Rehabilitation of Water Resources induced by Large Scale Mining in Germany

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Extended Abstract

Lignite extraction by open cast mining in the Lausitz and Leipzig mining area has had a high impact on surface and subsurface water resources. During mining in 150 years, the water withdrawal from the groundwater layer resulted in a deficit of more than 13 bil. m³. Furthermore, the water quality deteriorated due to oxidation of pyrites minerals in the overburden. Finally, the ground water rise causes a lot of problems due to construction work done in the meantime not respecting the final ground water level. The overall aim of rehabilitation is to restore a stable, mostly self-regulating water balance in the area, as well on quantities as well on qualities.

Fast flooding of more than 50 big open mine pits with water from nearby rivers and mines allows economic stabilisation of pit slopes as well as water quality. An integrated water management system had been installed on technical as well as organisational basis.This water management consists of a large number of controlled in- and outlets, weir, pipes and monitoring wells. An innovative controlling and steering entity (Flutungszentrale Lausitz) had been installed. Surplus waters from rainfall are diverted for flooding mining lakes in the catchment area of river Spree, Schwarze Elster and Neiße. Furthermore, sophisticated working tools to predict short and long term effects had been developed. Modeling long term water balance (WBalMo) is carried out to use water streams on a daily basis. This steering committee is supervised by water authorities of the Länder in order to fulfill the EU water frame directive.

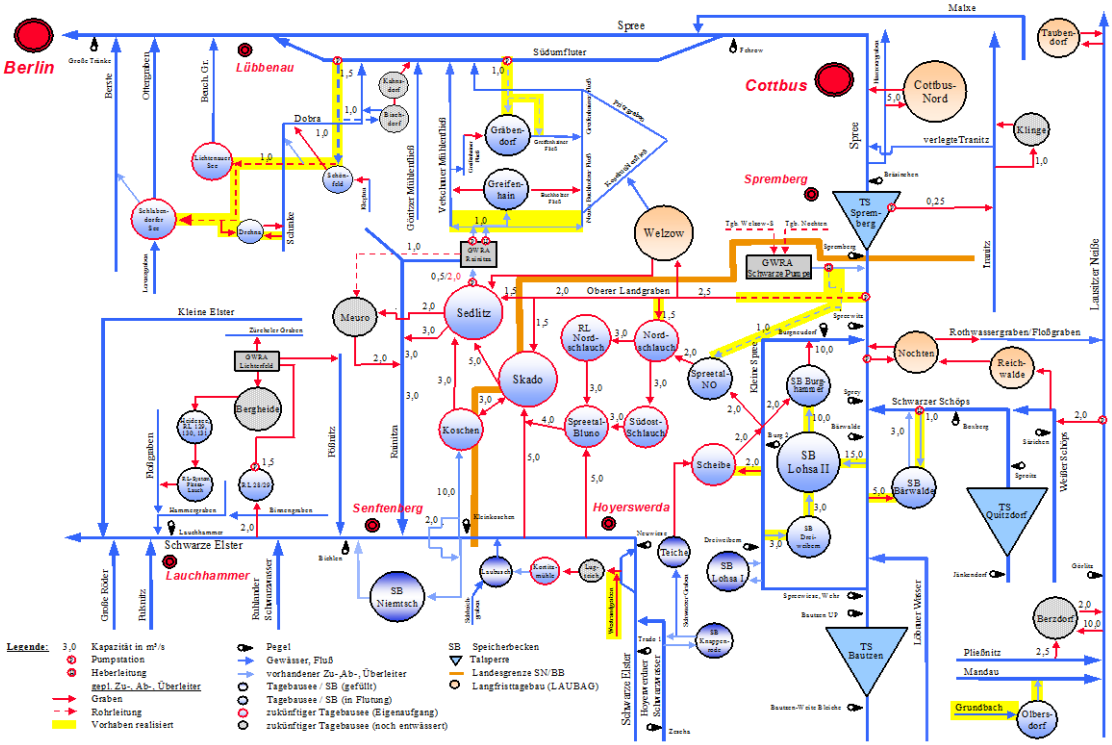

Figure 1 *Water management system in Lusatia*

Pit lakes and their run-off waters mostly do not meet the water quality requirement of discharge waters [1]. Hence, water treatment by chemical compensation as liming as well biological neutralization is carried out. Innovative liming technologies are developed with scientific support. A mobile treatment plant will treat the water by floating on the lake surface. Optimizing the liming process, the effectiveness on raw materials use has been pushed up. Further development work is carried out on test implementation with hydro carbonate buffering with CO_2 gas injection.

While mining on large scale ceased in this area, the ground water table rose in recent years. Water courses again are predominated by groundwater inflow. Large scale investigations have been carried out in order to detect the most important sources of iron contamination along the river Spree. Increased ferrous iron concentrations have been detected for example at highly permeable aquifers and the outflow of former bog areas. In order to remove iron from the Spree river water, various treatment units were designed and implemented. The concept for removing the iron followed the principles of simplicity in process, low cost design and minimal chemical additions. Water treatment plants are reused today as sedimentation ponds. Microbial treatment of groundwater shows good result significant by reducing iron and sulfate in the groundwater.

Key words: Water management system, iron hydroxides, sulfates, innovative treatment, removing iron techniques

References

[1] Grünewald, U. Uhlmann, W. Perspektive See, Cottbus/Dresden 2012