

CAVITIES AS THE SOURCES OF ACID MINE PROCESS IN THE NIWKA-MODRZEJÓW COAL MINE (POLAND)

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ABSTRACT: Acid mine process is one of the most significant sources the pollution of surface water. The intensive process was discovered in the Niwka-Modrzejów Coal Mine at the level 100-130 m. In this paper the method of prevention by the filling cavities of wastes from energy plants was proposed.

KEYWORDS: Acid mine process, Coal mine, Wastes from energy plants

RESUME: Les eaux de mine acides sont une des sources de pollution des eaux la plus importante. Cette pollution s'est révélée très importante dans la mine de charbon « Niwka-Modrzejów » (étage 100-130 m) aujourd'hui fermée. Dans cette publication, on présente la méthode de prévention de la pollution qui a été adoptée et qui consiste en un comblement des vides d'exploitation à l'aide de résidus industriels de production de l'énergie.

MOTS-CLEFS: Eaux de mine acides, Mine de charbon, Résidus industriels de production de l'énergie

1. Introduction

Acid mine drainage is one of the most significant environmental challenges and a major source of water pollution worldwide (Frost 1979; Younger 1995; Wood et al., 1999). Particularly acid mine processes constitute a notable problems at abandoned coal mines. The intensive acid mine process were discovered in the Niwka-Modrzejów C.M. in the Upper Silesian Coal Basin in Poland. (Pluta et al., 2002; Pluta, Jackowicz-Korczyński, 2003). In this paper the diagnosis of sites of acid mine process and method its prevention is presented.

2. Sampling area and its geology

The Upper Silesian Coal Basin (USCB) is located in the southern part of Poland. Sixty six hard coal mines were situated in this region (Fig. 1). The coal has been mined since the second half of the 18th century. One of the oldest coal mine is the Niwka-Modrzejów Coal Mine, which was active since 1810 to 2002. This mine was situated in the eastern part of the USCB (Fig. 1). Carboniferous formations consist of a complete profile of sediments from Namur A to Westfal B which is composed of claystones and sandstone and mudstones with layers of hard coal. This sediments are covered with formations of Quaternary formations of different seam thickness like fine and coarse sands, sand-gravel mixed interbedded with clay and loam. Carboniferous formation lie on the majority of coal area

almost on the surface but Quaternary sediments lie mainly on lower parts of river valleys where their seam thickness reaches up to about 50 m.

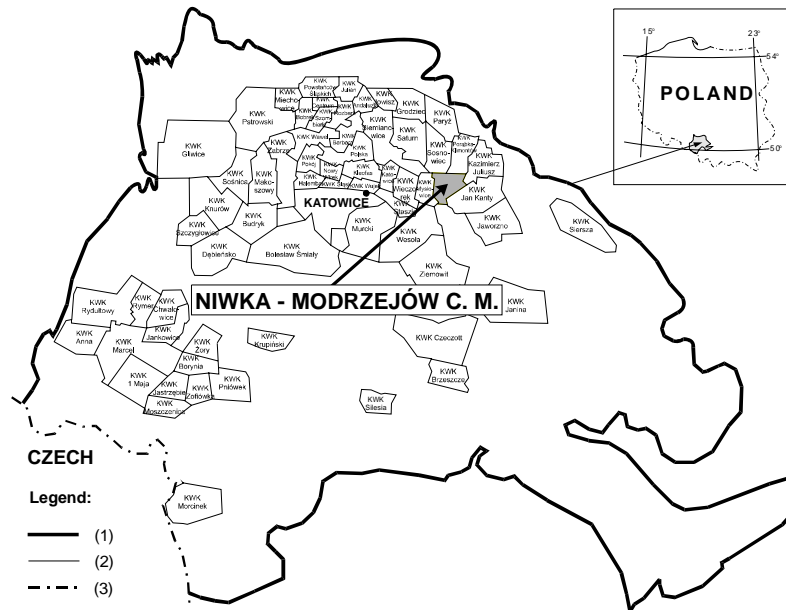


Figure 1. The coal mines of the Upper Silesian Coal Basin (Poland) (1-base of Carboniferous- bearing deposits, 2- coal mine boundaries, 3- boundary of Poland)

3. Cavities in the Niwka-Modrzejów Coal Mine

The intensively mining in the Niwka-Modrzejów C.M. came into being old mine workings in the Carboniferous formation. The capacity of these cavities in three regions close to the surface (I 450.000 m³, II 1.260.000 m³, III 1.870.000 m³) is about 3,5 mln m³ (Fig. 2).

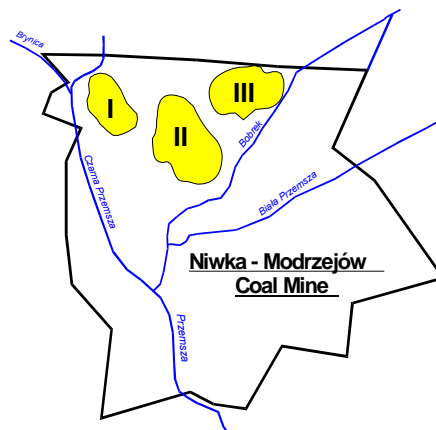


Figure 2. Location of cavities in three regions on the coal mine area of the Niwka-Modrzejów C.M.

4. Acid mine process in the Niwka-Modrzejów Coal Mine

Acid mine processes have been recognized in the Niwka-Modrzejów C.M. for about fifty years. One of the most intensive is located in cavities at the level of 100-130 m. Water from this level has pH between 2,5 and 3,8 and the temperature about 20°C. Concentrations of iron ions reach up to 1350 mg/dm³ and of sulphate ions up to 4440 mg/dm³.

5. Prevention of the acid mine processes

Prevention of the acid mine process in the Niwka-Modrzejów is necessary. Methods aiming at elimination of sulphide oxidation at the level of 100-130 m, which are significant sources of acid mine drainage and the pollution of surface water, should be used. The rocks containing the sulphide minerals must be separated from oxygen and waters. The potential risk of acid mine processes can be determined by filling of cavities in old mine workings up to level of 100-130 m. Implementation of appropriate prevention reduce the potential risk of sulphide oxidation has been determined by introduction of large quantities industrial wastes. Mostly kinds are fine-grained wastes from energy plants: fly-ashes of coal burning or flu gas desulphurization products.

6. Conclusions

In this paper the diagnosis of acid mine process and method its prevention in the Niwka-Modrzejów Coal Mine is presented. Acid mine process at the level of 100-130 m can be determined by filling the cavities in old mine workings by fine-grained wastes from energy plants.

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