

SH7/2/14 project

Towards a sustainable fine chemical and pharmaceutical industry: screening and re-utilisation of carbon-rich liquid wastes

Nowadays, many industries generate large quantities of aqueous wastes containing organic substances (process wastewaters=PWW's) beside inorganic compounds. Before discharging these wastewaters into the environment like domestic wastewaters, industrial wastes must undergo various physical, biological, chemical or combined treatments to reduce their toxicity and to convert them to biodegradable materials.

Within this large area of wastewater production, pharmaceutical industry is considered to be of great importance, due to its increasing volume which is accompanied by increase of by-products and wastes. Liquid wastes of high organic content which make up a high proportion of them have been classified as hazardous wastes and are mainly disposed of by incineration.

Among typical treatment methods applied for these kinds of wastes, biological treatment is primary method for removal of organic pollutants, but often not suitable since they may contain toxic, non-biodegradable and hazardous pollutants. Moreover, microbes are vulnerable to (chemical) shocks, further limiting their use in the chemical industry. This is especially so in the fine chemistry sector since the units are relatively small and operated mainly in batch mode, leading to large variations in effluent composition.

During our project work (SH7/2/14) there were elaborated methods for characterization, disposal and utilization of PWW's. The required qualification methods (Chemical characterization, COD and TOC measurements, Biodegradation characterization, BOD, Determination of the volatile organic content, Wet oxidation properties, XRF determination of metal content of wastewaters, Zahn-Wellens Test, NMR, GC-MS, HPLC-MS, toxicity measurements) serve for the classification of a given PWW, on the basis of the data served by these biological and chemical characterizing methods one can decide about the required treatment methods for the PWW in hand. A complex treatment plant has been suggested, it consists of primarily a medium size wastewater treatment plant with an activated sludge based process, in addition distillation, wet oxidation and advanced oxidation processes for the necessary complementary treatments of the different PWW's. The designed treatment plant includes storage tanks for the reception of the different (directly biodegradable and recalcitrant) PWW's and post treatment devices for the degradation of emergent pollutants and for disinfection.