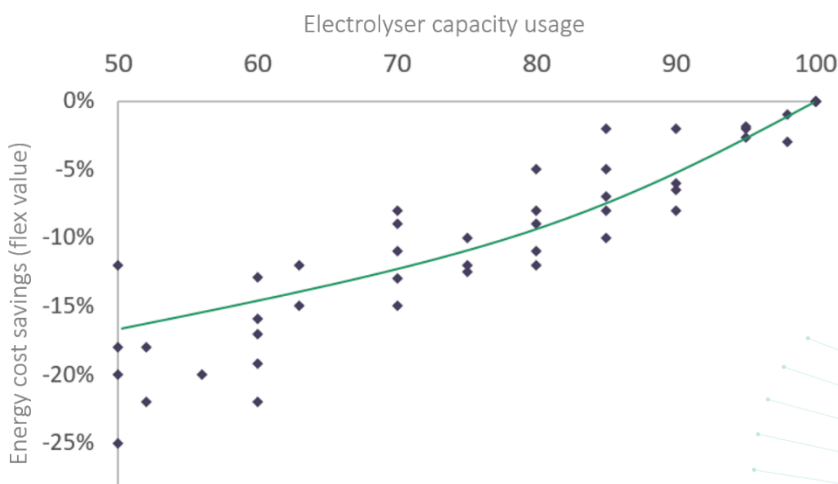


Techpaper #1 – electrolyser flexibility & capacity utilisation

An electrolysis process, and by extension, any industrial process is typically designed to operate as close to nominal capacity as possible. This way the investment (capex) yields the maximum return, as the installation is used to its fullest production capacity potential. While this utilisation at nominal capacity of a capex intensive asset might be strived at, in reality this goal might not always be met. In economic market reality, periods with lower and higher product demand exist, requiring the industrial processes to adapt their production volumes to market demand. Focussing on chlor-alkali electrolysis, where a brine is converted into chlorine gas and caustic soda, this is also the case. The products produced are chemical building blocks as used for the manufacturing of PVC, soap or other products. The prosperity of these markets, and by extension the state of the economy, will thus dictate the amount of chlorine gas and caustic soda to be produced.

This results in the fact that the production capacity, and thus the average load of an electrolyser, will fluctuate over time. While an electrolyser continuously running at nominal load does not entail any flexibility, lower capacity utilisation does allow room for optimal scheduling, i.e., flexibly consuming power. In fact, the lower the capacity utilisation, the more room for shifting of electricity consumption and thus a higher value is to be found linked to this flexibility. All of this of course within the technical and operational limits. The below figure qualitatively shows the energy costs savings, related to optimally making use of the flexibility of the electricity consumption, and linked to the electrolyser capacity usage. This function depends on various aspects, such as the minimum stable power level of the electrolyser, the ability to ramp up and down quickly, the size of the product storages, etc. and can be non-linear. On the other hand, the volatility of the energy prices play an important role, as a more volatile market offers more opportunities for valorising flexibility.

It can be concluded that flexibility in an electrolyser, especially in a chlor-alkali electrolyser, of which the produced products are used in a chain of chemical processes, vary with the capacity usage and indirect thus the market and economy. Greater value is to be found at moments with lower product demand. One could say the value of flex could be a natural hedge against the bottom of the cycle of the economy.



Graphical representation of the energy cost reduction linked to optimal flexible operations in relation to the capacity utilisation of the electrolyser.

