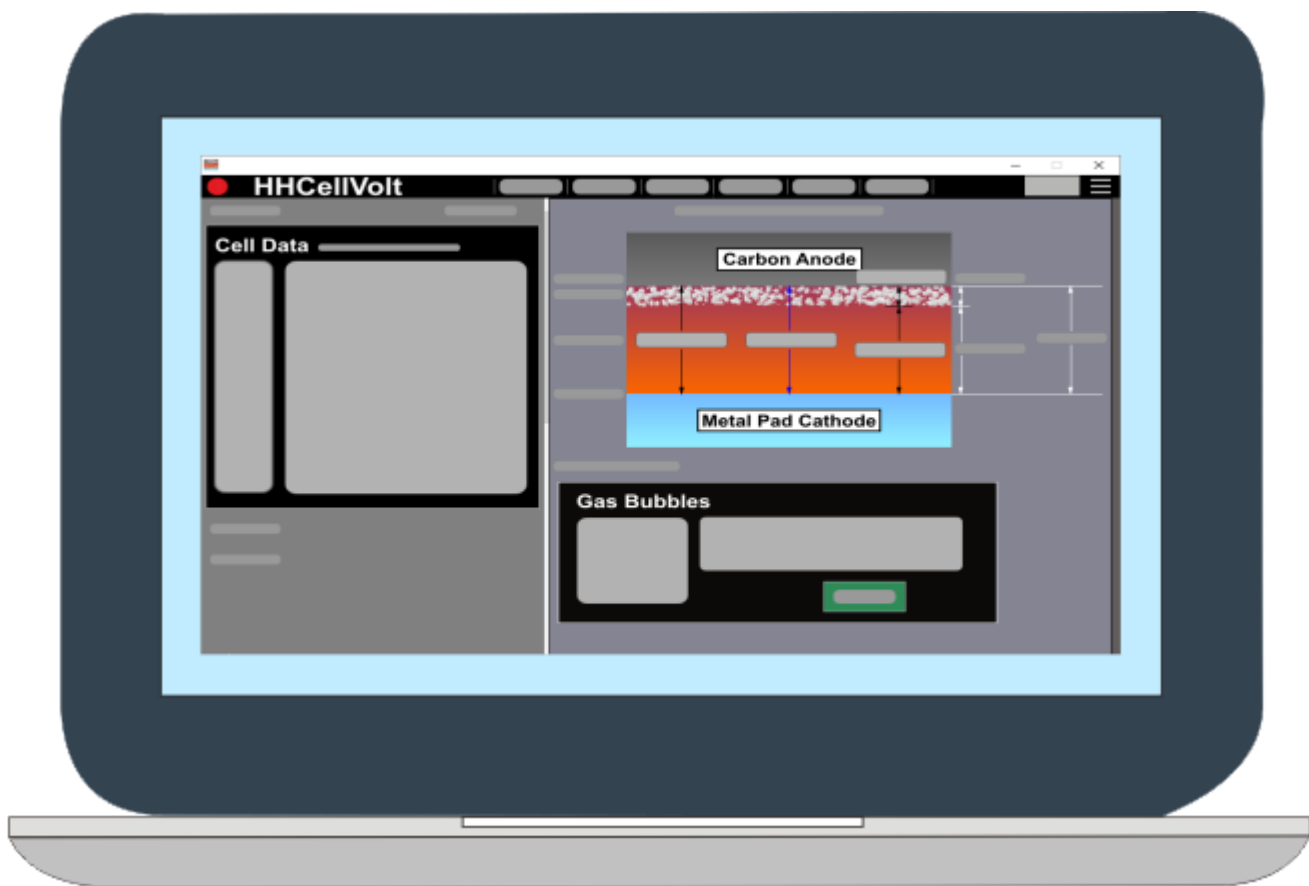


# About HHCellVolt

by Peter M. Entner



A short introduction to demonstrate the potential and capabilities of the HHCellVolt software.

For several years MS Windows PC programs were used to investigate the essential parameters to operate an Hall – Hérout electrolysis cell like the cell voltage, cell layout, operational factors and electrolyte properties. These programs let you optimize these parameters, for instance, concerning energy consumption or heat loss.

HHCeIlVot is an enhanced version of this software that contains new features. These pages describe in detail one of these extensions namely the energy balance.

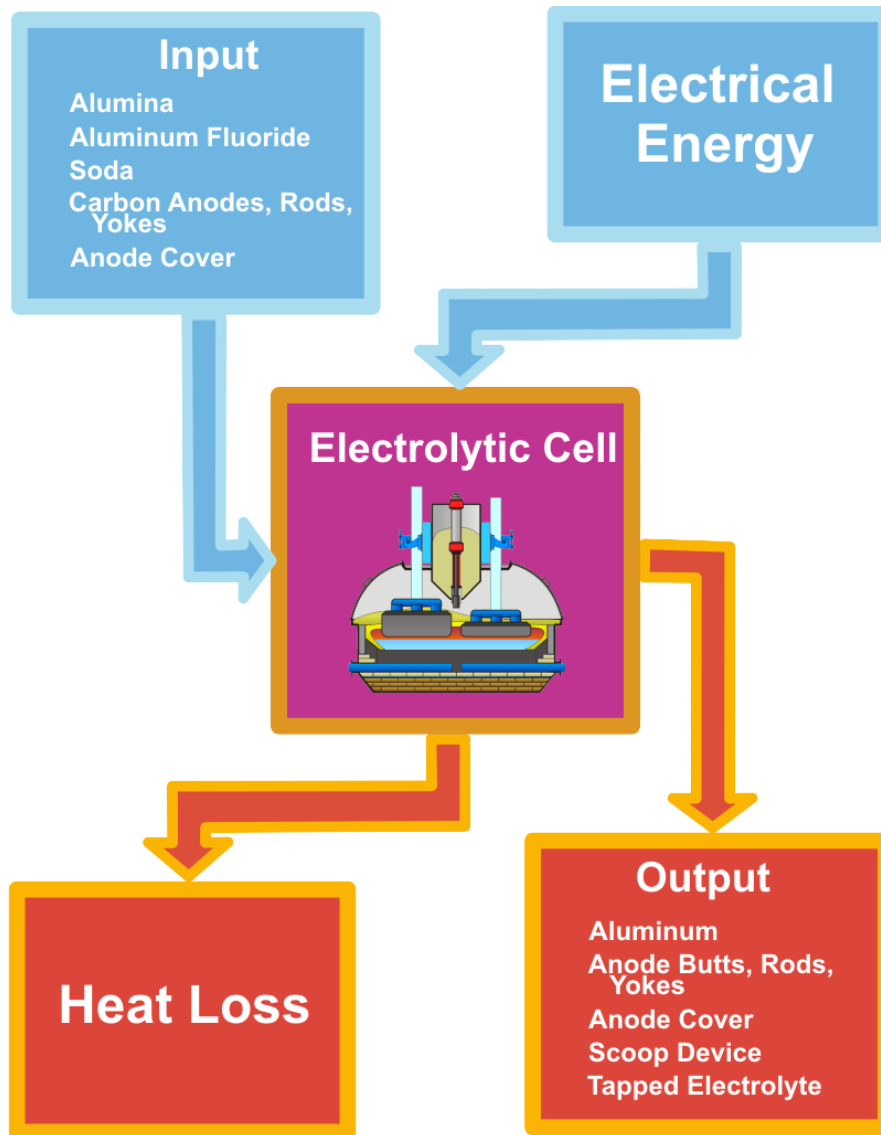
## **Basic Energy Balance**

The Basic Energy Balance considers the electrolysis reactions, heating of alumina as well as the anodes and the heat production of the internal busbars. At the beginning of program development this type of balance was used for educational purposes (seminars) and to demonstrate the effect of replacing the consumable carbon anodes by inert non consumable anodes.

## **Extended Energy Balance**

The Extended Energy Balance considers in addition to the Basic Energy Balance more events and chemical reactions that happen in the electrolysis cell.

The next figure shows the principle of this balance namely the material and energy that enters the electrolysis cell and the corresponding output.



## Reactions in the Electrolysis Cell

The chemical reactions and processes in the electrolytic cell produce either energy (exothermic reactions, heat sources) or consume energy (endothermic reaction, heat sinks)

HHCellVolt divides the additional chemical reactions and events (compared to the Basic Energy Balance) in the following way:

Alumina processes: phase transformation, reactions of impurities and sodium oxide reaction.

Anode Processes: carbon airburn, reaction of impurities and Boudouard reaction.

Other Processes: heat aluminum fluoride, radiation during anode change, heat anode cover and crust formation.

## Data Input

HHCellVolt applies default values but for every parameter you find panels to change these values. For the input fields you use the conventional keyboard or the mouse wheel and for some parameter value sliders are available:

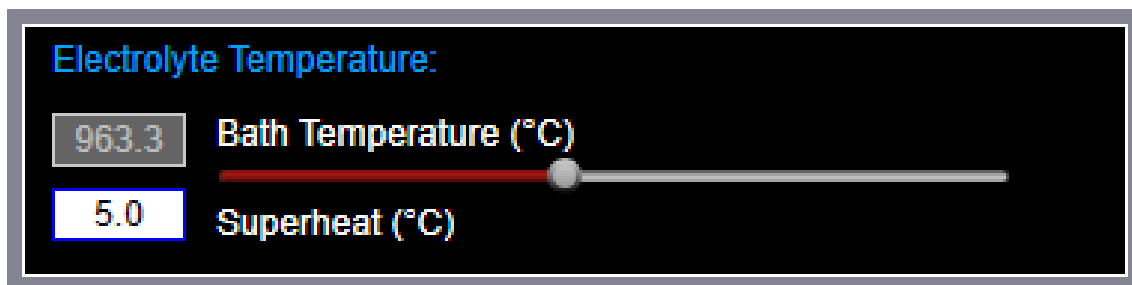


Fig. 1: Input fields and value slider for Bath Temperature and Superheat: the input field of the superheat is activated indicating that the bath temperature follows the liquidus temperature.

## Output of Results

For the energy balance you may select as units:

Power (kW),

Specific Electric Energy (kWh/kg Al),

Tension (V).

HHCellVolt uses for brevity Tension and not Equivalent Voltage as some publications are doing.

For the mass balance HHCellVolt calculates

Mass (kg/day),

Specific Mass (g/kg Al).

The next figure shows the calculation details in form of a Sources and Sinks Diagram

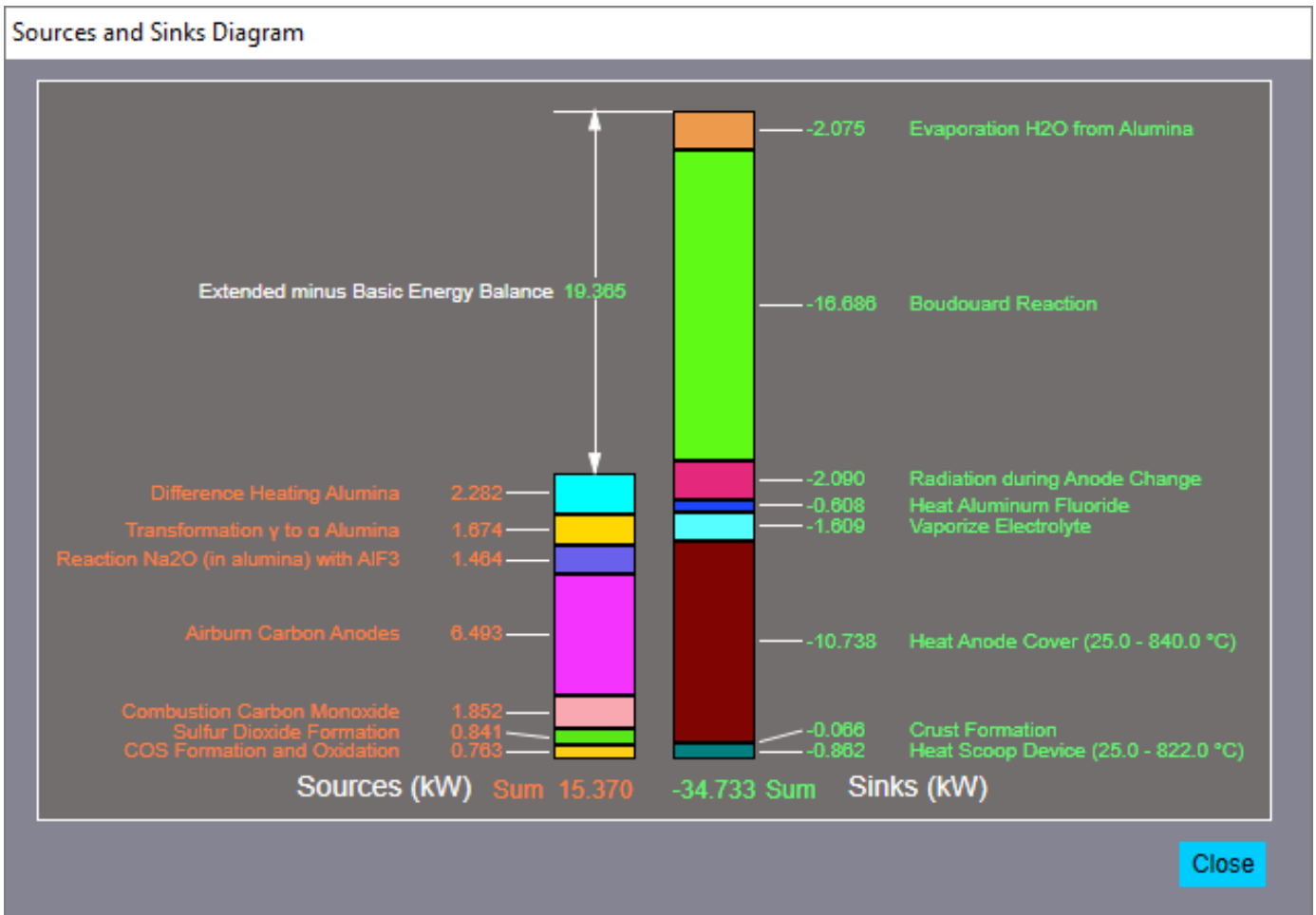


Fig. 1: Sources and Sinks Diagram of the reaction and processes HHCeIVolt takes into account in addition to the Basic Energy Balance.

## More Information

If you want to receive more information please consult the web site:



<http://peter-entner.com> .

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